


Spring 2017

# Facilitating Higher Levels of Thinking and Deeper Cognitive Processing of Course Texts Using Reciprocal Teaching Strategies in Asynchronous Discussion Forums

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FACILITATING HIGHER LEVELS OF THINKING AND DEEPER COGNITIVE  
PROCESSING OF COURSE TEXTS USING RECIPROCAL TEACHING  
STRATEGIES IN ASYNCHRONOUS DISCUSSION FORUMS

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A Dissertation Submitted to the Faculty of  
Old Dominion University in Partial Fulfillment of the  
Requirements for the Degree of

DOCTOR OF PHILOSOPHY

EDUCATION

OLD DOMINION UNIVERSITY  
May 2017

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## **ABSTRACT**

### **FACILITATING HIGHER LEVELS OF THINKING AND DEEPER COGNITIVE PROCESSING OF COURSE TEXTS USING RECIPROCAL TEACHING STRATEGIES IN ASYNCHRONOUS DISCUSSION FORUMS**

Jenifer R. Marquis  
Old Dominion University, 2017  
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Reciprocal teaching is an interactive instructional procedure that improves students' text comprehension skills through instruction that utilizes scaffolds of four comprehension-fostering and comprehension-monitoring strategies: predicting, questioning, clarifying, and summarizing (Palincsar & Brown, 1984, 1986; Palincsar, Brown, & Martin, 1987). Reciprocal teaching involves student-led instruction, modeling, practice, and feedback in metacognitive self-monitoring and evaluating strategies (Brown, Campione, & Day, 1981). The purpose of this study was to determine the potential of reciprocal teaching to facilitate deeper cognitive processing and higher levels of thinking related to course texts in an online, asynchronous community college course. The strategies and peer teaching were incorporated into discussion forums for dialogue, strategy use, and peer teaching.

Studies have shown that purposefully designed interactions can lead to improved learning in distance courses. According to Borokhovski, Tamim, Bernard, Abrami, and Sokolovskaya (2012), designed interaction treatments include intentionally implemented collaborative instructional conditions for increasing student learning. In this study, reciprocal teaching provided student-student, student-teacher, and student-content interaction and supported the negotiation of meaning in a social learning atmosphere. Peer teaching resulted in generative processing through the reworking of a topic from the textbook into a lesson and questions for

peers (Collins et al., 1989; King, 1991; Pressley et al., 1992; Rosenshine et al., 1996; Wood et al., 1990).

Quasi-experimental, multiple methods were employed to compare the effects of traditional discussions and reciprocal teaching discussions. A convenience sample of two sections of the same community college course was studied over 16 weeks. Outcome variables were level of thinking, understanding of course texts, online reciprocal teaching implementation, and students' reflections on the relationship between discussions, strategies, and learning. Results indicated that reciprocal strategies promoted significantly higher levels of thinking and deeper processing of course texts compared to traditional methods. The study found that reciprocal teaching could successfully be incorporated into the online format providing a space for students to use generative learning strategies and social negotiation to actively engage in discussions about their reading (Palincsar, 1998; Wittrock, 1990).

*Keywords:* reciprocal teaching, interaction, cognitive strategies, metacognitive strategies, peer teaching, asynchronous online course, and discussion forum.

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This dissertation is dedicated to my husband Bryce who always believed in me and sacrificed numerous hours to allow me to follow my dream of becoming a Ph.D. I also dedicate this dissertation to Grandma Madeline who taught me that my education is something that no one can ever take away. Finally, to my children Sarah, Lauren, Michelle, and Rudy who probably don't ever remember a time when I wasn't in school.

## ACKNOWLEDGEMENTS

Thank you to the faculty and peers who walked alongside me in my journey towards becoming a Ph.D. Each of you contributed to my knowledge of the field of Instructional Design & Technology in a unique and profound way and had a part in shaping my understanding of teaching, learning and technology.

I want to thank the entire faculty in the Instructional Design and Technology program at Old Dominion University. The high-quality instruction, synchronous course format and rigorous content of the program have prepared me to make a contribution to our field through research and scholarly activity. Most notably, I want to thank Dr. Ginger Watson who stepped in when my advisor and chair retired. She has provided the guidance I needed through many early morning Skype sessions. Her expertise and knowledge were an invaluable part of my education and success as a student.

I also want to thank my peers. Without your support this would have been a lonely six years, but knowing you were there kept me going. Becoming a PhD from a distance requires strong connections and support. I feel we have done this together. Thank you.

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## **CHAPTER I**

### **INTRODUCTION AND LITERATURE REVIEW**

#### **Introduction**

Learning can be challenging for students taking online, asynchronous college courses when much of the content is text-based and the course is not designed to offer alternatives to the types of interactions found in face-to-face and synchronous online classes including live class discussions, strategy instruction, real-time interaction with classmates, and the immediate opportunity to ask and answer questions (Abrami, Bernard, Bures, Borokhovski, & Tamin, 2011; Anderson, 2008; Kanuka, Rourke, & Laflamme, 2007). Furthermore, teaching online can be challenging because instructors must understand how to leverage the asynchronous tools in the course management system to facilitate strategies, dialogue, and cognitive and social interactions to support higher levels of thinking and deep understanding of course content (Abrami et al., 2011; Bernard et al., 2009; Bernard, 2004).

Studies have shown that designing more interactive instruction that allows students to communicate better among themselves and engage with learning materials can increase the effectiveness of distance education (Abrami et al., 2011; Anderson, 2003). Strategies designed to encourage high levels of student interaction with the content and with the teacher or other students have a significant positive influence on learning achievement (Abrami et al., 2011). Interaction involves the transfer of information between the student and student, the student and content, or the student and teacher (Moore, 1989). High levels of at least one of these types of interaction are vital to a quality online learning experience (Anderson, 2003).

One of the primary tools for interaction in an asynchronous online course is the discussion forum, but there is little evidence to show that it automatically facilitates the types of

interactions that lead to higher-level thinking and deeper levels of learning. According to Morrison, Watson, and Morrison (2012) the lack of deeper understanding found in student-student interactions in discussion forums can be attributed to a lack of initial understanding of the content prior to engaging in online discussions. Too often, students are assigned a reading passage or required to view a presentation or video without engaging in learning strategies to ensure that cognitive processing of the content occurs prior to or during discussion. When students don't understand the content, they will reword a previous post or contribute a superficial comment leading to little or no meaningful interaction with content (DeLoach & Greenlaw, 2007).

In a typical discussion forum, students complete a reading assignment or view content, answer an open-ended question posted by the teacher, and respond to other students in the form of a discussion. Interaction is occurring, but it is often superficial in nature. Students are able to complete the task with a surface-level post and a shallow response back to other students. The online teacher may not know if the students actually read the assigned text or viewed the content, and if they did, whether they understood it.

Strategies to connect students to content must be carefully selected and embedded in an online course in conjunction with providing opportunities for students to interact with each other and the teacher. While learner-content interactions have been found to be highly effective for helping students develop an understanding of new content, further research is needed to determine the nature of effective interactions and how to intentionally incorporate them into an online course (Bernard et al, 2009). According to Borokhovski, Tamim, Bernard, Abrami, and Sokolovskaya (2012), designed interaction treatments include intentionally implemented collaborative instructional conditions for increasing student learning.

Empirical evidence does exist for purposeful interaction strategies that are directly related to learning outcomes in discussion forums. Studies have been conducted on the use of discussion forum strategies such as scaffolds, frameworks, grading rubrics, instructor facilitation techniques, elaboration, and embedded strategy prompts (Giacumo, Savenye, & Smith, 2013; Johnsey, Morrison, & Ross, 1992; Kanuka, 2005; Kanuka et al., 2007; Nandi, Hamilton, & Harland, 2012; Reid, 2012). However, there is a gap in the literature about specific strategies that can be used to facilitate deeper understanding of text-based reading assignments and higher-level discussions about those texts in online discussion forums. In the present study, a set of cognitive and metacognitive strategies known as reciprocal teaching was incorporated into asynchronous discussion forums to provide strong associations to text-based content and high-level interactions between students, teacher and content.

Reciprocal teaching is an interactive instructional method that improves students' text comprehension skills through scaffolded instruction of four comprehension-fostering and comprehension-monitoring strategies along with peer-led discussions (Palincsar & Brown, 1984; Rosenshine & Meister, 1994). The four reciprocal teaching strategies are predicting, questioning, clarifying, and summarizing (Palincsar & Brown, 1984, 1986; Palincsar, Brown, & Martin, 1987). Reciprocal teaching involves peer teaching, modeling, practice, and feedback in metacognitive self-monitoring and evaluating strategies (Brown, Campione, & Day, 1981). While reciprocal teaching is well accepted in K-12 and higher education, it has never been studied in an online course using all four of the reciprocal teaching strategies and peer teaching. The purpose of this study was to determine the potential of reciprocal teaching to facilitate deeper cognitive processing of course texts and higher levels of thinking during discussions in an online, community college course. Participants used discussion forums for dialogue, strategy

use, and peer teaching, incorporating the full reciprocal teaching method and all three types of interaction.

### **Theoretical Framework**

The theoretical underpinnings of the present study are derived from a social constructivist philosophy and cognitive theory of learning. Participants in this study socially and cognitively interacted and learned from each other, the content, and the teacher concurrently through peer-led discussions and reciprocal teaching strategies. The course used in this study was *Foundations of Education*, a fully online community college course that students take to fulfill requirements for an early childhood education degree or as a prerequisite for transfer to an education program at a four-year university. This theoretical framework section discusses generative learning, social learning, and peer teaching which are reflective of the learning theories incorporated in the present study.

#### **Generative Learning**

Reciprocal teaching's early roots emerged from the theory of generative learning which supports the idea that learners should be active participants in their own learning experiences and not simply passive recipients (Bell & Kozlowski, 2008; Salas & Cannon-Bowers, 2001; Wittrock, 1974, 1990; Wittrock, Marks, & Doctorow, 1975). Since the introduction of generative learning, researchers have worked to develop and validate a set of cognitive strategies to help students perform less-structured tasks such as reading (Alvermann, 1981; Paris, Cor, & Lipson, 1984; Raphael & Pearson, 1985; Sullivan & Brown, 1984). Some of these strategies include elaboration (Boudreau, Wood, Willoughby, & Sprech, 1999), questioning the text, and generating novel examples (Hamilton, 1997). These strategies activate learning processes to aid in the development of strong mental models necessary for deep processing of text (Kintsch,

1998). In seminal research, Craik and Lockhart (1972) found that information processed at a deep level is better remembered than information processed at a shallow level.

### **Social Learning**

The role of social processes as a mechanism for learning is associated with Vygotsky (1978) who suggested that higher mental functioning of individuals has its origins in social sources. Reciprocal teaching includes the provision of a social setting that enables individuals to negotiate for understanding (Glaser, 1990). Students share the responsibility of determining the meaning of a text through social negotiation. In coursework involving shared discussion, the group's efforts are externalized in the form of a discussion (Alfassi, 1998). This process helps them coordinate their learning efforts in a socially supportive environment (Sporer & Brunstein, 2009).

### **Peer Teaching**

The effects of learning by teaching appear to depend on the extent to which the peer teacher engages in generative processing, that is cognitive processing devoted towards organizing the material into a meaningful representation and integrating this newly acquired information with prior knowledge (Mayer, 2005, 2009; Wittrock, 1989). Learning occurs when peer teachers engage in knowledge building by reflecting on their own understanding of the material and building upon their own prior knowledge while explaining to and answering questions (Roscoe & Chi, 2007, 2008). This social learning process often includes explaining, answering questions, and providing feedback (Cohen, 1986; King, Staffieri, & Adelgais, 1998). Roscoe and Chi (2007) believe the effectiveness of peer tutoring mostly depends on the quality of interactions, such as the nature of the explanations, answers, and feedback provided by the peer teacher. According to social constructivist philosophies, such cognitive activities enhance

comprehension for the individual doing the explaining, because the explainer often must clarify concepts, reorganize thinking, or in some manner re-conceptualize the material (King, 1991).

### **Literature Review**

The literature review is divided into two parts. The first part focuses on reciprocal teaching studies and how the reciprocal teaching method impacts learning. The second part reviews studies that include strategies and methods that impact learning in asynchronous discussion forums. In this study, the reciprocal teaching method will be used in the context of online, asynchronous discussion forums so research on both reciprocal teaching and asynchronous discussion forums are included in the literature review.

### **Reciprocal Teaching**

Reciprocal teaching is a multiple strategy approach that has been studied in many educational settings from elementary to higher education and has shown improvements in reading comprehension in both face-to-face and online settings (Brown & Palincsar, 1989; Palincsar & Brown, 1984, 1986; Palincsar et al., 1987; Palincsar, Ransom, & Derber, 1988-89; Yang, 2010). Reciprocal teaching was originally implemented and investigated with elementary and middle school students, but variations of the technique began occurring after research indicated a correlation between reciprocal teaching and reading comprehension. Reciprocal teaching studies were unique because instead of investigating a strategy in isolation, researchers examined a combination of four strategies as a complex strategy package (Klingner, Vaughn, & Schumm, 1998; Palincsar & Brown, 1984; Sporer & Brunstein, 2009). In the first pilot study, elementary students were taught to use the four activities of self-directed summarizing, questioning, clarifying and predicting, embedded in the context of a dialogue between student and teacher (Palincsar, 1982). Results showed the treatment group achieved criterion



performance on reading assessments while the control group did not. Two follow up studies showed dramatic improvements on daily assessment passages with beginning scores of 40% accuracy during baseline increasing to 70% and 80% by the 15<sup>th</sup> day of the reciprocal teaching intervention (Palincsar, 1982). Palincsar and Brown (1986) continued to study reciprocal teaching in a variety of settings and found that reciprocal teaching could be implemented in settings with larger more heterogeneous groups of students and a variety of text types (Palincsar & Brown, 1986).

Extending the previous work, Alfassi (1998) conducted a study focused on remedial readers in a large high school where reciprocal teaching yielded superior results as measured by experimenter-designed reading tests with an effect size of 0.35 to 1.04. However, standardized reading tests revealed no significant intervention effects for either group which is consistent with the results found in other studies (Alfassi, 1998).

Yang (2010) conducted a study on the design of an online reciprocal teaching and learning system to support teachers and students in college remedial reading instruction. A sample of 129 under-prepared college students were encouraged to use multiple strategies of reciprocal teaching that were supported by the functionalities of a dialogue box, chat room, discussion forum, and annotation tool in the system. Researchers measured proficiency levels with a pre- and posttest and documented use of the four strategies using the online system. The results showed that individual student's reading comprehension was enhanced by incorporating different functionalities of the online reciprocal teaching system (Yang, 2010). A limitation to this study was that students did not engage in peer teaching, which is an important aspect of reciprocal teaching.

**Peer teaching.** An integral part of the reciprocal teaching method is student-led discussions. In the present study, a weekly peer teacher posted a lesson and discussion questions on a topic in the assigned textbook chapter. Peer teachers in this study used generic question stems (Appendix A) as a scaffold to facilitate questioning during peer teaching. Rosenshine, Meister, and Chapman (1996) obtained strong, significant results in almost all studies that provided students with generic questions or question stems.

**Questioning.** The benefits of questioning extend beyond the peer-teaching role. All of the students must ask questions during reading as one of the reciprocal teaching strategies, even when they are not acting as the peer teacher. Collins, Brown, and Newman (1989) found that composing questions may require students to play an active, initiating role in the learning process. In a review of intervention studies, Rosenshine et al. (1996) reviewed 26 studies on teaching students to generate questions during or after reading a paragraph or passage. Rosenshine et al. (1996) found that teaching students the cognitive strategy of generating questions about material they had read resulted in gains in comprehension with an overall median effect size of 0.36 when standardized tests were used and 0.86 when experimenter-developed tests were used.

In a study on peer interaction and learning during teacher training, King (1991) found that students trained in generating comprehension questions during or after reading demonstrated gains in reading comprehension. Asking and answering questions prompted learners to think about the material read, elaborate upon it, organize it, and relate it to prior knowledge; and such cognitive activities foster comprehension (King, 1991). King found that reciprocal questioners externalized their cognitions through verbalization in the form of explanations indicating higher-level thinking.

King (1992) found that a guided questioning strategy facilitated learning by prompting students to generate specific thought-provoking questions pertaining to material to be learned, and those questions in turn elicited relevant explanations. Other studies have shown that elaborations provided when answering questions are more conducive to learning than elaborations provided by a teacher, textbook or other external sources (Pressley et al., 1992; Wittrock, 1990; Wood, Pressley, & Winne, 1990).

**Dialogue.** A critical aspect of reciprocal teaching is the quality of discussions. Rosenshine and Meister (1994) reviewed 16 studies on reciprocal teaching and reported there was little direct observation of the quality of dialogue in the studies represented, and no investigator presented a set of criteria specifically designed for evaluating it. No criteria checklists were developed that were specific to reciprocal teaching and few studies provided samples of the actual dialogues. Aside from the original Palincsar and Brown (1984) study, few researchers assessed the quality of student questions and summaries during the dialogues.

One study did report dialogue quality in a cooperative learning approach. Students in the treatment group received three days of researcher-facilitated instruction in how to use the strategies in cooperative groups (Klingner et al., 1998). From the fourth day on, these students worked in groups with a rotating group leader. Peer talk during cooperative group sessions indicated that 65% of discourse was academic in nature and content related, 25% was procedural, 8% was feedback, and 2% was unrelated to the task. This study is one of the few studies reviewed where measures of the quality of dialogue were used and objective results were reported.

In the present study, standard measurement tools were selected for the specific purpose of objectively analyzing dialogue and peer teaching. The researcher and teacher analyzed the

quality of peer teaching posts and responses by rating levels of thinking using the SOLO Taxonomy (Appendix B). In addition, students were graded on their use of the four strategies in the reciprocal teaching strategy forums using the Reciprocal Teaching Rubric (Appendix C).

### **Asynchronous Discussion Forums**

This portion of the literature review presents studies that emphasize learning in text-based, asynchronous discussion forums. The criteria for inclusion in this portion of the literature review include an objective assessment of learning and/or an analysis of level of thinking in the discussion forum. Level of thinking includes the terms critical thinking, higher-level thinking, cognitive presence, or deep learning.

**Higher-level thinking.** Several studies have been conducted to measure higher-level thinking among students during asynchronous discussions (Cheong & Cheung, 2008; de Leng, Dolmans, Jobsis, Muijtjens, & van der Vleuten, 2009; Yang, 2008). Yang (2008) explored the use of teaching assistants and Socratic dialog to foster critical thinking. In a pretest and posttest quasi-experimental study, Socratic dialogue was modeled and facilitated by teaching assistants. A posttest showed an increase in critical thinking and a qualitative analysis described how students' discussion moved from lower to higher phases of critical thinking. This study showed that small discussion groups using Socratic dialogue had a positive effect on fostering critical thinking (Yang, 2008). In another asynchronous study of discussions, learners were instructed to take a perspective in an authentic scenario. As a result, cognitive presence, critical thinking and higher levels of learning were exhibited (Darabi, Arrastia, Nelson, Cornille, & Liang, 2011). Scaffolds including facilitation prompts and rubrics for higher-order thinking were used by Giacumo, Savenye, and Smith (2013) and results showed the participants who used the scaffolds demonstrated higher-level thinking skills more frequently than those who used no scaffold.

Kanuka (2005) conducted an action research study to explore using diverse instructional strategies to facilitate higher levels of learning in text-based learning environments. Five instructional strategies were used in the study including: nominal group technique, synchronous brainstorming, debate, invited guest, and Web Quest. Kanuka used researcher observation notes, position papers, and the SOLO taxonomy to evaluate each of the instructional strategies' effectiveness. Web Quest was found to be the most effective strategy in this study. Results from these studies showed that instructional strategies can be translated to the online classroom and that certain instructional strategies are more effective than others at creating the conditions necessary to facilitate higher levels of learning (Kanuka, 2005). Kanuka concluded that text-based communication technologies could offer effective collaborative and cooperative learning environments that have the potential to facilitate higher levels of learning.

**Discussion quality.** Several studies have focused on the quality of discussions in asynchronous courses. Naranjo, Onrubia, and Segues (2012) analyzed the relationship between participation in an online discussion forum and the cognitive quality of the contributions made. Naranjo et al. (2012) found that a high level of presence and participation is a necessary, but not a sufficient condition for maintaining high-quality contributions through discussion. It is instructional strategies that are needed to achieve quality (Naranjo et al., 2012). One study introduced a framework for evaluating the quality of discussion forum activities between students and discussion facilitators (Nandi et al., 2012). Using the framework, Nandi et al (2012) revealed distinctive patterns of quality work, characterized by negotiation, research, conception and production. Kanuka et al. (2007) investigated the influence of five instructional methods on quality of online discussion using a case study method. Multiple data sources were used to evaluate the success of the methods including a quantitative content analysis (QCA) and

a rubric. These two instruments were used to assess the processes and cognitive presence in online discussions. The researchers described QCA as the systematic, objective and quantitative description of the manifest content of communication (Kanuka et al., 2007). The QCA analysis included segmenting transcripts into meaningful units, classifying the units into levels by cognitive presence, and summing the frequency of units in each phase. The results of the study showed that students engaged in Web Quest and debate activities posted a higher proportion and number of messages reflective of the highest levels of cognitive presence. Findings indicated that instructional methods do influence the quality of student' contribution to online discussion (Kanuka et al., 2007).

### **Conclusion**

Higher levels of thinking can be achieved using strategies in asynchronous forums, but there is not yet a standard set of strategies or prescribed heuristics for achieving these results. Furthermore, there is not a consistent measurement tool for evaluating asynchronous discussions. This literature review revealed that prior studies omitted details regarding the types of course content participants were discussing in the forums. The present study is distinguished from these studies by focusing on strategies for discussions related to text-based reading assignments. The reciprocal teaching method has given promising results in a variety of contexts with diverse types of learners across a wide age span. However, using the specialized format of an asynchronous discussion forum as a social learning venue for students to engage in the high impact, generative learning strategies of reciprocal teaching is yet to be explored.

## **Purpose of Research**

### **Problem Statement**

Without the chance to interact and actively engage in learning strategies during reading and discussions, asynchronous online students may reach only a surface-level understanding of course texts. Simply providing a space for student-student, student-teacher, and student-content interaction without incorporating research-supported strategies is not substantiated by the literature. Purposeful, strategy-rich discussion forums are needed to ensure students are able to negotiate meaning and deeply understand course texts. Instructional designers, teachers, and researchers should seek to identify heuristics and strategies that will engage online students in high-level, content-based discussions that will lead to deeper understanding of course content. This study seeks to make a contribution in this area.

### **Research Questions**

The purpose of this study was to extend the reciprocal teaching research into an asynchronous, online community college course. The focus was to determine whether reciprocal teaching could facilitate higher levels of thinking during discussions and deeper understanding of text-based reading assignments. The content used for discussions in this study came from the chapters in the course textbook.

This study addressed the following research questions:

1. To what extent did the type of discussion forum strategies, traditional or reciprocal, affect levels of thinking during posts in asynchronous discussion forums?
2. To what extent did the type of discussion forum strategies, traditional or reciprocal, facilitate deeper understanding of the course textbook?

3. To what extent could reciprocal teaching strategies and peer teaching be implemented in online, asynchronous discussion forums?
4. What impact did traditional discussion forums have on student reflections of the relationship between discussion forums and learning?
5. What impact did reciprocal teaching have on student reflections of the relationship between strategies, peer teaching and learning?



## CHAPTER II

### METHOD

This chapter presents the methods used in this study. Details of the participants, research design, variables, instruments, procedures, and data analysis are presented.

#### Participants

Twenty-five students enrolled in two different sections of the fully online community college course *Foundations of Education* participated in the study. The course was offered at a mid-sized coastal community college in the southeast region of the United States. The community college's enrollment is approximately 11,000 total students with 4,285 curriculum students and 6,793 work-force development students. The types of courses taken at the college include 37% fully online, 26% hybrid, and 36% face-to-face.

Participants were between 19 and 59 years old and the age ranges were similar in both sections of the course. Student demographics included a representative sample similar to the overall make-up of the community college including: American Indian/Alaska Native 0.5%, Asian/Pacific Islander 2.9%, Black 17.8%, Hispanic 8.4%, Other 10%, White 60.5%. While the overall college makeup by gender is 59.2% female and 40.8% male, the gender makeup for the two courses was 92% female and 8% male. Only two of the 25 students in the two courses were male. These ratios are typical of education courses taken at the college that lead to careers in teaching.

Due to small class sizes and the quasi-experimental design, the study was conducted during two different semesters. Fifteen students who enrolled in the course during spring of 2016 gave informed consent to participate and were designated as the control group. Ten students who enrolled in the course during fall of 2016 gave informed consent and became the

treatment group. Participants were selected using a convenience sample determined by their enrollment in one of the two course sections. The same instructor taught both courses using the same online course materials in the Moodle course management system.

*Foundations of Education* is one of the required 200-level courses for an Associate's Degree in Applied Science with an emphasis in Early Childhood Education at the community college. It can also be used as an elective towards an Associate in Arts Degree or accepted for transfer into a teacher education program at a four-year university. Many of the students enrolled in the course aspired to become classroom teachers as indicated in the Introduce Yourself forum.

All online courses at the community college use the Moodle course management system to facilitate instruction and learning. In the online section of *Foundations of Education*, all instructional materials, activities, assignments and assessments are completed in Moodle. To ensure students are prepared to learn online, the college requires students to complete an Online Orientation to Distance Learning. Once enrolled, students are automatically populated into the course for which they are registered and into the Online Orientation to Distance Learning. Each participant in this study completed the orientation and uploaded their certificate of completion as one of the first assignments in the course.

The Lead Early Childhood Instructor teaches *Foundations of Education* each semester at the college and was the teacher for both sections that were used in the study. The instructor also served as a member of the research team. The primary researcher was the Director of Distance Learning at the community college providing convenient access to electronic data from the two courses and the ability to embed treatment materials. The instructor and the researcher posted all of the instructional materials in the online class including the reciprocal teaching videos (Appendix D), the Grading Criteria for Discussion Forums (Appendix E), the Reciprocal

Teaching Rubric (Appendix C), the Peer Teaching Guidelines (Appendix F), and the question stems (Appendix A). The instructor posted weekly announcements in the Moodle News Forum to remind students of upcoming assignments and due dates. The course syllabi included the grading criteria for all assignments, activities, and assessments in both courses. The Moodle grade book was set to aggregate grades for assignments using weighted mean of grades including: 20% for forums, 20% for midterm and final exams, 20% for teaching observations, 20% for Quizzes, and 20% for a Research Report. The instructor and the researcher both rated discussion forum posts using the SOLO Taxonomy and inter-rater reliability.

### **Research Design**

This quasi-experimental, multiple methods study used both quantitative and qualitative methods to measure the impact of reciprocal teaching methods. The types of discussion forums in the control and treatment groups were used as the independent variables in the study, traditional discussions or reciprocal discussions respectively. The traditional group discussion forums required students to answer an open-ended question posted by the instructor based on the assigned textbook chapter. Students in the traditional group responded with an initial post and replied to two other students. The reciprocal group participated in four strategy forums based on the assigned textbook chapter and took turns peer-teaching for a week. The peer teacher presented a lesson and questions based on the textbook chapter and the other students responded to the peer-teacher's questions.

Initial posts were considered the first post students wrote in response to a discussion question, either teacher-led or peer-led. Responses were replies to an initial post. The responses in the traditional group came from students as part of the requirement of replying to two others.

The responses in the reciprocal group came mostly from the peer teacher in the form of comments or prompting as part of the peer teaching process.

Participants were conveniently assigned to either the traditional or reciprocal group based on the semester in which they took the course. To maximize internal validity, the researcher kept all assignments and activities not related to the treatment conditions consistent in both courses to control for confounding variables.

Experimental methods were used for comparing the two groups on two dependent variables: (1) levels of thinking in discussion forum posts and (2) deeper understanding of course texts. Observation data, the Peer Teaching Guidelines, and the Reciprocal Teaching Rubric were used to explore how reciprocal teaching was translated into asynchronous discussion forums. The researcher investigated how successfully the strategies and peer teaching were implemented in discussion forums by assessing the quality and quantity of interactions. For research questions four and five, survey data was collected and analyzed qualitatively to obtain rich descriptive data about reciprocal teaching from the students who participated in the study.

The dependent variables in the study included: level of thinking, understanding of course texts, online reciprocal teaching implementation, and students' reflections on the relationship between discussions, strategies, and learning. The primary sources of data collected in the study included: (a) posts in reciprocal forums for each chapter; (b) posts in peer-teaching forums; (c) posts in traditional forums; (d) midterm scores; (e) final exam scores; and (f) survey responses. All data was collected from the electronic records in Moodle.

## **Measures**

The instruments used to measure the dependent variables included: the SOLO Taxonomy, Midterm and Final Exam, Reciprocal Teaching Rubric, and the Learning Reflection Tool.

**SOLO taxonomy.** The SOLO taxonomy was first developed in 1989 to measure the quality of learning outcomes (Biggs, 1989). SOLO is a means of classifying learning outcomes in terms of their quality. SOLO is an acronym for ‘Structure of the Observed Learning Outcome’ and is based on the observation that as learning progresses it becomes more complex. At first students pick up only one or a few aspects of the task (uni-structural), then several unrelated aspects (multi-structural), then they learn how to integrate them into a whole (relational), and finally, they are able to generalize to other applications (extended abstract).

Table 1 shows the levels of thinking and numeric score associated with each level of the SOLO taxonomy.

Table 1

*Modes and Levels of the SOLO Taxonomy*

| Mode     | Structural level           | SOLO  |
|----------|----------------------------|---|
| Next     | Level 5: Extended abstract | The learner now generalizes the structure to take in new and more abstract features, representing a higher mode of operation. |
| Target   | Level 4: Relational        | The learner now integrates the parts with each other, so that the whole has a coherent structure and meaning.                 |
| Target   | Level 3: Multi-structural  | The learner picks up more and more relevant or correct features, but does not integrate them.                                 |
| Target   | Level 2: Uni-structural    | The learner focuses on the relevant domain, and picks up one aspect to work with.   |
| Previous | Level 1: Pre-structural    | The task is engaged, but the learner is distracted or misled by an irrelevant aspect belonging to a previous stage or mode.   |

Using the SOLO taxonomy in this study enabled quantification of written responses and was used to rate discussion forum posts and extended response questions on the midterm and final exams on a scale from 1-5.

**SOLO training.** The researcher and instructor participated in training to become familiar with the SOLO Taxonomy rating scale. The instructor and researcher met to review the SOLO Taxonomy levels and descriptors and then practiced independently rating discussion posts from an alternative class. A Pearson Product Movement Correlation was used to determine inter-rater reliability of the first training session. Afterwards, the researcher and instructor met to discuss their first set of ratings, the interpretation of the scale, and how they arrived at assigned ratings. The instructor and researcher then independently rated another set of discussion posts from an alternative class and calculated inter-rater reliability using the same procedure. A high level of inter-rater reliability was found after the second training session, which allowed the rating of actual posts in the study to begin.

**Inter-rater reliability.** The instructor and researcher scored each discussion forum post on a SOLO scale of 1 – 5. A Pearson Product Moment correlation was used to measure inter-rater reliability of SOLO scores from each rater. Once inter-rater reliability was established, the mean of scores for the two raters was used to represent the level of thinking during discussions. The reciprocal and traditional groups took the same midterm and final exams. The assessments were analyzed for deeper understanding of texts using objective scores for the multiple-choice questions and the SOLO Taxonomy for the extended response questions. The instructor and researcher used the same procedure for determining inter-rater reliability on the SOLO ratings of extended response questions. Once inter-rater reliability was established, the

mean of scores for the two raters was used to represent depth of understanding scores on the midterm and final exam.

**Reciprocal teaching rubric.** The reciprocal teaching rubric (Appendix C) was used to measure the treatment group on their application of the four reciprocal teaching strategies during discussion (Oczkus, 2010). There was a forum for each strategy where students were able to document their predictions, questions, clarifications, and summaries for each chapter in the textbook. The rubric was used to determine the quality of strategy use during discussions. Discussion posts were assigned a grade of 10, 15, 20, or 25 points to indicate the quality of strategy use within the reciprocal teaching strategy forums. The rubric categories included beginning, developing, proficient, and exemplary. The reciprocal teaching rubric was used to describe the extent to which the asynchronous forums were able to support reciprocal teaching strategies in the course.

**Midterm and final exam.** The midterm (Appendix G) and final exam (Appendix H) were used to measure how deeply students processed and understood the course reading materials. The multiple-choice questions on the exams were selected from a test bank produced by *Test Gen*, a powerful test generator that creates assessments for online testing. *Test Gen* is available exclusively from Pearson Education publishers and is provided as part of the curriculum for the *Foundations of Education* course. Test questions were based on the course textbook, *Introduction to Teaching* (Kauchak & Eggen, 2015).

The midterm and final exam each had 25 *Test Gen* multiple-choice questions that were aligned with the assigned reading selections. The multiple-choice questions were worth four points each for a total of 100 points on each exam. In addition, four extended-response questions were included in both the midterm and final exam to assess students' understanding at a deeper

level. The extended response questions were worth five points each for a total of 20 points and provided students an opportunity to elaborate on their understanding through writing. The extended response questions were based on the explicitly defined learning outcomes for each chapter in the textbook. The midterm and final exams were both worth 120 points.

**Learning reflection tool.** The Learning Reflection Tool was used as both a quantitative and qualitative measure (Appendix I). Students in both groups were surveyed three times during their course on weeks five, ten, and fifteen. The reciprocal group's survey was designed to obtain numeric scores and written reflections on the relationship between strategy forums, peer teaching and learning. The survey for the traditional group also generated numeric scores and written reflections, but focused on the relationship between the traditional discussion forums and learning. Students in both groups were asked to rate their respective discussion forums types on a scale of one to five, with one being extremely ineffective and five being extremely effective. Data from the Reflection Tool was collected through a link that was embedded into the course management system.

## **Procedure**

The study was conducted in two 16-week sections of the fully online community college course *Foundations of Education*. The course was structured so that students read one chapter from the textbook each week beginning in the second week of the course with chapter one. The course included an announcement each week, a textbook reading assignment, lecture materials with an outline of the chapter, and a presentation based on the key points of the textbook chapter. There was a midterm exam during week nine and a final exam during week sixteen. Other assignments included four classroom observation videos and a research paper. Both the reciprocal teaching group and traditional discussion group used the same course learning



materials and participated in the same assignments and assessments. Both groups participated in their own unique type of weekly discussion forum to discuss the assigned chapter of the textbook. The type of discussion forum was either traditional or reciprocal and was based on membership in either the treatment or control group.

**Reciprocal group.** The reciprocal teaching group received direct instruction on the reciprocal teaching method during the first and second week of class. The instruction was provided through video tutorials that were embedded into the course management system. The videos introduced learners to the rationale for reciprocal teaching in an introductory video and provide detailed instructions for engaging in each of the reciprocal teaching strategies in subsequent videos. There was one video for each strategy: predicting, questioning, clarifying and summarizing. A final video provided directions for how to ask effective questions during peer teaching using a set of generic questions stems.

**Strategy-based discussions.** Starting in week 3, the reciprocal teaching group participated in discussion forums related to the assigned chapter for the week. For each chapter, five reciprocal teaching forums were made available, one for each of the four strategies and one for peer teaching. The forums provided an area for students to engage in the strategies before, during, and after reading. They posted in the strategy forums for 11 weeks based on textbook chapters two through twelve. Reciprocal teaching strategy forums were not required during the two weeks of embedded training or the weeks of the midterm and final exam.

Participants provided their predictions *before* beginning reading in the Prediction Place forum. They made predictions using clues from the text such as: titles, headings, pictures, captions, bold, and italicized text. *During* reading students asked questions about the text in the Question Quest forum for their peers or the instructor to answer. *After* reading, students wrote a

summary of the chapter in the Summary Space forum. Any time during the week, students were encouraged to post items from the textbook chapter for which they needed clarification in the Clarifying Corner forum for the instructor or other students to address. The strategy forums correlated with the reciprocal teaching method which includes predicting, questioning, clarifying, summarizing. Appendix K shows the instructions in Moodle for each of the strategy forums.

***Peer teaching and questioning.*** Peer teaching took place in a Peer-Teaching Forum each week. The researcher modeled the process of being the peer teacher in Chapter 2 during week three so students would have an example to follow. Data was not collected for peer teaching during week three since it was intended to serve as a model and provide scaffolding to the students.

Peer teachers taught during 10 weeks of the study for textbook chapters three through twelve, but did not participate in peer teaching during the weeks of the midterm and final exam. Each of the 10 students in the reciprocal teaching group signed up for a week to peer teach using a Google Spreadsheet that was linked to their course in Moodle. Each peer teacher chose a topic from their selected chapter and prepared a lesson and questions for the other students to discuss. Using the Peer-Teaching Guidelines, peer teachers posted their lesson in the Peer-Teaching forum by midnight on Wednesday of their week to teach. The guidelines suggested the lesson could be a presentation, summary or outline. They were instructed to post discussion questions that were open-ended and did not have just one correct answer. Peer teachers were encouraged to select a question stem when writing their discussion questions to promote higher-level thinking. The number of discussion questions was not specified and peer-teachers could select a media of their choice for the lesson as long as it was linked back to the Peer-Teaching forum.

Student responses and discussions took place from Thursday to Sunday night. Students responding to the peer teacher could not see other student's posts until they posted their own initial response, after which they began discussions. Peer teachers facilitated the discussion for their own questions through elaboration and explanations of their selected topic.

**Traditional group.** The traditional discussion group participated in all of the same instructional activities and assessments as the reciprocal teaching group, but did not peer teach, view any of the reciprocal teaching training videos, or participate in the reciprocal teaching strategy forums.

*Traditional discussion forums.* The traditional group participated in three instructor-led discussion forums for each reading assignment. The three forums were designed to control for the amount of time spent discussing since the treatment group had strategy forums and peer teaching. The goal was to design the forums so both groups posted in approximately the same number of forums each week spending a comparable amount of time in discussion. For this study, the first discussion forum in each of the 10 weeks was used for data collection and analysis for the traditional group.

The traditional discussion forums were set up like those found in most online courses to provide an authentic comparison of approaches to online discussion. Students were required to respond to an initial question with a substantive post and reply to two other students. Students responding to the teacher-led discussion question in the traditional forum could not see other student's posts until they posted their own initial response, after which they could begin discussing. Teacher-led discussion questions were based on objectives stated in textbook. The Grading Criteria for Discussion Forums was used for both the traditional and reciprocal groups.

To provide an avenue for communicating with the instructor, similar to the Clarifying Corner, an additional forum was set up for the traditional group to ask questions of the instructor each week.

**Assessments.** Students in both groups took a 30-question midterm and a 30-question final exam. Both examinations had 25 multiple choice questions developed through Test Gen by Pearson publishing and 5 extended response questions based on the course learning outcomes as defined in the textbook. The tests were not timed and students were able to use their textbook and notes. The tests were designed so that students would have to apply their learning to answer the extended response questions.

The instructor and the researcher scored the extended response questions using the SOLO Taxonomy to differentiate between surface-level and deeper understanding of each chapter in the course textbook. To prevent researcher bias, the extended response answers of students were printed and coded using student birthdates so the researcher and teacher did not know from which group the responses were submitted during rating. Extended response questions 27, 28, 29, and 30 were included in the analysis, but question 26 was removed from the scoring for both groups due to an error in the question. One of the students reported that the answer to the question was located in a chapter not covered prior to the exam.

**Reflections.** Students in both groups accessed and completed the Learning Reflection Tool link three times during the course during weeks five, ten and fifteen.

### **Data Analysis**

The analysis for this study focused on data from the following sources for the traditional and reciprocal groups (a) traditional forum posts, (b) reciprocal strategy forum posts, (c) peer teaching forum, (d) midterm scores, (e) final exam scores, and (f) survey reflections.

**Higher-level thinking.** The first one-way ANOVA analysis compared SOLO scores of all discussion posts between groups including initial posts and responses combined. Next level of thinking SOLO scores for only initial posts were compared between groups using a one-way ANOVA. Finally, only the responses to initial posts were compared for the traditional and reciprocal groups using a third one-way ANOVA.

**Deeper understanding.** Three analyses were conducted to compare scores between groups on the midterm and final exams. The first one-way ANOVA compared the overall test scores including multiple-choice and extended response in a between group comparison. The second one-way ANOVA compared only the multiple-choice items between groups. The third one-way ANOVA compared only the extended response items between groups. Test score results between groups were used to determine whether the treatment resulted in a significant difference in depth of understanding of course texts.

**Reciprocal teaching implementation.** Observation methods and descriptive statistics were used to determine whether the reciprocal teaching method could be translated into an online, asynchronous course using discussion forums. The Reciprocal Teaching Rubric was used to determine the quality of strategy use by obtaining a mean score for each of the strategies for each student. The rubric grades for each strategy were used to calculate measures of central tendency including mean, median and mode of strategy scores to determine the quality and quantity of strategy use. Observations were used to evaluate peer-teaching transcripts and make a determination of successful peer teaching. Transcripts of peer teaching lessons and questions were evaluated for quality using the Peer Teaching Guidelines. Descriptive statistics of the quality of peer teaching were explored and reported.

**Survey reflections.** Students in both groups were instructed to reflect on their respective discussion forum types in weeks five, ten, and fifteen using the Learning Reflection Tool. The mean of survey scores was compared between groups over the three administrations of the survey. A six-step thematic analysis was conducted on the reflections of both the control and treatment groups (Braun & Clarke, 2006). The researcher began by reading the reflections of students that were collected in the survey and jotting down initial ideas. Recurring key words or interesting features were used to determine initial codes. Codes were then separated into potential themes. Themes were then reviewed in relation to the codes to determine if there was a good fit before the themes were refined and named. Extracts from the reflections that related back to the research questions and literature review were included in the results section of the study.

A summary of the research questions, variables and measures is provided in Table 2.

Table 2

*Research Questions, Data, and Analysis Methods*

| Research Question  | Dependent Variable / Measure  | Analysis   |
|--|---|--|
| To what extent did the type of discussion forum strategies, traditional or reciprocal, effect levels of thinking during posts in asynchronous discussion forums? | Level of thinking in discussion forums /<br>SOLO Taxonomy ratings (1=lowest – 5=highest)                | One-way ANOVA for between group comparisons of all posts including initial and responses<br><br>One-way ANOVA for between group comparisons of initial posts<br><br>One-way ANOVA for between group comparisons of responses |
| To what extent did the type of discussion forum strategies, traditional or reciprocal, facilitate deeper understanding of course textbook                        | Deeper understanding of course texts<br><br>Overall midterm and final exam scores (0 - 120 Points Each) | One-way ANOVA for between group comparison of overall score<br><br>One-way ANOVA for between group comparison of multiple choice scores<br><br>One-way ANOVA for between group   |

|  |  |   |
|--|--|---|
| chapters?  | <p>Multiple choice<br/>midterm and final<br/>exam scores (0 - 100<br/>points each)</p> <p>Extended response<br/>midterm and final<br/>exam scores scored<br/>with SOLO Taxonomy<br/>(0 - 20 points each)</p> | comparison of extended response scores  |
| To what extent could reciprocal teaching strategies and peer teaching be implemented in online, asynchronous discussion forums?        | <p>Quality of strategy use<br/>during discussions (10<br/>– 25 Points)</p> <p>Guidelines for Peer-<br/>Teaching (0 -100<br/>Points)</p>  | <p>Reciprocal teaching rubric scores</p> <p>Peer teaching observations</p> <p>Descriptive statistics: mean, median, mode</p>              |
| What impact will traditional discussion forums have on student reflections of the relationship between discussion forums and learning? | Survey data for traditional discussion forums (1-5 Points)   | <p>Learning Reflection Tool scores</p> <p>Thematic analysis of reflections on the relationship between discussion forums and learning</p> |
| What impact will reciprocal teaching have on student reflections of the relationship between strategies, peer teaching and learning?   | <p>Numeric survey scores<br/>for strategies and peer<br/>teaching (1-5 Points)</p> <p>Written reflections on<br/>survey</p>  | <p>Learning Reflection Tool mean scores</p> <p>Thematic analysis of reflections of each strategy and peer teaching</p>                    |

## CHAPTER III

### RESULTS

This chapter presents the results of the analyses of the five research questions. Results are reported according to each of the dependent variables: level of thinking during discussion, deeper understanding of course texts, quality of reciprocal teaching implementation, and student reflections of discussion forums, strategies, and peer teaching. Since two of the research questions involved using SOLO Taxonomy as a rating tool, an inter-rater reliability was established prior to ratings during the study. The raters participated in two training sessions to learn how to use the tool so that coding was consistent across the study. A Pearson Product Moment Correlation was conducted to establish a baseline of inter-rater reliability scores. The results from the two training sessions are reported in Table 3. Fifteen posts were rated during each of the two separate training sessions. The first training produced a correlation of  $.701, r(15) = .701$  which increased to a stronger correlation of  $.944, r(15) = .944$  by the end of the second training.

Table 3

*Pearson's Product Moment Correlation for Training on SOLO Taxonomy*

|               | n  | R    |
|---------------|----|------|
| SOLO Training | 15 | .701 |
| Session 1     |    |      |
| SOLO Training | 15 | .944 |
| Session 2     |    |      |



### **Research Question One**

Research question one explored the extent to which the type of discussion forum strategies, traditional or reciprocal, affected levels of thinking during posts in asynchronous discussion forums. Both the researcher and teacher independently rated 10 discussion forum posts related to 10 textbook chapters using the SOLO Taxonomy for both the traditional and reciprocal groups. An inter-rater reliability for all of the independently rated posts was obtained using a Pearson Product Moment Correlation. Ratings for initial posts and responses were used to determine inter-rater reliability of all posts for the 10 chapters. There was a strong correlation of ratings for all initial posts and responses combined,  $r(513) = .910$ .

Next a Pearson Product Moment Correlation was conducted to calculate inter-rater reliability of posts by chapter for each of the 10 separate chapters. There was a varying but strong correlation between raters for each chapter that was included in the analysis as shown in Table 4. Inter-rater reliability ranged from .886 to .959 across all chapters. Once inter-rater reliability was determined, an average was taken of the two raters' scores to designate the level of thinking score for each post used in the analysis.

Table 4

*Pearson Product Moment Correlation of Ratings for Each Chapter*

| Chapter | Number of Posts | Correlation |
|---------|-----------------|-------------|
| 3       | 47              | .886        |
| 4       | 46              | .918        |
| 5       | 46              | .910        |
| 6       | 52              | .843        |
| 7       | 56              | .926        |
| 8       | 52              | .912        |
| 9       | 51              | .891        |
| 10      | 58              | .892        |
| 11      | 52              | .959        |
| 12      | 53              | .945        |

Three separate one-way ANOVA's were used to analyze the level of thinking between the traditional and reciprocal group. The first one-way ANOVA compared SOLO scores between groups for all posts, including initial posts and responses. The second one-way ANOVA compared SOLO scores between groups for just the initial posts. The third one-way ANOVA compared SOLO scores between groups for just the responses.

**One-way ANOVA all posts.** In a between group comparison, a one-way ANOVA was conducted to determine if the level of thinking for all initial discussion posts and responses was significantly different for the traditional group ( $n = 15$ ) and the reciprocal group ( $n = 10$ ). During testing of assumptions, two outliers were found, as assessed by boxplot, but the scores

and were kept in the analysis since they represented the actual scores of two students in the study. Data was normally distributed for each group, as assessed by Shapiro-Wilks test ( $p > .05$ ); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .440$ ). Level of Thinking SOLO scores for all posts were higher in the reciprocal group ( $M = 4.1$ ,  $SD = 0.4$ ) than in the traditional discussion group ( $M = 2.8$ ,  $SD = 0.3$ ), and the difference between these discussion groups was statistically significant,  $F(1,23) = 94.699$ ,  $p < .001$ . There was a large effect size,  $\eta^2 = .81$ . Table 5 shows the result of the one-way ANOVA conducted on all posts to determine level of thinking in discussion posts.

Table 5

*One-way ANOVA of SOLO Rating of All Posts*

|                | Sum of Squares | df | Mean Square | F      | Sig.    |
|----------------|----------------|----|-------------|--------|---------|
| Between Groups | 9.586          | 1  | 9.586       | 94.699 | .000*** |
| Within Groups  | 2.328          | 23 | .101        |        |         |
| Total          | 11.914         | 24 |             |        |         |

Note. \*\*\* $p < .001$

The analysis showed that the reciprocal teaching group had significantly higher level of thinking during all combined initial and response discussion posts,  $p < .001$ . The reciprocal teaching groups' mean scores ( $M = 4.1$ ) were an average of 1.3 SOLO points higher than the traditional group ( $M = 2.8$ ) on level of thinking.

**One-way ANOVA initial posts.** For this analysis, only initial posts of the traditional and reciprocal groups were compared using a one-way ANOVA. Again, the scores of each rater were averaged after inter-rater reliability was determined. The rating for initial posts for each

group across all weeks was used to determine the level of thinking of initial posts. A one-way ANOVA was conducted to determine if the level of thinking in discussion forums for initial posts was different for the traditional group ( $n = 15$ ) than for the reciprocal group ( $n = 10$ ).

There were no outliers, as assessed by boxplot; data was normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .388$ ). The mean level of thinking SOLO scores was higher in the reciprocal group ( $M = 4.4$ ,  $SD = 0.3$ ) than in the traditional group ( $M = 3.4$ ,  $SD = 0.4$ ). As shown in Table 6, the differences between the groups was statistically significant,  $F(1,23) = 41.593$ ,  $p < .001$ . There was a large effect size  $\eta^2 = .81$ . Since the groups were statistically significantly different ( $p < .001$ ), the null hypothesis can be accepted.

The analysis showed that the reciprocal group had significantly higher level of thinking during initial posts,  $p < .001$ . The reciprocal groups' mean scores ( $M = 4.4$ ) for initial post were 1.0 Solo point higher than the traditional group ( $M = 3.4$ ).

Table 6

One-way ANOVA of All Initial Posts

|                | Sum of Squares | df | Mean Square | F      | Sig.    |
|----------------|----------------|----|-------------|--------|---------|
| Between Groups | 6.316          | 1  | 6.316       | 41.593 | .000*** |
| Within Groups  | 3.493          | 23 | .152        |        |         |
| Total          | 9.809          | 24 |             |        |         |

Note. \*\*\* $p < .001$

**One-way ANOVA responses.** For this analysis responses to initial posts for the traditional and reciprocal groups were compared using a one-way ANOVA for between group comparisons. A one-way Welch ANOVA was conducted to determine if the level of thinking of responses to initial posts was different in the traditional discussion group ( $n = 15$ ) than in the reciprocal group ( $n = 10$ ). There were no outliers, as assessed by boxplot. Data was not normally distributed for each group, as assessed by Levene's test of homogeneity of variances ( $p = .004$ ) so the determination was made to conduct a Welch ANOVA. Mean level of thinking scores was lower for the traditional ( $M = 2.3$ ,  $SD = 0.2$ ) than the reciprocal group ( $M = 3.8$ ,  $SD = 0.6$ ). As shown in Table 7, the differences between the discussion groups was statistically significant, Welch's  $F(1, 10.036) = 57.533$ ,  $p < .001$ . There was a large effect size  $\eta^2 = .78$ . The groups were statistically significantly different ( $p < .001$ ) and the null hypothesis can be accepted.

Table 7

Welch ANOVA of Responses

|       | Statistic <sup>a</sup> | df1 | df2    | Sig.    |
|-------|------------------------|-----|--------|---------|
| Welch | 57.533                 | 1   | 10.036 | .000*** |

Note. \*\*\* $p < .001$ . Asymptotically F distributed.

The reciprocal teaching discussion group had significantly higher level of thinking during responses to initial posts,  $p < .001$ . The reciprocal teaching groups' mean scores ( $M = 3.8$ ) for response were 1.5 Solo points higher than the traditional group ( $M = 2.3$ ).

To determine the differences in level of thinking for initial posts and responses within each group, a comparison of the means within each group was conducted. The reciprocal groups' initial post mean ( $M = 4.4$ ) and their response mean ( $M = 3.8$ ) differed by .6 Solo points. The traditional group's initial post mean ( $M = 3.4$ ) and their response mean ( $M = 2.3$ ) differed by

1.1 SOLO points. Compared to the reciprocal group, the traditional group had a greater difference between initial posts and responses by half a SOLO point.

### **Research Question Two**

Research question two explored the extent to which the type of discussion forum strategies, traditional or reciprocal, facilitated deeper understanding of course textbook chapters.

**Midterm.** The midterm exam had 25 multiple-choice questions worth four points each and four extended response questions worth five points each for a total of 120 available points. The multiple-choice questions were automatically scored by the Moodle course management system based on the answer key provided by Pearson Test Gen. The extended-response questions were scored by the two raters using the SOLO Taxonomy. Once inter-rater reliability was established a mean score of the two raters was used for the analyses to determine deeper understanding of course texts.

**Midterm inter-rater reliability.** To determine inter-rater reliability for the extended response questions on the midterm two Pearson Product Moment Correlations were run. The first examined inter-rater reliability of all four extended response questions combined. The second examined inter-rater reliability for questions 27, 28, 29, and 30 separately. A total of 23 out of the 25 students took the midterm exam. There were 92 extended response questions answered on the midterm out of 100 for both the traditional and reciprocal group. A Pearson Product Moment Correlation showing a strong inter-rater reliability of all midterm extended response ratings,  $r(92) = .940$ . The correlation for the separate analysis of the four extended-responses questions included 23 participants who answered questions 27, 28, 29, and 30. The analysis yielded varying strong correlations between raters. Question 27 had a correlation of .933,  $r(23) = .933$ . Question 28, showed a strong correlation of .876,  $r(23) = .876$ . Question 29

had a strong correlation of .947,  $r(23) = .947$ . Question 30 showed a correlation of .970,  $r(23) = .970$ .

**Final Exam.** The final exam also had 25 multiple-choice questions worth four points each and four extended response questions worth five points each for a total of 120 available points. The multiple-choice questions were automatically scored by the Moodle course management system based on the answer key provided by Pearson Test Gen. The extended-response questions were scored by the two raters using the SOLO Taxonomy. Once inter-rater reliability was established a mean score of the two raters was used for the analyses to determine deeper understanding of course texts.

**Final exam inter-rater reliability.** To determine inter-rater reliability for the extended response questions on the final exam, two Pearson Product Moment Correlations were run. The first examined inter-rater reliability of all four extended response questions combined. The second examined inter-rater reliability for questions 27, 28, 29, and 30 separately. All twenty-five students took the final exam. There were a total of 100 extended response answers on the final exam including answers for both the traditional and reciprocal group. The Pearson Product Moment Correlation yielded a strong inter-rater reliability of all final exam extended response questions between raters,  $r(100) = .912$ . Questions 27, 28, 29, and 30 had varying strong correlations between raters. Question 27 showed a strong correlation of .944,  $r(25) = .944$ . Question 28 had a strong correlation of .829,  $r(25) = .829$ . Question 29 showed a strong correlation of .883,  $r(25) = .883$ . Question 30 had a strong correlation of .952,  $r(25) = .952$ .

**One-way ANOVA.** Six, one-way ANOVA analyses were conducted to compare the dependent variable, deeper understanding of course texts, between groups. The one-way ANOVAs included between group comparisons of the following scores: (1) overall midterm

total; (2) extended response on midterm; (3) multiple-choice on midterm; (4) overall final exam total; (5) extended response on final; and (6) multiple-choice questions on the final. Following each analysis is an explanation of results.

**One-way ANOVA for overall midterm.** A one-way ANOVA was conducted to determine if total midterm scores were different for the traditional discussion group and the reciprocal discussion group. There were no outliers as assessed by boxplot; data was normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .153$ ). Total midterm scores were higher for the reciprocal group ( $M = 112.4$ ,  $SD = 4.7$ ) than for the traditional group ( $M = 103.3$ ,  $SD = 8.4$ ). The differences between the discussion groups was statistically significant  $F(1,22) = 9.619$ ,  $p = .005$  as shown in Table 8. There was a small effect size,  $\eta^2 = .30$ . The group means were statistically, significantly different ( $p = .005$ ) and therefore, the null hypothesis can be rejected.

Table 8

*One-way ANOVA of Midterm Total Scores*

|                | Sum of Squares | df | Mean Square | F     | Sig.   |
|----------------|----------------|----|-------------|-------|--------|
| Between Groups | 484.576        | 1  | 484.576     | 9.619 | .005** |
| Within Groups  | 1108.257       | 22 | 50.375      |       |        |
| Total          | 1592.833       | 23 |             |       |        |

Note. \*\* $p < .01$



The reciprocal group scored significantly higher total scores than the traditional group on the midterm. The reciprocal groups' mean ( $M = 112.4$ ) was 9.1 points higher than the traditional groups' overall midterm scores ( $M = 103.3$ ).

***One-way ANOVA for extended response on midterm.*** A one-way ANOVA was conducted to determine if midterm extended response SOLO scores were different for the traditional discussion group and the reciprocal discussion group. There were no outliers as assessed by boxplot; data was normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .418$ ). Total midterm SOLO scores were higher for the reciprocal group ( $M = 4.5$ ,  $SD = 0.4$ ) than for the traditional group ( $M = 3.1$ ,  $SD = 0.5$ ) on extended response questions. The differences between the discussion groups was statistically significant  $F(1,21) = 56.844$ ,  $p = .001$  as shown in Table 9. There was a large effect size,  $\eta^2 = .73$ . The group means were statistically, significantly different ( $p < .001$ ) and therefore, the null hypothesis can be rejected.

Table 9

*One-way ANOVA Comparing Midterm Extended Response Responses*

|                | Sum of Squares | df | Mean Square | F      | Sig.    |
|----------------|----------------|----|-------------|--------|---------|
| Between Groups | 11.049         | 1  | 11.049      | 56.844 | .000*** |
| Within Groups  | 4.082          | 21 | .194        |        |         |
| Total          | 15.131         | 22 |             |        |         |

Note. \*\*\* $p < .001$

The reciprocal group scored significantly higher extended response scores than the traditional group on the midterm. The reciprocal groups' mean ( $M = 4.5$ ) was 1.4 Solo points higher than the traditional groups' overall midterm Solo scores ( $M = 3.1$ ).

***One-way ANOVA for midterm multiple-choice items.*** A one-way ANOVA was conducted to determine if midterm multiple-choice scores were different for the traditional discussion group and the reciprocal discussion group. There were three outliers as assessed by boxplot. The decision was made to continue the analysis since the outliers represented actual scores. Data was not normally distributed for each group, as assessed by Shapiro-Wilk test ( $p < .05$ ). There was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .564$ ). Total midterm SOLO scores were higher for the reciprocal group ( $M = 94.6$ ,  $SD = 5.0$ ) than for the traditional group ( $M = 92$ ,  $SD = 7.5$ ). The difference between multiple choice scores was not statistically significant  $F(1,22) = .905$ ,  $p = .352$  as shown in Table 10. The scores were not statistically, significantly different ( $p = .352$ ) and therefore, the null hypothesis cannot be rejected.

Table 10

*One-way ANOVA for Midterm Multiple Choice Questions*

|                | Sum of Squares | df | Mean Square | F    | Sig. |
|----------------|----------------|----|-------------|------|------|
| Between Groups | 39.433         | 1  | 39.433      | .905 | .352 |
| Within Groups  | 958.400        | 22 | 43.564      |      |      |
| Total          | 997.833        | 23 |             |      |      |

The reciprocal group scored higher multiple-choice scores than the traditional group on the midterm, but not at the significant level. The reciprocal groups' ( $M = 94.6$ ) multiple choice scores were only 2.6 points higher than the traditional groups' ( $M = 92.0$ ).

**One-way ANOVA overall final exam.** A one-way ANOVA was conducted to determine if total final exam scores were different for the traditional group and the reciprocal group. There was one outlier as assessed by boxplot; data were normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); but homogeneity of variances was violated, as assessed by Levene's test of homogeneity of variances ( $p = .025$ ). Since the assumption of homogeneity of variances was violated, the Welch ANOVA was used. Total final exam scores were higher for the reciprocal group ( $M = 111.9$ ,  $SD = 4.5$ ) than for the traditional group ( $M = 98.7$ ,  $SD = 12.9$ ). The differences between the discussion groups on the total final exam was statistically significant, Welch's  $F(1, 19) = 18.576$ ,  $p < .01$  as shown in Table 11. There was a small effect size,  $\eta^2 = .30$ . The groups were statistically significantly different ( $p < .01$ ) and the null hypothesis can be accepted.

Table 11

*Welch ANOVA for Overall Final Exam.*

|       | Statistic <sup>a</sup> | df1 | df2    | Sig.   |
|-------|------------------------|-----|--------|--------|
| Welch | 13.454                 | 1   | 18.576 | .002** |

Note. \*\* $p < .01$ . Asymptotically F distributed.

The reciprocal group scored significantly higher on overall final exam scores than the traditional group. The reciprocal groups' overall score ( $M = 119.9$ ) was 21.2 points higher than the traditional groups' overall final exam scores ( $M = 98.7$ ).

**One-way ANOVA extended response final exam.** A one-way ANOVA was conducted to determine if final exam extended response scores were different between groups. There were no outliers as assessed by boxplot; data was normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); and there was homogeneity of variances, as assessed by Levene's test of homogeneity of variances ( $p = .175$ ). Total final exam scores were higher for the reciprocal group ( $M = 4.4$ ,  $SD = 0.4$ ) than for the traditional group ( $M = 3.5$ ,  $SD = 0.6$ ). The differences between the discussion groups was statistically significant  $F(1,23) = 18.206$ ,  $p < .001$  as shown in Table 12. There was a medium effect size,  $\eta^2 = .44$ . The group means were statistically, significantly different ( $p < .001$ ) and therefore, the null hypothesis can be rejected.

Table 12

*One-way ANOVA of Extended Response Scores on Final Exam*

|                | Sum of Squares | df | Mean Square | F      | Sig.    |
|----------------|----------------|----|-------------|--------|---------|
| Between Groups | 5.430          | 1  | 5.430       | 18.206 | .000*** |
| Within Groups  | 6.860          | 23 | .298        |        |         |
| Total          | 12.290         | 24 |             |        |         |

Note. \*\*\* $p < .001$

The reciprocal group scored significantly higher extended response scores than the traditional group on the final. The reciprocal groups' overall scores ( $M = 4.4$ ) were 0.6 Solo points higher than the traditional groups' overall final Solo scores ( $M = 3.5$ ).

**One-way ANOVA of multiple-choice final exam.** A one-way ANOVA was conducted to determine if multiple choice final exam scores were different for the traditional discussion group and the reciprocal discussion group. There was one outlier as assessed by boxplot, but the

decision was made to continue with the analysis since it represented an actual score. Data were normally distributed for each group, as assessed by Shapiro-Wilk test ( $p > .05$ ); but homogeneity of variances was violated, as assessed by Levene's test of homogeneity of variances ( $p = .028$ ). Since the assumption of homogeneity of variances was violated, the Welch ANOVA was used. Total final exam scores were higher for the reciprocal group ( $M = 94.3, SD = 3.6$ ) than for the traditional group ( $M = 84.8, SD = 11.7$ ). Table 13 shows that the differences between the discussion groups on the total final exam was statistically significant, Welch's  $F(1, 17.671) = 8.625, p < .01$ . There was a small effect size,  $\eta^2 = .21$ . The groups were statistically significantly different ( $p < .01$ ) and we can accept the null hypothesis.

Table 13

*Welch's ANOVA for Multiple Choice Scores on Final Exam.*

|       | Statistic <sup>a</sup> | df1 | df2    | Sig.   |
|-------|------------------------|-----|--------|--------|
| Welch | 8.625                  | 1   | 17.671 | .009** |

Note. \*\* $p < .05$ . Asymptotically F distributed.

The reciprocal group scored significantly higher multiple-choice scores than the traditional group on the final. The reciprocal groups' score ( $M = 94.3$ ) was 9.5 points higher than the traditional groups' multiple-choice scores on the final ( $M = 84.8$ ).

### **Research Question Three**

Research question three explored the extent to which reciprocal teaching strategies and peer teaching could be implemented in online, asynchronous discussion forums. To determine the extent to which reciprocal teaching could be utilized in an asynchronous online course, several factors were examined. First the features and processes of the reciprocal teaching method used in the traditional, face-to-face classroom were considered. Reciprocal teaching has

most often been used as a method to improve reading comprehension in face-to-face classrooms. The typical implementation includes placing students into small groups to read a passage of text. Students are involved in discussions in real time using the four reciprocal teaching strategies as they read. The peer teacher facilitates the group and prompts other students to share their predictions, clarifications, questions and summaries.

The extent to which this method was implemented in an online, asynchronous course is explained by describing how effectively students could replicate the strategies and peer-teach in the online context. Students were not able to have live verbal discussions in this context, but they could have discussions around a text using generative strategies. Even though there was a delay in time, students could still lead a discussion by posting a lesson and questions with feedback to other students. It was determined that the foundational features of reciprocal teaching could be implemented in online, asynchronous contexts. The strategies and peer teaching were common elements in both iterations but the practice was unique to each setting.

The qualifying conditions of being able to predict, question, clarify, summarize and peer teach while being separated in time and space led to the implementation of text-based reciprocal teaching discussion forums. Discussion forums allowed students to share ideas back and forth with all the transcripts housed in one area for review. Students did not read and respond at the same time, but the thoughts posted were held in time in the forum for students to assimilate and process when they were ready. The discussion forum was found to be a tool that could bring students closest to a real dialogue used in classroom-based reciprocal teaching. Instead of real-time verbal activity, discussions were conducted through text in a time-delayed condition.

**Strategy Forums.** To determine the effectiveness of strategy use in this environment, students were rated on each strategy forum post using the reciprocal teaching rubric. Rubric

grades were awarded 25 points for an exemplary post, 20 points for a proficient post, 15 points for a developing post and 10 points for a beginning post. A frequency distribution of all strategy posts combined showed that the mean of the 381 posts over the 11 weeks was 24, ( $N = 381$ ,  $M = 24$ ,  $SD = 1.9$ ). Only one student scored at the beginning level, four students scored at the developing level, 65 students scored at the proficient level, and 311 students scored an exemplary on the rubric in the overall strategy forum analysis. Table 14 shows the descriptive statistics for the quality of discussion forums for each type of forum and overall.

Table 14

*Descriptive Statistics for Strategy Forums**Forum*

|                   | N   | Minimum | Maximum | Mean    | Std. Deviation |
|-------------------|-----|---------|---------|---------|----------------|
| Predicting Place  | 96  | 20.00   | 25.00   | 23.5938 | 2.25985        |
| Question Quest    | 96  | 20.00   | 25.00   | 24.3229 | 1.71982        |
| Clarify Corner    | 95  | 15.00   | 25.00   | 24.2632 | 1.92526        |
| Summarizing Space | 94  | 10.00   | 25.00   | 23.8298 | 2.78490        |
| All               | 381 | 10.00   | 25.00   | 24.0026 | 2.21894        |

***Predicting place.*** The predicting place forum provided a very functional avenue for students to post their predictions before reading the textbook chapter using text features as clues and background knowledge. Although this forum was seldom used for dialogue between students, it did provide a place for students to document their predictions prior to reading. Students posted in the Prediction Place forum a total of 96 times with 69 exemplary and 27

proficient posts. Frequency data displayed in Table 15 shows the mean, median and mode of the predictions posted in the Prediction Place forum.

Table 15

*Frequency Data for the Predicting Place Forum*

|                | Valid | 96      |
|----------------|-------|---------|
| Mean           |       | 23.5938 |
| Median         |       | 25.0000 |
| Mode           |       | 25.00   |
| Std. Deviation |       | 2.25985 |

**Question quest.** The Question Quest forum was a purposeful space for students to write questions that went with the ideas and theme of the text during reading. It also proved to be a highly interactive forum for student-teacher and student-student discussions. Students posted 96 times in the question quest forum and the instructor replied to 45 of the posts with answers to their questions. Other students also replied to the questions asked in this forum for a total of 35 times. The benefit of asking questions in an asynchronous discussion is that the teacher and students has time to formulate thoughtful responses to the questions before responding. There was truly all three types of interaction in this forum through the asking and answering of questions. Table 16 shows data from the Question Quest forum.



Table 16

*Question Quest Forum Descriptive Statistics.*

|                | Valid | 96      |
|----------------|-------|---------|
| Mean           |       | 24.3229 |
| Median         |       | 25.0000 |
| Mode           |       | 25.00   |
| Std. Deviation |       | 1.71982 |

**Clarifying corner.** The Clarifying Corner also proved to be a very interactive forum where the students and instructor exchanged information about course content. Table 17 shows that the students posted items for which they needed clarification 95 times in the forum. The instructor responded with answers 50 times with explanations and answers to their questions. The benefit of the clarifying corner was that it provided a place for students to seek assistance without feeling intimidated. Another benefit was the instructor had time to research answers and write well-developed response to student's questions.

Table 17

*Clarifying Corner Forum Descriptive Statistics.*

|                | Valid | 95      |
|----------------|-------|---------|
| Mean           |       | 24.2632 |
| Median         |       | 25.0000 |
| Mode           |       | 25.00   |
| Std. Deviation |       | 1.92526 |

**Summarizing space.** The summarizing space forum brought learning around full circle as students wrote the important events, points and key details of the chapter. After reading, the summary was a way for students to review and retell the chapter in their own words. In this format, students could return to their summaries later to review material. Writing a summary is a way to mentally review what was learned in the chapter and the Summarizing Space forum provided a functional place for summaries. Table 18 shows that students posted a total of 94 times in the Summarizing Space forum with a mean score of 23.8.

Table 18

*Descriptive Statistics for Summarizing Space Forum*

|                | Valid | 94      |
|----------------|-------|---------|
| Mean           |       | 23.8298 |
| Median         |       | 25.0000 |
| Mode           |       | 25.00   |
| Std. Deviation |       | 2.78490 |

**Peer Teaching.** The peer-teaching forum was found to be a very effective way for students to lead class discussions. The asynchronous forum was conducive to carefully planned lesson content and discussion questions posted by students and may function better than in a face-to-face setting where a student peer teaches without time to formulate a well-developed lesson and questions.

The peer teaching was done whole group in this study due to the logistics of managing small groups and multiple discussions. Students were instructed to post a lesson with a clear

presentation, summary, or outline of their topic. They were to post an open-ended discussion question that did not have just one correct answer and focused on an important aspect of the lesson. The final requirement was that they used one of the question stems to formulate a question to promote higher-level thinking during responses.

The peer teachers posted their lesson and questions by midnight of Wednesday. They were responsible for facilitating the discussion for the week. Several students reached out for help when posting their lesson to the discussion forum since they weren't used to using the features in the forum to post links, videos, and lesson content. One student came to campus to get assistance with posting her lesson.

**Peer-teacher lesson.** The 10 peer teachers were graded on their lesson quality. Students could earn a total of 50 points for the lesson, 25 points for an open-ended question and 25 points for a question based on one of the question stems for a total of 100 points. The students' mean score for just the lesson was 45 points, ( $M = 45$ ). Six students scored a perfect 50 points for their lesson, three students scored 40 points, and one student scored 30 points. All of the peer teachers received full points for posting an open-ended question and a question using a question stem.

Students signed up for a chapter to peer teach and chose a topic of interest from the chapter. The researcher and instructor realized it would be more beneficial in the future to provide students with a list of topics from which to choose for their peer teaching. Two students picked topics that were not that interesting and did not promote engaging discussions although they got full points for following directions and successfully completing their peer teaching.

An unexpected outcome from the peer-teaching forum was that students chose to use various media and technology during peer teaching even though they were simply asked to post their lesson and questions in the discussion forum. Students chose to link their lesson to the

discussion forum using technology such: Prezi, Voicethread, YouTube, and content-rich websites. Perhaps due to the audience of their peers, many students went above and beyond the expectations communicated in the Peer Teaching Guidelines. Overall, it was found that the reciprocal teaching method was very well supported very well through asynchronous discussion forums in an online course.

### **Research Question Four and Five**

Prior to presenting the individual results for research question four and five, a similarity in the written survey responses for both groups is discussed. A theme of thinking was discovered in the transcripts of the both the traditional and reciprocal groups. Students responding to questions on the surveys for the traditional group and each of the reciprocal group categories (predicting, questioning, clarifying, summarizing and peer teaching) strongly felt that the discussions contributed to thinking and learning. The surveys indicated that discussion forums of both types contributed to thinking, understanding, and learning.

**Research Question Four.** Research question four focused on the impact that traditional discussion forums had on student reflections of the relationship between discussion forums and learning. Responses provided on the Learning Reflection Tool were analyzed using quantitative and qualitative methods. Students rated the discussion forums for their effectiveness in learning on a scale of 1-5, with 5 being extremely effective and 1 being extremely ineffective. Students reflected about the traditional discussion forums by writing a response in a textbox within the Google Form survey. The first survey yielded a mean score of 4.2, ( $N = 13$ ,  $M = 4.2$ ). The second survey yielded a mean score of 4.4, ( $N = 9$ ,  $M = 4.4$ ). The third survey yielded a mean score of 4.4, ( $N = 9$ ,  $M = 4.4$ ). The mean of scores for students' reflections of traditional discussion forums and learning across all three surveys was 4.3, ( $N = 31$ ,  $M = 4.3$ ).

The written responses were analyzed for themes related to student attitudes towards discussion forums and learning. The themes and anecdotal quotes are included in the final codebook (Appendix L). During the six-step thematic analysis the researcher accessed the survey responses and read over the reflections finding over thirty recurring key words. The text was organized into initial codes based on the key words. Codes were then separated into potential themes. The themes initially had two or three associated words to describe them such as generating ideas, knowledge, and understanding. Themes were then reviewed in relation to the codes to determine if there was a good fit before the themes were refined and paired down to a single name. Quotes from the reflections that related back to the research questions and literature review were included in the results section of the study.

The four themes that emerged from the traditional groups' survey responses were: enjoyment, perspectives, thinking, and interaction. Many mentions of the word enjoyment were found in the data. Some students said they loved the discussion forums. The cited reasons that included "hearing what other students had to say" and being able to "connect with fellow classmates". The responses showed that students liked discussing and found it to be a way to collaborate with peers and "learn about others thoughts". One student wrote, "Without discussion forums, I would be stuck with my own personal thinking and feelings on a particular topic."

Another theme that was identified in the traditional groups' reflections was thinking. Students used words such as understanding, thinking and processing as they described their activity in the traditional discussion forums. One student wrote, "The discussion forums have contributed to my learning by pushing me and encouraging met to think deeper". Many students shared about how forums helped them learn and understand and several specifically associated

the learning with reading. One student wrote, “The questions make me think and understand what I just read.”

The third theme that was identified for the traditional group was perspectives. The words opinion, perspectives, and points of view were found throughout the reflections. The students appreciated learning through others’ viewpoints to get new ideas and think about the topic from a different perspective. One student stated, “Seeing other student’s point of views has allowed me to expand my knowledge.”

The final theme that was identified was interaction. As online students, they appreciated the opportunity to interact through discussions. Students mentioned that the forums help build connections. Several students felt that the interaction in discussion forums was important because “interacting with other students in an online class is hard to do.”

Even though the data for the traditional group did not show higher levels of learning in the forums, students felt the discussion forums contributed to their learning. In addition, they truly seemed to enjoy participating in the traditional discussion forums.

**Research Question Five.** Research question five focused on the impact that reciprocal teaching had on student reflections of the relationship between strategies, peer teaching and learning. Responses provided on the Learning Reflection Tool were analyzed using quantitative and qualitative methods. Students rated each strategy for its effectiveness on a scale of 1 – 5 with 1 being extremely ineffective and 5 being extremely effective. Student shared their thoughts about each individual strategy and peer teaching by writing a response in a textbox within the Google Form survey. A total mean score of all survey responses (N = 36) for all three weeks for each strategy was predicting (M = 3.9), questioning (M = 4.0), clarifying (M = 4.0), and summarizing (M = 4.3). Peer teaching across all three surveys (N = 36) was (M = 4.2). The total

mean for all strategies and peer teaching was 4.1 as compared to the traditional groups' mean of 4.3. The students in the traditional group rated the discussion forums higher than the reciprocal group.

The reciprocal groups' survey was divided into five sections all within one survey. It asked students reflect on how each of the four strategies and peer teaching impacted learning.

**Strategies.** For the prediction strategy, students felt predicting helped prepare them for learning and anticipate what they were going to learn. Some student reported that they enjoyed guessing about the text and going back to find out if the guess was correct. One student said predicting "kicked started her brain". Predicting helped students feel more prepared to read the chapter and more interested prior to reading. One student thought the process was "reflective and helped her gain a deeper understanding of the material". Predicting helped students think about the chapter and for one student was considered "a process of thinking". However, several of the students did not feel predicting was effective and didn't like using the predicting strategy.

The questioning strategy got students thinking. It was a great way to extend the thought process. Through forming questions students could gain more insight into the lesson. One student wrote, "Being able to form my own questions from the context in the chapter gives me a deeper understanding of what I've read". Students appreciated having a place to posted questions and get answers. Questioning was viewed as especially helpful if there was content that was not understood.

The two themes that were identified for clarifying included helpful and answers. A major benefit for at least one student was that there was a place to ask questions without the fear of being a bother. It was an avenue for students to freely ask the questions that usually remain unasked in an online class. It helped students get a better understanding. One student wrote,

“This forum is very helpful when I am feeling a little unsure of a topic in the chapter.” The clarifying corner forum was a great learning experience when there were questions or something that was not clearly understood. The forum also gave clarification to students for “things they didn’t know they needed at the time”. Not all students found clarifying helpful and some thought it was too similar to the questioning strategy.

Summarizing allowed students to reflect and review the material. It helped them solidify learning. The theme of understanding was identified. Many mentioned how summarizing helped them understand and remember. Summarizing was attributed to helping students organize thoughts. One student wrote, “I believe the summary is the most important part. For me, to be able to summarize helps me to remember what I need to remember the most.” Students felt it was a good way to make sure they understood what was read.

Students felt peer teaching was innovative, unique and fun. Several students stated they had never experienced peer teaching and it was a fresh new way to learn. Students enjoyed the different ways each person taught. They liked that it was a different way to learn and were excited about the opportunity to teach their peers. One student wrote, “It's a fresh, new way for me to learn. Being taught by someone who is at the same level as me is a new concept, and I'm greatly enjoying it. I look forward to my week of peer teaching.” Many thought peer teaching added to their learning. They found the peer teaching informative. One student wrote, “Peer teaching added some ease to it and made learning fun. Isn't that what learning is all about?”



## CHAPTER IV

### DISCUSSION AND CONCLUSIONS

The focus of this study was to extend the reciprocal teaching research into an asynchronous, online community college course to determine whether reciprocal teaching could facilitate higher levels of thinking during discussions and deeper understanding of text-based reading assignments. This chapter interprets the results of the study as they relate to the literature on reciprocal teaching. Limitations, implications and future research opportunities are also presented in this chapter.

According to Borokhovski et al. (2012), designed interaction treatments include intentionally implemented collaborative instructional conditions for increasing student learning. In this study the highly interactive reciprocal teaching method was implemented in an online asynchronous course using discussion forums for collaboration, strategy use and peer teaching. The reciprocal teaching forums provided a space for students to use generative learning strategies and social negotiation to actively engage in discussions about their reading (Palincsar, 1998; Wittrock, 1990).

#### **Interaction**

Like findings reported in the literature, reciprocal teaching in the context of an online, asynchronous community college course supported interactions that led to higher levels of thinking and deeper understanding of course texts. All three types of interaction were present in the reciprocal teaching implementation. Student-content, student-teacher, and student-student interaction occurred as students used cognitive and metacognitive strategies to process the content in the course textbook throughout the entire reading process: before reading in the Prediction Place forum, during reading in the Question Quest and Clarifying Corner forums, and

after reading in the Summarizing Space forum. Student-content interaction was present in all the forums as student posts were based on the content in the course textbook. The high prevalence of student-content interaction ensured there was not a lack of initial understanding of content prior to engaging in online discussions. The Peer-Teaching forum facilitated student-student interaction as students asked and answered questions and responded to each other.

Peer teaching resulted in generative processing through the reworking of a topic from the textbook into a lesson and questions for peers (Collins et al., 1989; King, 1991; Pressley et al., 1992; Rosenshine et al., 1996; Wood et al., 1990). Writing the lesson required students to externalize their cognitions in the form of explanations and elaborations for other students. Generating questions using the questions stems initiated cognitive processing for the peer teacher. Rosenshine et al. (1996) found that teaching students the cognitive strategy of generating questions about the material they had read resulted in gains in comprehension.

### **Higher-level Thinking**

In this study, there was a significant difference between groups for level of thinking in discussion posts. The results related to research question one showed that discussion forum posts in the reciprocal group were at a significantly higher level of thinking than the traditional discussion group based on SOLO Taxonomy ratings. All three analyses that focused on level of thinking showed significant differences between groups: (1) initial post and response; (2) initial post; and (3) response.

#### ***Discussion Forum Posts.***

The decision to analyze combined initial posts and responses together as well as initial posts and responses separately allowed consideration of the entire dialogue where students talk about a text in back and forth discussion. The type of dialogue and level of thinking found in the

transcripts for initial posts and responses looked very different for each of the groups. In the reciprocal group, initial posts were made in reply to the peer teacher's lesson and most the responses came from the peer teacher. The initial posts showed higher levels of thinking and were very academic in nature. The students seemed to seriously focus on the lesson topic and related their answers back to the content in the textbook. The transcripts showed that the reciprocal group's dialogue more often generalized the structure of the question to take in new and more abstract features and integrated the parts with each other so that the whole had a coherent structure and meaning. The question stems that peer teachers used to formulate their questions may have attributed to the higher-level thinking found in initial posts.

In the traditional group, where initial posts were made to an open-ended teacher posted question the dialogue back and forth did not exhibit higher levels of thinking. Students posted back and forth in more casual discussions with personal stories and opinions on the topic. The discussions were more social in nature. The traditional group did not always provide original thinking in their answers, but often regurgitated the textbook content. The transcripts showed that often they simply reworded ideas from the textbook instead of providing authentic answers of their own. DeLoach and Greenlaw (2007) found that when students don't understand the content, they reword a previous post or contribute a superficial comment. There is no way to know whether the students read the textbook each week since they could answer the open-ended, opinion-based discussion question without understanding the chapter. Many of their responses were at a low level on the SOLO Taxonomy. They focused on the relevant domain, and picked up only one aspect to work with. Morrison et al. (2012) attribute the lack of deeper understanding found in student-student interactions in discussion forums to a lack of initial understanding of the content prior to engaging in online discussions. The traditional discussion

forums were not designed to initiate high levels of student-content interaction, but did provide a space for students to collaborate, discuss and interact.

### **Deep Processing**

The results related to the second research question found that the reciprocal group had a greater depth of thinking than the traditional group. In this study, statistically significant differences revealed that the reciprocal group had deeper understanding of course texts on the overall midterm scores, the extended response midterm scores, the overall final exam scores, the extended response final exam scores and the multiple choice final exam scores. Midterm multiple-choice scores did not show a significant difference between groups possibly in part because the multiple-choice questions were not written to elicit higher levels of thinking. Students could find the answers to the multiple-choice questions directly from the textbook and the exams were open book. Alternatively, the extended response questions were designed to measure students' levels of thinking through written responses that required understanding of overall learning outcomes for each chapter covered on the exams.

The significant findings for research question two may be attributed to the reciprocal groups' extensive interaction with textbook content, since the exam questions focused solely on the textbook. Students in the reciprocal group spent each week participating in reciprocal teaching strategies designed to improve comprehension and understanding of a text. As shown in prior studies on reciprocal teaching, gains in reading comprehension resulted from strategy use and peer teaching (Palincsar & Brown, 1984; Palincsar, Brown, & Martin, 1987). Furthermore, the reciprocal teaching method could not be practiced without close examination of the textbook chapter each week. There was no doubt students read the chapter if they were able to participate in the strategy forums. Prior to reading, their predictions tapped into prior knowledge and

activated learning. Through questioning the text, students had to mentally rework the content. They had to think about the material read, elaborate upon it, organize it, and relate it to prior knowledge. Through summarizing, students reflected on the main ideas in the chapter and reworded the content using their own words. These generative learning strategies fostered comprehension resulting in the significantly higher scores on the midterm and final exams.

### **Reciprocal Teaching Implementation**

Findings revealed that the full reciprocal teaching method was very effectively implemented in the online course including strategies and peer teaching. Through the transcripts in Moodle, observations were made about how well reciprocal teaching was incorporated in the course. The discussion forum transcripts showed that peer teaching and strategies were translated into the online context quite well. Peer teachers used a variety of media and were able to successfully post a lesson and questions according to the Peer Teaching Guidelines. The peer teacher focused on answering questions, providing clarifications, and elaborating on the textbook, creating a condition for higher learning (King, 1992; Rosenshine et al., 1996).

Scores on the Reciprocal Teaching rubric measured the quality of strategy use in the strategy forums. Students were able to write predictions, questions, clarifications and summaries for each textbook chapter with a high level of success. The strategy forums and peer teaching supported the three types of interaction in distance learning through reciprocal teaching. Reciprocal teaching was effective for facilitating higher levels of thinking and deeper understanding of course texts in an online, asynchronous environment.

## Survey Reflections

Survey responses collected three times throughout the course did not show a difference over time in mean survey scores. Reflections showed that students in both groups attributed the discussion forums to thinking and learning. Students in both groups felt the forums helped them understand the perspectives of other students. Interaction was identified for its importance when learning online.

The survey for the reciprocal group was divided by strategy to help gain insight into student perspectives on each strategy. Students felt predicting helped prepare them for reading. Students found questioning helpful, especially when the instructor or other students answered the questions they posted. Similarly, the responses in the survey related to clarifying showed that students found value in having a space to post items for which they needed clarification where they could receive answers from the instructor. Summarizing helped them understand, remember and organize thoughts. Students felt peer teaching was innovative, unique and fun. They enjoyed the challenge and looked forward to being the peer teacher. Overall both groups of students highly rated their discussion forum types.

According to the ratings, students in the traditional group responded more favorably to the discussion forums than the reciprocal group. Perhaps the more leisurely format and open-ended, opinion-based questions gave the students a more enjoyable experience. To further make this point, none of the students in the traditional group expressed that they didn't find the discussion forums useful in learning. However, several entries in the survey for the reciprocal group indicated dissatisfaction with the strategies and communicated that the strategies weren't useful for learning, although the empirical results of the study indicate otherwise. The dislike of the

strategies for these students may have been due to the extra work of participating in the reciprocal method. The strategy forums and peer teaching may have been more rigorous and required more cognitive effort than the students wanted to expend. Reciprocal teaching is hard work.

### **Limitations**

This section discusses the limitations of the study. Issues such as small sample size, sampling procedure, difficulty level of course, potential experimenter bias, lack of pre-assessment, consideration for number of posts, and technology used by peer teachers may limit the generalizability of this study without further investigation.

The first limitation of this study was the small sample size ( $n = 25$ ). The low number of students enrolled in the two sections of the course resulted in a small sample size. There were 15 students in the traditional group and 10 students in the reciprocal group. Research conducted with a larger sample size would increase the validity of the results and generalizability of the findings.

A second limitation was the sampling procedure. The study was conducted over two different semesters to obtain enough participants for a control and treatment group. Since the traditional group participated during the spring of 2016 and the reciprocal group participated during the fall of 2016 there may have been a threat to external validity.

A third limitation was the difficulty level of the course and textbook used in the study. Community colleges are two-year institutions and courses are not reflective of the difficulty level of bachelors or masters level courses. The course, *Foundations of Education* is a survey course and is not as difficult as more advanced upper-division courses. The only prerequisite for the

course is English Composition. The introductory nature of the course may not have necessitated higher-level thinking.

Although every effort was made for discussion ratings to be blind, the researcher and instructor may have been able to distinguish between the groups based on the content of the discussions in the forums. The raters' familiarity with the teacher-led discussion questions may have led to experimenter bias.

Another limitation was the lack of a pre-test or pre-assessment to measure prior content knowledge. Without a pre-test, there was no way to determine whether the significant results of the study were due to the treatment or the student's prior knowledge or aptitude.

A further limitation was that the quantity of posts was not factored into the analysis of this study. This study focused on the quality of posts and not the quantity, but the number of posts could have been a contributing factor to the outcomes of the study.

A final limitation came with the technology used by some of the peer teachers. Peer teachers were not trained to use the technology in Moodle and there was occasionally a struggle to get the lesson posted and viewed. Some of the students had difficulty accessing the lessons without intervention from the teacher.

### **Implications**

The implications of this study are discussed through three lenses: researcher, instructional designer, and instructor with a focus on reciprocal teaching for increased learning in distance education. This study showed that through purposeful design and strategic implementation, research-supported instructional strategies could be translated into an online, asynchronous course resulting in higher levels of learning. Online courses should be designed and taught using validated methods for learning even if the methods were not originally studied in or designed for



an online context. Online instructors in higher education need to understand learning theory and best practices for online teaching so they can purposefully select the technology and strategies that will bring about learning in the online course.

Based on the promising findings of this study, practitioners may want to adopt reciprocal teaching in their online courses. For successful implementation, students must first be taught how to use the strategies and act as peer teachers. Direct instruction may be embedded in the learning management system during the first weeks of class using videos, presentations, and documents. The instructor should model the strategies and act as the peer teacher early in the course to show students what is expected and how to participate. Posting grading criteria and rubrics will provide clear standards for successful practice of reciprocal teaching in the course.

### **Perceived Learning**

Much of the prior distance education research focused on perceived learning and did not measure actual student learning through empirical methods. A large body of distance education research focused on student attitudes towards learning, motivation or satisfaction, but did not address true learning outcomes. More studies should be conducted like this one using experimental methods with instruments that are designed to measure learning. After conducting a meta-analysis on distance education, Bernard et al. (2004) found that more valid and reliable distance education research should be conducted by researchers using quantitative measures of learning. Bernard et al. (2004) found that studies should focus on learning outcomes that are defined by level of thinking, moving beyond recall and comprehension to higher-order thinking. The present study quantified learning through instruments that measured deeper understanding of texts and higher-level thinking on an online course.

## **Technology**

We know that technology alone does not improve learning, but is simply the vehicle that delivers the strategies that do improve learning (Clark, 1984, 1994; Ross & Morrison, 1989). In his argument over whether media could improve learning, Clark equated technology to a grocery truck carrying groceries. He argued that the groceries in the truck symbolized learning strategies and the truck symbolized the technology. In the case of distance education, technology is the primary delivery mechanism for the instruction so it is important to learn how to optimize its use. According to Ross and Morrison (2013), distance education alters the question of interest from “Is technology effective?” to “How can it be used most effectively, given the learning conditions at hand with its special attributes?” The learning management system is not simply a delivery technology; it allows for two-way interactions. Online instructors must understand how to leverage its features to facilitate interaction strategies that will lead to high levels of learning. Instructional designers must figure out how design instruction using the technology tools in the learning management system to facilitate learning in online courses. Gagne’ (1987) wrote that instructional technology researchers are interested in both improving understanding of the conditions of optimal learning and identifying means of using media-based strategies to promote those conditions. Gagne’s insight fits well in distance education today.

The findings of this study specifically demonstrated that the instructional strategies used in the reciprocal teaching method could be extended into the discussion forums of the online classroom and they did improve learning. The discussion forum was the online tool chosen to support this complex method of instruction with multiple strategies and interactions. However, there are many other synchronous and asynchronous tools available in the learning management

system besides the discussion forum that may be optimal for supporting cognitive strategies for learning. Some include journals, blogs, wikis, messaging, chats, webpages, audio, video and many more. The list of technology tools is vast due to the capability to link external and third-party tools and technology within the learning management system. Our focus must shift to learning how the attributes in the learning management system and other associated technologies can accommodate research-based instructional strategies for higher levels of learning.

### **Future Research**

In this study the original reciprocal teaching method was implemented with fidelity. The full method with strategies and peer teaching was translated online. Since reciprocal teaching is a complex strategy package, all the strategies and peer teaching are essential components. While future researchers of online reciprocal teaching may experiment with variations of the strategies using different technologies, all the strategies and peer teaching should be kept together as a package. Future research should address the limitations of this study and be used to establish heuristics for practitioners who want to implement the method. Eight recommendations for future research are presented in this section.

First, future research that involves rating discussion forum posts in online learning should include at least one rater who is blind to the treatment and not involved in the study as a researcher or instructor. If ratings from the additional rater were found to be equivalent to the other raters it would give more validity to the outcomes of the study.

The second recommendation involves including a measurement of mental effort. The specific questions and methods unique to each group could have resulted in differing levels of mental effort and workload. In future studies, surrogate measures of mental effort and/or workload should be constructed to determine the difficulty level of treatments. These measures

would help determine whether the learning conditions in either of the groups required more mental effort and processing.

Next, a pre-test should be administered prior to the start of the study to ensure the control and treatment groups are made up of students with similar levels of content knowledge and abilities. The results of the pre-test could be used to account for individual and group differences and their potential influence on achievement within the course. Another benefit of administering a pre-test would be to show a change in participant's learning over time using the pre-test as a baseline. It is recommended that the pre-test be aligned with the midterm and final exam.

A fourth recommendation is to study the long-term transferability of the reciprocal teaching strategies and learning. This study investigated the effects of reciprocal teaching over one 16-week semester. However, transfer of knowledge is important, as is the ability to use strategies over time in other contexts. Future studies should look at transfer effects across multiple courses over time for individual students.

A fifth recommendation is to experiment with the timing of reciprocal teaching training and/or strategy use. Through different training regimes, researchers could determine the influences that timing and sequencing of treatments have on the outcome variables in the study. In addition, changes to the frequency of reciprocal teaching strategies and peer teaching use could determine if there is an optimal number and/or interval for using the reciprocal teaching method.

Further investigations could look at the effects of reciprocal teaching on students who are initially good or poor predictors, questioners, or summarizers to determine how the use of the strategies and peer teaching impacts these different learner types.

Finally, by studying reciprocal teaching in different levels and types of online courses, researchers could determine if there is an ideal content area or level of content for online reciprocal teaching. Like the original reciprocal teaching studies that focused on remedial readers, online reciprocal teaching could be studied in developmental online courses to determine the effects on students with lower reading abilities. Conversely, implementing reciprocal teaching in more challenging courses may enable students to better understand difficult content.

### **Conclusion**

Reciprocal teaching in higher education has been implemented with only the peer-teaching component or with only the strategies, but it is recommended that the four strategies and peer teaching be kept together as a package. This study was unique in that the full method was implemented with fidelity. The study design and methods were not meant to distinguish whether individual strategies or peer teaching contributed to the significant results.

The discussion forums provided a social setting so that students could share the responsibility of making meaning through social negotiation using generative learning strategies (Glaser, 1990; Vygotsky, 1978; Wittrock, 1974, 1990). The reciprocal teaching strategies and peer teaching fostered high levels of student interaction with the content and with the teacher and other students having a significant positive influence on learning. Peer teaching resulted in generative processing through the reworking of a topic from the textbook into a lesson and questions for peers (Collins et al., 1989; King, 1991; Pressley et al., 1992; Rosenshine et al., 1996; Wood et al., 1990). It is the complete complex strategy package that worked.

There is a need for more studies in distance education focused on improving text comprehension through research-validated strategies such reciprocal teaching. It is up to

researchers, instructional designers and teachers to ensure that online courses are engaging, interactive and most of all optimally designed for learning. While this study was a step towards understanding how to increase learning from texts using specific interaction strategies in an online, asynchronous course, there is a lot left to discover about effective learning interactions in the realm of distance education.

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**Appendix A. Generic Question Stems (Ryan, 1971)**

What is a new example of...?

How would you use...to...?

What would happen if...?

What are the strengths and weaknesses of...?

What do we already know about...?

How does...tie in with what we learned before?

Explain why...

Explain how...

How does..affect...?

What is the meaning of...?

Why is... important?

What is the difference between...and...?

How are...and...similar?

What is the best..., and why?

What are some possible solutions for the problem of...?

Compare...and... with regards to...

How does...effect...?

What do you think causes...?

Do you agree or disagree with this statement:... Support you answer.

## Appendix B. SOLO Taxonomy

### *Modes and Levels of the SOLO Taxonomy*

| Mode     | Structural level           | SOLO  |
|----------|----------------------------|---|
| Next     | Level 5: Extended abstract | The learner now generalizes the structure to take in new and more abstract features, representing a higher mode of operation. |
| Target   | Level 4: Relational        | The learner now integrates the parts with each other, so that the whole has a coherent structure and meaning.                 |
| Target   | Level 3: Multi-structural  | The learner picks up more and more relevant or correct features, but does not integrate them.                                 |
| Target   | Level 2: Uni-structural    | The learner focuses on the relevant domain, and picks up one aspect to work with.   |
| Previous | Level 1: Pre-structural    | The task is engaged, but the learner is distracted or misled by an irrelevant aspect belonging to a previous stage or mode.   |



**Appendix C. Reciprocal Teaching Rubric (Oczkus, 2010)**

| <b>Strategy</b> | <b>Exemplary (25)</b>  | <b>Proficient (20)</b>   | <b>Developing (15)</b>   | <b>Beginning (10)</b>  |
|-----------------|--|--|--|--|
| <b>Predict</b>  | <p>Uses text features and clues to make logical predictions</p> <p>Uses background knowledge to make predictions</p> <p>Consistently uses the language of predicting</p> <p>Gives solid reasons for predictions</p>  | <p>Provides predictions that make sense</p> <p>Makes predictions based on text clues, background information</p> <p>Checks predictions after reading</p> <p>Uses the language of predicting most of the time</p>   | <p>Makes some simple, sensible predictions</p> <p>Sometimes uses text clues and background to make predictions</p> <p>Makes some predictions that are not sensible</p> <p>Begins to use the language of predicting</p>   | <p>Predictions don't always make sense</p> <p>Does not use text clues such as illustrations, headings, to make logical predictions</p> <p>Predictions are wild and not text based</p> <p>Experiences difficulty even when prompted in giving reasons for predictions</p> |
| <b>Question</b> | <p>Consistently asks a mix of well-crafted questions that go with the events and ideas of the text; inferential questions; and critical thinking questions that take the discussion beyond the text</p> <p>Asks questions about the theme and deeper meaning of the text</p> | <p>Asks several levels of questions including a mix of literal recall questions about the main ideas of the text, literal recall about important details of the text, and inferential questions</p> <p>Wonders about the text and beyond</p> <p>Sometimes asks</p> | <p>Asks simple recall questions that go with the text and begin with who, what, when, where, why, how, and what if</p> <p>Asks simple "I wonder" questions that relate to the text</p> <p>Sometimes asks inferential questions</p> <p>Sometimes asks main idea</p> | <p>Experiences difficulty formulating even simple literal recall questions that begin with question words</p> <p>Asks questions about details in the text rather than important ideas</p> <p>Asks questions that do not correspond to the text</p>                       |

|                  |  |   |   |  |
|------------------|--|---|---|--|
|                  |  | questions of the author<br><br>Asks critical thinking questions   | questions   |  |
| <b>Clarify</b>   | Identifies words and ideas that are unclear<br><br>Consistently identifies and uses a rich variety of strategies for figuring out difficult ideas and portions of text<br><br>Identifies and clarifies high-level ideas such as idioms, metaphors, and symbolism | Identifies words to clarify<br><br>Sometimes identifies ideas and portions of text to clarify<br><br>Consistently uses more than one strategy for clarifying words and ideas                    | Identifies words to clarify<br><br>Identifies ideas and portions of text to clarify when prompted<br><br>Uses the same one or two strategies to figure out words and ideas<br><br>Sometimes does not realize that meaning has been lost<br><br>Begins to use language of clarifying | Does not stop to try to figure out words<br><br>Identifies words to clarify when prompted<br><br>Identifies ideas to clarify when prompted<br><br>Uses only one strategy to figure out words or ideas and needs to be reminded of others<br><br>Does not realize when he or she is stuck |
| <b>Summarize</b> | Retells in own words using some of the new vocabulary<br><br>Gives only most important events, points, and key details<br><br>Summarizes, giving points in order<br><br>Uses text structure to organize  | Leaves out unimportant details<br><br>Usually retells in own words using a vocabulary word or two from the text<br><br>Gives most of the points in correct order<br><br>Usually draws from text | Finds it difficult to separate main ideas from unimportant details<br><br>Includes some of the events in order but may give some out of order<br><br>Leaves out some of the important events and  | Does not remember much of the reading<br><br>Recalls random ideas or events from the text<br><br>Includes unimportant details<br><br>Needs heavy prompting to respond  |

|  |   |  |  |  |
|--|---|--|--|--|
|  | summary<br>Uses rereading and text supports such as illustrations and headings to summarize | structure to summarize<br>Rereads and uses clues from the text | ideas<br>Needs prompting to reread or use text clues | Does not reread or use text clues as tools for summarizing |
|--|---|--|--|--|

### **Appendix D. Reciprocal Teaching Training Videos**

Predicting - <https://youtu.be/v8CMSYncISI>

Questioning - [https://youtu.be/Oi7h8\\_7e0f4](https://youtu.be/Oi7h8_7e0f4)

Clarifying - <https://youtu.be/FO1slz4zNq0>

Summarizing - [https://youtu.be/Tv\\_-GQDHRg](https://youtu.be/Tv_-GQDHRg)

Dialogue and Peer Teaching - <https://youtu.be/3EX4SzUHMKw>

## Appendix E. Grading Criteria for Discussion Forums

### **An EXCELLENT post will be worth 25 points and will:**

- Addresses all of the questions and instructions in the prompt
- Include higher-level thinking
- Take in more abstract features of the topic
- Generalize and apply to the real world
- Demonstrates thoughtful reflection
- If reading and or research was required, a good post will demonstrate that this has been done prior to writing the post, including proper citation
- Is not just an opinion, but is based on fact
- Those facts are best demonstrated by research in your text; articles that are “scholarly”
- Be free from error including grammatical errors.

### **A Great post will be worth 20 points and will:**

- Address most of the questions and instructions in the prompt
- Integrate the parts with each other so that the whole has a coherent structure and meaning
- Demonstrate reflection
- May or may not have citations and research
- Based on fact, not just an opinion
- Is not redundant
- Be mostly free from error

### **An ACCEPTABLE post will be worth 15 points and will:**

- Include relevant and correct features
- Is mostly opinion
- May or may not meet the word count

### **A BELOW-AVERAGE post will be worth 10 points and will:**

- Focus on only one aspect of the lesson
- Not applied to real-world
- Have multiple errors
- Be weak in reflection
- Does not meet the word count

### **An UNACCEPTABLE post will be worth 0 points and will:**

- Learner is distracted or mislead
- Post is irrelevant
- Answer is incomplete
- Doesn't make sense
- Doesn't answer the question

### **Appendix F. Peer Teaching Guidelines**

The purpose of the Peer Teaching forum is to have a student-led online discussion about an important topic in the textbook chapter. The Peer Teacher must post the “lesson” and a discussion question by 11:59 pm on Wednesday night for up to 100 points. Other students in the class must post an initial response to the peer teacher’s lesson and discussion question between Thursday and Sunday of each week.

**No points are awarded for late posts.**

1. The lesson provides a clear presentation, summary, or outline of the topic including supporting details (50 points).
2. The discussion question is open-ended so there is not just one correct answer. It must be focused on an important aspect of the lesson. (25 points).
3. A question stem from the list was included to promote higher-level thinking during responses (25 points).

### Appendix G. Midterm Exam

1. Of the following, which is the most important teacher role?
2. The PRAXIS series is best described as:
3. "The process of using standardized tests to determine whether or not students have mastered essential knowledge and skills and basing promotion and graduation on test performance," best describes:
4. Children who return to empty houses after school and who are left alone until parents arrive from work are best described as:
5. A form of school violence that involves a systematic or repetitious abuse of power between student is best described as:
6. Which of the following are part of the definition of socioeconomic status (SES)?
7. The process of socializing cultural minorities so that their behaviors fit the social patterns of the majority is best described as:
8. "A variety of strategies schools use to accommodate cultural differences and provide educational opportunities for all students" is best described as:
9. Of the following, the description that most closely relates to mainstreaming is:
10. A plan created for every student having an exceptionality that includes an assessment of the student's current level of performance, objectives, strategies to ensure that the student is making ...
11. The historical period in American Education that most contributed to the strong link between religion & education was the:
12. Which of the following best describes an important problem with tax support for public schools?

13. The Supreme Court decision that made the policy "separate but equal" illegal was:
14. "A framework for thinking about educational issues and a guide for professional practice" best describes which of the following:
15. Some schools strongly emphasize basic skills, such as reading, writing, math, and now even computer literacy. The educational philosophy most closely associated with this emphasis is:
16. Of the following, which is the decision most closely related to forming your own philosophy of education?
17. The person given the ultimate responsibility for a school's operation is the:
18. "What teachers teach and what students (hopefully) learn," best describes:
19. Technical schools are designed to:
20. A geographical area given the legal responsibility for education within its borders is best described as:
21. You're applying for a job. Of the following, which will be most influential in determining whether or not you get the job?
22. Which of the following best describes a Charter School?
23. You will certainly be required to hold a bachelor's degree to teach, and you may be required to have a major in an academic area, such as math, science, or history. These mandates come from:
24. A process designed to ensure that teachers are competent and morally fit to work with youth is best described as:
25. A legal agreement between a teacher and a local school board is best described as:



26. In your own words, explain how the current reform movement in education is changing the teaching profession.
27. In your own words, describe societal changes and the implications of these changes for education.
28. In your own words, explain how cultural diversity influences learning and how effective teachers respond to this diversity.
29. In your own words, explain why a personal philosophy of education is important, and describe the steps involved in forming one.
30. In your own words, explain the differences between legal and ethical influences on the teaching profession.

## Appendix H. Final Exam

### Final Exam

1. Which of the following best describes the primary criticism of the term “at-risk?”
2. The process of socializing cultural minorities so that their behaviors fit the social patterns of the majority is best described as:
3. Support staff best describes which of the following?
4. According to Gallup poll examining public opinion, which of the following is the biggest problem facing local schools?
5. A principle requiring teachers to use the same judgment and care as parents in protecting children under their supervision is best identified as:
6. Which of the following best describes instruction?
7. Which of the following best describes explicit curriculum?
8. Of the following, which best describes the goal of service learning (involving students in social service projects)?
9. Which of the following is the best description of censorship?
10. Which of the following is not an outcome of effective management?
11. A classroom environment in which learners feel physically and emotionally safe and they feel personally connected to their teacher and peers best describes:
12. The amount of time a teacher or school designates for a topic or subject matter area is called:
13. Two students are fighting on the playground, but neither is in any of your classes. Of the following, which is the best description of your responsibility in this case?

14. Bloom's taxonomy consists of six categories. Which of the following is not one of those categories?
15. Of the following, which is the best definition of assessment?
16. Information students are given about their current understanding that can be used to increase future learning is best described as:
17. A teacher identifies a specific goal, arranges information so patterns can be found, and then guides students to the goal. This approach to instruction is best described as:
18. The process of assessing teachers' classroom performance and providing feedback they can use to increase their expertise is best described as:
19. Status granted to teachers after a probationary period (typically three years), indicating that employment is essentially permanent, is best described as:
20. The process of requiring students to demonstrate that they have met specified standards and holding teachers responsible for students' performance is best described as:
21. Which of the following is the best description of charter schools?
22. For which of the following are job opportunities likely to be the greatest?
23. A new teacher is attempting to maximize the likelihood of finding a job. Based on population growth patterns in the U.S., where will the opportunities be the greatest?
24. The process of gathering information about a teacher's competence for the purpose of making decisions about retention and promotion is best described as:
25. Which of the following percentages most accurately describes the proportion of students who are members of cultural minorities in the 20 largest school districts in our country?
26. In your own words, describe the different definitions of curriculum, and explain how curriculum and instruction are related.

27. In your own words, describe productive learning environments and explain how they contribute to learning
28. In your own words, describe instructional strategies, and identify applications of these in learning activities.
29. In your own words, explain how reform efforts focusing on standards, testing, and accountability are influencing the curriculum and classroom instruction.
30. In your own words, identify factors that contribute to a successful first year of teaching.

## **Appendix I. Learning Reflection Tool**

### **Treatment group instructions**

Please use this form to reflect on your use of reciprocal teaching strategies during the course.

Please rate each strategy for how effective it was in your learning (on a scale of 1 – 5) by selecting a numeric score (1 = extremely ineffective and 5 = extremely effective). Then, provide a written response discussing your thoughts about using each strategy and its effectiveness for learning in an online classroom.

Please rate peer teaching for how effective it was in your learning (on a scale of 1 – 5) by selecting a numeric score (1 = extremely ineffective and 5 = extremely effective). Then, provide a written response discussing your thoughts about peer teaching and its effectiveness for learning in an online classroom.

### **Control group instructions**

Please reflect on the discussions in the forums during the course. Rate how the discussions have impacted your learning (on a scale of 1 – 5) by selecting a numeric score (1 = extremely ineffective and 5 = extremely effective). Then, provide a written response discussing thoughts about the discussions and their effectiveness for learning in an online classroom.

**Appendix J: Sample Teacher-Led Discussion Questions for Control Group**

Q1: Discuss the major rewards and challenges in teaching. How do experienced and beginning teachers feel about the rewards and challenges of teaching? What are the implications of these findings for you as a beginning teacher?

Q2: What are the major arguments for and against testing teachers? Do you feel teacher tests are an effective way to ensure teacher quality, or are there better ways to guarantee teacher competency?

Q3: Discuss how the changes in American families have impacted public education over the past 50 years.

## VITA

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Jenifer R. Marquis  
STEM and Professional Studies, Darden College of Education  
Old Dominion University, Norfolk, VA

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### **Professional Profile**

Jenifer has extensive professional experience in public education ranging from primary to postsecondary education. Jenifer is a life-long learner with a reputation for innovation, enthusiasm, creativity, and integrity.

### **Professional Experience**

#### **Director of Distance Learning and Professional Development: November 2015 – Present Craven Community College**

Provides creative leadership for the Office of Distance Learning and the Center for Teaching and Learning to include strategies for continuous improvement.

Manages the Moodle Learning Management System.

Works with faculty to design online courses based on quality standards.

Designs and delivers professional development for the college.

Coordinates and monitors the ADA Compliance Plan

#### **Instructional Coordinator: 2014 – 2015 East Carolina University**

Regional recruiter for State Employees Credit Union Partnership East serving the Northeast and Coastal Consortium.

Academic advisor for online degree programs in Elementary Education and Special Education conducting advising sessions using face-to-face and online technologies.

Marketer for SECU Partnership East promoting the program throughout the Northeast and Coastal regions.

**Teacher/Instructional Designer: 2012-2014**  
**Mankato Area Public Schools**

Taught elementary students in a self-contained classroom using an innovative instructional approach while incorporating educational technology, research-based instructional strategies, Response to Intervention (RTI), and Professional Learning Communities (PLC).

Incorporated balanced literacy, and reciprocal teaching to improve students' reading comprehension and fluency.

Assessed students using formative and summative assessments including DIBELS, Minnesota Comprehensive Assessments (MCA), National Educational Assessment (NEA), and common formative assessments across the grade level.

Hired to design and develop a Moodle course for teachers across the district aligning the Common Core State Standards for Language Arts and the district reading curriculum.

Served on the Board of Directors for the Educare Foundation, a non-profit organization that awards grant funding to teachers for innovation and instructional technology. Reviewed grants and participated in organizing the annual Educare fundraiser.

Sought out by the Director of Media and Technology to serve on the district Media and Technology Committee. Met quarterly to discuss implementation of technology and allocation of technology resources for Mankato Area Public Schools.

Selected as chair of the school Media and Technology Committee. Set meeting schedules and agendas, recruited members, and collaborated to make decisions about media and technology in the school.

Wrote and was awarded \$16,000 Initiative Grant for a classroom set of iPads, a charging cart, and a wireless access point. Incorporated 21<sup>st</sup> century skills, project-based learning, and authentic assessments using 1:1 iPads in the classroom.

**Distance Education Coordinator: 2011-2012**  
**Nash Community College**

Provided professional development to faculty and staff on emerging technologies and the Moodle course management system for online course delivery. Taught faculty and staff the principles of effective instructional design for high-quality online courses.

Awarded the Nash Community College Foundation's *Innovation Award* for a program I built from the ground up called LEARN INSync. LEARN INSync is an acronym for Learn Innovatively at Nash Synchronously. Using two-way audio and video technology,



instructors and distant students connected virtually in real-time, removing the barrier of distance and location.

Coordinated the conversion from Blackboard to Moodle and provided all professional development related to the project.

Served as the Blackboard and Moodle Administrator for the college handling all aspects of the college's online and hybrid courses.

**Instructional Technology Lead Teacher: 2005-2011**  
**Edgecombe County Public Schools**

Provided workshops and coached teachers and administrators on curriculum, instruction, assessment and technology integration.

Wrote grants for instructional technology from the following sources: Enhancing Education through Technology (EETT), American Reinvestment and Recovery Act (ARRA/Stimulus), Science, Technology, Engineering and Math (STEM). Through these funds, the district was able to put technology in the hands of teachers and students.

Facilitated Professional Learning Communities (PLC) for teams of teachers within the department of Curriculum and Instruction.

Led workshops on unpacking the Common Core Standards with a team of Instructional Coaches from the district.

Using a Train-the-Trainer model spearheaded instruction on the Intel Teach Program resulting in 23 Intel Master Teachers and over 200 Intel trained teachers.

Coordinated North Carolina Virtual Public School (NCVPS) classes in the four high schools in the district.

Led the monthly Media and Technology Facilitator meetings for the district.

**Classroom Teacher: 1998-2005**  
**Helendale School District, California**

Taught kindergarten, first grade, and sixth grade at Helendale Elementary and Riverview Middle School.

Coordinated the school science fair and participated as a judge at the county level.

Facilitated a Balanced Literacy workshop at an all day in-service meeting for teachers. Developed and delivered the entire day of professional development.

**Education****Old Dominion University  
Norfolk, Virginia**

Ph.D. Instructional Design & Technology, May 2017  
Member of the Graduate Student Organization.

**National University  
La Jolla, California**

Master of Science in Educational Administration  
Superintendent and Principal License

**California State University  
San Bernardino, California**

California Teaching Credential, K-8  
Cross-Cultural, Language, and Academic Development (CLAD) Certification

**The University of Iowa  
Iowa City, Iowa**

Bachelor of Arts in Liberal Studies

**Professional Memberships**

Association for Educational Communication and Technology (AECT)  
International Society for Technology in Education (ISTE)  
North Carolina Technology in Education (NCTIES)

**Conference Presentations**

Marquis, J. (2017, March). Reciprocal teaching in an online community college course. Graduate Research Achievement Day, Norfolk, VA.

Marquis, J., Colon, T. (September 2016). Reciprocal teaching for higher-level discussions and deeper learning in online courses. Faculty Showcase, New Bern, NC.

Marquis, J. (2016, April). Online reciprocal teaching. North Carolina Community College Association of Distance Learning Conference (NC3ADL), Raleigh, NC.

Marquis, J., Smith, C. (2015, September). Advising strategies for distance learners. North Carolina Association of Colleges and Teacher Educators (NC-ACTE), Raleigh, NC.

Marquis, J. Hardison, B., Patterson, C, Prout, R. (2011, April). Strategies for a one-to-one laptop initiative. Conference of Educational Leadership, Raleigh, NC.

Marquis, J. Hardison, B., Witherspoon, C. (2010, March). One-to-one laptops. North Carolina School Boards Association, Raleigh, NC.

Marquis J., Pierce, V. (2009, March). Focus on field trips with technology. Southeast Regional Technology Conference, Greenville, NC.