

How Preservice Teachers Work in Collaboration:
Do Past Experiences and Beliefs Influence the Quality of their Heedful Interrelating

by

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A Dissertation Presented in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Approved April 2016 by the
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ARIZONA STATE UNIVERSITY

May 2016

ABSTRACT

This research investigated preservice teacher collaboration in the context of an undergraduate teacher preparation program. Small groups of preservice students were examined over five collaborative work sessions as they collaboratively designed and delivered instructional projects for their fellow classmates. This investigation contributes to understanding of factors that influence the quality of preservice collaboration to help teacher educators better prepare preservice students for current collaborations with their peers and future collaboration in professional settings. A parallel mixed methods design with an embedded two case study was employed to analyze and interpret two research strands – one quantitative, and one qualitative. Quantitative results served as complementary to corroborate the qualitative findings. The quantitative results and qualitative findings indicate that beliefs about future professional collaboration and past collaborative experiences impacted students' current collaborative efforts. Students with *expanded beliefs* about professional collaboration and/or a *flexible orientation* toward collaboration were more likely to heedfully interrelate than students with *simple beliefs* and/or an *inflexible orientation*. Preservice students' perceptions of the quality of their own and their group heedful interrelating remained stable across the phases of the collaborative task. However, analysis of the HICES noted significant differences in groups' perception of the quality of their collaborative interactions. Finally, analysis of the two-case study indicated that high quality heedful interrelating among group members created the more effective collaborative instructional project. A model of how preservice beliefs and orientations may influence their heedful interrelating during collaboration, and impact their efforts in designing and creating effective collaborative

instruction was presented. The dissertation research contributed to a more thorough understanding of factors that influence preservice collaboration as they prepare for professional collaboration, when the outcomes of collaboration are critical not only for themselves, but also for their own students. Implications for educational practice and further research point towards the continued need to better understand the processes of preservice collaboration, and factors that impact their interaction as they learn to collaborate for improving instruction, and how teacher preparation programs can support and best address their needs as they prepare for their critical careers.

DEDICATION

This dissertation is dedicated to my loving family, especially my husband, K. Bellamy Brown, without whom I would be lost like a canoe in the Okefenokee. Also, to my sons, Benjamin B. Brown and Kendon L. A. Brown, who provide light and warmth always. You are my everything!

ACKNOWLEDGEMENTS

I would like to thank my dissertation chair, Michelle E. Jordan, PhD for her constant support, encouragement and tutelage. Without her help, it would have been impossible for me to finish this dissertation and my doctoral studies. Thanks for being the rock upon which I could rely to build knowledge and skill. You are a gem! Thanks also to my committee members, Jill K. Stamm, PhD, and Sarah R. Daniel, PhD for their time and contributions to this work. I would also like to thank Robert D. Strom, PhD, who was instrumental in getting me started on this path, but retired before I was able to complete my program. Also, thanks to Jared T. McLain who encouraged me to pursue a PhD, to my friend Lynn Fox, PhD who went out of her way to assist me, and Ashley E. Burch, PhD who went above and beyond the call of duty, without ever having met me. To all of these, I am forever grateful.

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Chapter 1: Introduction

Students enrolled in teacher education programs (i.e. preservice teachers) need opportunities to learn and practice skills needed for their profession, including those of successful collaboration. In current educational contexts, professional teachers not only instruct and interact with pupils, but also work in collaboration with colleagues on complex problems of their craft (Dobber, Akkerman, Verloop, & Vermunt, 2014; Dufour, 2004; Gellert, 2008). This same type of collaborative practice should, therefore, be included in preservice education programs (Dobber et al., 2014; Kaasila & Lauriala, 2010; Nevin, Thousand, & Villa, 2009). Yet, increased implementation of collaboration among professional teachers has not led to an increased understanding of collaboration among preservice teachers (Dobber, et al., 2014). Preservice course work may include collaborative activities, without a focus on collaboration as the learning objective. Nevertheless, how preservice teachers think about collaboration and the skills involved may influence their collaborative efforts with classmates during their professional preparation programs and with professional colleagues in the future (Ellis, 2010; Malderez et al., 2007; Ruys, Van Keer & Aelterman, 2010; Timostuk & Ugaste, 2010; Van Huizen, Van Oers, & Wubbles, 2005). Currently, little is understood about the micro-interactional processes of preservice teacher collaboration and how these processes may be influenced by students' past experiences in collaboration and beliefs about collaboration in professional contexts.

This study addresses preservice teacher collaboration through an observational mixed methods study of students' quality of interaction (i.e. heedful interrelating) as they

collaborated in small groups to design and deliver course content-related instructional projects to their classmates. The purpose of this research was to extend the research on how preservice teachers' past experiences and beliefs about professional teacher collaboration influenced their current collaborative interaction. This is important because how preservice teachers think about and experience collaboration is likely to influence their contributions now and with colleagues in the future.

The Need for Teacher Collaboration

Historically, educators worked mostly alone in isolation with their students; individually responsible for student learning (Hargreaves, 1994; Little, 2003; Rosenholtz, 1989a). In modern education, collaboration among teachers has become an integral part of school structures (Barron, 2003; Murray, 2004; Van den Bossche, Segers, & Kischer, 2006). Foregrounding of collaboration in schools may in part be due to the current trend towards increased responsibilities for teachers, and the need to tailor instruction that meets the needs of increasingly diverse student populations (Houser, 2005; Leana, 2011; Levin & Marcus, 2010; Nevin, Thousand, & Villa, 2009). In addition, education policy makers have also pointed out that because students are future employees, collaborative activities and assignments should be a part of schooling to prepare young people for work as an employee capable of contributing to collaborative enterprise (Blumenfeld, 1996). Moreover, school reforms have begun to emphasize collaborative work among teachers as a means of improving teaching and student learning (Gable & Manning, 1997; Louis, Marks & Krause, 1996; Leanna, 2011, Morse, 2000).

High quality teacher collaboration needed for improvement in teaching and student learning is difficult to achieve, and by no means automatic (Johnson, 2003;

Kelchtermans, 2006; Little, 1990). Obstacles to the development of high quality teacher collaboration identified in research include: teachers' attitudes about collaboration, time and effort required for developing effective collaborative relationships, and problems and conflicts associated with compromise (Achinstein, 2002; Goddard et al. 2007; Little, 1990). Attempting to understand variances in teacher collaboration, research has moved toward unraveling the actual processes of professional collaboration (Woodland, Lee, & Randall, 2013). Nevertheless, fewer inquiries have addressed the processes of preservice teacher collaboration; how they learn to collaborate, or how best to prepare them for future professional collaboration. Conjointly, research has indicated that teachers' beliefs about collaboration influence their collaborative efforts (Friend & Pope, 2005; Turner, Warzon, & Christensen, 2011), and that collaborative skills can improve with training and continued practice (Azevedo, 2009; Ruys, Van Keer, & Aelterman, 2010; Weick & Roberts, 1993). It is therefore likely that preservice teachers' beliefs about professional collaboration, past experiences with collaboration, and collaborative training received during teacher preparation will influence their collaborative efforts now, and in the future as professionals.

Broadly defined, teacher collaboration occurs as teachers work together planning, implementing, and evaluating teaching strategies and practices toward the common goal of enhancing student learning (Dobber et al., 2014; Goddard, Goddard & Tschannen-Moran, 2007; Woodland, Lee & Randall, 2013). Productive collaboration entails that together teachers set goals for student learning, design and implement instructional strategies to address student needs, and evaluate the effectiveness of those strategies (Friend & Cook, 2013; Woodland et al., 2013). A growing body of research indicates

that this on-going cycle of collaborative discussion, decision, action, and evaluation appears essential to building teachers' instructional practices that impact student learning and achievement (City, et al., 2009; Darling-Hammond et al., 2002; Koliba & Woodland (nee Gajda), 2009). In addition to improving teachers' instructional practices, teachers' work conditions also improved when teachers work in highly functioning and cohesive professional teams (DuFour, 2004, Rosenholtz, 1989a). Teachers report increased levels of confidence, enthusiasm, innovation, job satisfaction and moral support, as well as a heightened commitment to teaching (Hargreaves, 1994).

Howbeit, as noted above, not all professional collaboration is productive (Achinstein, 2002b; Kelchtmans, 2006; Hargreaves, 1994), and may be difficult to achieve, even when school support structures are in place (Corrigan, 2000). High quality collaboration requires trust and security, which takes time to develop (Achinstein, 2002; Hargreaves, 1994). Furthermore, collaboration on complex issues can be time-consuming and emotionally demanding, particularly when teachers must challenge their deeply held values of practice (Achinstein, 2002; Johnson, 2003). Many teachers fear too frequent collaboration will deprive them of their autonomy, individuality and creativity (Hargreaves, 1994). For these and other reasons, teachers often prefer to maintain congeniality, and confine their collaborative efforts to cooperating on lesson plans, solving classroom management, or maintaining the existing circumstances (Munthe, 2003; Sato & Kleinsasser, 2004; Smylie, 1995). Research has also reported the negative impact of teacher cliques, the development of "groupthink", and loss of personal development when teachers rely too heavily on colleagues (Hargreaves, 1994; Munthe, 2003).

Meeting the Challenges of Studying Collaboration

As a complex social process, the study of collaboration, poses challenges for theory and methodological development alike (Damsa, 2014; Volet & Vauras, 2013). Collaborative groups are social systems uniquely different from individuals working side by side but on their own (Damsa, 2014, Johnson & Johnson, 2005, Molenaar et al., 2014; Weick & Roberts, 1003; Woodland et al., 2013). Neither groups, nor the products of the collaborative work, can be understood by examining the individuals or the individual contributions of group members (Weick & Roberts, 1993). Much of the traditional research related to collaboration in academic contexts has been grounded in one of two theoretical frameworks, social interdependence theory and socially shared metacognitive regulation. However, each of these frameworks has limitations for understanding the processes and outcomes of collaboration. Thus, new frameworks may be needed to further understanding of collaboration in general and of preservice teacher collaboration specifically.

Social Interdependence Theory is a social psychology framework rooted in the early research of group dynamics that has frequently been applied to examining student collaboration in educational contexts. Tenets of the theory focus on how the structure of group goals influences patterns of interaction, and therefore, outcomes (Johnson & Johnson, 2005). Groups working together to accomplish shared goals may develop patterns of interactions that define *positive interdependence*. In turn positive interdependence supports the emergence of *promotive interactions*, a high quality type of collaboration (Johnson & Johnson, 2005, O'Donnell, 2006). Research employing this theoretical perspective, has in general applied single method quantitative methods

focused on delineating the positive outcomes of collaborative learning, such as: improved student achievement, better retention of subject matter, more creative and accurate problem-solving, willingness to persist in the task, increased effective performance of a future similar task, and positive interpersonal relationships among students (Johnson & Johnson, 2009; Johnson, Johnson, & Smith, 2007).

Social interdependence theory has played a significant role in introducing and extending conceptualizations of group collaboration in academic contexts. However, in the early surge to document the positive benefits of collaboration, less research attempted to uncover the interactional processes of collaboration. When research indicated that collaborative groups with similar structure, contexts, and goals sometimes failed; discussions of positive outcomes failed to explain the variance (Barron, 2000). To address this gap, social interdependence theorists called for more research into the micro-processes of collaboration (Johnson & Johnson, 2005). Other educational research of student collaboration began to focus on the processes of micro-interaction in collaboration.

Socially Shared Metacognitive Regulation is a framework focusing on the micro-interactional processes within small-groups (i.e. two to four) of collaborating students, and has most frequently employed qualitative methods of analysis (Goos, 2002; Khosa & Volet, 2014). Stemming from the larger framework of regulation of learning, socially shared metacognitive regulation posits that collaborative processes are a result of the specific micro-interactions in groups; the give and take of conversation, and active behavioral participation (Volet & Vauras, 2013). The highest quality of collaboration results as group members monitor, and control their own thoughts and behaviors, while

simultaneously organizing and monitoring collective learning and activities in progress toward collective goal achievement (Iiskala, Vauras, Lehtinen, & Salonen, 2011; Molenaar et al., 2014).

Research applying this framework indicates that socially shared metacognitive regulation in student discourse is related to more frequent solution of complex problems (Goos, 2002; Khosa & Volet, 2014), and, higher levels of collective content understanding resulting in higher achievement (e.g. De Backer, et al., 2015; Prins et al., 2006; Van der Stel & Veenman, 2010). By unraveling the complex interactions of collaboration, researchers hope to contribute to more successful collaborative experiences for students.

For the purposes of the present study, it is useful to compare social interdependence theory and socially shared metacognitive regulation in terms of what they offer for understanding preservice teacher collaboration. Social interdependency theory points us towards promotive interaction as critical to the success of collaboration, but offers few tools for understanding what it looks or sounds like. This may in part be due to the tendency of the studies to use quantitative methods that may have difficulty exposing the fine-grained processes of collaboration. However, the assumption that similarly structured groups and goals will produce high quality collaboration has also not been realized (Khosa & Valet, 2014). Socially shared metacognitive regulation, while often employing complex methodologies that include both qualitative and quantitative approaches, tends to focus on how social regulation influences individual outcomes that result from collaboration or social interaction. However, the concerns of the present research and of teacher education go beyond individual learning outcomes.

The issues for teachers, both professional and preservice, is not only whether, and the extent to which individuals learn through their collaboration, but also whether they engage in the kinds of high quality interactions capable of progressing a collective task (e.g., designing instruction, evaluating student outcomes). Thus, when addressing collaboration among preservice teachers, the focus on individual learning alone must shift to a dual focus that includes learning content and pedagogic strategies for instruction of others (Dobber, et al., 2014; Gellert, 2008; Ruys, Van Keer, & Aelterman, 2010; Shulman, 1987), as well as whether and how preservice teachers develop high quality collaboration that leads to effective collaborative instruction. Other frameworks may be needed to provide greater insight into how preservice students engage in learning content and pedagogy while attempting to create collaborative instruction.

Heedful Interrelating is a framework borrowed from organizational management research, and was first applied in educational contexts by Jordan and Daniel (2010). This framework contributes the concept and ability to analyze the collective “minding” that can develop in collaborating groups. *Collective mind* or distributed cognition, is the idea that cognition can be interpreted as shared and distributed among group participants, and develops from the care or “heed” with which the collaborative works together. From their research on organizations requiring near perfect operations, such as aircraft carrier flight decks, Weick and Roberts (1993) developed the concept of heedful interrelating to help explain the consistent, high-quality performance of group members in these high-risk settings. These authors found that heedful interrelations among the crew accounted for the almost complete lack of disasters, as individuals demonstrated careful, attentive, willful communication and behavior, while also avoiding careless, thoughtless, habitual

communication or behavior, in achieving successful aircraft flight and recovery operations. As crewmembers developed collective minding through their heedful interactions they were able to respond and adapt to unexpected, extreme events. Since the seminal investigation of flight deck teams, heedful interrelating has been examined among teams in healthcare (Tallia, Lanhan, McDaniel, & Crabtree, 2006), product innovation and production (Dougherty & Takacs, 2004), as well as educational settings (Daniel & Jordan, 2015, and in press; Jordan & Daniel, 2010). This body of research provides support for heedful interrelating as a basic theory for understanding effective social interaction and high quality collaboration.

The framework of heedful interrelating provides well-developed descriptors of high quality collaboration. *Contributing, representing, and subordinating* are collective interactional processes, which when enacted with care, intention and volition (i.e. heed) characterize high quality interaction in collaboration, and support high quality task outcomes, whether the task is successful aircraft recovery, product innovation, or, potentially, preservice teacher collaborative instruction.

This borrowed framework may help illuminate the micro-interactional processes with which educational researchers have been grappling. Jordan and Daniel (2010) identified discourse markers of heedful interrelating while examining university students in a preservice education course who were participating in collaborative learning projects. Their research of heedful interrelating in education adds unique constructs to the framework important to investigations of collaboration that occurs mostly through discourse, like that of collaborating students. Nonetheless, heedful interrelating, with its combined focus on both collaborative task and interaction, is an uncommon perspective

in educational research. Yet, this joint focus becomes of major importance when examining preservice teachers who through collaboration must develop content and pedagogic knowledge, while applying both types of knowledge to the design of instruction suited to their preservice classmates.

The complex social nature of collaboration requires theoretical frameworks capable of depicting its complexity, and presents challenges when devising analytic methods capable of examining this complexity. The mixed methods approach to research involves the use of both qualitative and quantitative methods within a single study to arrive at integrated conclusions that are more credible and persuasive than is possible with the sole use of either method (Creswell & Plano Clark, 2011; Johnson & Onwuegbuzie, 2004; Teddlie, & Tashakkori, 2009). Inquiries applying mixed methods have been growing in research applications in education and the social, behavioral, and health sciences (Ivankova & Kawamura, 2010). The extent to which the use of mixed methods research has increased may well be attributed to applying the strengths of both methods in exploring complex social issues from multiple perspectives (Tashakkori & Creswell, 2008). A mixed methods approach is well suited to the examination of the complex social process of collaboration among preservice teachers.

Purpose Statement

The purpose of this mixed methods study is to extend our understanding of the quality of preservice teacher collaboration during the design and presentation of instructional projects. A convergent parallel mixed methods design was used in which quantitative and qualitative data strands were collected in parallel, analyzed separately, and then integrated (Creswell & Plano Clark, 2011). To execute this approach,

quantitative data from two survey questionnaires were collected and analyzed. The surveys examined heedful interrelating in collaborative interaction, and explored preservice teachers' beliefs about future collaboration as professional inservice teachers. Concurrently, qualitative data were collected, including researcher observations, audio/video recordings, written reflections, interviews, and quantitative assessment of collaborative groups' instructional projects. Qualitative analyses probed the quality of preservice collaborative interaction and instruction, in addition to inquiring into the influences of past experiences, and beliefs about future collaboration. It was hoped that together, qualitative and quantitative data would extend our understanding of how preservice teachers interact as they design and present instruction, and how past experiences and beliefs about future professional collaboration might influence the quality of their interactional efforts as well as the quality of their collaborative projects. The reason for collecting both quantitative and qualitative data was to converge and integrate the two forms of data to bring greater insight to these issues than would have been obtained by the sole use of either type of data.

The following research questions guided the study design:

1. How do preservice teachers' perspectives of their previous collaborative experiences and their beliefs about professional teacher collaboration influence the quality of their heedful interrelating during the current collaborative project?
2. How and to what extent do preservice teachers' perspectives of the quality of their heedful interrelating change across phases of the collaborative project?

3. How is the reported and observed quality of heedful interrelating among members of two focal groups related to the creation of their collaborative instruction projects?

Chapter Two: Literature review

Collaborative work today is seen as an important facilitator of beneficial outcomes across academic and organizational workgroup teams. In terms of student activity, since the 1960's, collaborative group work has been increasingly implemented in all levels of education, with proponents citing numerous benefits as justification for its growing popularity (Johnson, Johnson & Smith, 2007; Johnson et al., 1981). In business organizations, collaborative groups have been found to outperform individuals, especially in product and knowledge development (Kozlowski & Ilgen, 2006; Vanita et al., 2009). More specific to this study, collaboration has surfaced within educational organizations as a method of addressing the increased demands of the teaching profession (DuFour, et al., 2006; Woodland, et al., 2013). School district leaders frequently require teachers to collaborate with colleagues across departments (Goddard, Goddard, & Tschannen-Moran, 2007; MetLife Survey, 2010) in developing instruction or helping each other improve teaching strategies and outcomes (Leana, 2011). Given these current educational practices, preservice students need to learn the skills needed to work in collaboration as professional teachers (Dobber, et al., 2014; Friend & Cook, 2013). It may prove beneficial to develop and practice these skills during academic coursework when professional careers are not yet at risk and the impact on future students is still minimal (Goddard, et al., 2007). Thus, students who intend to become professional teachers will likely benefit from working in collaboration with their colleagues (Levin & Marcus, 2010; Molenaar, Daly, & Slegers, 2011) to help prepare them for the collaborative nature of the teaching profession.

This chapter is divided into two sections. In the first section the literature on teacher collaboration is reviewed, followed by a shorter subsection reviewing the literature related to preservice teacher collaboration. In the second section the literature on group collaboration is reviewed focusing on the three theoretical frameworks that ground the dissertation research: social interdependence theory, socially shared metacognitive regulation, and heedful interrelating. Each framework is applied to the development of preservice teacher collaboration.

Preparing preservice teachers for professional collaboration

In this first section of the literature review, previous research on teacher collaboration is reviewed. The societal changes that have influenced educational reforms toward less isolation for teachers and greater shared responsibility among teachers in schools is briefly reviewed. Next, research that has considered the benefits of teacher collaboration for teachers, students, and school reforms is discussed. Also described are obstacles associated with teacher collaboration along with a discussion on recommended ways of building high quality collaboration among teachers. In each of these subsections possible implications for preservice teacher preparation for professional collaborative practice is discussed. Finally, the section ends with a short section reviewing literature related to preparing preservice teachers for professional collaboration.

Contextualizing Teacher Collaboration

Historically, collaboration has not been the norm in education. In the past, American school teachers have typically been isolated in their classrooms, teaching their students alone, and relying on their own expertise or trial and error methods of

improvement (e.g. Lortie, 1975, Rosenholtz, 1989b; Sarason, 1996). However, changes in society and increased needs of education seem to demand a change in this model. In his seminal work, *Changing Teachers, Changing Times*, Hargreaves (1994) describes how various societal pressures; constant technological change, increasing cultural diversity, scientific uncertainty, failing economies and accelerated global changes are affecting schools and teachers world-wide.

Facing these stresses figures heavily in the problems of education, and yet, with all the incumbent problems of societal pressures, educational institutions may persist in approaching new problems with old systems. Some reform efforts have suggested that teachers take on new problems and roles, while also persisting in their traditional roles (Keltchermans, 2006). However, as teaching innovations increase, the time and ability to implement them decreases, putting teachers and students at risk. Student failures incite further criticisms of teaching methods and education. As concern increases for future generations, so does the pressure to “fix” education (Hargreaves, 1994).

During the last two decades of reform efforts, and teacher collaboration has surfaced as one of the more effective approaches to educational improvement (Garet et al., 2001; Levin & Marcus, 2010; Louis et al., 1996; Wasley et al., 2000; Wenglinsky, 2000). Reformers and administrators often view teacher collaboration as the key component to implementing the growing list of local and national reforms expected of schools today (Brownell, et al. 1997). Seminal research on teacher collaboration described the importance of less teacher isolation and more shared responsibility. Rosenholtz (1989a) described teacher isolation as probably the greatest barrier to improved educational practices. Hargreaves (1994) argued that the multiple social

pressures noted above would continue to affect both schools and teachers, and increase the need for teachers to collaborate effectively. More recent reviews of teacher collaboration have outlined how increased diversity has maintained a need for professional teacher collaboration and increased the need for preparing future teachers to collaborate across disciplines (Nevin, Thousand & Villa, 2009; Winn & Blanton, 2005). There is little doubt that preservice teachers will someday collaborate with other professional teachers. This expectation increases the need for teacher educators to understand how collaborative experiences during teacher preparation may influence students' future collaboration as professionals.

Benefits of Teacher Collaboration

Teacher collaboration has been described as having many benefits. Research has linked collaboration with various positive outcomes for students, school reforms and teachers (Hargreaves, 1994; Johnson, 2003). Professional collaborative working relationships help teachers improve their knowledge and teaching skills, as well as address student instructional needs (Gable & Manning, 1997). Effective collaboration is related to improvements in both teacher skills and student achievement (Burbank & Kauchak, 2003; Loughran et al., 2004). Research on collaborative practices among teachers has noted that those who establish a strong sense of collegiality and collaborative practices are more likely to develop better instructional strategies, and thereby better support for student learning (Little, 2003). Garet et al. (2001) noted that collaboration among teachers increased teachers' knowledge and skills, resulting in better instruction and student outcomes. Research also indicates a positive relationship between teacher collaboration and student outcomes such as improved reading, math and science

scores (Goddard et al., 2007; Leana, 2011; Newmann et al., 2001; Wenglinsky, 2000), and lower drop out rates in low-income urban schools (Darling-Hamond et al., 2002).

Working together and learning from colleagues provides teachers with valuable opportunities to develop their expertise and address diverse student needs (Friend & Pope, 2005, Gable et al., 2004; Little, 2003). By examining students from the various perspectives of their colleagues, teachers may develop knowledge of needs and strengths that they could not achieve through the limited view of their individual interaction with the student. With in-depth understanding they can create learning strategies to meet specific needs (Jenkins & da Costa, 2001). Collaboration also allows for the collective to intervene before difficulties become entrenched (DuFur, 2004). Conversely, a child's educational needs may not be met when teachers do not share their knowledge about that child (Hart, 1998).

When teachers plan together, workload may be reduced for all involved. Some lesson plans and tests may be utilized across the group, reducing duplicative efforts, and allowing particular knowledge or strengths of each individual to be utilized more effectively (Dearman & Alber, 2005; de Lima, 2003; Johnson, 2003; Joyce & Showers, 1996). Group planning sessions also provide teachers with opportunities to offer advice and support when needed (Little, 1990).

Collaborative opportunities contribute to an increased sense of community and collegiality. Through exchange of ideas and viewpoints and discussing instructional practices, collaboration encourages change. High quality collaboration provides a sense of support and encouragement (Bullough, 2005; Hausman & Goldring, 2001). Research suggests that the willingness and confidence teachers need to take risks, experiment with

new methods and make changes to improve their practice can be supported through sharing and cooperation (Dearman & Alber, 2005, Hargreaves, 1994). McAllister and Murphy (1990), researching schools in New York City, reported that student achievement was higher in schools where teachers had strong ties to colleagues with whom they often worked on instructional issues. Teachers not only benefit, but so do students, as instructional practices improve. Conversely, when schools foster isolation, teachers rarely change instructional practices (Rosenholtz, 1989a; Schmoker, 2006; Smylie et al., 1996). When isolated from each other, teachers cannot share skills and knowledge with colleagues. This prevents the opportunity to learn from each other. Under these conditions, teachers are less likely to adopt changes and struggling teachers are more likely to struggle and fail (Conley et al., 1988; Rosenholtz, 1989b). The key to change is the reduction of isolation (Darling-Hammond, 1998; Hall & Hord, 2006).

Furthermore, the need for teacher collaboration goes beyond day-to-day instructional planning. Successful school reform appear to reside in the collaborative culture of the school (Morse, 2000). Research indicates that school reforms are more likely to succeed when teachers who will be responsible for implementing the new practices, and participate in the decision-making process (Huffman & Kalnin, 2003; Louis et al., 1996; Preskill & Torres, 1999). Furthermore, some educational reforms have floundered because they did not fully integrate teachers in all stages of implementation (Fullan & Hargreaves, 1991).

Historically, teacher professional development has taken place in isolation and has been heavily dependent on the expertise of outsiders. However, collaboration has been noted as a particularly effective alternative avenue for teacher development

(Hargreaves, 1994). As collaboration provides an alternative to reliance on outsider input and gives teachers control and active involvement in their own professional development. Additionally, teachers are more likely to ask for help on instructional issues from a trusted peer than from a designated expert such as a principal or district resource person (Leana, 2011; Little, 2003). Required professional development courses taught by outsiders may provide little that is relevant to teachers needs. Plus, if no arrangements are provided to practice and apply new strategies; integration into the teaching repertoire is unlikely. Collaborative working relationships also help teachers sustain their commitment and obligation to continuous professional improvement (Rosenholtz, 1989).

Research has indicated that a positive relationship exists between teacher collaboration and teachers' confidence or self-beliefs about teaching (Beatty, 1999; Jenkins & da Costa, 2001; Johnson, 2003). The belief and confidence that one can succeed at teaching, and have a positive impact on student learning, is an important indicator of instructional outcomes (Armor et al., 1976; Goddard, Hoy, & Hoy, 2000). Bandura (1986) posited that a teacher's belief that s/he can positively affect student learning is entwined with the development of student cognitive skills. Furthermore, these beliefs and expectations are believed to be influenced by past experiences and whether past successes are attributed to chance or skill (Bandura, 1977).

The relationship between teacher collaboration and development of confidence in one's ability teach effectively has important implications. Much research has specifically addressed the issue of how teachers' beliefs and perspectives about teaching influence various student outcomes. These outcomes include, but are not limited to: enhanced enthusiasm for teaching (Allinder, 1994, Erb, 1995, Pounder, 1998), greater expectation

for student success (Gibson & Dembo, 1984), decreased criticism of student efforts (Guskey, 1984), and greater acceptance of responsibility for student learning outcomes (Marlow-Iroff, O'Connor, & Bisland, 2004). As teacher collaboration supports the development of confidence in one's ability to teach effectively, it potentially fosters a positive impact on student outcomes.

The burden and anxiety of relying solely on personal reflection and evaluation for skill improvement is eased through collaborative efforts. Collaboration may foster a climate in which teachers collectively practice reflection, question ineffective teaching routines and evaluate new teaching strategies (Dearman & Alber, 2005). This collective reflection and evaluation of teaching strategies, allows teachers to support one another's growth, and teaching can improve (Ackerman et al., 1996; Brandt, 2003; Little, 2003).

Obstacles to Collaboration

Collaboration may sound like a panacea for the ills of education and the teaching profession. However, there are challenges and concerns as well. Conflicts will likely arise. Achinstein (2002) notes that conflict is an inherent part of the collaborative process. During discussions of values and practices differences can be accentuated (Achinstein, 2002; Grossman, Wineberg & Woolworth, 2001). While intellectual conflict can spark innovative ideas and opportunities for growth, when it becomes personal or emotional, it can spoil collaborative efforts (Achinstein, 2002; Hargreaves, 1994; Walker, 1999). However it arises, whether from disagreement over new practices, personal insecurities or out of a sense of competitiveness (Achinstein, 2002; Coorigan, 2000), conflict can undermine collaboration. If teachers are unable to resolve the conflict, it can nullify the purpose of the collaboration (Rosenholtz, 1989b).

Hargreaves (1994) noted that when collaboration is imposed (i.e., *contrived*, p. 186) it becomes a threat to true effective collaboration. When administrations regulate collaboration, teachers may resist or find that regulated times and methods of collaboration do not work for them (Diez & Blackwell, 2002; Hargreaves, 1994; Little, 1990). If allowed to collaborate as they see the need and in the ways they see fit, individual teachers will develop their own style of interaction (Friend & Cook, 2013; Louis et al., 1996). Simply requiring teacher to work together will not guarantee quality collaboration and therefore, contrived collaboration may negate the benefits (Hall & Hord, 2006).

Some teachers are not receptive to the collaborative process or motivated to participate. Motivating teachers to participate can be difficult. Most university teacher education programs do not teach collaboration skills (Erickson, Minnes-Varndes, Mitchell, & Mitchell, 2005). Further, few professors teach collaboratively, so students rarely see collaboration modeled (Goddard et al., 2007). Since many teachers have been trained to work alone, they may not understand the benefits and fear a loss of autonomy, privacy or independence (Bezzina, 2006). Lacking a belief that collaboration has value, teachers may not be willing to invest time and effort (Diez & Blackwell, 2002; Wineburg & Woolworth, 2001).

Providing Contextual Support for Teacher Collaboration

Teacher collaboration has important and wide-ranging consequences. Examining the multiple benefits of collaboration highlights the need for providing a context that supports teacher collaboration. Rosenholtz (1989a), in a seminal work on school cultures, noted that despite many contrived settings of collaboration teachers still found

ways to collaborate productively. She identified school culture as the mediating support factor that supported the development of collaboration. School administrators can provide a foundation for effective teacher collaboration by leading with shared vision and values, and enlisting faculty in the decision-making process (Conley et al., 1988; Darling-Hammond et al., 2002; Hausman & Goldring, 2001; Wasley et al., 2000). Administrative endorsements for collaboration also include allowing teacher autonomy, and providing teachers the freedom to judge the organization and content of their work (Clement & Vandenberghe, 2000). Allocating time and resources, while also decreasing teachers' administrative responsibilities provides a supportive context (Darling-Hammond et al. 2002; Marks & Louis, 1977; Woodland (nee Gajda) & Koliba, 2008). Other administrative approaches for fostering collaboration include: creating a sense of “oneness” or community, fostering a sense of mutual security, advocating for sharing learning and ideas, as well as providing training in skills and competencies needed to aid teachers in achieving school goals (Nias et al., 1989).

More directly pertinent to this study, as the primary participants in the collaborative process, teachers play a major role in the quality of collaborative outcomes. Research indicates that successful professional collaboration is a complex interplay of several factors including: teachers working relationships, perspectives and attitudes toward collaboration, and, motivation for the collaborative issues and tasks (Diez & Blackwell, 2002; DuFour, 2004; Kelchtermans, 2006; Kwakman, 2003, Rosenholtz, 1989a). Accordingly, high quality teacher collaboration likely includes relationships of trust and mutual respect, positive attitudes and perspectives about the collaborative process, motivation and willingness to participate, and interest in the issues or tasks,

within a school climate of support for collaboration (Achinstein, 2002; Brandt, 2003, Hausman & Goldring, 2001; Russell & Flynn, 2000, Rosenholtz, 1989a). Effective collaboration requires critical analysis of classroom practices, but a willingness to participate in scrutiny of one's own professional practices can only occur as it is coupled with confidence and trust (DuFour et al., 2006). Trust and mutual respect also play an important role in the conflict that arises as an inherent part of collaborative discussions of deeply held values and practices (Erickson et al., 2005; Johnson, 2003). Achinstein (2002, p. 448) adds that the challenge of collaboration is to find a balance between maintaining caring, supportive relationships, while also "sustaining the constructive controversy that is necessary for authentic professional learning." Collaborative relationships characterized by mutual respect arise from multiple experiences and interactions (Corrigan, 2000). Thus, administrators and teachers alike should realize that successful collaborative programs develop over time.

Furthermore, teachers' beliefs and attitudes are important contributors to the school collaborative culture (Diez & Blackwell, 2002; DuFour, 2004; Kwakman, 2003). As such, it is vital that teachers have positive perspectives and attitudes about the collaborative process, and that they are motivated and willing to participate (Achinstein, 2002; Brandt, 2003; Hausman & Goldring, 2001; Russell & Flynn, 2000). Additionally, teachers may need to subordinate some of their autonomy toward higher levels of student outcomes (Bezzina, 2006; Little, 1990). The quality of both professional teacher and preservice teacher collaboration may be influenced by individuals' perceptions and beliefs about the significance or effectiveness of collaboration (Ruys, Van Keer, & Aelterman, 2010). Understanding how preservice teachers' beliefs and perceptions

influence their collaborative interaction during projects involving learning content, pedagogy, design and delivery of instruction may be important.

Research on Preservice Teacher Collaboration

The preceding sections focused on literature reporting various outcomes of professional teachers' collaborative interactions and the impact of that collaboration for teachers. Far fewer studies have examined collaborative interactions of students as they study and learn about the craft of being a professional teacher. The following section discusses research that examines collaboration as it pertains to student teacher preparation.

In an examination of university level teacher preparation programs, researchers found that while most programs implemented collaboration during coursework, preservice teachers themselves preferred not to collaborate during their academic preparation, and few of the programs examined provided instruction in the pedagogical use of collaborative learning for future classroom practice (Ruys, Van Keer, & Aelterman, 2010). In another study, four groups of preservice teachers nearing the end of their academic training were observed during real-time collaboration (Dobber et al., 2014). The results noted that two of the groups were unable to collaborate successfully. The authors suggested that if collaboration skills transfer from preparation to professional contexts, as has been assumed, then half the students were not adequately prepared to contribute in professional collaboration. They also noted that the practice of using collaboration solely as a means of performing coursework, is not necessarily preparing students for their future professional networks.

Timostsuk and Ugaste (2010) explored issues of community among preservice teachers in a qualitative interview study. As background, they noted that professional teacher often have a strong sense of community which enhances their ability to collaborate. However, the preservice teachers they studied expressed little to no sense of community. Further, Van Huizen et al. (2005) noted that the preservice education programs they studied focused primarily on the theoretical aspects of teaching, where as professional teachers focus on productivity. Malderez et al. (2007) concluded that teacher education programs should include strategies for developing cohesive preservice teacher groups, to prepare student teachers in classroom management and professional collaborative practice. This raises concerns about the education of preservice teachers. If professional teachers need to and are required to collaborate, this research suggests that teacher education at the university level should include collaborative instruction and practice. Without such opportunities, preservice teachers may not learn to expect to collaborate as an aspect of professional practice, develop positive beliefs about the benefits of collaboration, or garner interactional skills needed for successful collaboration. Yet, little research exists to guide teacher educators in facilitating collaborative instruction and practice. Thus, the next section turns to examining the wider literature on collaboration in academic contexts.

Understanding Collaboration in Academic Collaborative Groups

Although scant research exists examining preservice teacher collaboration, extensive research has addressed collaboration in academic collaborative teams more generally. Research on collaborative interaction in educational settings has often been described through two theoretical frameworks: social independence theory and socially

shared metacognitive regulation. Thus, in this, the second section of this chapter, literature is discussed that relates to collaboration in academic collaborative groups, particularly in higher educational contexts, with a focus on literature grounded in three theoretical frameworks. These frameworks are posited as lenses that may illuminate preservice teacher collaboration to help teacher educators prepare students for future collaboration as professional teachers.

The first of these frameworks is *social interdependence theory*, which posits that when task and goals are properly structured positive interdependence occurs, which supports the emergence of promotive interactions (Johnson, et al., 2007). *Promotive interaction* is described as the highest quality of collaboration, in which individuals are presumed to strive for their best performance, and encourage others to do the same, as the group joins efforts in production of knowledge and products. Research from the social interdependence perspective has examined how a variety of variables may influence collaboration. These variables include, but are not limited to: teacher involvement, group composition, task type and difficulty, and group evaluations. Few researchers adopting a social interdependence framework have examined the micro-interactions among students as they collaborate. This limits the theory's ability to explain how the processes of collaborative interaction are associated with collaborative outcomes.

The second framework examined is *socially shared metacognitive regulation*. This is a relatively new framework derived from the over-arching theory of regulation in learning. It describes group collaboration as regulation of interaction in reference to shared objectives or goals. Groups that mutually and effectively select, and use shared social and metacognitive processes are better able adapt and integrate their collaborative

interaction in attaining collective goals, or solving problems (De Backer, et al., 2014; Iskala, et al., 2011; Khosa & Volet, 2014; Molenaar et al., 2014). Inquiries employing this framework have noted that the more complex the task, the greater the need for high quality collaborative interaction across both learning and task production (Goos, 2002; Iskala, et al., 2011; Khosa & Volet, 2014). Further, groups that engaged in higher quality collaborative interaction directed toward knowledge acquisition, were more likely to regulate and sustain engagement in the collaborative processes that fostered increased knowledge production (De Backer et. al., 2014, Molenaar, et al., 2014).

Taken together, research from these frameworks has explored the characteristics of interaction in collaboration, and has begun the process of unpacking the micro- interactional processes of high quality collaboration. Both frameworks suggest that higher quality collaborative interaction is linked with more successful knowledge and product development. However, both are focused on examining the effect of collaboration as it influences individual student learning, while attending less to how collaborative effort is enjoined towards to production of a collective outcome (e.g., designing and implementing an instructional project).

Another framework that might be conscripted to examine collaboration in educational settings is that of *Heedful Interrelating*. Borrowed from organization management research, the concept of heedful interrelating has been used to examine high quality interaction in collaboration, and describes how careful attentive collaborative interactions contribute to group success (Jordan & Daniel, 2010; Weick & Roberts, 1993). Examining collaboration in a variety of organizational settings, findings have indicated that the greater the quality of heed in collaboration the better the shared

solutions (Alexander et al., 2008; Bijlsma-Frankema et al., 2008; Cooren, 2004; Dougherty & Takacs, 2004; Druskat & Pescosolido, 2002; Scott & Trethewey, 2008; Tallia, Lanhan, McDaniel, & Crabtree, 2006). Examining collaboration in educational settings through the lens provided by this concept may further illustrate the interactional processes of promotive interaction, and enhance our understanding of socially shared metacognitive regulation.

Heedful interrelating focuses on collaborative interaction entwined with the task, therefore, it provides for analysis of micro-interactions and the twofold task of preservice collaboration; learning for mastery of concept and pedagogic techniques, and learning to apply both in designing instruction that meets the need of students. The theoretical framework for the research uses heedful interrelating to address questions and inform methodology related to studying the quality of collaboration among students, and how the quality of their collaborative interactions may be impacted by various affective perceptions. Therefore, in this study heedful interrelating among preservice teachers is examined in combination with their various beliefs and perspectives about collaboration, and its relationship to the quality of the instructional projects they create and implement together. It is proposed that integrating this framework with the two educational frameworks will increase understanding of the processes and conditions of quality interaction in the twofold task of preservice teacher collaboration.

In the remainder of this chapter, social interdependence theory and socially shared metacognitive regulation are presented as two theoretical frameworks that often used in educational settings to examine collaboration. The framework of heedful interrelating is introduced as a means of examining preservice teacher collaboration. Within each of the

three frameworks, particular attention is paid to previous inquiries found to address preservice or professional teacher collaboration employing that particular theory. Finally, the three theoretical frameworks are linked together as a method of examining quality of interaction and how perceptions of collaboration may influence the quality of interaction in complex task of designing instruction.

Social Interdependence Theory

The historical roots of Social Interdependence Theory can be traced to the Gestalt school of psychology. In particular, Gestalt psychologists began to shift the focus of their theories towards viewing the individual as a whole, an ever-changing combination of behavior and perception. Kurt Koffka, one of the founders of the Gestalt school, applied the concept of fields to individuals acting in groups (1935). He theorized that groups were dynamic systems (wholes) in which the interdependence among the parts (members) shifts and varies. Building on Koffka's definition of groups, Kurt Lewin theorized that interdependence among group members is the key feature of groups (1947). Lewin believed that it is the interdependence among individuals that defines a group. Groups are systems with specific characteristics, such as common or mutual goals. A group, then, is a dynamic system in which any change among any individual or sub-group of individuals, influences and changes other individuals, sub-groups and/or the entire group. Lewin coined the term "group dynamics" as a key concept that still in use today in various organizational theories.

Of necessity, a group consists of at least two individuals; otherwise interdependence cannot exist. Individuals in the group must be inter-connected so that any behavior or action causes change and adaptation across the system. However,

behavior and actions are dependent on perceptions. At any given time behavior (or action) is a combination of perceptions of the three fields (social, psychological and situational), meaning that behavior is calibrated to and cannot be understood outside the current unfolding situation. The merging of mutual goals with the desire to achieve them results in a type of tension, or interaction, that determines the interdependence among group members (Super & Harkness, 2003).

The imagery of a chain link fence may be a useful analogy. Chain link fences are a system of interwoven steel wires, generally used for the purpose of creating barriers. The linked wires are entwined and interdependent. If one wire is moved, its movement reverberates through the entire system as all wires shift in response to the movement. Even the spaces among the links change shape as the system responds. However, without attachment to fence posts, the linked system will remain interconnected but unable to create barriers. Fence posts provide the tension necessary for the linked chain system to accomplish the purpose of being a barrier.

Lewin's work highlights some important concepts related to this study of preservice teacher collaboration. Group members are interdependent. Perception influences individual and group interaction. The combination of a perceived mutual goal and group motivation to achieve that goal is the source of interaction among group members.

Expanding the study of group collaboration to include a focus on learning within groups, Lewin's student, Morton Duetsch, formulated a theory of social interdependence. Duetsch (1949) defined two basic tenets of social interdependence: (a) the structure of the goals and the situation determine the interdependence among group members, and (b)

the type of group interaction determines the achievement of, or failure to achieve, group goals (Johnson, Johnson and Smith, 2007). He also described three states of social interdependence: positive, negative and no interdependence. Each type of interdependence has a different impact on the individual and group members. *Positive interdependence* (cooperation) exists when group members believe that individual goal achievement is possible if, and only if, all group members achieve their goals. This belief yields promotive interactions that occur as individuals encourage, facilitate and promote each other's efforts toward goal attainment. *Negative interdependence* (competition) exists when individuals believe that goal achievement is only possible if other individuals with whom they are in competition fail to obtain their goals. This results in oppositional interactions as individuals discourage and obstruct each other's efforts in achieving the goal. *No interdependence* (individualistic effort) exists when individuals believe they can achieve their goals regardless of whether other group members do or do not achieve their goals. This results in no interactions, as individuals work independently without interacting with each other (Deutsch, 1949). Self-interest may result or intensify under conditions of both negative and no interdependence. Negative psychological processes may result in sustaining or strengthening of self-interest, leading to indifferent or adversarial interaction patterns between group members. Students working under negative conditions will not engage in the productive interactions that aid group learning (Johnson & Johnson, 1989). Only positive interdependence requires the participation of all group members and their commitment to successful group goal attainment (Jensen et al, 2002).

A student of Deutsch, David Johnson, further developed the concept of positive interdependence. Positive interdependence is the first essential element of collaboration in which group members share a collective goal and believe that goal attainment depends on the participation of all group members. These conditions set the stage for specific patterns of interaction to develop among group members (O'Donnell, 2006). These patterns or processes of interaction are: *substitutability*, in which one person's actions can substitute for another's; *inducibility*, being open to the influence of another; and *positive cathexis*, in which positive interactions predominate (Johnson & Johnson, 2005, 2009; Johnson et al., 2007). Together these conditions and processes explain how self-interest develops into group interest. Mutual or group interest occurs as individuals become emotionally invested in group goals. In turn, this fosters an openness to the influence of others in the group, and a willingness to allow one person's actions to substitute for another's. Moving from self-interest to mutual interest is an important characteristic of successful group interaction and achievement (Johnson & Johnson, 2005, 2009; Johnson et al., 2007).

Successful group cooperation and learning is dependent on positive interdependence (Hwong, Caswell, Johnson & Johnson, 1993). True collaborative tasks can only be completed successfully if all group members can and must depend on each other (Fransen, Kirschner, & Erbens, 2011). Methods of structuring positive interdependence include: *task interdependence*, which refers to the interconnections among tasks, and the extent to which group goal attainment depends on distributing roles, sharing tasks and resources; and, *outcome interdependence*, the extent to which individual rewards and costs depend on successful group goal attainment (Johnson &

Johnson, 2005). Task interdependence tends to enhance group communication, helping and information sharing, while outcome interdependence tends to foster tolerance in brainstorming, concern for group mates' outcomes and persistence in searching for solutions or compromises (Van den Bossche, Segers, & Kirschner, 2006).

Interdependence, as structured through tasks and outcomes, leads to greater shared responsibility among group members as well influencing positive patterns of interaction (Wageman, 1995). Positive interdependence is the structure upon which promotive interactions among group members are built (Jensen et al., 2002; Johnson & Johnson, 1989).

Promotive interaction. A model of promotive interaction could be thought of as a collection social skills needed for high quality cooperation and interaction. Jensen, Johnson & Johnson (2002) define promotive interaction as individuals encouraging and assisting each other's efforts to achieve in order to reach collective goals. Ideally, promotive interactions build a caring and supportive environment that buoys sustained social and cognitive processes. As an interaction pattern that can only develop when positive interdependence exists, promotive interactions support group interaction in which individuals realize that how they think, talk and act toward group mates or the task will influence how well the group performs. Promotive interaction implies that individuals understand their group mates' ideas, questions, and explanations, in addition to understanding the task problem, and proposed solutions. When interacting promotively group members can develop trust, offer help, and create patterns of effective communication. Individuals focus on their own productivity and understanding, while also supporting the productivity of their group mates. As they accurately take each

other's perspective, they have increased ability to offer explanations and ask probing questions that enhance learning among the group. In groups where promotive interaction emerges individuals support each other's efforts, and conflict and stress are managed constructively.

Characteristics of the task or learning activity in which students are involved also influences the processes of promotive interaction. Open-ended complex tasks require more conversation, resources, and group coordination to arrive at solutions that are not obvious. Therefore, promotive interaction is most likely to be found in the interaction patterns of groups involved in open-ended complex tasks.

Social interdependence theory and positive interaction patterns. The body of research inquiries related to social interdependence theory is extensive and spans across multiple settings from business to international relations, and educational settings (Johnson & Johnson, 2005). Through mostly quantitative methods, the efficacy and benefits of cooperative/collaborative aspects of the theory have been compared to a great variety of outcomes. For instance, research has found that cooperation/collaboration tends to result in higher achievement, better retention of subject matter, more frequent use of critical thinking, more creative and accurate problem-solving, willingness to persist in the task and take on challenging tasks, more internal motivation, greater time on task, and increased transfer of learning (Johnson, Johnson, & Smith, 2007). Second, research indicates that cooperation promotes more positive interpersonal relationships among students, whether from different ability, social class, cultural, language and gender groups (Johnson, Johnson, & Smith, 2007).

Features of promotive interaction. Of greatest importance to this dissertation study are examinations that specifically address promotive interaction in educational settings. As noted previously, promotive interaction is a set of cognitive and social skills that may emerge, and support successful collaboration as students work toward achieving mutual goals. Understanding the nature of these productive collaboration skills, and the conditions under which promotive interactions may occur should contribute to the ability to reproduce these conditions and allow more students to have positive experiences as collaborators. However, research has less frequently identified the specific social and cognitive interactive processes that contribute to promotive interactions.

Early scholarly discussions of promotive interaction followed similar lines of inquiry as the general theory of social interdependence. Quantitative analyses have been used to compare promotive interaction to negative and no interactions conditions in regards to particular outcomes. In an example of this early research, Jensen, Johnson and Johnson (2002), operationalized promotive interaction as managing the task, giving each other data and asking questions, clarifying information, providing opinions and arguing, and assisting the group process. This analysis found that promotive interaction is correlated with higher test scores when compared to control groups of negative or no interdependence. Various research examinations catalogue other benefits of promotive interactions. Johnson and Johnson's (2005) subsequent literature review of these studies helped to solidify its importance: (a) providing mutual help and assistance (Johnson, 1981); (b) exchanging information and materials (Webb, 1997); (c) challenging conclusions and reasoning (Johnson & Johnson, 2005); (d) advocating and supporting efforts toward goal achievement (Pallak, Cook & Sullivan, 1980); (e) acting in

trustworthy ways (Johnson, Johnson & Smith, 2007); (f) managing stress and conflict (Naught & Newman, 1966); and (g) persisting to goal completion (Johnson & Johnson, 1989).

Further research on promotive interaction highlighted the benefits derived from caring and supportive interactions. First, students have opportunities to learn from their peers through the process of modeling. Group members can serve as models for their peers. Peers can serve as models of interaction and other group processes. This type of modeling is different from instructions given by the instructor and it opens another avenue for learning and understanding. Students may be able to model actions, while yet unable to understand the principle behind the actions. Subsequent discussion and elaboration helps to solidify learning (Salomon and Perkins, 1998). Second, goals of academic achievement and social learning can be accomplished simultaneously (Roseth, Johnson, & Johnson, 2008). Last, many employers seek employees with the social skills for collaboration. The social skills needed for promotive interaction helps students gain valuable collaborative skills recognized in the workplace. Moreover, students practice and receive feedback in the lower risk setting of a classroom where jobs and income are not at stake (Smith, 2008).

While benefits of promotive interaction have been described, the processes of the concept have only been thinly sketched. To identify the process of conversation in promotive interaction, Webb (2009) observed and studied younger students involved in question and answer episodes during open-ended tasks. She identified features of promotive interaction as students provided help to each other through their questions and answers. When providing help their interactions featured; correctly timed help, relevant

help, and the correct amount of help. When receiving help their interactions indicated an understanding of help received, and application of the new understanding. However, beyond Webb's contribution, little is known of the group conversational flow during episodes of promotive interaction.

Evaluating social interdependence theory. Social interdependency theory has had a profound impact on educational research by documenting the positive correlation between promotive interaction and numerous learning outcomes (Johnson and Johnson, 2005). The approach has provided schools and teachers with an alternative to individualistic, competitive learning environments. It has moved group work and collaboration to a position of importance in student instruction.

Still, there are important issues to address. First, structuring groups, tasks and goals has not provided an understanding of why groups with similar structures, tasks and goals may fail to cooperate or produce positive outcomes (Barron, 2000). It is possible for group collaboration to produce a high quality product without everyone understanding or learning the material (Webb, 1997). Second, there is no accounting for individual abilities and motivation. It is assumed that all students have the complex cognitive skills needed for high quality interaction. Hence, the quality of interaction is dependent on the teacher's ability to impart the necessary social skills, as well as structure groups, tasks and assessments (O'Donnell, 2006). Last, the connections between the collaborative structures and processes of promotive interaction are not fully developed. The give and take of interaction and communication, whether discursive or behavioral, is not clearly documented in the research. This makes it difficult to understand how group interaction

and interpersonal skills are related to each other and therefore, how they relate to the task and to task outcomes.

Integrating the concept of promotive interaction into the research program, suggests that the concept might benefit by integration with the concept of heedful interrelating. As a concept of high quality positive interaction, promotive interaction is thought to occur as groups develop mutual concern to support and encourage each other in joint efforts toward the goal achievement. This careful and attentive type of group interaction is closely related to the concept of heedful interrelating. As promotive interactions increase, so to does the heed with which a group attends to the task. Both promotive interaction and heedful interrelating focus on the social and cognitive skills needed for successful collaboration. While heedful interrelating has well-defined concepts of micro-interaction, these concepts have been less well defined in promotive interaction. Therefore, it is possible that integration with heedful interrelating framework may help articulate the micro-interactions (actions, behaviors and discourse) of promotive interaction.

Socially Shared Metacognitive Regulation

More recent conceptualization of groups in educational research is shifting the focus of analysis from procedural structures of groups and outcomes (Barron, 2000) to the relationship of the group as it interacts with its environmental context in much the same way as a living organism (Volet, Vauras, & Salonen, 2009). Biological living systems, through constant interaction with their environment, are constantly changing and adapting. The concept of living systems has also been applied to social relationships, such as societies, networks and collaborative groups (Volet et al., 2009). The concept of

emergence describes how living systems continually experience integration and adaptation through constant interaction with their environment (Miller, 1978). Living systems theory has contributed the concept of emergence to the study of groups (Corning, 2002). Groups and individuals mutually affect each other, and many of these effects are determined by the social context and the interaction between the group and its environment (Corning, 2002). A collaborative group is not the same thing as individuals working side by side; examining only whole-part relationship provides a bounded view of group collaboration (Volet et al., 2009). Understanding collaboration as an emergent phenomena arising through interactions among group members provides researchers with significant challenges (Damsa, 2014).

The theory of socially shared metacognitive regulation is predicated on living systems theory in conceptualizing groups as emerging systems that continuously evolve through group members interactions with each other and with their shared context. *Socially shared metacognitive regulation* is defined as the regulatory skills and strategies used by group members to control, organize and monitor their own, a group member's or the group's learning processes and is most often identified in verbal activities or discourse. In the theory's focus on cognitive regulation of learning, it shares a lineage with research on regulation of learning. This aspect of its evolution is described next.

Overview of regulation in learning. The term, *meta*, stems from Greek philosophers who used it in reference to human consciousness. In modern usage, "meta" is often used as a prefix that refers to the levels of abstraction in concepts. Flavell (1976, 1979) first used the term, *metacognition*, to describe how people direct and guide their cognition or thoughts to help them to achieve their goals. In simplest terms it might be

phrased as, thinking about thinking. A scholarly definition of metacognition is: “a representation of cognition that provides awareness of cognition” (Elfkliides, 2009, p. 138). Metacognition has two functions: monitoring and control. The monitoring function coordinates the input of knowledge or information, while the control function applies strategies that manage the use of that information for goal achievement or problem solving. Socially shared metacognitive regulation draws on the concept of metacognition, as well as that of regulation.

Self-regulation of learning is defined as controlling and monitoring one’s own cognition, metacognition, perception and volition in attaining personal goals Efklides, 2009). Self-regulation refers to monitoring and controlling not only cognition, but emotions and behaviors as well. It is an executive function that acts in a top down management style to control the various cognitive processes needed for goal achievement. When self-regulation is applied to theories learning, the concept becomes self-regulated learning. Self-regulated learning describes learning as individual implementation of strategies that manage cognition and behaviors to promote both learning and achievement. The key strategies needed for all types of regulatory learning have been defined and described as: orienting, planning, monitoring and evaluating (Efklides, 2009).

Mainstream research on self-regulated learning has targeted the individual in different learning situations and tasks (Zimmerman, 1989). Self-regulated learning research includes the social context of the collaborative activities, but the overarching goal is to understand individual adaptation within the particular regulatory activity (Zimmerman, 2008). Use of collaborative group work in educational settings has

proliferated, and so has research attempting to understand the complex processes of learning and collaboration and unpack the conditions that contribute to successful group efforts (Volet, et al., 2009). The study of the individual within the social context shifted to the study of the regulatory processes of learning along a continuum from individual to joint regulation, and lately has included, socially shared perspectives (Jarvela, et al., 2010).

Socially Shared Regulation of Learning is defined as the actions and interactions by which group members reciprocally regulate each other, and adapt their collaborative activities to achieve shared goals (Hadwin et al., 2013). It refers to the interdependence of social and individual processes in the joint construction of knowledge (Jarvela, et al., 2010). The interactional processes of active discussion and participation support the emergence of knowledge as both a part of and an outcome of the interactional processes (Iiskala, et al., 2011).

Socially shared regulation posits that our knowledge and understanding develop through our social interactions. Knowledge is constructed as group members interact with each other, primarily through communicative actions (Linell, 2009), and within the context of the task (Iiskala, et al., 2011). This level of collaboration requires that all processes of regulation for learning are interdependent and concentrated on the completion of the collaborative task or product outcome (Volet et al., 2009a). Since it requires equity and collective regulatory processes, this type of regulated learning can only occur in cooperative group settings and collaborative tasks (Volet et al., 2009b). Research studies of socially shared regulation of learning have examined what is shared, such as knowledge and beliefs, or what is strategized and regulated, such as shared

planning for task completion, or shared perceptions of the task (Iiskala et. al., 2011). Data for research is often obtained from episodes of collaboration in academic tasks, while analysis concentrates on the regulated learning processes that are shared and collaboratively constructed among all group members (Hadwin et al., 2011).

Socially shared metacognitive regulation. Learning in collaboration prompts students to regulate both their interactions and learning (Hadwin et al., 2011; Hurme, 2006). To regulate these activities, students need a metacognitive awareness, including activities used to oversee their own thinking for learning (Iiskala, Vauras & Lehtinen, 2004). When metacognition becomes socially shared and regulated, groups organize, monitor and control their collective activities around the learning task (Volet, Vauras, & Salonen, 2009). *Socially shared metacognitive regulation* is the term coined by Vauras and Volet (2013) to define these social and cognitive regulatory processes used by collaborating groups in demanding ill-structured knowledge or product based tasks (Khosa & Volet, 2014). Interactional processes, such as active discussion and participation, support the emergence of metacognitive regulation (De Backer, 2014). As a result of the metacognitive regulatory processes knowledge may emerge as both a part of and an outcome of the interactional processes (Molenaar, 2014). When metacognitive regulation is shared among group members, the collective group assumes responsibility for regulation of both learning and learning-centered activities (Iiskala, et al., 2011). They collectively apply skills and strategies to control, coordinate and monitor their knowledge development and outcomes (Hadwin et al., 2011; Khosa & Volet, 2014; Meijer et al., 2006). Planning of group goals, monitoring the group's understanding of subject matter, as well as collectively controlling and adapting learning strategies are

illustrative of metacognitive processes taking place on a group level (De Backer, et al., 2014).

Research has also noted that groups do not continuously function at a specific level of regulation (Khosa & Volet, 2014). Individual and group members self-regulate and co-regulate throughout the collaborative process (Khosa & Volet, 2014). Therefore, self and social regulation can occur simultaneously (De Backer, 2014). Group interactional processes can be seen in both verbal and non-verbal participation, but metacognitive processes are most often noted in verbal interactions (Molenaar, et al., 2014). However, socially shared metacognitive regulation is not applied to verbalized thinking aloud, nor are episodes of one group member attempting to regulate the group cognitive activity considered to be socially shared metacognitive regulation (De backer, 2014).

Integrating socially shared metacognitive regulation research. The socially shared metacognitive regulation framework is relatively new, and research inquiries are still limited. Conceptualizations of shared metacognitive regulation vary among scholars (Hadwin & Oshige, 2011; Molenaar et. al., 2012; Rogat & Linnenbrink-Garcia, 2011; Iiskala et al., 2011; Volet et al., 2000a, 2013), but most agree on a need to specify and unify terms. For now, scholars agree on the complex nature of the concept and that analysis of that complexity is challenging. Because it is a cognitively oriented concept, research involving socially shared metacognitive regulation generally examines students involved in small learning groups, using mixed methods as a means of converging multiple sources of data. An implication of this research is that with increased understanding of collaborative process, educators may be able to provide classroom and

instruction supports that enhance academic achievement (Volet & Vauras, 2013). This is of particular importance for the “training of preservice teachers who will need to support and foster students’ learning” (Azevedo, 2009, p. 93).

These characteristics of the research have application for answering questions about the quality of collaboration in complex tasks. For example, an early study involving metacognitive regulation among high school seniors noted that collaborative groups who monitored and evaluated each other’s thinking were successful in completing a greater number of more complex mathematics problems than the groups who did not engage in monitoring or critical thinking at a group level (Goos et al., 2002). Furthermore, Iiskala et al. (2011) extended this work in an observational discourse analytic study of fifth-grade students working in small groups on complex mathematics problems. Episodes of shared metacognitive regulation were observed more frequently and lasted longer when groups were engaged in solving the more difficult problems, as opposed to the moderate or easy problems. Plus, the episodes of socially shared metacognitive regulation fostered productive, and inhibited non-productive, group problem-solving activities.

Thus, socially shared metacognitive regulation has been noted in both younger and older students and appears to be reciprocally related to the quality of collaboration; such that when tasks are more complex, the need for higher quality collaborative processes increases. Consequently, the quality or level of shared metacognitive regulation improves shared focus and resolution of the complex task. In the present study of preservice teachers, it was presumed that the open-ended project of creating collaborative instruction would elicit episodes of high quality collaboration, while in turn,

the outcomes of the project were expected to reflect the level of quality in the collaboration.

One of few studies examining socially shared metacognitive regulation among preservice teachers examined small groups collaborating on an open-ended task of learning and teaching each other subject matter (De Backer, Van Keer & Valcke, 2014). The particular course in which the student teachers were enrolled provided training in a method of instruction called *Reciprocal Peer Training*. Training in the method was used as an intervention for the study. Simplified, the reciprocal peer training intervention focused on skills of constructive dialogue such as monitoring interactions, asking thought-provoking questions, offering constructive feedback, and providing knowledge-building explanations. Hypotheses included that both the complexity of the task and the specific instruction in tutoring through questions and answers would elicit discussions for mutual exchange of ideas. In particular, it was expected that episodes of socially shared metacognitive regulation, and the quality of subject learning would increase as groups engaged in socially shared metacognitive regulation. Analysis showed that understanding of subject matter was greater in groups who engaged more frequently in socially shared metacognitive regulation. Similar findings resulted from an examination of fifth grade students involved in online learning supported through peer-generated questions and answers (Molenaar, Sleegers, & van Boxtel, 2014), and in research that examined veterinary students analyzing complex medical cases (Khosa & Volet, 2013). In all three studies, the more thought-provoking the questions and discussion, the more frequent the episodes of socially shared metacognitive regulation, which resulted in stronger subject knowledge. To the contrary, shallow discussions, questions and answers,

were less likely to elicit socially shared metacognitive regulation and resulted in shallower subject knowledge.

Additional research suggests that when students engage in discussions related to knowledge acquisition or metacognitive regulatory acts, they were more likely they are to engage in socially shared metacognitive regulation (De Backer et. al., 2014). This implies that shallow discussions of subject matter or regulatory processes are not only less likely to facilitate socially shared metacognitive regulation, but may also inhibit group discussion and learning. Khosa and Volet's (2014) findings were similar; the veterinary students who spent more time on discussions of procedures, produced lower quality medical case analyses. These studies provide insights about how educators may optimize learners' collaborative experiences through training collaborative learners in discussion skills, especially questions and answers. Given the important role of discourse, both De Backer et al. (2014) and Molenaar et al. (2014) suggest training that supports high quality collaborative discourse; in particular thought-provoking questions, and knowledge-building answers may be worth the investment of time and effort.

Evaluating socially shared metacognitive regulation. Collectively, this research has found that when groups engage in socially shared metacognitive regulation, they are more likely to develop higher quality collaboration, and produce better learning outcomes than groups that do not engage in such regulation (De Backer, et al., 2014; Iiskala, et al., 2011; Khosa, & Volet, 2014; Molenaar et al. 2014). As a framework focused on collaborative learning, socially shared metacognitive regulation has contributed well-defined conceptualizations of how group micro-interactions may influence learning of

individual content knowledge. However, this research has less often focused on how collaborative interactions may influence development of collective instruction.

The socially shared metacognitive regulation framework provides an important grounding for this examination of high quality collaboration. The concepts of organizing, monitoring and controlling actions and conversation toward shared goals are also embedded in the concept of heed. Heedful interactions, whether verbal or behavioral, are attentive and willful in group collaborative progression toward the shared goal. Research of socially shared metacognitive regulation specifically focuses on goals of learning, but heedful interrelating provides a focus on how collective efforts entwine with collective outcomes. The framework of heedful interrelating is proposed as useful in examining the micro-interactions of discourse and actions among preservice students as they engage in the open-ended tasks of collective knowledge development, and collective creation and implementation of collaborative instruction.

Framework of Heedful Interrelating

The concept of *heedful interrelating* was posited by organizational theorists, Weick and Roberts (1993), to describe the high quality collaboration they observed in teams working in high reliability settings. High reliability settings are complex and unpredictable and pose enormous safety risks for people and expensive equipment. Flight deck crews on aircraft carriers and emergency response fire fighters are examples of high reliability teams. Despite the high risk and complex unpredictable settings, the quality of their interactions affords nearly failure-free performance. This is particularly intriguing given that the varied activities and intense requirements of failure-free performance seem like disasters waiting to happen. Weick and Roberts (1993) posited

that careful, purposeful individual communication and actions integrated with the activities of the others decreased incidence of failure. Conversely, the likelihood of failure increased when communication and activities became careless, indifferent, unconcerned and habitual. The concept of heedful interrelating combines the actions of interrelating with the quality of heed. It describes group processes of interaction and how those interactions affect the group functioning. *Heedful interrelating* can be defined as the way in which individual group members carefully attend to the immediate task, while also conscientiously and vigilantly integrating their roles, activities and communications into the roles and activities of the entire group toward accomplishing the group goal.

It is important to understand the component of *heed*. Heed is not a behavior. It is the way in which, or how, behaviors are performed, suggesting that the performer has been alert, attentive, and taken considered action. Careful, mindful, monitored and thoughtful actions are heedful, denoting quality of performance and communications. Heedful behaviors are the combined result of learning and experience, performed with thought and purpose. To the contrary, when heed declines behavior becomes *heedless*. Heedless behaviors are mindless, thoughtless and careless. Failure to take note, or pay attention may result in heedless actions. Heedless actions are not ignorant and do not result from lack of intelligence, but from failure to be attentive to the immediate situation. Habitual behaviors that have been drilled and replicated to become routinized and automatic are not heedful (Weick & Roberts, 1993).

Interrelating is the second component of Heedful Interrelating. It describes the properties of group processes that influence heed. For these properties, Weick and Roberts (1993) extended Lewin's (1947) concept of "shared fields," that groups are a

unique social system in which they may act as though they are controlled by a single entity. Once this unique system is in place, individuals will adapt and integrate their actions to achieve an envisioned goal, but only and if, they believe that the other group members are also integrating their actions into the same envisioned goal. When this situation occurs, the group is no longer a compilation of individual activities, but has become an interwoven system of activities and individuals attempting to complete the envisioned goal.

Interrelating describes the process of how individuals and actions advance toward goal achievement. It consists of three types of intertwined actions: contributing, representing and subordinating. *Representing* occurs when people envision the joint system action. In other words, they act as if they belong to a group, creating the social force that directs them. *Contributing* occurs when individuals construct their actions by taking into account the needs of others and the immediate situation. *Subordinating* occurs when group members adjust their individual behaviors into the envisioned joint system. Properties of groups from the above discussion can be restated: When individuals act as if they are a group, they construct their actions (i.e., contribute), as they believe all other group members' also construct their actions (i.e., represent), to combine and interrelate all constructed actions (i.e., subordinate) toward attainment of the envisioned goal. Heed describes the quality with which the actions of contributing, representing and subordinating are carried out. Interrelating becomes more heedful when the actions of representing, contributing and subordinating are thoughtful, conscientious, and willful. Therefore, heedful interrelating has two parts: (1) interacting with careful attention to the immediate task, while at the same time, (2) paying attention to how one's

own actions influence group members and integrate into the group goal (Weick & Roberts, 1993).

Heedful interrelating in organizations. Scholars have explored the concept of heedful interrelating in various organizational settings, such as board meetings and product innovation. Across these various organizational settings, heedful interrelating has been associated with: sustained productivity among research and development teams involved in product innovation (Dougherty & Takacs, 2004), inventive solutions to behavioral health care issues (Cooren, 2004), effective sharing of mental models in self-managing teams (Druskat & Pescosolido, 2002), improved knowledge sharing in clinical research and drug development (Alexander, Sanne, Roth, Williamson, & Berg, 2008), decreased firefighter vulnerability to hazards (Scott & Trethewey, 2008), increased trust among employees and managers (Bijlsma-Frankema et al., 2008), and improved patient care in medical practices (Tallia, Lanhan, McDaniel, & Crabtree, 2006).

Dougherty and Takacs (2004) proposed that the concept of heedful interrelating describes the types of social relationships needed in many organizations. They examined Heedful interrelating in organizations involved in product innovation and creation. Similar to Weick and Roberts (1993), the authors believe that the effective social processes of heedful interrelating can develop in teams and organizations that do not involve high-risk safety settings. Product innovation is a complex set of problems that, if not attended to with care and thought, may cause financial ruin. Heedful interrelating adequately describes the types of relationships needed by multiple team members across various departments, who have responsibility for all stages of product research and development. From discovering ambiguous user needs to quickly and efficiently solving

production and marketing problems, the entire process requires effective, volitional actions and communications. Successful innovation teams displayed optimal heedful interrelations. The teams' quality of heedful interrelating supported the creativity needed for product development and marketing, which in turn promoted better outcomes for the larger organization (Dougherty & Takacs, 2004).

In a rare discourse analytic study of heedful interrelating, Cooren (2004) analyzed the conversation of board members in a drug rehabilitation health care organization. By means of naturalistic observations and systematic discourse analysis of board meeting conversations Cooren concluded that heedful interrelating occurs in ordinary conversation. Examples of contributing, representing, and subordinating were found in the patterns of discourse. The board members mutual adjustments in their conversation helped them envision and contribute to the shared goal of the meeting. As members reciprocally interacted with each other, they integrated and adapted thoughts and ideas of fellow board members. The heedful interrelating of the group created added depth, texture and originality to the shared solutions to problems. The more heedful the conversations, the more informed, intelligent and interwoven were the integrated and shared solutions. During discussions, board members tried to gain the vision of each other's ideas, build on each ideas, expertise and knowledge, to eventually agree on shared solutions to problems. This important illustration of heedful interrelating is relevant to collaborative groups in learning situations in which the quality of interactions determines learning outcomes. Students face the same type of needs in discussing solutions to learning problems where the outcomes are dependent on the quality of their interactions.

Druskat and Pescosolido (2002) examined self-managing teams in various types of manufacturing plants. They proposed that heedful interrelating would increase shared expectations of work behaviors and operations within teams and across teams. Previous studies have indicated that shared expectations about work environment, culture and behavior improve work team effectiveness by enabling members to anticipate each others needs and actions, as well as reduce member conflict (Weick & Roberts, 1993). Among manufacturing teams, communication is sometimes difficult, but teams need the ability to adapt quickly to unpredictable circumstance and thus reduce operational errors. Druskat and Pescosolido (2002) noted that heedful interrelating supported the development of shared mental models operationalized as improved feedback, attitudes, information exchange, and team relations. These findings are especially important to this research because they connect heedful interrelating to relevant issues of expectations and attitudes about the task, behavior, feedback and information exchange as students collaborate in learning teams focusing on design tasks. Extrapolated further, it also addresses issues that school districts face as expectation for collaboration increases among professional teachers.

Heedful interrelating in educational settings. Educational researchers have also begun to explore the potential utility the framework of heedful interrelating may have in classroom collaboration. Jordan and Daniel (2010) applied the framework of heedful interrelating in educational settings. Using naturalistic observations they examined university preservice students in collaboration creating interactive instruction. By meaning of a method of conversational analysis, similar to that of Cooren (2004), they proposed to that occurrences of heedful interrelating could be found in the discourse of

students, and that from these episodes, discourse markers of heedful interrelating might be manifested.

Examining the micro-interactions among group members, Jordan and Daniel (2010) established that most students engaged in contributing, representing and subordinating. They identified markers of heedful discourse, and developed a method to differentiate the levels of heed expressed during the collaboration. Similar to high-risk teams, the quality of these interactions varied with the heed used to perform the interactions. Heed varied across students, groups and also across collaborative episodes. Contributions were heedful when they focused on the task and the group progress toward completion. *Interruptions and overlaps* in speech indicated that an individuals were attempting to represent, understand or clarify the ideas of another member or integrate their thoughts into the previously stated idea. Representing was noted in speech as contributions that merged with or adapted the group's representation of the task. When followed by these types of contribution, pauses indicated that group members were taking time to thoughtfully consider and represent each other's ideas clearly. *Rephrasing and mirroring* indicated subordination of individual ideas to the evolving group vision of the project. *Asking and responding* to questions signaled that students were attempting to assess the accuracy of their understanding/representation of their group mates' ideas or their version of the group's present goal. *Connecting the past, present and future* was demonstrated when prior experiences were recalled, brought into current discussion and integrating/subordinating them into the current task.

Continuing their explorations of the heedful interrelating framework in educational contexts, Daniel and Jordan (2015) developed a self-report instrument that

measures students' perspectives of the quality of their own interactions with group members during collaborative academic tasks. The six-item scale is referred to as the Heedful Interrelating in Collaborative Educational Settings (HICES) scale. Rationale for the development of the scale arises out of the inability to explain the variance in collaborative group outcomes through group composition or task type (Barron, 2000; O'Donnell, 2006). As a result, many investigations have shifted the spotlight to the social and cognitive interactions of collaboration in hopes of explaining why some groups fall short of expectations (See Barron, 2003). An example of this shift, is research that points to enhanced group outcomes when students focus on the shared task as well as the social skills and processes involved in collaboration (Johnson, Johnson, & Smith, 2007; Johnson & Johnson, 2005, 2009). This led Daniel and Jordan (2015) to theorize that allowing students to reflect on and assess their perceptions of the quality of their own collaboration, and the level of their heedful interrelating, might help them identify and adopt the social skills and processes needed for successful collaboration and outcomes. The HICES measure generated from their work is theoretically consistent with Weick and Roberts (1993) conceptualization of heedful interrelating, feasible to administer in classroom settings, applicable to various groups and tasks, and demonstrated as valid and reliable.

The HICES scale described above is further detailed in the section on research methodology. For the discussion here, it is important to note that it was administered to individual students to ascertain their perspectives across the phases of the collaborative task, with a revised version administered to derive groups' perspectives of their total collaborative efforts. Scholars have noted that constructs that revolve around individual

and group socio-cognitive aspects are difficult to measure; however, scales and questionnaires that ask individual perspectives are, at minimum, one method for examining affective and behavioral attributes (Yoo and Kanawattanachai, 2001).

The last study discussed in this section reviews how training students for heedful interaction with group members might affect their collaborative skills during a group assignment (Daniel & Jordan, in press). In an educational psychology course, undergraduate students were assigned to two different groups; training intervention or control group. Students in the intervention group were introduced to the framework of heedful interrelating along with the concepts of subordinating, representing and contributing. Research on how awareness of one's metacognitive thinking influences the individual's functioning within a group is relatively new. Thus, Daniel and Jordan (2015) proposed that training in the heedful social and behavioral skills described by the framework might have a beneficial impact on students' collaborative work. Students in the intervention group reported that heedfulness training supported new ways for them to reference their own interactions with group members and promoted positive effective collaborative experiences.

These recent studies of heedful interrelating in educational settings have particular relevance to this inquiry (Jordan & Daniel, 2010; Daniel & Jordan, 2015, in press), as this study examines students' perspectives on the quality of their own and their group members' collaborative efforts. Not only were the authors the first to apply heedful interrelating in educational settings, but the discourse markers they developed to identify occurrences of heedful interrelating. (Jordan & Daniel, 2010) and were used as initial deductive coding for the observational data collected for this research. In addition, the

HICES scale developed by Daniel and Jordan (2015) is designed to measure student perspectives of their heedfulness in collaboration. This instrument was one of the methods used to explore students' perspectives of their collaborative experiences in this research program. In their most recent study (Daniel & Jordan, in press), these authors' work provided insight into how students' perspectives influence their collaboration. This study delves further into issues of how perspectives, attitudes and beliefs influence collaborative experiences among preservice teachers.

Strengths and weakness of heedful interrelating. As a concept that addresses the quality of collaboration, heedful interrelating contributes important identifiers of high quality interaction. The strength of this identification system is how it contributes to understanding the quality of micro-interactions in collaboration. This is evidenced in the heedfulness examined across organization settings. Both of social interdependency's promotive interaction and socially shared metacognitive regulation revolve around the importance micro-interactions among group members. Heedful interrelating provides a description of those micro-interactions and methods to envision them across various settings, including education.

While more of complication than a weakness, the study of heedful interrelating is particularly suited to qualitative methods, such as the field observations from which Weick and Roberts (1993) developed the framework. This type of research can be difficult to manage, but in turn presents researchers with new areas of examination. One such area is that of preservice teacher preparation, which is the focus of this inquiry. This framework will provide the conceptualization of quality collaboration used in the research program.

Relating Frameworks of Collaboration to the Current Research

Social interdependence theory and socially shared metacognitive regulation are frameworks that examine small-group collaboration in educational settings. As educational frameworks, they share certain conceptualizations of how collaboration influences individual learning. Both conceptualize collaborative groups as dynamic interactive systems in which effective high quality interactions may emerge and, produce quality outcomes. They also share the view that high quality collaboration lies within the type and level of group interaction. Both frameworks depict high quality collaboration as located in specific effective characteristics of participants' interactions. Accordingly, when individual interactions coalesce into effective and productive high quality group interactions; it is more likely that groups will produce high quality knowledge and/or products.

Heedful interrelating framework contributes a focus on how the importance of the task influences the interactions of collaboration as well as the collaborative outcomes. This focus on how task influences collaboration and outcome adds dimension to educational research less frequently noted in the literature. Collaboration in educational settings is not as dramatic as collaboration in high-risk situations, such as aircraft carrier flight decks; nonetheless, preservice teacher collaboration bears its own high risks (Dobber, et al., 2014).

Integrating the three frameworks in studying preservice teacher collaboration may further delineate the relationship between collaborative interaction, task and outcomes. Social interdependence theory has postulated that when the group environment, task and goals are properly structured positive interactions should occur. Positive interaction, in

turn, supports the development of the highest quality of collaboration or promotive interaction, in which individuals are presumed to strive for their best performance, while encouraging others to do the same. However, the theory does not describe how group interaction is shared or regulated in the production of tasks or goals. On its own, it cannot address questions of how group interaction influences production of learning or task outcomes.

Socially shared metacognitive regulation contributes to the understanding of high quality collaboration as emerging from collective metacognitive strategies to control and monitor interactions in reference to the shared learning or task. Use of these strategies occurs mostly, though not exclusively, through group discussion. Learning and task production are the result of details occurring during the interaction processes; the give and take of conversation and participation activities. The framework outlines how group and individual learning and task production occur through collective cognitive regulation of interaction.

The heedful interrelating framework describes the quality of collaborative interaction; careful, attentive, and willful (Weick & Roberts, 1993). It provides a lens for examining the type of interactions, whether in discussion or activity. It folds the communication flow among group members into the task at hand. This focus on communication integrated with the task is important in discussions of preservice teacher collaboration because in teacher preparation courses the task of individual learning becomes entwined with learning for instruction of others.

Collaboration is a complex social process. Each of these frameworks describes this complexity, while highlighting various intricacies of the process. Integrating the

three frameworks may provide a useful lens for examining productive high quality collaboration and learning outcomes in educational contexts. Providing tasks and structures that support positive interactions may afford the emergence of promotive interactions. As positive and promotive interactions are established, the group may develop higher level cognitive regulation strategies as they control, monitor and evaluate learning and task production. In turn, collaborative interactions whether verbal or non-verbal which are enacted with heed, support and entwine with group cognitive regulation to advance the collaborative efforts toward learning or task production.

As has been noted above, students in higher education are frequently called upon to collaborate for their own learning; but as they become preservice teachers, collaboration involves a dual purpose. Unifying the approaches to collaboration, that of learning for self and learning for instruction, may provide a balanced view of preparation for student teachers in managing classroom and cohort relationships as well as future professional collaborative relationships. As a research tool, heedful interrelating may provide an overarching framework that can address questions of what group interaction looks like, and how group interactions may evolve and relate to the projects outcomes.

Chapter Three: Research Methodology

Collaboration is a complex social process that warrants investigation from various perspectives. Consequently, it also poses challenges in designing research methods and analysis capable of depicting this complexity (Creswell, Feters, & Ivankova, 2004). A mixed methods research design was chosen to address this complexity. Mixed methods research intentionally combines both quantitative and qualitative approaches in a single study (Johnson & Onwuegbuzie, 2004). In turn mixed methods “forces the methods to share the same research questions, to collect complementary data, and to conduct counterpoint analyses” (Yin, 2014, p. 65). Greene (2008) described mixed methods as a practical form of research inquiry that invites the use of multiple viewpoints to provide understandings of the complex social world. Merging and integrating methods has been described as an extension of how individuals regularly solve problems; through the use of numbers, words, discussions, observations and various types of reasoning (Morgan, 2007).

Conscripting the methods into a single study forces integration, and through employment of a broad range of perspectives allows the research address complex problems (Teddlie & Tashakkori, 2009). The use of mixed methods is justified when: data collected from one method may not be sufficient for investigating and representing the complexities of the research question, results of the study need to be explained, exploratory results need to be generalized to another context, or a particular research question needs to be addressed in multiple phases (Creswell & Plano Clark, 2011; Morse & Niehas, 2009). Early in the design phase of this research program, it was recognized

that a single method study would likely prove inadequate to address the research questions. It was also recognized that while mixed methods studies are more difficult to execute, designing a mixed methods study held promise in addressing research questions. The rationale for selecting a mixed methods research design was the flexibility to: draw on the strength of each method, use multiple sources of data with the intent of integrating the methods, and provide comprehensive and thorough answers to the research questions needed to address a complex social process.

Purpose of the Convergent Parallel Design

Mixed methods research embodies certain methodological characteristics that distinguish it from research that employs a single approach, whether quantitative or qualitative. These characteristics permeate all phases of the research, guide selection of the specific mixed methods design, and are expressed along a continuum in the implementation of the various design types (Ivankova, 2015). This particular mixed methods research program is a convergent parallel design (Creswell & Plano Clark, 2011). The purpose of a convergent design is to provide a more comprehensive understanding of study issues, through data triangulation and corroboration. This design was chosen as triangulation and convergence of the qualitative and quantitative data was sought for each research question to strengthen confidence in the inferences drawn from the study (Greene, 2008).

By definition, this design employs simultaneous collection data from both qualitative (QUAL) and quantitative (QUAL) methods. This research program has one strand of QUAL and QUAN data collection, separate QUAN and QUAL analysis, and an integration or merging of the two strands. Characteristically, convergent designs place

equal emphasis on the research strands. However, in this study the overall emphasis was on the QUAL strand. Though, emphasis shifted from time to time during the study based on the need to understand the issues, and access to specific data (Teddlie & Tashakkori, 2009). The goal of this QUAL emphasis was to provide in-depth descriptions beyond those provided by QUAN strand statistical results. In addition, the case studies portion of the research required more time to implement, and entailed substantial data collection and analysis from a variety of sources. The processes of merging and integration occurred in analysis as the two strands were converged and integrated during the interpretation phase.

Research using mixed methods is not new to educational contexts. Indeed, education has a long history of using mixed methods. The Chicago School studies from the 1920's and 30's are early examples of combining of qualitative interviews and quantitative surveys within the same research program to investigate various educational concerns (O'Connor, 2001). The following are examples of mixed methods research with particular relevance to the current study: Tashakkori and Teddlie (2003) examined collaboration in educational settings; Scott and Sutton (2009) combined and merged quantitative questionnaires and qualitative open-ended responses to examine trends in emotional change as teachers learned a new writing pedagogy; Bridwell-Mitchell (2012) integrated qualitative ethnographic observations and interviews with multiple administrations of a qualitative survey to examine how teachers attitudes influenced their classroom instructional practices; and Hayden and Chiu (2015) qualitatively analyzed preservice teachers' reflective journals, then combined that data, through the process of "quantizing," to statistically examine relationships between preservice teacher's reflective practice and their ability to solve problems in instructional practices. These

examples provide insight into the types of data and mixing of methods currently used by educational researchers, and also set precedence for the methods of data collection and analysis used in the current program of research.

In this chapter the methodology used in this research program is delineated. This chapter includes the philosophical assumptions underlying the selection of mixed methods, the research setting, context of the collaborative task, and participant selection. Chapter 4 addresses methods of data collection and procedures of analysis.

Epistemological Assumptions

Philosophies and beliefs about how knowledge is gained are inherent in all phases of a research project, from theoretical lens, data collection and analysis, to interpretation, and reporting of results (Teddlie & Tashakkori, 2009). The relatively recent increase in the use, and the evolving norms and practices, of mixed methods research has led to requests that researchers articulate their philosophical assumptions (Creswell & Plano Clark, 2011, Shannon-Baker, 2015). The purpose of this section is to describe the philosophical assumptions influencing this mixed methods inquiry.

This research was conceived, implemented and interpreted through pragmatic assumptions. While researchers may approach mixed methods from various philosophical stances, many embrace pragmatism as their philosophical approach (Tashakkori & Teddlie, 2003). Pragmatism in America can trace its roots to scholars such as John Dewey and William James (Morgan, 2007). Pragmatists take the position that both qualitative and quantitative methods are rigorous and persuasive, and have value in addressing research problems; rejecting an either-or approach to selecting research methods for a single study. From a pragmatic approach, priority is placed on the

research questions, and securing comprehensive answers those questions, rather than adhering to specific research methods or the philosophical paradigm associated with those methods. Instead, pragmatism views specific paradigms as instruments through which to examine research problems. Pragmatists place value and importance on what is functional and applied; the focus is on achieving outcomes that provide practical answers to research questions (Johnson & Onwuegbuzie, 2004). Using a pragmatic approach, this research program focused on the questions; and capitalized on the complementarity available through the use of both qualitative and quantitative methods, in hopes of providing thorough answers to the research questions.

Research Context

Selection of the research setting is an initial step in research sampling as it significantly contributes to the quality of data collection, and inferences that can be drawn from analysis about the population of interest, and therefore, should be carefully selected to maximize opportunities to answer research questions (Babbie, 2005; Taskakkori & Teddlie, 2003). As study questions probe issues of preservice perspectives on, and interaction in, collaboration it was important to select a research setting in which preservice coursework involved collaborative practice. The setting selected for the research was an educational psychology course embedded within a teacher preparation program at a large university in the southwest US. Students preparing for careers as professional teachers at this university are admitted to the university's Normal School as preservice teachers, which distinguishes them as developing professionals. Teacher preparation is a two-year track, beginning with a student's junior year of university coursework. Prior to program admittance, students have spent two years in general

education courses. Preservice teachers are admitted as a cohort and move through their two years of preservice education with the same group of peers. Attending classes together over the years may afford students valuable opportunities to develop a sense of professional community, form social bonds, and develop trust with cohort classmates.

Educational Psychology Course

The educational psychology course in which study participants were enrolled is a 15-week three-hour course intended for the first semester of course work after being accepted into the teacher preparation program. Students in the class are typically planning to teach in elementary school grade levels (K-8). The purpose of the course is to support students' learning of planning and conducting effective instruction based on learning theories and principles. Unlike some coursework, this particular instructor's course section includes both the practice of collaboration and instruction for collaborative interaction. The instructor is an assistant professor in the Normal School at the University. Having spent eleven years as an elementary school teacher, teacher preparation is important to her. Her interests center on learning, cognition, and motivation, especially as found in classroom discourse. She is particularly interested in peer interactions as they occur in authentic collaborative tasks, and their potential to influence learning. Therefore, she designs the collaborative work in the course to mirror the types of collaboration required of professional teachers. Collaboration is both a specific instructional strategy implemented by her, as well as targeted preparation for work in professional teaching contexts. Students are also asked to engage in reflection and evaluation, both individually, and by giving and receiving peer feedback.

During this course, students frequently collaborate in various groups to exchange ideas about course content. Students participate in two major collaborative projects during the semester. However, the study data collection and research focused on the first of these two assignments, in which student groups collaboratively design and implement instruction for their classmates based on concepts from one of the major books used in the course. Prior to each collaborative work session, students received instruction about collaborative skills, communication practices or challenges associated with collaboration, the process of creating and designing instruction, or principles of pedagogy. The aim of this instruction was to help students develop a repertoire of higher quality collaboration, and support design of content and pedagogic fit to the fellow students with whom groups will share their collaborative instruction. In-class time for collaborative work sessions was provided to allow opportunities for mentoring by the instructor, who meets with each group during the collaborative work sessions to provide feedback about their work-in-progress. Mid-way through the collaborative projects groups were asked to share their plans for instruction with classmates to receive peer feedback. This was a class-wide critique process for analyzing content and instruction. The instructor was also available before or after class for questions and mentoring. Data collected and analyzed in this research program, with the exception of student interviews, occurred as part was course work required of students whether they participated in the research or not. However, only work produced by students agreeing to participate in the research was collected and analyzed.

As students were assigned more than one collaborative project during the course, structures that support the emergence of positive interdependence were established early

in the semester. Positive interdependence may emerge when group members believe that individual goal achievement is possible if, and only if, all group members achieve their goals (Johnson & Johnson, 2005; O'Donnell, 2006). Therefore, once students were assigned membership in a group, but before the first collaborative work session of the project, group members were required to post their contributions and communication on the university interactive Blackboard site. This provides opportunities for the instructor to track group collaborative progress, and continued collaborative posting on the interactive site also affords opportunities for the instructor to provide further mentoring of the group. Group meetings outside class time were also encouraged if necessary to complete the collaborative instruction project. Additionally, the instructor does not include the course concepts delivered by the groups as part of her regular class instruction. Therefore, all students in the class are dependent on the various groups to provide interesting and useful subject matter contained in the various book chapters. Delivery of the collaborative instruction was observed and qualitatively assessed by the instructor, with written feedback provided to the group on the Blackboard site.

Collaborative Instruction Projects

The first collaborative project of the semester was selected for the dissertation research. Students were assigned to four-member groups. Their collaborative task was to design and implement a 30-minute lesson for their classmates. The collaborative instructional project they designed was based on their reading of one chapter of a book on cognitive learning theory, a major component of the course. The project provided four in-class collaborative work sessions, up to 45 minute per session, over a period of two

weeks. The instructor added a fifth work session, as she perceived the time was needed based on progression of the groups in the project.

This collaborative assignment was chosen specifically because it mimics the various complexities experienced in professional teacher collaboration; designing, creating, delivering and analyzing instruction to improve their teaching strategies and student outcomes (Dobber, et al., 2014; Woodland et al., 2013). Professional teachers are expected to skillfully design effective instruction by combining deep, varied knowledge of both content and pedagogy, while balancing the needs of students, and unpredictable classroom environments (Bransford, Darling-Hammond & Le Page, 2005; Milner, 2010; Shulman, 1987).

Designing and improving effective instruction is notably open-ended, cognitively demanding and complex (for examples of open-ended, cognitively challenging tasks see: De Backer, et al. 2014; Dougherty & Takacs, 2004; Iiskala, et al. 2011; Khosa & Volet, 2014; Scott & Tretheway, 2008). Open-ended problems are ill-structured, ambiguous and include multiple interdependent sub-problems. Both the problem and the solution are undetermined, requiring cognitive effort and creativity for resolution. There is no specified answer to the problem; no set of step-by-step instructions to designing and delivering instruction. The challenging complex nature of open-ended tasks appears to elicits higher quality group interaction, as collaborative resources and efforts are brought to bear on the complexities of the task (Cooren, 2004; Dougherty & Takacs, 2004; Weick & Roberts, 1993). In turn, high quality of collaborative efforts tends to result in high quality hybrid products, not traceable to the individual efforts. Conversely, simple close-ended tasks, such as confirming assignment due dates, require little cognitive effort, tend

to elicit less collaboration, any collaborative interaction is likely to be of lower quality, and result in individual products (Goos, 2002; Khosa, & Volet, 2014). Thus, as a series of open-ended problems, the collaborative instruction project examined by the research is intended to expose processes of high quality preservice heed, and how their heed may be related to the quality of their creation and delivery of collaborative instruction.

Subject matter for inclusion in the groups' collaborative instruction was initially randomly assigned by the instructor based on a popular best-selling book written by a cognitive psychologist describing various theories of learning. Chapters from the book were randomly assigned to each group. Groups were asked to select material from their assigned chapter they considered most pertinent to classmates, and were then responsible to collaboratively teach this information to their classmates as their students. The material from this book was not be presented by the instructor, leaving classmates reliant on groups to teach the content of the various book chapters. Delivery of the collaborative instruction was planned in chapter order to maintain the flow of concepts discussed in the book.

Phases of the collaborative work sessions. Another component of the research was examining heedful interrelating across the phases of the collaborative project, and exploring any episodes of socially shared metal cognitive regulation. Effective creation and delivery of instruction is the process of combining the components of content knowledge, pedagogic expertise, and understanding of students (Shulman, 1987). Effective collaborative instruction brings the heed of collective minding to bear on these challenging tasks. Overall, the collaborative project can be described as a series of open-ended tasks. As a pedagogic strategy, the five collaborative work sessions were

implemented to support knowledge development, and guide students through the creative design processes of developing instruction.

Work sessions one and two included a jigsaw or parallel component that required group members to share prepared content and pedagogic knowledge with group members. Prior to each session, group members were either assigned pre-determined readings (e.g., their assigned chapter, a portion of a website explaining various types of instructional strategies) or asked to identify additional resources through their own exploration (e.g., “Research at least 2 additional resources related to your assigned Willingham Chapter to supplement your understanding of the ideas your group determined to be most important, e.g., YouTube videos, blogs, interviews, figures, tables, activities, etc.”). For each assignment, group members were instructed either to bring a notecard with pertinent reflections (e.g., “BRING a notecard with what YOU think are the three most important ideas from the chapter”), or to post to their group’s online project forum set up by the instructor (e.g., “Post a short description of the resources you identified. Also include ideas for how you could use these resources to help your classmates understand the most important ideas in your chapter.”).

Division of group labor during the first two work sessions was intended to help students develop understanding of content and pedagogy more rapidly than when working alone. Work Sessions 3, 4, and 5 focused on the complexities of fitting content and pedagogy to student level, and developing a plan for delivery of the instruction. So while there are five work sessions, in actuality there were three phases across the project: (1) develop shared content knowledge and jointly decide which content to include in the collaborative instruction; (2) develop shared pedagogic knowledge and choose the

strategies best suited to content and classmates as students; and (3) develop group lesson plan for the collaborative instruction project.

Delivery of the collaborative instruction projects occurred across three weeks, with each group having 30 to 40 minutes to instruct their fellow preservice classmates (one to two groups implemented their instructional project during each class session). The instructor and researcher observed, and qualitatively ranked, the groups' collaborative instruction based on group demonstrated understanding of content, application of pedagogy, and adaptation of their instruction to the needs and interests of their classmates as students (Shulman, 1987). The instructor provided written feedback for increased mentoring and learning.

Participants and Consent Procedures

University IRB permission was requested and granted for data collection across two semesters to accommodate a pilot study as well as collect data from a second semester of the course during the 2015 Fall semester. The study was introduced to the preservice teachers by the researcher on the first day of class. The use of the audio/video equipment, the interview process, and the schedule was explained. Written reflections and administration of the HICES scale were part of course work, but it was noted that only written reflections and scale survey information from participants would be used as data for the research project. Participation was described as voluntary, and participation or non-participation as having no impact on grades. After asking if students were willing to participate, volunteers were given consent forms to sign. In addition to the verbal descriptions, the consent form (See Appendix F) contains a written section informing students that participation is voluntary with no penalty for non-participation. Students

who chose not to participate were not video recorded. When their image or voice was inadvertently captured, it was not transcribed or used as data in any way.

Participant Characteristics

Students enrolled in this educational psychology course during the Fall 2015 semester were undergraduates. Age of enrolled students ranged from 19 to 25. Participation in the research was high; volunteers totaled 24 out of the 26 students enrolled in the course; females ($n = 23$), and male ($n = 1$). The ethnic make-up included: White females ($n = 19$); Hispanic females ($n = 3$); African American female ($n = 1$); and White male ($n = 1$). Most participants were in their junior year ($N = 22$). Two participants were in their fourth year of study due to changing majors, and one of these had taken a child development class from the same instructor previous to enrolling in this course.

Following recommendations for sampling strategies in convergent parallel inquiry, a convenience sampling strategy was used for the quantitative strand and a purposeful sampling method for the qualitative strand (Creswell & Plano Clark, 2011, Yin, 2014). This small sample is considered adequate for qualitative strand, which seeks in-depth information and understanding about individuals and issues under study, and is less concerned with generalizing results. However, quantitative strand samples would preferably be larger for probabilistic sampling, and generalization of results to a larger population. Therefore, it is important to recognize that the sample is not representative of the population of all preservice students in all classrooms.

Student Collaborative Groups

The student groups included in the study were selected for analyses in three phases. First, all students participating in the research were grouped into six small work groups (four groups of four students and one group of three students). Group composition was based on grade level teaching interest. This rationale for group composition was based on a pilot study conducted Spring 2015 in which higher quality of collaboration was observed among preservice teachers grouped by similar grade level teaching interest (Author, 2015). Therefore, this method of grouping students was intended to support the emergence of heedful interrelating for purposes of addressing research questions about the quality of heed among collaborating preservice teachers. An additional, rationale for grade level groups was the similarity to professional settings in which teachers may be asked to collaborate across grade level departments with unfamiliar colleagues. From the six groups of students, one group was de-selected from the audio recordings, as funding for the research only provided for five audio recorders. This de-selected group had a part-time student, and was considered least comparable all other groups composed of full-time students. Data from all six groups were analyzed in the quantitative strand of the research, and in the qualitative strand content analysis of written reflections, but not in the qualitative discourse analysis.

The second phase involved selecting four focal groups to participate in the semi-structured interviews. The group de-selected for interviews only had three students, rendering it less comparable to the other groups with four members. Group members from the four-recorded groups (16 students) were asked to participate in one 20-minute semi-structured interview. Interview participants were offered incentives for their

participation. Incentives consisted of 10 points of extra-credit, or a \$5 Starbucks gift card. Students were allowed to indicate their preference either before or after their interview.

Group Selection for the Embedded Two-Case Study

The third phase included selection of groups for the case study analysis included as part of the larger mixed methods research program. According to Yin (2014) case study design is an appropriate method to examine complex social phenomenon, and for inclusion or embedding within mixed methods research designs. Furthermore, case study analysis is appropriate: (a) in addressing explanatory research questions of how and why (i.e. RQ 3); (b) when relevant behavior cannot be manipulated (i.e. this is a naturalistic study in which the researcher had no control over students behavior); and, (c) when the research involves observations of events and the ability to conduct participant interviews (Yin, 2014).

It was predicted that the quality of heedful interrelating would vary in the groups and that this variance might explain the differences in the collaborative instruction projects. Therefore, a multiple-case study approach was taken by selecting two contrasting cases (i.e. a two-case study). From the four-recorded groups, the two most contrasting groups were selected based on the qualitative rankings of their collaborative instruction projects. Specifically, groups selected for the two-case study had the highest and lowest qualitative rank order. Each case is defined as the interaction, activities and the collaborative instruction of one group of students across the phases of the collaborative project. This included three weeks of collaborative work sessions, and the 30-minute collaborative instruction delivered by the group.

The purpose of selecting the highest and lowest ranking groups was to examine how the quality of their heedful interrelating might help explain the differences in the quality of the instruction they created together. Specifically, the two-case study was included to help address the research questions of how the quality of students heedful interrelating may have influenced the quality of their collaborative instruction projects (RQ3).

Establishing Quality and Validity

In mixed methods research, measuring the overall quality of the research can be problematic because of the intentional mixing of the research strands (Creswell & Plano Clark, 2011). Assessing the quality of the mixed methods research can be described through the concept of legitimation (Onwuegbuzie & Johnson, 2006). This term incorporates the qualitative concepts of validity, as well as the qualitative concepts of credibility, quality and trustworthiness (Teddlie & Tashakkori, 2009). In a convergent mixed methods design, threats to validity must address concerns of timing or sequence of data collection, analysis and interpretation of the qualitative and quantitative strands (Ivankova, 2015). Application of legitimation is different for the two strands. Traditionally, quantitative researchers have evaluated the quality of research by examining validity and reliability, whereas qualitative researchers evaluate quality by examining rigor and trustworthiness. In keeping with the convergent mixed methods design this section separately evaluates the quality and validity of the quantitative and qualitative strands.

Quantitative validity and reliability. Validity is the extent to which a quantitative instrument or tool measures what it is intended to measure in order to permit

relevant interpretation of the scores. Reliability is the extent to which an instrument produces similar results under similar conditions, consistently measuring what it is intended to measure (Coladarci, Cobb, Minium, & Clark, 2011). To address concerns of validity and reliability in the quantitative strand, measures (TCS subscales, and HICES) previously validated and found to be reliable were selected for use in the research program. One threat to the quantitative strand was the fact that the TCS was validated and found reliable with professional teachers. A literature review was not successful in locating a reliable and valid instrument for preservice teachers. Therefore, the choice was made to use subscales from the TCS as a valid and reliable instrument designed for inservice teachers, as the population into which preservice students will graduate. Cronbach's alpha test of reliability was also conducted for all scales and surveys. An additional threat to quantitative validity and reliability, was the use of the group adapted HICES, which was validated and found reliable with individual students, but has not been tested as valid or reliable for individual assessment of group members. However, the purpose of the data gathered from this instrument was not generalization of results, but an exploratory comparison with students' qualitative written reflections about group member interactions.

Qualitative rigor and trustworthiness. Qualitative research relies on different assumptions about validity. The subjective and interpretative nature of qualitative research reflects participant views and experiences as interpreted by the researcher. Therefore, addressing rigor and trustworthiness is based on whether research conclusions accurately represent participants' experiences and perspectives. Instead of the conventional measures of validity employed in quantitative research, the rigor and

trustworthiness of qualitative inquiry may be evaluated using the following criteria: credibility, transferability, dependability and confirmability (Onwuegbuzie & Johnson, 2006). There are various strategies that mixed methods researchers can employ to reduce potential threats to rigor and trustworthiness of the qualitative strand (Ivankova, 2015). The next paragraphs describe strategies employed to enhance the rigor and trustworthiness of the qualitative strand, these strategies are based on Lincoln and Guba's (1985) criteria for assessing the quality of qualitative research.

First, credibility is the extent to which study findings are congruent with reality; in other words, are the findings believable from the perspective of the participants. Credibility is described as one of the most important factors in qualitative trustworthiness, as it connects the quality of the research to outcomes and their consequences for participants (Ivankova, 2015). Strategies employed to support credibility included: (a) triangulation - multiple methods used for data collection and analysis; (b) prolonged time at study site - two semesters at the study site with preservice students to develop in-depth understanding of their perspectives and eliminate researcher biases; (c) persistent observation - three semesters of observation to identify patterns and consistency in the data; (d) member checking - was limited but served to corroborate my accuracy in interpretation; (e) peer debriefing - colleague not involved in the research questioned me about procedures and findings; (f) negative case analysis - searched for and addressed disconfirming evidence with colleagues or resolved it by re-examining the data (Lincoln and Guba, 1985).

Second, transferability is the degree to which qualitative findings can be transferred to other settings. This is not the same as quantitative generalizability.

Qualitative transferability is based on the importance of describing the details of the research and its context. However, whoever “transfers” the results to a different context is responsible for judging the appropriate applicability (Lincoln & Guba, 1985). My strategy to support transferability involved carefully collecting data, and providing detailed descriptions of the research setting, participants, data, and analytic procedures.

Third, dependability is the extent to which the qualitative findings might be repeated with similar results. Again, this is different from the quantitative emphasis of replicating research to achieve the results. Qualitative dependability emphasizes the importance of using and describing systematic procedures of data collection and analysis, this provides a system, and trail for others to follow, while acknowledging that changes in the research setting and may influence research findings. Strategies used to support dependability included: (a) triangulation - discussed above, (b) keeping an audit trail - involved documenting the procedures and processes of data collection, analysis and interpretation, and (c) using an external audit - colleague not involved in the study reviewed the procedures and findings to ensure accuracy (Lincoln & Guba, 1985). Last, confirmability is the extent to which the study findings are based on participants’ views, and can be corroborated by participants. It aims at reducing bias and distortion by centering research findings in the data. The strategies employed to enhance confirmability included: (a) triangulation, (b) keeping an audit trail, (c) practicing reflexivity by writing about assumptions and understandings to clarify researcher bias (Lincoln & Guba, 1985).

Chapter 4: Methods of Data Collection and Analysis

Data analysis in mixed methods research entails a separate analysis of quantitative data through quantitative methods, and an analysis of qualitative data through qualitative methods. Implementing mixed methods also requires techniques appropriate to mixing or integrating the strands of data collection and analysis. However, to arrive at legitimate results and credible interpretation, both the qualitative and quantitative strands must undergo similar steps of careful, systematic preparation for analysis and interpretation (Creswell & Plano Clark, 2011).

In this parallel convergent mixed methods design, data analysis was conducted throughout the research process, including throughout data collection and through the interpretation of results. Integration and mixing data strands was dependent on the research questions, but integration was the critical component in the choice of mixed methods research. Integration of methods required procedures of data collection and analysis were carefully chosen as complements to each other, as well as to safeguard quality in data collection, analysis and interpretation. Consistent with the research program's design, the qualitative and quantitative data were collected concurrently, analyzed separately, then compared and integrated in order to address the following research questions:

1. How do preservice teachers' perspectives of their previous collaborative experiences and their beliefs about professional teacher collaboration influence the quality of their heedful interrelating during the current collaborative project?

2. How and to what extent do preservice teachers' perspectives of the quality of their heedful interrelating change across phases of the collaborative project?
3. How is the reported and observed quality of heedful interrelating among members of two focal groups related to the creation of their collaborative instruction projects?

This was not a strictly linear process, as qualitative analyses often required an iterative progression to base both the analysis and interpretation in the data.

In reporting mixed methods research, the qualitative and quantitative research strands are discussed separately in both the collection and analytic phases, before describing how the strands were mixed and integrated. The purpose of this chapter is to describe how the strands of quantitative and qualitative data were analyzed separately, and then merged to address research questions. QUAN and QUAL strand analytic procedures are discussed separately, followed by a discussion of how and when the integration of the strands occurred. Results from the QUAN strand analysis, and findings from the QUAL strand analysis are reported in Chapter Five. A timeline of data collection and analysis techniques can be found in Appendix A.

Data Collection: QUAN Strand

The purpose of the quantitative data strand was to provide parallel observations, triangulation of data and credibility of research findings (Greene, 2008). Quantitative data collection included results from the Heedful Interrelating of Collaboration in Educational Settings survey (HICES; from Daniel & Jordan, 2014), and subscales of the Teacher Collegiality Scale (TCS; from Shah, 2011). Surveys and questionnaires are quantitative tools designed to gather data using questions with fixed response options

aimed at collecting respondents attitudes or opinions about specific issues (Groves et al., 2009). Statistical analyses of the surveys administered in this study were intended to highlight trends in attitudes and perspectives. As these instruments are effective in providing considerable information about issues in a short period time, this data was collected to aid in identifying issues requiring further investigation and to identify individuals for follow-up interviews (Babbie, 2004). The survey responses were used as both primary and supplemental data sources.

Surveys and scales are quantitative sources of data often applied in mixed methods research of educational contexts (Ivankova, 2015). Indeed, the following research inquiries are illustrative examples of ways in which surveys in educational contexts have been used to address research questions similar to those examined in the current research project: Daniel & Jordan (2015) developed the HICES scale to capture students' perspectives of the quality of their interactions in collaboration; Jarvela, Volet and Jarvenoja (2010) used a questionnaire in their research of how students' attitudes about collaboration changed over time; Jarvenoja, Volet and Jarvela, (2013) developed a questionnaire to study how emotions and attitudes influenced collaborative communication; and, Van den Bossche, et al. (2006) employed a survey to investigate how students' beliefs and perceptions about group collaboration influenced collaborative behaviors.

QUAN Data - TCS subscales survey

Data from the subscales of the larger TCS survey were intended to address research questions of how perspectives and beliefs about professional teacher collaboration may influence preservice teachers collaborative heedful interrelating as

they design and deliver a collaborative instruction project (RQ1 and RQ3). A literature search yielded no results for a scaled survey constructed and tested to measure preservice teacher perspectives on future professional collaboration. However, as a survey validated using exploratory and confirmatory factor analysis, and tested among public school teachers, the TCS held promise. An added bonus was that Shah had defined collegiality as the highest quality (i.e. most heedful) collaboration among professional teachers. The original 39-item survey consisted of seven subscales describing high quality collaboration among professional teachers. However, the entire TCS was too long for students in this study to complete in the allotted time. Three subscales were selected for use in this research: Joint Planning and Assessment (JPA), Sharing Ideas and Expertise (SIE), and Sharing Resources (SR). These particular subscales were chosen due not only to time constraints but also because the questions within the individual subscales addressed many basic behaviors and dimensions of collaboration needed for preservice collaboration. Assuming some familiarity with basic collaborative skills was reasonable, particularly in light of the fact that the preservice students participating in this research are in their third year of university studies, while only in the first semester of their teacher preparation.

In addition to its contribution to the quantitative data collected for the research, the TCS subscales survey was also coursework required of all students, not just participants. As such, the instructor chose to add three pedagogic questions at the bottom of the survey page. The three questions were singly selected from the original TCS, but from subscales other than the three already in use. As single items the three questions have not been tested or validated, but were added to the assignment by the instructor as a pedagogic strategy to increase her understanding of students for the purpose of improving

instruction. The instructor's three pedagogic questions were: (a) Teachers accept shared responsibility for student learning across their school, (b) Teachers collectively analyze data about student learning, and (c) Teachers observe each others teaching as part of sharing and improving instructional practices. All items were scored on a seven point Likert-scale, ranging from, 1 = Strongly Disagree, to 7= Strongly Agree. The TCS subscales and the three pedagogic questions can be seen in Appendix B.

QUAN Data: HICES scale

Data collection through the HICES scale designed by Daniel and Jordan (2015) provided data used in addressing the research question of how preservice teachers' perspectives on their heedful interrelations in collaboration changed across the phases of the collaborative work sessions (RQ2). In addition, at the end of the collaborative project a version of the HICES adapted to capture both self and group perspectives was administered to provide information that addressed the question of how reported and observed heedful interrelating among group members was related to their delivery of their collaborative instruction (RQ3).

The HICES scale was developed as a measure of students' heedful interrelating during collaborative educational tasks. It was demonstrated as a psychometrically sound self-report instrument to examine post-secondary students self-reported level of heed in interrelating during collaborative academic work (Daniel & Jordan, 2015). The first stage of development indicated statistical validity of the scale items in relation to heedful interrelating concepts. The second stage of the scale development indicated a significant positive moderate correlation with HICES and collaborative academic outcomes. In all administrations, Chronbach's alpha reliability coefficients were at or above .85,

suggesting a strong reliability for heedful interrelating in educational contexts (Daniel & Jordan, 2015). Many surveys used in education are lengthy, using 81 or more questions (see Zimmerman, 2008 for several examples). However, the HICES questionnaire has six items. Completing it after a collaborative work session only requires about five minutes of class time, and is not excessively burdensome for students (Daniel & Jordan, 2015). Use of the questionnaire provides a valuable opportunity to quickly capture student perceptions of interaction before too much of the experience is lost. As a self-report tool, it measures students' self-evaluation, reflection and interpretations of their heedful interrelating immediately following a collaborative event. Responses are made using a 7-point Likert-type scale (1 = *Not at all true of me* and 7 = *Very true of me*). See the six items in the HICES scale in Jordan & Daniel (2010, p. 30).

As part of the collaborative instructional project that was the focal assignment for the current study, all students responded to the HICES scale whether or not they participated in the dissertation research. The instructor employed the HICES as a strategy to improve the quality of students' heedful interrelating in collaboration through self-reflection on one's own actions of interrelating. As a self-report instrument, the HICES affords opportunities to reflect, and record reflections from that day's collaborative work session, while also, providing a close to real-time view of student perspectives. Like a snapshot may record a specific event, the scale can record a specific perception of collaboration. Developing better collaborative skills requires reflection and evaluation (Friend & Cook, 2013; O'Donnell, 2006). When students reflect on and evaluate their own and others' collaboration they may note collaborative skills that need improvement, and may aid them in their future professional collaboration.

As part of the research program, the HICES scale was administered to collect data across four collaborative work sessions. Upon each administration, students were briefly reminded that the purpose of the questionnaire was reflection and evaluation for improved heedfulness in collaborative skills, and that careful, critical reflection of their own strengths and weakness may prove beneficial for them now and in the future. The class met two times per week. The collaborative assignment was intended to include four collaborative work sessions spanning two weeks. However, a fifth work session was added to accommodate the two groups who were to deliver instruction on the first day scheduled for project presentations. At the end of each collaborative work session, except the fifth work session, students used the HICES to reflect on and evaluate the quality of their own heedful interrelating, and how their perceptions may have changed over the course of the collaborative project.

After the fifth and last collaborative work session, the group-adapted form of the HICES was administered to capture individual students' perspectives of the heed with which their group peers collaborated. This data provided information about students' perspectives of themselves as collaborators, as well as their perspectives about the quality of heed with which they and their group members collaborated. This adapted form of the HICES survey has not been tested for reliability or validity. Therefore, it is important to keep in mind that, similar to other self-report measures, the adapted version is still an individual's reflective perception of peers' heedful interrelating, and as such, results are not immediately transferable to other students in different educational tasks or settings. The group-adapted version of the HICES can be found in Appendix C.

Limitations of Surveys and Questionnaires

As with all research methods, collection of survey data presents its own set of problems. One problem is that people tend to portray themselves in the best possible light when completing self-surveys, and potentially select only the end points of the scale (Groves et al., 2009). Nevertheless, the variance between reported and observed quality of collaboration and project outcome is needed to discuss of how beliefs and past experiences may have influenced both. When used alone, survey questionnaires would present only one picture of students perception of the quality of their collaboration, but the strength of mixed methods research is triangulation of data; the collection of data from multiple sources. Mixing two strands of research provides may reveal divergence, or provide convergence, and corroboration in data collection and analysis, thereby offering depth of understanding not available through the use of a single source of data collection (Johnson, Onwuegbuzie, & Turner, 2007). It is not unusual for respondents to use the more positive end of a survey, as people and students prefer to cast themselves in a positive light (Groves et. al., 2009). Thus, qualitative strands of data, including direct observations of preservice teachers' interactions during collaborative work sessions, were collected in order to gain multiple perspectives on students' beliefs and interactions.

Data Collection: QUAL Strand

The purpose of the qualitative data collection strand was to collect data pertaining to the heedfulness of preservice collaborative interaction and instruction; and how perspectives of, and past experiences in, collaboration might influence both preservice teachers' collaboration during the current collaboration and the quality of their collaborative instructional projects. Qualitative data sources included: written self-

reports, naturalistic observations, interviews, audiovisual materials, and the instructor's qualitative assessment of each group's instruction. All are sources of qualitative data often used in convergent mixed methods research (Creswell & Plano Clark, 2011). This section begins with a brief description the pilot study through which the qualitative data collection procedures were tested and improved for implementation in the current study. The remainder of the section is then devoted to discussing the qualitative data collection processes and management methods used in the current study.

QUAL Data: Pilot study

In Spring 2015 semester a pilot study was conducted in an educational psychology course taught by the same instructor who taught the course in the current study. Pilot studies are recommended as a way of gaining experience in collecting and managing qualitative data (Sampson, 2004). Therefore, the main focus of the pilot study was to practice, and refine protocols for the large quantities of qualitative data planned for collection in the dissertation research program, such as: classroom observations, written reflections, surveys, questionnaires, interviews, and artifacts from the collaborative project. Along with practice in data collection, the pilot study aided in development of protocols for observations and student interviews. The pilot study student interviews proved highly effective in enriching the data collection. Asking students directly about their experiences provided detailed qualitative data about their experiences and beliefs, while also contributing to the credibility and authenticity of the qualitative data collection (Dellinger & Leech, 2007). Therefore, the rich data gained from the pilot study interviews, provided a rationale for requesting one-on-one interviews from the collaborative groups of preservice teachers. In the end, the interview was an important

choice for a study examining perspectives of self and others. The pilot study also prompted my rationale for group selection by grade level teaching interest. Interviews from the pilot study indicated that students preferred to work among colleagues of similar teaching interests, and the more successful collaborative projects in the pilot study were found to comprise students with similar teaching level interest. This indicated that heed was most likely to be found in groups with similar teaching interest.

The pilot study also surfaced a critical need to rearrange the tables used as desks into clusters to enable face-to-face interaction. The study was conducted in a classroom where rectangular desks fitting two chairs on a single side were arranged in traditional rows. Thus, when students gathered in their groups for collaboration, they were often spaced along a row of four. This made it difficult for all group members to interact effectively together as a group. Analysis of the pilot study data indicated that table arrangement significantly hampered collaboration. Without ready access to the group, students quit participating, while others went to extreme measures such as arm waving to get their group mate's attention. Although rearranging tables for every class session was an arduous task; it was deemed necessary in supporting emergence of high quality, heedful collaboration in the current study.

The remainder of this section describes the qualitative data collection methods implemented in the full dissertation study, which as described above were much influenced by my experience in the pilot study. Sources of qualitative data are clustered into three categories: self-report materials, observations and audio-video data, and artifacts. Each of these categories is discussed in turn below.

QUAL Data: Self-report materials

Qualitative self-report data included: student written reflections of past collaborative experiences and beliefs about professional teacher collaboration, open-ended responses to questions about students' heedful interrelating during work sessions, students' post-project written reflections, and semi-structured student interviews. The purpose of these qualitative data sources was to obtain in-depth reflective information about study topics, provide students with opportunities to clarify or add information not captured by the quantitative instruments, obtain firsthand accounts of students' experiences in their collaborative groups, and allow them to discuss collaboration or course concerns away from group mates and the instructor, where students may not have been comfortable discussing these topics. Self-reports and interviews are frequently employed strategies of data collection in convergent research designs (Creswell Plano Clark, 2011). The following paragraphs discuss each qualitative self-report source.

Written reflections. Written reflections of student beliefs about professional teacher collaboration and their past experiences in collaboration were collected at the beginning of the semester and were intended to contribute to RQ1. These questions for written reflection were included as homework immediately after the TCS survey had been administered in class. Administration of the survey prior to the take-home written reflections of teacher collaboration was a pedagogic strategy to introduce students to ways in which professional teachers may collaborate, as well as provide focus for the written reflections. As these students are at the beginning of their teacher preparation track, it was assumed that their knowledge of professional collaboration was limited. Take-home written reflection questions asked preservice students to reflect on, and write

about past collaborative experiences, their beliefs about professional teacher collaboration, and how these might influence their current collaborative efforts. The reflective writing data afforded opportunities for in-depth description of experiences, and perspectives not available through quantitative surveys, or the time-constrained interviews. Finally, students post-project written reflections allowed me to interpret both their perceptions of the quality of their group product, and their group's overall heed in interaction. Written reflection questions are found in Appendix D.

Open-ended responses related to heedful interrelating. Open-ended responses were planned to contribute to analysis of the research question pertaining to how students perceived changes in their own or their group mates' quality of interrelating during the collaborative project (RQ2). Open-ended questions were included with the quantitative HICES instrument for additional information or clarification that might aid in the analysis of the research question pertaining to how students perceived changes in their own or their group mates collaboration during the collaborative project (RQ2). As previously noted, the HICES individual perspective, it was administered after four of the five collaborative work sessions, and with each administration, students were briefly reminded that the purpose of the survey was reflection and evaluation for improved heedfulness in current and future collaborative experiences. Each administration of the HICES included open-ended writing options with each of the six questions. The open-ended option gave students the opportunity to comment on their own or their group mates' collaborative interactions. Another open-ended option was included at the bottom of each HICES survey page for students to describe an example of their collaboration

during that day's work session. This was intended to capture students' perceptions of their heedful interrelating that day or any changes they felt had occurred over time.

Semi-Structured Interviews

The semi-structured student interviews were planned to address research questions of how students' perspectives of their past collaborative experiences, and beliefs about professional teacher collaboration influenced the quality of their interactions during collaboration (RQ1), and how the quality of reported and observed interaction among team members might influence their collaborative instruction (RQ3). Interviews also contributed information about changes in students perspectives of their collaborative quality (RQ2). Qualitative interview data is commonly used in mixed methods research (Creswell, 2007).

I had only one opportunity to interview each of the selected students. Therefore, I chose a semi-structured protocol. Semi-structured interviews include the use of open-ended questions to guide the interview; however, participants have freedom to express their views, allowing participants to influence the narrative (Spradley, 1979). The semi-structured protocol also allows opportunities for the interviewer to follow relevant topics that develop as each participant describes their perspective (Kvale & Brinkman, 2009). This protocol also allowed me to pursue questions prompted by student written reflections of past collaborative experiences, beliefs about professional collaboration, and the open-ended responses about changes in students' perspectives of HI across the collaborative work sessions. Student interviews granted students opportunities to share a version of their thoughts and insights that may not have been communicated in the quantitative surveys or written reflections. See the interview protocol in Appendix E.

Initially, I had planned to interview only students from two focal groups, based on the higher or lower quality of their collaboration. However, during classroom observations data emerged that prompted me to change my selection strategy to include interviews from four groups of students. All interviews were conducted within twenty-four hours after a particular collaborative work session, but before the subsequent work session began. This method was selected to provide students with time to reflect before the interview, but not so much time that thoughts and insights were lost. Place of interview was chosen by each student, in order to accommodate their schedule. Interviews were timed to last no more than 20, and were audio recorded, and transcribed when necessary. I did not take notes during interviews to afford better rapport with the student, deemed essential to good interview data (Fontana & Frey, 1994). Per IRB consent, students received extra credit in the course or a \$5.00 Starbucks gift card for participating in the interviews. Immediately after the interviews I wrote narrative descriptions of my understanding and interpretations of the interview with each student. This will allowed me to capture my impressions and thoughts before losing the information from memory.

Member checking. Member checking is considered an important method of verifying and validating data from interviews (Creswell, 2007). It serves to check and critique the data the researcher derived from the interviews. Often member checking provides further data for investigation and triangulation. Formal member checking was scheduled as voluntary activity in this study. My scheduled opportunity for member checking was on the last two days of class during class time. For those two days, students were engaged in round-robin activities of 12 minutes each. There were multiple

activities positioned at stations around the classroom. Students selected activities in which to participate. One of those activities was the opportunity to discuss current research understandings, including interviews with me. During this scheduled time I was able to request that some students review study findings with me, and some students voluntarily choose this activity. Member checking also occurred through text, when I had brief questions, and informally when I encountered students between classes. As a student myself, I took advantage of informal chats for member checking. However, overall I had limited opportunities to do member checking with students.

QUAL Data: Naturalistic observations

Collection of the classroom observation data provided a base for understanding the entire research program, and was a major source of data used in the case study analysis. Observational data were collected over the five collaborative 30-minute collaborative work sessions and during the implementation of Groups A, B, E and F's collaborative instructional projects. Observational data collected through researcher field notes and audio-video recordings, were conducted with consideration for the participants in mind. Two students had declined to participate in the study. I was careful to situate recording equipment so as not to capture their voices or images.

Naturalistic observations and audiovisual materials are an appropriate source of data for convergent research programs where observations may corroborate and provide triangulation other data collection (Ivankova, 2015). Observations and audiovisual materials contributed to answers for research questions of how preservice teachers' perspective of their past collaborative experiences, and beliefs about professional teacher collaboration influenced the quality of their interactions during the current collaborative

project (RQ1), how their perspectives of their HI changed during the project (RQ2), and how their reported and the observed quality of interaction within the group related to the creation of students' collaborative instruction (RQ3). Collecting data from observations and audiovisual recordings, whether observed or not, is an important method for examining students involved in real-time normal classroom activities (Wolcott, 1999). It also allows exploration of details in discourse that may not be easily captured through in other data (Schiffrin, 1994). As student collaboration is reflected in the language they use in collaboration (Jordan & Daniel, 2010), and the activities or behaviors of interaction (Jordan & Henderson, 1990; Khosa & Volet, 2014), it was imperative to collect data that included student discussions and actions.

Observations can produce 'thick' and rich data, but that data comes with some complications. A concern for all observers is how their presence changes the attitudes and behaviors of the participants (Miles, Huberman, & Saldana, 2014). I attempted to mitigate this problem by introducing myself as a graduate student interested in collaborative activities, yet separate from their course outcomes. Another concern is that ways in which students experience and manage their real-life collaborative activities may not be visible to me as the observer, yet some of these events are key issues for participants in their subsequent collaborative activity. Even experienced observers do not 'see' everything (Eisenhart, 2001). In addition, observational data requires good listening skills and attention to detail. As an apprentice researcher, I likely missed some key elements.

A researcher 'sees' through theoretical grounding and knowledge that guide what actions to observe closely (Erikson, 1986). Focused observations may surface fine points

and complexities that might otherwise slip away. Background readings, training and understandings contribute to the focus and orientation of the observations, sometimes whether we know it or not (Eisenhart, 2001). Miles, Huberman and Saldana (2014) suggest that prior instrumentation and theory-based categories, codes or terms can be valuable when working within a particular framework in which this information already exists. Since I sought to understand heedful interrelating in the context of preservice teacher training, and, the framework has existing terminology for describing heedful interactions, my observational focus included searching for episodes of contributing, representing and subordinating. These three descriptors of heed applied to both behaviors and discourse. Jordan and Daniel's (2010) discourse markers helped me fine-tune episodes of heed in the discourse (See the heedful interrelating discourse markers in Jordan & Daniel, 2010, p. 8). The framework of Social Interdependency contributed a focus on group structures of positive interdependence and promotive interaction (Jensen, Johson, & Johnson, 2002). Socially Shared Metacognitive Regulation (Khosa & Volet, 2014) guided focus on levels of collective cognitive regulation. All descriptors were intended to provide a foundation for coding field notes and audio-video materials (See the heedful interrelating coding scheme in Jordan & Daniel, 2010, p. 6), but also allowed the emergence of new codes and categories within the data. In addition, during observations, even when I could not hear everything being said, HI often occurred as students' body language became more animated. Student's tended to lean toward each other with facial expression intent on the collaboration. These changes in gestures, facial expressions and the general tone of the discussion helped cue me that something was happening.

My observational protocol for managing qualitative data collected in the field included both writing descriptive and reflective field notes about experiences, hunches and learnings as they occurred (Lofland & Lofland, 1995). As suggested by Creswell (2007), I wrote portrait-style detail of participants, the physical setting and researcher reactions. My observation protocol included: reviewing the research questions and the discourse markers, clustering desks, placing group labels on tables, checking batteries in all recording devices, beginning each observation session by describing the setting, and recording my reactions during observations.

Expanding field notes shortly after the work sessions was an essential part of my observational protocol. Knowing what to attend to, being able to hear, trying to write while listening and watching, and the inability to focus on everything at once, made it important to record impressions and interpretations as soon as possible before they were lost. Rewriting and expanding my cryptic field notes helped me make sense of the data, and brought context that might otherwise have been lost had I not expanded soon after the observations. The expanded notes immersed me in the data, and became an important source of data as the beginning stages of data analysis and interpretation (Emerson & Fretz, 2001). These notes also proved invaluable. At one point a student experimented with an audio recorder, and deleted a portion of the previous day's data, causing me to be thankful I had developed the habit of expanding field notes immediately after observations.

An additional concern with observation data is that it is time consuming to collect, and generates a good deal of data, making it difficult to manage. All my field observational notes have been systematically de-identified, labeled, filed and stored in

files with hard-copy back-ups. I used a writing program called *Scrivener* that stores all research files with the written document; everything from audio-video materials, to online data, photos (even journal articles associated with the project). The *Scrivener* files are labeled by date and time of the data collection and filed under a pseudonym.

QUAL data: Artifacts. Collected artifact data addressed research questions of how reported and observed quality of interaction among group members relates to the creation and presentation of their collaborative instruction (RQ3). Data sources in qualitative research often include artifacts, objects or texts produced by study participants (Creswell, 2007). In this research program collected artifact data included: student written reflections (discussed above), online communication and the instructor's qualitative evaluation. This evaluation includes her written comments of the collaborative presentations the collaborative instruction. Collecting this data improved understanding of the research context, provided corroboration and triangulation with interview and observation data.

Online Blackboard site postings were one type of artifact data collected in this study. As part of the regular work associated with this project, students communicated with each other and the professor via online postings to the University's Blackboard site. These communications were considered part of the collaborative group discourse. In current classroom settings, online Blackboard postings and Google.docs are naturally occurring activities for students, and contributed to the data collection sources.

Student's collaborative instructional projects were observed and video-recorded by the researcher. The instructor observed and also took observation notes as students delivered their collaborative instruction. The collaborative assignment selected for the

research program occurs in the first few weeks of the first semester of the first year of study participants' teacher preparation track. Due to the neophyte nature of these students, the instructor does not assign grades for this project. Instead, she observes, evaluates and provides written comments on the groups' collaborative instruction. She bases her observations and evaluation on the group understanding of subject matter, pedagogic fit and understanding of classmates needs (Shulman, 1987). As collaborative outcomes the presentations were important indicators of heed in group collaboration. As with other methods of data collection in the study, this and all artifact data sources were produced as part of the students' learning and work in the course, and their collaborative instruction assignment.

Analysis: QUAN strand

The purpose of the following section is to describe the statistical methods and procedures used to analyze the QUAN data research strand. The aim of the quantitative analyses was to examine relationships in the quantitative data and integrate results to create broader understanding of the research issues. Three quantitative data sources were collected: the TCS subscales and three pedagogic questions; the HICES questionnaire collected four times across the phases of the project; and the HICES-adapted for individual perspectives of group heedful interrelating collected after the completion of the project. Program for the Social Sciences (SPSS) was used to compute all quantitative statistical analyses. Preliminary analysis of each quantitative data source began with descriptive statistics, and frequency counts, including the mean, standard deviation and range. Inferential statistical tests were also performed when warranted to further

investigate relationships in the data. Procedures as applied to data sources are discussed below.

TCS Subscales

As described in the QUAN data collection, three subscales were extracted from the original TCS (Teacher Collegiality Scale) for use in the research program. The three extracted subscales were: Joint Planning and Assessment (JPA); Sharing Ideas and Expertise (SIE); and, Sharing Resources (SR). Preliminary exploration of the student responses ($n = 24$) to the TCS included descriptive statistics for each of the three subscales: JPA, $M = 4.87$ ($sd = .838$); SIE, $M = 5.21$ ($sd = .781$); SR, $M = 5.69$ ($sd = .927$). All means of the three subscales were above the median of the seven point Likert-scale. Internal consistency (reliability) analysis was also conducted for each of the three subscales using Cronbach's alpha, results were: JPA subscale, 7 items ($\alpha = .75$); SIE subscale, 6 items ($\alpha = .64$); and, SR subscale, 3 items ($\alpha = .74$).

To evaluate any differences between participant responses to the three subscales one-way repeated measures analysis of variance (ANOVA) was conducted. While there were three potential outlier responses, there were no extreme points as assessed by inspection of boxplots. Looking at the residuals, none of the potential outliers were three or more standard deviations from the mean. In addition, the data for all subscales, except the SR subscale, were normally distributed, as assessed by a Shapiro-Wilk test ($p > .05$). The SR subscale was found to be not normally distributed with $p = 0.007$. However, the Q-Q plot for this subscale showed minimal deviation from normality, and ANOVA is robust to violations of normality. Mauchly's test of sphericity indicated that the assumption of sphericity was not violated, $\chi^2(2) = 5.5$, $p = .064$. Results of the ANOVA

indicated a statistically significant difference between the mean score on the three subscales, $F(2, 46) = 14.44, p < .001$, partial $\eta^2 = .39$. Post hoc analysis was conducted with a Bonferroni correction revealed statistically significant differences between the mean score on all three subscales. Mean score on the Joint Planning and Assessment ($M = 4.89, SE = .17$) was lower than both Sharing Ideas and Expertise ($M = 5.22, SE = .16$), and Sharing Resources ($M = 5.69, SE = .19$), $p = .024$ (95% CI, $-.64$ to $-.04$) and $p < .001$ (95% CI, -1.22 to $-.42$), respectively. Sharing Ideas and Expertise mean score was significantly lower than Sharing Resources mean score, $p = .04$ (95% CI $-.95$ to $-.01$). These results combined with the high means of the three subscales suggest that while most students reported believing that professional teachers were likely to collaborate through cooperative sharing of ideas, expertise and resources, as well as joint planning and assessment. Nevertheless, students were least likely to describe professional teacher collaboration as joint planning and assessment.

The three questions added to the TCS by the instructor for pedagogic purposes, were also examined for patterns in preservice perceptions of professional collaboration. These questions, while not part of the validated TCS, nevertheless addressed the more complex and evaluative activities of collaboration. Exploration of the means and histograms indicated that the means of all the three questions were lower than the means for all three subscales of the TCS. The means for these questions clustered closer to the mid-point of the 7-point Likert-scale of the overall survey. With 24 respondents, the means and standard deviations for the three questions were: Question 17, $M=4.50$ ($sd=1.56$); Question 18, $M=4.79$ ($sd=1.35$); and Question 19, $M=4.70$ ($sd=1.42$). The means of the three pedagogic questions, similar to the means of the TCS subscales,

indicated that students were less likely to describe professional teacher collaboration as collective analysis and evaluation, or shared responsibility for student learning.

Parallel QUAL content analysis of students written reflections and individual interviews indicated that most student participants believed that professional teachers do indeed collaborate through joint planning, sharing ideas, expertise and resources, but most students had no conception that professional collaboration might include joint assessment, or shared evaluation. Combining this finding from the qualitative analysis with results from the quantitative analysis prompted further investigation of the three TCS subscales.

To investigate this potential divergence of analyses, the analysis of subscales was re-examined. Two of the subscales, the JPA and the SIE, contain items describing the two types of collaboration. The JPA contains items describing collaboration as: Joint Planning, and Joint Assessment. The SIE contains items describing collaboration as: Sharing Ideas/Expertise, and Shared Evaluation. Thus, the calculated means of the individual items of the JPA and SIE subscales related to planning and sharing were compared to the means of items related to assessment and evaluation (the SR subscale only describes sharing resources). This comparison indicated a pattern of lower means occurring on the items addressing professional collaboration as assessment and evaluation. At this juncture, both the JPA and the SIE were each split two subsections: Joint Planning and Joint Assessment; and, Sharing Ideas and Expertise and Shared Evaluation. The two subsections created from the JPA, consisted of three items representing Joint Planning, and four items representing Joint Assessment. The two subsections created from the SIE consisted of five items representing Sharing Ideas and

Expertise, and one item representing Shared Evaluation. Cronbach's alphas were calculated to examine internal consistency for each new subsection (except Shared Evaluation which had only one item), and are reported as follows: Joint Planning, 3 items ($\alpha = .65$); Joint Assessment, 4 items ($\alpha = .55$); and Sharing Ideas, 5 items ($\alpha = .54$).

A repeated measures ANOVA was conducted to test whether there were statistically significant differences among the two types of items, now represented by four subsections (two in the JPA, and two in the SIE) and the SR subscale. While there were three potential outliers, there were no extreme points as assessed by inspection of the boxplot. Looking at the residuals, none of the potential outliers were 3 or more standard deviations of the mean. The data for all the subscales, except Sharing Resources, were normally distributed, as assessed a Shapiro-Wilk test ($p > .05$). Resource was found to be not normally distributed with $p=0.007$. The Q-Q plot for this subscale showed minimal deviation from normality. Since ANOVA is robust to violations of normality, the analysis was continued. Mauchly's test of sphericity indicated that the assumption of sphericity had been violated, $\chi^2(9) = 15.61, p = .076$. As a result, epsilon (ϵ) was .73, as calculated according to Greenhouse & Geisser (1959), and was used to correct the one-way repeated measures ANOVA. Response to the subscale was statistically significantly different for the different subscales, $F(4, 92) = 20.49, p < .001$, partial $\eta^2 = .47$.

Post hoc analysis with a Bonferroni adjustment revealed statistically significant lower responses on the Assessment Subsection, when compared to both the Planning subsection ($-.948$ (95% CI, -1.441 to $-.455$), $p < .001$), the Sharing subsection ($-.931$ (95% CI, -1.376 to $-.486$), $p < .001$), and the Resources subsection (-1.226 (95% CI, -

1.812 to -.639), $p < .001$). Responses to the Evaluate subsection were statistically significantly lower than the Planning subsection (-1.125 (95% CI, -1.835 to -.415), $p = .001$), the Sharing subsection (-1.108 (95% CI, -1.811 to -.405), $p = .001$) and the Resources subsection (-1.403 (95% CI (-2.147 to -.658), $p < .001$). There was no statistically significant difference found between the following subsections: Assessment and Evaluate (.177 (95% CI, -.612 to .966), $p = 1$); Planning and Sharing (.017 (95% CI, -.424 to .458), $p < .0005$); Planning and Resources (-.278 (95% CI, -.747 to .191), $p = .788$); or Sharing and Resources (-.294 (95% CI -.886 to .297), $p = 1$). The results of both tests of ANOVA and the means of the three additional pedagogic questions indicate that while most students reported believing that professional teachers were likely to collaborate through cooperative sharing of ideas, expertise and resources, as well as joint planning. Students were much less likely to describe professional teacher collaboration as joint assessment, shared evaluation, or collective analysis and responsibility.

Results of the ANOVAs and the means of the three additional pedagogic suggested that combining the new subsections and the pedagogic questions could provide some initial guidance for a new scale examining preservice perspectives of professional collaboration. To further examine this prospect, the subsections of Joint Assessment and Shared Evaluation were combined with pedagogic questions 18 (Teachers collectively analyze data about student learning); and question 19 (Teachers observe each others teaching as part of sharing and improving instructional practices). This new combination consisting of seven items represented *Collaborative Assessment, Evaluation and Analysis*. Cronbach's alpha for the 7 items was .75. Next, the subsections of Joint Planning, and Sharing Ideas were combined. This new combination consisted of eight

items represented *Collective Sharing and Planning*. Cronbach's alpha for the 8 items was .74.

HICES scale responses collected four times across phases of the project.

Collecting data from the HICES four times was intended to identify trends and patterns in students' self-reported perspectives of heed across the phases of the project. Preliminary exploration of this data included calculation of descriptive statistics of mean, median, mode, variation, and standard deviation for each item at each time point (four collaborative work sessions) across the phases of the project for all participants.

Calculating the means for each item on the scale afforded not only information about the item, but afforded a comparison of the average dispersion of scores about the mean; how and the extent to which students were using the scaled items. Different means were found for each question indicating response variance across questions. However, the means for all six questions were above the Likert mid-point (4). So, while participants responded to questions using all seven Likert-scale points, they were more likely to use the higher points of the scale (four through seven). Additionally, calculating standard deviation allowed further comparison of the dispersion of responses across individuals, and across time between scale items, and across the four data collections of the scale. In the reported standard deviations from the mean of each collection point, responses tended to vary less than one point on the Likert-scale in Sessions One, Two, and Four; but slightly more than more than one point on the Likert-scale in Session Three.

Descriptive statistics were also calculated for the total scale responses from all individual participants ($n = 21$) across the four data collection sessions of the project.

Results for the total scale score are as follows: Session One, $M = 5.56$, $sd = .684$; Session

Two, $M = 5.78$, $sd = .707$; Session Three, $M = 5.52$, $sd = 1.03$; and, Session Four, $M = 5.68$, $sd = .914$. Cronbach's alpha was also conducted for each of the four HIECS data collections. Results for the 6 HICES items are as follows: Session One, $n = 23$ ($\alpha = .75$); Session Two, $n = 23$ ($\alpha = .67$); Session Three, $n = 21$ ($\alpha = .80$); and, Session Four, $n = 23$ ($\alpha = .67$). Daniel and Jordan (2015) in developing the 6 item HICES reported a Cronbach's alpha of .85.

To compare students' self-reported heed across the four work sessions of the collaborative project, the means of their individual HICES scale scores were analyzed using a one-way repeated measures ANOVA. While there were three potential outliers, there were no extreme points as assessed by inspection of the boxplot. Looking at the residuals, none of the potential outliers were three or more standard deviations of the mean. Although students responded to items using mostly the upper end of the Likert-scale, ANOVA is robust to the normality assumption and Q-Q plots did not visually show a significant difference from the normal. Due to repeated measurements, sphericity was assessed to measure variance of the difference between combinations of groups. Mauchly's test of sphericity indicated that the assumption of sphericity had been not been violated, $\chi^2(5) = 7.934$, $p = .160$. This indicated that while ANOVA was still an appropriate test, the assumptions we can make based on the results of the test are limited due to the abnormal distribution of the responses. There was no significant effect for session, Wilks' Lambda = .86, $F(3, 22) = .96$, $p = .43$.

Although, results of the one-way repeated-measures ANOVA indicated that individuals' perceptions of the quality of their heedful interrelating did not vary across the phases of the project, further analyses were conducted to determine whether groups'

varied in their collective perception of the quality of their interrelating across the phases of the task. Thus, a new variable was created for each group by averaging all group members' individual mean scores on the HICES for each session. A mixed analysis of variance (ANOVA) with a between subject factor of group was then conducted to test for significant difference between session (a repeated measurement) and group (a fixed factor) on the dependent variable (i.e., students' HICES scale scores). A significance level of .01 was selected. The more stringent significance level was selected because of the presumed violation of independence of observations assumption. Since students were working in collaborative groups, they cannot be considered independent from each other on the outcome measure. Given Stevens (2007) recommendation for dealing with this scenario, the significance level for the analysis was set at .01 (rather than .05) knowing that the actual error rate might be closer to .05 or .10.

HICES-Adapted for Group Perspectives of Heedful Interrelating

As noted in previous collections of HICES data, students in responding to the HICES group-adapted questionnaire, tended to rate their perspective of their own and their group members heed in collaboration using the higher points of the Likert-scale. Exploration of the HICES group-adapted data upon entry to the SPSS data set indicated that students were rating the quality of their own, and their group mates' interactions in collaboration highly (Group Mean = 5.65, SD = .45). The lack of variance, coupled with missing HICES group-adapted data from focal Group F, made it untenable to continue with analyses of this data, as there was little variance to explain.

However, to assess whether students' perceptions of the quality of their interrelating were related to the quality of their collaborative instructional project, a

composite HICES score was calculated for each group. This score was an average of the four HICES scores taken over four sessions. To assess the relationship between group ranking according to qualitative criteria, and the composite HICES score a Spearman's rank-order correlation was used. The Spearman's correlation indicated there was no correlation between groups' composite score over the four sessions and the group rank order on their collaborative instruction project. Further, quantitative analysis was therefore not appropriate.

Limitations of Sample Size on QUAN Analysis:

All QUAN data collected in the study was measured using ordinal ranked data from Likert-type scales, and the sample size was small ($n = 24$). The sample, $n = 24$, was small for quantitative analyses, limiting statistical power. Due to the small sample size, generalizability from the results is limited and curtailed the use of complex modeling procedures. Therefore, the quantitative methods of analyses are limited to describing aspects of this sample, with little or no application to other similar samples (Colidarci et al., 2011).

Ordinal Ranking of Collaborative Instruction Projects

The presentation and delivery of each group's collaborative instructional projects was assessed by both the instructor and the researcher. However, as the first collaborative project of the semester, intended as an introduction to the complex process of designing instruction, group ranking on the project did not contribute to students' course grades. Assessment of the instructional projects was grounded in the processes of effective teaching described by Shulman (1987). Accordingly, successful collaborative instruction required groups to demonstrate collective knowledge of selected content,

combined with effective pedagogic strategies for delivering appropriate and relevant instruction for their classmates as students. Both the instructor and the researcher separately ranked group projects from highest to lowest in quality of collaborative instruction they delivered to their classmates. Upon comparison of projects' rank order, there was 100% agreement between the instructors' and researchers' rankings. Groups received an ordinal ranking as follows: Group A (highest rank); Group B (mid-high rank); Groups C and D (middle rank); Group E (mid-low rank); and Group F (lowest rank).

Analysis: QUAL Strand

The purpose of this section is to describe the qualitative methods and procedures used to analyze the QUAL strand of data. The main focus of qualitative analysis is to develop in-depth, holistic explanations of research problems (Tesch, 1990). Combined with the results of the quantitative analyses, the qualitative findings contribute a broader perspective on the study issues.

Methods of qualitative analysis are varied and there is no prescribed approach. Yet, coding, or the classifying of qualitative data into categories or themes that move from general to specific conceptual understandings, is a common analytic process among many qualitative analyses (Creswell & Plano Clark, 2011). Coding was a core component to the qualitative analyses used in this research program. Another frequently employed method of qualitative analysis is the constant comparative method (Boeije, 2002). As an inductive method of analysis, constant comparative techniques involve the comparison of a unit of data to all other units of data that are similar (Strauss & Corbin, 1998). This iterative analysis of differences and/or similarities among the units of data

allows for new insights and meaning to be drawn from the research. Effective qualitative analysis is an iterative and cyclical, not the linear process often noted in quantitative analysis (Ivankova, 2015).

As part of the process of qualitative analysis, participants were de-identified by changing individual names to pseudonyms. In addition, group labels as discussed in the research to not correspond to the original distinguishing labels given to each collaborative work group. During data collection group names were designated by chapter content. As reported in the research, groups are labeled by rank order (Group A through F) on their collaborative instruction. However, student groups were not informed of their ordinal rank on the project, therefore groups are also de-identified in the research.

Often begun as data is collected, qualitative analysis allows understandings to develop during data collection supporting adequacy of collection, and aiding in managing the daunting task of a full and complete analysis of qualitative data (Miles, Huberman, & Saldana, 2014). To that end, I began qualitative analysis concurrent with the earliest qualitative data collection. In accordance with the convergent parallel research design, the qualitative data was analyzed independently using qualitative methods. This section describes the qualitative processes used in qualitative data analysis.

Content Analyses of Written Reflections and Focal Student Interviews

According to Merriam (2009), all “qualitative data analysis is content analysis in that it is the content of interviews, notes, and documents that is being analyzed” (p. 205). Methods of content analysis were applied to student written reflections about beliefs about professional collaboration and their past collaborative experiences. Student

interviews, as a rich data source, contributed to all research questions, and were also analyzed through content analysis using both deductive and inductive approaches.

Content analysis of students' beliefs about professional teacher collaboration.

Students' written reflections of their beliefs about professional teacher collaboration were first coded deductively using a prior codes derived from the TCS subscales: joint planning and assessment; sharing ideas or expertise; and sharing resources. A second stage coding involving In Vivo coding, provided insight for re-organizing the a priori codes. Two new codes were created, and labeled as; joint assessment, and shared evaluation. In addition, another category emerged from the data that was labeled "other." This category included students' beliefs about professional teacher collaboration that had not been mentioned in the subscale items such as; teachers collaborating with parents, or community members. Constant comparative techniques surfaced the two conceptual themes used to described students' beliefs about professional teacher collaboration as: *expanded* and *simple*. The *expanded* conceptual theme described professional teacher collaboration including various complex collective activities such as: the more demanding aspects of collective assessment, evaluation, and school-wide responsibility for student learning, as well as the simpler more cooperative types of collaboration in which teachers cooperatively divide labor, or sharing ideas, expertise or resources. The *simple* conceptual theme described professional teacher collaboration as a less complex set of activities that mostly involved cooperative division of labor and sharing of ideas, expertise and resources.

Content analysis of students' past collaborative experiences. Content analysis of students' past collaborative experiences were first coded deductively separating

experiences into an a priori coding of good or bad experiences, as I had expected to find this information in the data. Following an intuition I developed a second stage coding, in which I re-combined the previous codes represent students' descriptions of what they had learned from past collaborative experiences. In Vivo coding played a large role in this round of analysis because students own words were highly indicative of their personal learning experiences in collaboration. This type of coding exposed me to the breadth and intensity of student experiences not noted by the deductive coding of good and bad experiences. In Vivo coding also surfaced a category of students' describing mixed experiences with collaboration. However, these categories did not conceptually describe the data. Using constant comparative techniques, I compared and re-combined codes to arrive at the two conceptual themes used to described students' perspectives of past collaborative experiences: *flexible*, and *inflexible orientations* to collaboration. These conceptual themes more fully encompassed the influence of student's previous collaborative experiences. The *flexible orientation* included student awareness that successful collaboration required attention to how their activities, whether discursive or behavioral, fit the current state of the group interaction and project. It also included an awareness with effort and practice collaborative skills could be improved over time. The *inflexible orientation* reflected a perspective that collaboration was a static experience, in which individual actions and efforts had little influence on group interaction or the collaborative product. In addition, this theme reflected the perspective that both collaborative experiences, and individual interactions and skills were likely to remain stable over time.

Content analysis of interviews with focal students. Interview data is not so much collected as co-authored (Kvale & Brinkmann, 2009), as the researcher forms impressions and interpretations during the interview process. Therefore, I tried to hear the data as the students represented their perceptions. Immediately after the interviews I listened to the interview, wrote narrative summaries, made memos about coding ideas, and interconnections between interviews or other data. This process helped me organize the interview data, and begin to make sense of it. I compared my narrative impressions to the other coded data sources in order to check my own potential biases.

Each student was interviewed only once for a total of sixteen interviews conducted across the phases of the collaborative project. The interview data provided a wealth of information about students' perspectives, beliefs and concerns. All research questions were enhanced by the interview data. As a data source the interviews was coded both deductively and inductively. Deductive coding contributed to the themes that had already emerged from written reflections and the TCS survey. Inductive coding allowed unanticipated themes to emerge (i.e., views of the teacher preparation cohort and development of collaborative skills). Students provided details about how group interaction (contributions, representations and subordinations) created the collaborative instruction. They described triumphs or struggles in the current collaborative project, and expressed concerns about how to gain the collaborative skills they need for their professional careers. Students described their use of the HICES tool and their perception of its value. They also expressed views on professional teacher collaboration and the teacher cohort model. Codes and themes from interview data were therefore multifaceted,

and analyzed across various topics, which provided both in-depth and broader understandings of concepts.

Conversational Discourse and Interaction Analysis of Observations

Naturalistic observation and audiovisual-recorded data was analyzed using conversational discourse and interaction analysis. However, Creswell (2007) noted that analysis of this type of data actually begins with collection, because the researcher is both instrument and analysis. Data collection of observations is an inescapably a selective process. Stake (1994) underscores this idea, noting that qualitative data and methods of analysis are inherently reflective and interpretive. Yet, it is the researcher's knowledge of theory and background information that allows the selective, reflective process to surface what others may miss (Miles, Huberman & Saldana, 2014). Miles, Huberman and Saldana (2014) recommend use of a theoretical framework to guide observational data collection. Conceptual frameworks provide concepts by which to filter, and ensure quality data collection, as well as guard against the threat of data overload that may lead to poor analysis.

During collection phase of classroom observational data, I focused my observations on identifying concepts from the various frameworks: evidence of positive interdependence (Johnson & Johnson, 2005; Volet & Vauras, 2013) and promotive interaction (O'Donnell, 2006); episodes of collaborative knowledge construction characteristic of socially shared metacognitive regulation (Khosa & Volet, 2014); and, episodes of heedful interrelating as representing, contributing and subordinating. In addition, I also reviewed the research questions. I reviewed the heedful interrelating discourse markers Jordan and Daniel (2010) found in student conversation, which provided an additional identifiers of collaborative episodes for inclusion in expanded field notes. After each collaborative classroom work session I expanded my

observational notes, made memos for initial coding of the data, and wrote narrative descriptions of my interpretation and understandings the group interaction during the particular collaborative work phase.

While still in data collection and the early stages of analysis, as recommended by *interaction analysis* (Jordan and Henderson, 1995) I created *content logs* as soon as possible after the collaborative works sessions. I did this by playing and stopping the recordings, noting the time counter, providing a heading and writing rough summaries of the events on the tape, or noting particular events (e.g., Audio/video recording, Group B, day 5, time stamp 15.55 to 25.01, Lucy stands, leans against wall). I also made notes about activities, such as note taking, online searches for information and student artifacts, that were of significance in the group interaction (Jordan & Henderson, 1995). In capturing behavior and discourse, I focused on my attention of events or episodes related to the three frameworks of the study (positive interdependence, socially shared metacognitive regulation and heedful interrelating) and that were specifically of interest to the study. In particular, the first listening, I focused on capturing incidence of positive interdependence (e.g., Audio recording, Group F, day 1, time stamp 11.07, all students are prepared with content ideas). The time stamped recording logs and summaries functioned as a trail map simplifying movement through the audiovisual data. In another, listening to the tapes, I focused on capturing instances of socially shared metacognitive regulation (e.g. Group A, day 1, time stamp 13.55, group begins probing content for inclusion in lesson).

My primary concern was examining heedful interrelating among group members, and how it might influence the process of creating group instruction, therefore most of

my efforts focused on identifying instances of heed. To do this I loosely based my *conversation analysis* on Cooren's (2004) examination of heedful interrelating in boardroom conversation, and Jordan and Daniel' (2010) examination students in educational settings. Returning back to the expanded notes, logs and memos I re-examined the episodes I had selected as salient. During this process some selected episodes were rejected as heedful, as well as some instances that had been considered heedful during field observation. These less heedful episodes were considered disconfirming evidence or counter examples (Erickson, 1992).

Next, heedful episodes were selected from each recorded group during each work session. While waiting for the professional transcribing service to complete their work, which including transcribing approximately one third of the audio recordings, I transcribed what were considered the most heedful episode from each of the four recorded groups (ranging from 12 to 37 student talk turns). This aided my immediate immersion in the data. These transcribed discourse episodes were then coded for Contributing, Representing and Subordinating and Jordan and Daniel's (2010) discourse markers were applied (p. 8). I found that some episodes were easier to code if the discourse markers were applied before deciding if the talk turn was a Contribution, Representation or Subordination. In addition, some talk turns were also more closely aligned with the indicators of heed described by Jordan and Daniel (2010, p. 6).

As the professional transcriptions became available, I coded these transcriptions in the same way as described above. Last, even though heedful interrelating may be suggested by the presence of the discourse markers, this does not unquestionably demonstrate that heedful interactions are occurring. As students in collaborative work

groups are often concerned about grades, most students attempt some level of heed. Therefore, I next identified the level of heed and the focus of heed. This was done by examining both the context of the talk turn and by identifying the circumstances in which the talk turn was made. At times it included examples of socially shared metacognitive regulation. Finally using the constant comparative method I moved back and forth between the groups' as I compared coded segments and instances of heed within and between groups.

Member checking as analysis. Member checking is considered an important method of verifying and validating data from interviews, therefore a form of analysis (Creswell, 2007). It serves as triangulation of data and analysis. Unfortunately, I was not able to member check with each student that I interviewed. However, the member checking I did served to corroborate my understandings of the data for specific students with whom I had the opportunity to talk. After all groups delivered their collaborative instruction, the instructor provided a round-robin activity day. One of the activities was the opportunity to "chat with the researcher". Participation was voluntary. For those who chose this activity I asked them to reflect on their group interaction and the quality of the product they created. For example, Zack chose to visit with me. He reflected that this collaborative group had worked very well together beginning with the first work session, and felt they had produced interesting instruction, as their fellow students appeared engaged in the activities. In particular, he enjoyed the group's exploration of ideas. Nikki also chose this activity. She spent less time with me than Zack, but also described this collaborative group as having produced an interactive product because they worked well together. Both were members of Group A, their descriptions of their

group interaction corroborated my interpretation of both their interaction and the quality of their product. Thus, I have some confidence that my interpretations are reflective of students' perceptions of the quality of their group's collaborative interaction and instruction.

Interrater agreement. The quality of coding and theme development was supported through collaborative coding. Interraters mostly participated in coding the audiovisual recordings (Smagorinsky, 2008). Coded segments that I found promising were shared with two colleagues, both PhD's involved in education; both professors use collaboration extensively in the courses they teach. Together we examined the segments of audiovisual recordings repeatedly, taking notes and forming hypotheses. We carefully attended to how individuals contributed, progressed the task, or responded to each other, and issues and problems of the task. What we thought we saw, and heard on recording was sometimes challenged. Some segments of the data had been transcribed, and this proved helpful in cases where group discussion was particularly overlapped. To reduce confirmation bias, we examined counter-evidence, and replayed the clips until we came to a consensus. Differences in interpretation were often grounded in my familiarity with students' interactions afforded by my field observations and repeated exposure to and immersion in the audiovisual data.

Two-Case Study Analysis

Professional transcription focused on the work sessions of the two focal groups selected for the embedded case study design. Coding methods applied to the two focal groups transcripts were as described above. Thus, having listened to all the recordings of collaborative work sessions for Group F, and Group A, and having identified episodes of

their highest level of heedful interrelating in all three phases, ultimately, I micro-analyzed five episodes from each group, each group's highest level of heed that occurred in each work session. I coded for level and focus of heed, and ways of enacting heedful interrelating for each group before comparing across them.

Conducting the two-case study, involved two types of triangulation: *between-method* - comparison across qualitative and quantitative methods, and *within-method* - comparison within multiple qualitative or quantitative methods (Denzin, 2010).

Triangulation utilized the constant comparison of heedful interrelating within and between groups to arrive at interpretations of how the quality of group heed influenced the collaborative projects. Analysis of the two-case study is further described in the Chapter Five: Results.

Chapter Five: Results

This chapter reports results of combined quantitative and qualitative analysis. Results related to each of the three research questions are discussed in turn.

Results for Research Question 1

RQ1: How do preservice teachers beliefs about professional teacher collaboration and their perspectives of their previous collaborative experiences influence the heedfulness of their interrelating during the current collaborative project?

To address RQ1 required first coming to understand preservice teacher participants' beliefs about professional teacher collaboration and then relating these beliefs to the quality of their interrelating (i.e., level of heedfulness) during collaborative work sessions. The following section begins with a discussion of results related to these issues. Addressing RQ1 also required coming to understand preservice teacher participants' perspectives on their past collaborative experiences and then relating those perspectives to the quality of their interrelating. These issues are discussed in the second half of the section.

Heedful Interrelating and Beliefs about Professional Teacher Collaboration

Frequency counts and descriptive statistics of each of the three subscales of the Teacher Collegiality Survey (TCS) were examined for patterns in preservice perceptions of teacher collaboration in professional settings. Exploration of the means and histograms indicated that means of the three subscales [Joint Planning and Assessment (JPA), Sharing Ideas and Expertise (SIE), and Sharing Resources (SR)] were high as students tended to respond to the survey using the higher points of the 7-point Likert-

scale of the survey. With 24 respondents, the means and standard deviations for the three sub-scales were: JPA = 4.87 (sd = .838); SIE = 5.21 (sd = .781); SR = 5.69 (sd = .927). This was not unexpected for two reasons: (a) students are frequently taught that teachers collaborate, though not necessarily how teachers collaborate (Dobber, et al., 2014), and (b) students tend to use the upper end of the Likert-scale portraying themselves and their perceptions in the best possible light (Groves, et. al., 2009). The high means on each subscale indicated that most students in the course reported believing that professional teachers were likely to collaborate through cooperative sharing of resources, ideas and expertise, and joint planning or assessment.

Results of a one-way repeated measures ANOVA, reported in the analysis section, indicated a significant difference between the mean score on the three subscales, $F(2, 46) = 14.44$, $p > .001$, partial $\eta^2 = .39$. Post hoc analysis with a Bonferroni correction revealed statistically significant differences between the mean score on all three subscales. Mean score on Joint Planning and Assessment (mean = 4.89, SE = .17) was lower than both Sharing Ideas and Expertise (mean = 5.22, SE = .16), and Sharing Resources (mean = 5.69, SE = .19), $p = .024$ (95% CI, -.64 to -.04) and $p < .001$ (95% CI, -1.22 to -.42), respectively. Sharing Ideas mean score was significantly lower than Sharing Resources mean score, $p = .04$ (95% CI -.95 to -.01). While there were statistically significant differences in responses to the three TCS subscales, students were least likely to describe professional teacher collaboration as joint planning and assessment.

The three questions added to the TCS by the instructor for pedagogic purposes, were also examined for patterns in perceptions of professional collaboration. These

questions were singly selected from the larger validated TCS scale. They addressed more complex and evaluative activities of collaboration. Descriptive analysis indicated that the means of all the three questions were lower than the means for all three subscales of the TCS. The three question means clustered closer to the mid-point of the 7-point Likert-scale than the means of the three subscales (JPA, SIE, and SR). As noted in the analysis section, the means and standard deviations for the three questions were: Question 17, $M = 4.50$ ($sd = 1.56$); Question 18, $M = 4.79$ ($sd = 1.35$); and Question 19, $M = 4.70$ ($sd = 1.42$). The means of the three pedagogic questions indicated students were less likely to describe professional teacher collaboration as collective analysis and evaluation, or shared responsibility for student learning.

The parallel qualitative content analysis of students' written reflections on their beliefs about teacher collaboration and focal student interviews indicated that all students ($n = 24$) noted sharing or planning as part of professional collaboration. The examples below are representative quotes from students' written reflections on teacher collaboration as sharing and planning:

- Gwen: "It's imperative that teachers collaborate through sharing ideas about how to teach. If one teacher has an awesome lesson on math, she should share with others.
- Sasha: "Becoming a teacher...includes working together with professional colleagues to plan for more engaging lessons. Teachers can also be more efficient by developing materials together."

- Pilar: “I think it is essential that professional educators collaborate and cooperate with each other to ensure all resources are being used to full advantage in benefiting students.”

These quotes illustrate students’ beliefs that teachers have a responsibility to share their best lesson ideas with their colleagues and/or to plan together. Students perceived the benefits of such sharing and planning to be increased efficiency and effectiveness that would benefit students. They wrote little about how such collaboration has its effects.

However, unlike responses to the TCS scale data, the findings from the qualitative analysis indicated that most students did not describe professional collaboration as including joint assessment, or shared evaluation. Despite the pedagogic inclusion of the three questions, far fewer students ($n = 7$) described collaborative assessment or evaluation as part of professional collaboration. Those who did address assessment and evaluation expressed differing perspectives. Four students expressed positive beliefs about teachers’ collaborative assessment and evaluation, while three students expressed negative beliefs about collaborative assessment and evaluation.

The following descriptions of positive beliefs were from the written reflections of two students with *expanded beliefs*. Eva wrote, “Good collaboration should include planning, teaching, and then assessing results together, teachers can’t improve if they don’t know what went wrong.” In this reflection, Eva articulates her understanding of assessment as the most important step in a sequential process of teacher collaboration. In Eva’s estimation, growth is not possible without collaborative assessment. Pilar’s experience observing teachers with whom she worked as an intern influenced her beliefs that school-wide achievement is possible through a process of teachers’ collaborative

evaluation: “The teachers at my intern school discuss their students’ results together. That way they can improve everyone’s teaching. It’s to help all the kids, not just the best teacher’s kids. I want to be a part of that.” Furthermore, Pilar’s experience has led her to value such collaboration in her own future professional life (i.e., “I want to be a part of that”). These students were aware of the positive impact, made possible through joint efforts to improve.

Of those students whose written reflections showed that they even considered collaborative assessment and evaluation a possibility ($n = 7$), almost half expressed negative beliefs ($n = 3$). The negative beliefs expressed by these students reveal misunderstandings about the nature and processes of professional collaboration, and current educational settings. The first quote was extracted from Lucy’s written reflection as she describes teacher collaboration as lacking professionalism, which does not allow teachers to jointly address a student’s needs, but in her estimation, harms students. She writes, “Teachers should never share evaluations of students with each other. It becomes fodder for lunchroom gossip and damages the child’s reputation.” The next two quotes came from student interviews. First, Erin contradicts pedagogic question nineteen as she defines collaborative evaluation as limiting the teacher’s independence and creativity through evaluation, and critical thought processes as punitive rather than instructive, informative and a vehicle for improvement: “It’s fine to watch others teach, as long the feedback is centered around what went well. No one is perfect, so one teacher can’t criticize another’s way of doing things”. The final comment is from Sue, “I don’t see any reason to evaluate teaching methods as a group. I’m not responsible for students’ learning when they aren’t in my class.” Sue’s perspective deviates from of the concept

represented by pedagogic question seventeen, but is similar to the historical American model of teaching alone and being solely responsible for student learning. However, in today's collaborative educational settings, as a professional Sue will likely discover that, indeed she does have various students from various classes for which she is responsible.

In summary, from the qualitative content analysis, it appears that most students' were at least aware of collaborative sharing and planning by teacher collaborators. However, for many, the idea that professional collaboration might include assessment and evaluation was not on their radar. And, for those who were aware of assessment, and evaluation as professional collaborative activities, they were divided in their perceptions of its effectiveness. All in all, as a group, these preservice teachers exhibited a strong distinction between beliefs about professional collaborative sharing and planning, and beliefs about professional collaborative assessment and evaluation.

During continued exploration of written responses from individual students, I further clustered students into two categories; those with *simple beliefs* about teacher collaboration and those with *expanded beliefs* about teacher collaboration. This re-clustering emerged seven out of the 24 participants as having *expanded beliefs* about professional teacher collaboration. Students were included in this category when their descriptions of professional teacher collaboration (in written reflections and/or interviews) articulated something beyond explication of simple cooperative sharing and planning. Often this included elements of assessment and evaluation, as described above, but other participants' included in the *expanded beliefs* category described broader diverse elements of collaboration, such as: teacher mentoring, school-wide teacher

responsibility for student outcomes, and collaboration as a set of skills needed for participation in effective collaboration as preservice and professional teachers.

The conflict between simpler cooperative activities of teachers, and the more complex collaborative assessing and evaluating needed for improving teaching and students outcomes has been noted in research on professional teacher collaboration. This research suggests that teachers often struggle with collaborative assessment and evaluation of their instructional practices (Achinstein, 2002; Kelchtermans, 2006). These authors argue that such activities are emotionally challenging, and potentially threatening, and therefore, sometimes avoided by teachers. Likewise, socially shared metacognitive regulation authors (Jarvela & Jarvenoja, 2011; Khosa & Volet, 2014; Volet & Vauras, 2013) have argued that collective assessment and evaluation activities are cognitively challenging, and a critical part of a high-level development of content learning; far more demanding than simpler types of cooperation that involve cooperatively dividing labor, sharing of knowledge, or joint planning for action. Extrapolating from these findings, I suggest that most of the preservice teachers in the current study recognized teacher collaboration as a fairly simple, straightforward process of cooperation through sharing and planning, while only a few understand professional teacher collaboration as a challenging, complex process involving collective evaluation.

These findings from the qualitative analysis prompted further investigation of the three TCS subscales. A statistically significant difference had been found between the three subscales, but high means were found on all the three subscales. These quantitative results combined with the preservice teachers' scarce mention of professional collaborative assessment and evaluation, and the negative comments all surfaced in the

qualitative content analysis, suggested that this merged the analysis did not yet adequately describe preservice beliefs about collaboration. Instead, these issues appeared to indicate divergence between data sources and analysis. Therefore, I returned to the TCS subscales, and examined the means for all items of three subscales. This comparison indicated a pattern of lower means occurring on the items addressing professional collaboration as assessment and evaluation.

At this juncture, both the JPA and the SIE were each split two subsections: Joint Planning and Joint Assessment; and, Sharing Ideas and Expertise and Shared Evaluation. The two subsections created from the JPA, consisted of three items representing Joint Planning, and four items representing Joint Assessment. The two subsections created from the SIE consisted of five items representing Sharing Ideas and Expertise, and one item representing Shared Evaluation. A repeated measures ANOVA was conducted to test whether the difference among the two types of items, now represented by four subsections (two in the JPA, and two in the SIE) and the SR subscale, was statistically significant.

Specifically, the JPA and SIE subscales both contain items describing teacher collaboration as joint planning and sharing of ideas, expertise and resources. These two subscales also contain items describing teacher collaboration as joint assessment and shared evaluation. To investigate this potential divergence, the quantitative results of the TCS subscales were re-examined. Particularly, the calculated means of the individual items of the JPA and SIE subscales related to planning and sharing were compared to items related to assessment and evaluation (the SR subscale only addresses sharing resources). This comparison indicated a pattern of lower means occurring on the items

addressing professional collaboration as assessment and evaluation. Essentially, both the JPA and the SIE were each split into two subsections: Joint Planning contrasted to Joint Assessment; and, Sharing Ideas and Expertise contrasted to Shared Evaluation.

Accordingly, one subsection of the JPA now contained three items representing Joint Planning, and a second subsection containing four items representing Joint Assessment. Additionally, the SIE subscale now consisted of a subsection with five items representing Sharing Ideas and Expertise, and another subsection with one item representing Shared Evaluation. A repeated measures ANOVA was conducted to test whether the difference between the two types of items now represented by four subsections (two in the JPA, and two in the SIE), and the SR subscale, was statistically significant.

Results of the repeated measures ANOVA indicated a strong statistical difference between the four JPA and SIE subsections, and the SR subscale: $F(2.529, 58.158) = 11.861, p < .001$, partial $\eta^2 = .34$. Joint Assessment was significantly lower than both Joint Planning ($p < .001$) and Sharing Ideas and Expertise ($p < .001$), with mean differences of: $-.708$ (SE $.140$) and $-.931$ (SE $.144$) respectively. In addition, Shared Evaluation was significantly lower than both Joint Planning ($p = .009$), and from Sharing Ideas and Expertise ($p = .001$), with differences of $-.885$ (SE $.233$) and $-.018$ (SE $.226$) respectively. And finally Sharing Resources was significantly lower than Sharing Ideas and Expertise ($p = .011$), with mean difference of $-.511$ (SE $.137$). These results indicate at least 95% certainty that students tend to rate collaborative planning and sharing higher than collaborative assessing and evaluating among professional teachers. Students rate Sharing Resources somewhere in between the other two types of professional collaboration represented by collaborative assessment and evaluation, and collaborative

planning, and sharing of ideas, expertise and resources. This result is convergent with findings from the qualitative content analysis in that both analyses indicate that students were less likely to report that professional collaboration includes collaborative assessment and evaluation.

The lower means on the three pedagogic questions also converge with this result. Because the pedagogic questions were not part of the validated scale, they were not included in the ANOVA analysis. However, the mean of each question ($M=4.50$; $M=4.79$; and $M=4.70$, respectively) is lower than the mean of the original JPA ($M=4.87$). Extrapolating from these findings, would suggest that students rate professional collective planning and sharing much higher than they rate professional collective assessment, evaluation, analysis and responsibility.

Beliefs about professional teacher collaboration and heedful interrelating. To examine how beliefs about professional teacher collaboration might influence the quality of heedful interrelating during collaborative work sessions, I decided to focus on the seven students who had been identified as having *expanded beliefs*. These students, by chance, were spread among four of the five recorded groups. From my multiple listening and viewing of the audio-video recordings I had previously selected, and summarized particularly heedful group episodes, one from each group's collaborative work sessions across the three phases of the project. Having analyzed talk turns by types of heedful interrelating, and by breadth of heed as indicated through the discourse markers, I returned to the episodes to identify, if and how, heed within those episodes was expressed by students with *expanded beliefs*. The intent was compare those talk turns of students with *expanded beliefs* to those of their group mates for frequency and/or breadth of

heedful talk turns within the selected episodes. The purpose of this analysis was to explore whether and how students with *expanded beliefs* differed from their peers in their propensity to engage heedfully in the collaborative work sessions.

Counting discourse markers that indicate heedfulness becomes complicated as the markers can be used interchangeably for different acts of interrelating (Jordan & Daniel, 2010). For example, the discourse marker, Asking Questions, might be considered an instance of heedful Contribution if the question asks for clarification (e.g. “What is our goal for today?”), or Asking Questions, might be an instance of heedful Representation if the questions ask a group member to probe at their understanding (e.g. “How did you think that activity fit with the concept?”). Further, as noted in the Jordan & Daniel (2010) table of discourse markers, each marker has a variety of circumstances under which the marker may be considered an instance of heed (p.8), and, if determined to indicate heed, its use may vary in terms of quality of heed (i.e., high to low). This can only be interpreted within the context in which a turn takes place (Cooren, 2004). Therefore, to understand the impact of the variety and sophistication of the contributions, representations or subordinations made by group members with *expanded beliefs* of teacher collaboration, it was important to examine their quality of their heedful interrelations as expressed through the discourse markers in their context of heedful episodes, and in comparison to those of their group mates.

For this part of the analysis, heed, as expressed through the discourse markers, was considered of higher quality when: students’ language or action thoughtfully, richly attempted to create share meanings that connected to the current state of the project; encouraged others to contribute; clarified, or probed their own or others’ representations

in order to build acceptable solutions to the task; displayed subordination through careful, thoughtful answers to group members questions; and/or, agreed to plans not initiated by the individual but considered by the individual to aid in creation of the collaborative lesson. In the two first phases of the project this included thoughtful, detailed, rich delivery of content and pedagogic instruction that was connected to rich narratives of examples, past experiences or needs of their classmates as students. In the more creative work sessions of the third phase of the project (i.e., designing the instruction) this higher quality of heed included seeking or providing justification for fit of content or pedagogy by making language more exact, and/or interrelating in adaptive and responsive ways that talked the lesson plan into existence. Heed was considered of lower quality when: language held few details with thin, flat, or unclear representations; narratives to connect to examples and experiences were few or less rich and detailed; ideas were less frequently probed; fewer attempts were made to emerge shared language or meaning; patterns of interaction were off topic, or did not fit the current state of the project; and/or interrelations were more habitual, and less-responsive.

Through analysis, I noted that students with *expanded beliefs* tended to make higher quality heedful contributions, representations and/or subordinations than their group mates who had *simple beliefs* about teacher collaboration. This was not necessarily evident by the amount of talk turns. Some students with *expanded beliefs* exhibited greater frequency of talk turns than their group mates (e.g., Reese, in Group B, had the most talk turns in all focal episodes from her group); others took fewer talk turns than their peers (e.g., in Group E, Mar's talk turns comprised a small proportion of the total talk turns in all the focal episodes from her group). However, the distinguishing feature

of their talk turns was not the frequency, but the quality and breadth of heed. Like Jordan and Daniel (2010), I found that: “in trying to distinguish more heedful from less heedful episodes of interrelating in students’ conversations, [I] noted that most students often engaged in representing, contributing, and subordinating. It was the heedfulness with which they enacted these actions that varied across students and across discourse events, and that heedfulness was discernible in the language and discourse that students used” (p. 15). Table 1 illustrates counts from three collaborative episodes from all three groups, not selected for the two-case study. Heedful talk of group members is displayed by type and frequency for each group member during the selected episode.

Table 1

Comparison of Frequencies of Heedful Interrelating of Members with *Expanded Beliefs about Professional Teacher Collaboration* with Other Members Across the Three Phases of the Project

	Group B	Group C	Group E
	Frequency of Heedful Contributing, Representing, & Subordinating*		
Group	C=10	C=4	C=3
Member with	R=8	R=5	R=4
Expanded	S=3	S=1	S=1
Beliefs	Total = 21	Total = 10	Total = 8
Other Group Members	C=10	C=4	C=14
	R=4	R=2	R=4
	S=1	S=2	S=1
	Total = 15	Total = 8	Total = 19
	C=5	C=5	C=7
	R=3	R=4	R=6
	S=1	S=2	S=1
	Total = 9	Total = 11	Total = 14
	C=4	only group three members	C=5
	R=1		R=2
	S=0		S=0
	Total = 5		Total = 7

* C= Contributing, R= Representing, S= Subordinating; frequency counts are based on three high-heed episodes randomly selected for each group from across all three phases of the project

Table 1 shows total frequency counts for type of heedful talk turns - contributing, representing, subordinating - from three high-heed episodes randomly selected for three groups across the three phases of the collaborative project. These three groups were the only recorded groups in which a single member was identified as having *expanded beliefs* about professional teacher collaboration (no members in Group F had *expanded beliefs*; two members in Group A were identified as having *expanded beliefs*). The first row shows the heedful talk turns of the group member with *expanded beliefs*, the rows below that represent other members of the group. Frequency counts of type of heed exhibited in episodes provides some idea of how these members interacted with their group mates.

The group member with *expanded beliefs* tended to more heedfully interrelate at a higher level. Also, they use a wider variety of discourse markers that indicate heed, and focus more on developing understanding of concepts, and pedagogy, or attempting pedagogic fit of content to their students. For instance Bryn in Group C used both a Contribution and a Representation in expressing concern that a planned activity may need adjustment for students to accomplish (e.g., "...the motions game was to fit our visual learning concept, but maybe we should review the word list." *C-WW, fit previously initiated idea into current context*. "What if they spend all their time thinking up motions, and not trying to memorize the words?" *R-AQ, probing pedagogic fit to students*).

By way of contrast, group members with *simple beliefs* tended to interrelate at a lower level and focus more on the project requirements and planning the sequences of the lesson, and less on appropriate fit of content with pedagogy. Though, Lucy (member

with *simple beliefs* about teacher collaboration) was a negative case example in that she tended to be heedful, but most of her heedful talk turns pertained to the planning part of the project rather than the concept building, designing, or connecting topics that are more likely to facilitate learning (De Backer, et al., 2014) and higher quality of project completion (Khosa & Volet, 2014). Other members with *simple beliefs* about teacher collaboration also tended to focus on less collaborative activities. For example, Jane from Group C, responded to Bryn's concerns about the motion game mentioned above by suggesting "Just give them more time" (*C – IO, contributing to the sentence program*), and not probing pedagogic fit any further.

A caution here, in some groups, the members I interpreted as having the lowest levels of heed were also those who did not have many talk turns in general. This was noted in Group B's member Ida, who often sat with her chair perpendicular to her group members, did not take many talk turns and her talk turns tended to be less heedful. Thus, sometimes low heed could be seen in physical manifestations rather than only through talk.

Illustrative example of heedful interrelating by a group member with expanded beliefs. As an illustrative example of the contrast between a group member with *expanded beliefs* and her group mates with *simple beliefs*, I offer one episode from Phase 3 (Day 4) in Group B. Group B consisted of one member, Reese, who had *expanded beliefs* about teacher collaboration; Lucy, whose particularly negative belief about teacher collaboration is noted above; and Faye and Ida who both had *simple beliefs* about teacher collaboration as identified in the content analysis of written reflections and their interviews. Prior to the moment of this episode Faye and Ida were discussing an

extracurricular campus activity. As noted in the frequency counts above, these two students were less likely to interrelate with heed, than were Reese and Lucy. Although, across the project Faye collaborated more frequently and with higher quality of heed than Ida. Until this episode, Reese and Lucy have been planning the sequence of activities for the project. Visible in the video data, Reese turns her gaze toward Faye, hand motions to her and asks about an activity Faye recommended in a previous work session. Her behavior appears intended to draw her groupmates' back to the current collaboration, by referencing the previously recommended activity and by physically inclusive motions to Faye. As noted by Weick and Roberts (1993) heedful interrelating is found in both behaviors and discourse. In turn, the use of audiovideo materials recommended by Jordan and Henderson's (1995) interactional methods allows behavior, heedful or not, to become a part of the analysis. For each turn, in the excerpt below I show the type of interrelating move (i.e., contributing, representing, or subordinating), as well as the discourse marker, with a brief description of the circumstance of the discourse marker, and note emergence or hindrance of socially shared metacognitive regulation.

Episode 1: Excerpt from Phase 3, Group B

1) Reese: (turns and motions to Faye) What did we decide about the fill in the blank activity? [*S - assist group member in returning to task; C- AQ, check status of Faye's previously initiated idea with current progress in project*]

2) Ida: We're using it. [*C - IO, supports the sentence program*]

- 3) Lucy: We also need an introduction. [*C – IO, continues and builds on the current sentence program*]
- 4) Reese: Oh yeah, can we look back at our content? Factual knowledge must precede skill.... [*C – CPPF refers to previous work session; P - pause for reflection*]
- 5) Reese: So, what was the purpose of the fill in the blank activity again? [*R – AQ, avoids assuming knowledge of other's thinking*]
- 6) Lucy: It ties in with the concept of; knowledge of skills are needed to improve knowledge. They have to have knowledge to fill in the blanks. [*C - WW, refines idea and builds by chaining to line 5*]
- 7) Reese: So, knowledge about the answers allows them to fill in the blanks correctly? [*R – AQ, check representation*]
- 8) Lucy: Yes. And that moves the lesson to - factual knowledge precedes memory [*C – IO, add phrase to build/progress project*]
- 9) Reese: Were you thinking of it as an introduction? [*C - AQ, checks representation of design*]
- 10) Lucy: I think it works. [*C - IO, supports sentence program*]
- 11) Faye: It's a good activity for the knowledge thing and the intro. [*C - IO, dovetailing to previous ideas of lines 6 and 10*]
- 12) Reese: Yeah, seems like a nice tie in to concept. [*S- agree to plan, R-WW, makes language more exacting*]

*Note: Abbreviations used from Discourse Markers (Jordan & Daniel, 2010): IO - Interruptions and Overlapping Speech; P - Pausing; WW - Ways with Words; AQ - Asking Questions; CPPF - Connecting Past, Present and Future

In the episode above, focal member Reese was the only member of her group identified as having *expanded beliefs* about teacher collaboration, as noted by both the content analysis of her written beliefs and her interview, in which she discussed the importance of learning by watching each other teach, and teachers giving and receiving peer feedback as a method of evaluation. This episode begins with Reese's behavioral Subordination attempt to include her group mates who have been off topic. Her Contributing talk turns are examples of four types of discourse makers that often indicate high levels of heedful interrelating; Ways with Words, Connecting Past Present and Future, Pausing, and Asking Questions. Her Representing talk turns include examples of two discourse markers, Asking Questions, and Ways with Words. In her first Contribution (line 1, discourse marker - Ways with Words) Reese checks the status of Faye's previously initiated idea in relation to the current state of the assignment. Her second Contribution (line 4, discourse markers - Connecting Past, Present and Future, and Pausing) reminds the group of their content selection from the previous work session. The discourse marker (Pause) at the end of this Contribution creates space for reflection. Her third Contribution, (line 9, discourse marker - Asking Questions) occurs later in the episode, as she checks her own representation of their proposed lesson design. Two of Reese's Representation talk turns are examples of the discourse marker, Asking Questions. However, these Representations have different purposes. Her first Representation question (line 5) avoids assuming that she knows what Lucy is thinking, and is an attempt to understand the pedagogic purpose of the activity. According to Khosa & Volet's (2014, p. 295) coding seeking meaning and purpose are indicators of high level socially shared monitoring of metacognitive regulation, but this attempt by

Reese fails to develop into group level cognitive regulation. Reese's second Representation question (line 7) checks her Representation with Lucy's Representation of how the fill in the blanks activity connects to the lesson concepts. Reese's final Representation talk turn (line 12, discourse marker - Ways with Words) adds a phrase that clarifies Faye's thin description of the activity's connection to the concept (line 11). In this final talk turn (line 12, discourse marker - Interruptions and Overlapping Speech) Reese also exhibits an example of Subordination, she agrees to the activity initiated by Faye as an introduction for their collaborative instruction.

Reese's behavior and discourse, indicate heed through the attempts to include group members, her connection to previous idea from an earlier work session and review of the topic they intend to teach using language that is likely to develop shared understandings of concepts. She seeks a justification of the purpose of the activity and checks her understanding of the purpose and how it connects to the sequence of their lesson. Justifying and clarifying of concepts and pedagogy are behaviors that researchers in socially shared metacognitive regulation have noted as promoting deeper understanding and better outcomes (Khosa & Volet, 2014).

In contrast, both Lucy's instances of heed are Contributions (lines 6 & 8, discourse markers - Ways with Words). In her first Contribution, she explains how the fill-in-the-blank activity fits into the lesson design; and in the second, she links her talk turn into Reese's question about the purpose of the activity. Her language in the first instance is clear ("They have to have knowledge to fill in the blanks"), but could have further refined the Representation by describing whether the knowledge needed for the activity was knowledge of a particular content, or knowledge of how to actually fill in the

blanks. Lucy's lack of clarity and refined language becomes evident as Reese checks her Representation of the activity with Lucy's Representation. In addition, Lucy's lower level heed is accompanied by a focus on planning and ordering the task ("We also need an introduction" and "that moves the lesson to..."). Her talk turns shift the focus from the more cognitively demanding development of conceptual and pedagogical understanding to the less cognitively demanding activities of planning and ordering the project. These activities are necessary and therefore heedful, but require less heed, less cognitive processing (and indicate low levels socially shared metacognitive regulation) and are less likely to produce the knowledge of concepts and pedagogy necessary for better outcomes (Iiskala, et al., 2011).

Episode 1 above began with Reese's attempt to re-engage Faye in the collaboration, but it is Ida who responds. Her Contribution is expressed through the discourse marker Interruptions and Overlapping Speech as she supports group progress by continuing the sentence program, and not further detracting from the lesson plan. However, this instance is of low heed ("We're using it"). The language lacks detail, is habitual, and indicates an assumption of what the other group members are thinking. Faye's Contribution indicates that she has knowledge of the discussion at hand, but her language in describing their content concepts as, "knowledge thing", is habitual and vague; not a careful description ("It's a good activity for the knowledge thing and the intro").

Although, Reese takes the most talk turns in this example, the episode itself is representative of many episodes analyzed for this group in the distinctions I noted between Reese and her group members in terms of the quality of her heedful

interrelating. Reese's frequent talk turns might suggest that her heedful, careful, and probing interaction was simply too frequent, or considered too careful and tedious by her group mates. Ida was often disengaged as she stared across the room. Perhaps her group mates might have interacted with greater heed had she taken fewer talk turns. However, as indicated in the discourse analysis Reese's interactions were of higher quality overall, as she focused on the task at hand, and attempted heedful, rich and probing interaction in understanding concepts while attempting to build the lesson plan. While her group mates interrelating exhibited lower heed, habitual language, and a focus on project particulars rather than conceptual understanding.

This pattern was noted in other members with *expanded beliefs*. In Group C, Abby (*expanded beliefs* member) focused on content development and pedagogic fit, while Jane (*simple beliefs* member) focused on completing task requirements. For example, Bryn's approach to content selection was to pick the chapter headings from the book, while Abby had choose content she believed useful for her classmates and related it to her own experiences. In Group E, Noni (*simple beliefs* member) contributed a pedagogic instruction that consisted of a definition of direct instruction, and noted it was used for lectures and giving instructions. Whereas her group mate, Tana described her pedagogic strategy of indirect instruction through an example of indirect instruction used in one of their shared cohort classes and her response to the strategy as employed in the class.

Thus, from my interpretation of the data I concluded that preservice teachers *expanded beliefs* about professional teacher collaboration positively influenced the heedfulness of their interrelating during their collaborative work sessions. This is not to

say that individuals with *expanded beliefs* always interrelated with high heed, nor were they the only group members to interrelate heedfully. Clearly, other factors and characteristics influenced students' heedful interactions during the collaborative project. I turn next to examine students with a *flexible orientation* to collaboration.

Heedful Interrelating and Flexible Orientation to Collaboration

To examine the extent to which students' perspectives on their past collaborative experiences might have influenced their heedful interrelating, I first had to understand how each individual perceived their past experiences. To accomplish this, I conducted content analysis of students' beginning-of-the-semester written reflections on their past experiences of collaboration. This content analysis was supplemented with data from interviews. Through the content analysis I identified students as having a *flexible orientation* to collaboration or an *inflexible orientation* to collaboration.

As detailed in written reflections or interviews, students with a *flexible orientation* to collaboration described awareness that successful collaboration required attention to their activities integrated into the collective. They also indicated that this integration may require effort as they attempted to adapt to the current state of the group interaction and project. Students with this orientation also encouraged group mates in their efforts to integrate to the group interaction, and progress group goals. They also described awareness that collaborative skills could be improved over time. For example, Mar, Group E noted: "I've learned that everyone should be encouraged to participate. I don't always know the best ways to encourage someone, but I do try to be a good listener, and ask helpful questions". Students with an *inflexible orientation* reflected a perspective that collaboration was a static experience, in which individual actions have little influence on

group interaction or the product. They expressed little awareness of effort or lack of effort on their part might influence group interaction or progression toward group goals. Students' written reflections and interviews reflected this theme expressed the perspective that both collaborative and individual interactions were likely to remain fixed and stable over time. Faye, Group B, noted: "Ever since middle school, I've not really liked working in groups. I always seem to be the only who works." Ida, also in Group B, noted: "I've always had wonderful collaborative experiences. Everyone always does their part."

Through this analysis I categorized 14 students as having an *inflexible orientation* and 10 students as having a *flexible orientation* to collaboration. To examine how previous collaborative experiences might influence the quality of heedful interrelating, episodes indicating expressions of heed by students with the *flexible orientation* to collaboration ($n = 10$) were selected and analyzed. Students with the *flexible orientation* to collaboration were found across the participant groups as follows: three in Group A, none in Group B, one in Group C, three in Group D (not a recorded group), three in Group E, and none in Group F. Analyzing the same high heed episodes as before, I now focused on comparing the heedful interrelating of students identified as having a *flexible orientation* with their group members who were identified as having an *inflexible orientation* to collaboration. As there were more students with a *flexible orientation*, than students with *expanded beliefs* about teacher collaboration, most groups had some combination of students with a *flexible orientation*, and students with *expanded beliefs* about teacher collaboration. The exceptions were: Group B, with a single member with *expanded beliefs* about teacher collaboration, and no members with a *flexible orientation*

to collaboration; and Group F, with no members with a *flexible orientation*, or *expanded beliefs*.

Similar to students with *expanded beliefs* about teacher collaboration, students with a *flexible orientation* to collaboration made more heedful contributions, representations, and/or subordinations than their group mates. Group members with *flexible orientation* toward collaboration were more discursively sophisticated in the ways they heedfully interrelated, using a variety of discourse markers to make their contributions, and attempts to represent richly, and in their subordinations. In the next section, I present an illustrative example of Group E, in which there was only one member with a *flexible orientation*.

Illustrative example of the discourse of a group member with a flexible orientation. The illustration below is excerpted from Phase 3, Work Session 3 of Group E. Quality of group interaction for most groups, this one included, increased as they entered the more creative third phase of the project. In this group Mar has a *flexible orientation* to collaborative work, Tana has a combined *flexible orientation* to collaboration and *expanded beliefs* about teacher collaboration, and Noni's beliefs about professionals teacher collaboration were expressed as *simple beliefs*. Sue as noted above was one of the students who expressed particularly negative beliefs about teacher collaboration. She also had an *inflexible orientation* toward collaboration, as expressed in her written reflection, "I'm always organized and prepared, but I have never had good experiences because students are disorganized and unresponsive when their ideas aren't favored".

This group's collaborative instruction was qualitatively ranked as mid-low, just one rank above the lowest ranked group. Overall, Sue took more and longer talk turns than any member of Group E. In her interview Group E member, Tana expressed extreme frustration with Sue's over-contributing, which she felt excluded others from sharing ideas. Tana's written reflections expressed both a collaborative *flexible orientation* and *expanded beliefs* of professional collaboration, nevertheless she noted that she did not "have the skills necessary to cope" with Sue's over-contributing. Mar (Group E) who had a *flexible orientation* to collaboration, also noted in her interview that she was uncertain how "to cope with over-contributors." However, Mar also stated that every collaborative experience is a chance to learn better communication skills, and indicated that communication and relationships are particularly important when students would remain in the cohort for two years. In her interview, Noni (Group E) noted that Sue participated a great deal, but noted that Sue is "really organized," repeating what Sue had told the group several times about her organizational skills.

The excerpt below is from the Group E's third work session. Work session three was the beginning of the more creative open-ended phase three of the project. This episode is centered on the initial ideas for creating the group's collaborative instruction. Group members have been listening to Sue's recap of the various pedagogic strategies presented by group members during work session two.

Excerpt 2: Phase 3, Work Session 3 from Group E

- 1) Sue:all those strategies we talked about work better with different subjects...(other contributions)...so you really have to do an experiment to learn science. (pauses) [C - CPPF, reminds group of previous day's discussion on pedagogy]
- 2) Mar: So now, we need to look at our concepts and see which strategies are best to help us teach our content, right? So like Tana, when you were teaching about indirect instruction, didn't you have an idea about getting in groups to// [R - AQ, checking representation of assignment, C - CPPF, fitting previously initiated idea into current phase of project]
- 3) Tana: //Yes, I suggested putting the class in groups and let them talk about their experiences with drill and practice. [C - IO, builds on previous speaker's ideas]
- 4) Noni: Like talking about times it helped them for a test or something? [R - AQ, asking for clarification]
- 5) Tana: Yes, like drilling and practicing helped me learn the times tables. It probably helped others too. [C - CPPF, clarifies by referencing common experiences]
- 6) Sue: Still, it depends on the subject...(lengthy contributions)...Like in history maybe storytelling works best. [C - IO, contributes to sentence program]
- 7) Mar: So, storytelling helps us remember history facts? That seems to connect to our concepts too, how could we use it? [R - AQ, asking for clarification, and asks Sue to probe the idea for inclusion in the lesson]
- 8) Sue:direct instruction is lecturing, so it fits with storytelling. [C - IO, adds to sentence program]

9) Tana: We only have 30 minutes. A lecture might be boring for them, could it be a short story? [*C - CPPF, reminds group of project requirements, imagines classmates as their students*]

*Note: Abbreviations used from Discourse Markers (Jordan & Daniel, 2010): IO - Interruptions and Overlapping Speech; P - Pausing; WW - Ways with Words; AQ - Asking Questions; CPPF - Connecting Past, Present and Future

Sue's opening Contribution reminds the group of the various pedagogies they discussed during the previous work session. But, Mar's heedful Representation (line 2) orients the group to the collaborative task of fitting content with pedagogy, as opposed to discussing pedagogy in general. At the same time she converges Tana's earlier idea to the current phase of the task. Tana (line 3) Contributes her idea for pedagogy and Noni (line 4) checks her Representation of the proposed pedagogy. Sue's less heedful Contribution (line 6) takes the group back to a discussion of pedagogy in general. She does not address how pedagogy can be used for instruction of the group content. In (line 7) Mar clarifies through Representation to assist Sue probing her idea for possible inclusion in the collaborative instruction. Sue's next Contribution continues the less heedful approach, but it also appears that she may not understand the distinction between discussing pedagogy in general, and pedagogy as it relates to the instruction of their content as Mar has suggested. Tana's Contribution, has heedfully recognized the needs of her classmates as students, has not recognized or clarified her group member's misunderstanding.

This episode exposes also provides an example of socially shared metacognitive regulation. Again, applying Khosa and Volet's (2014, p. 295) coding Mar's connection to

Sue's less heedful talk transitions the group to attempting pedagogic adaptation to concepts indicates high level monitoring (line 2). Noni's questions and Tana's clarifications indicate the high level monitoring the collective development of content and pedagogy (lines 3 -5). Mar's focus on helping Sue integrate into the current state of the project by tying Sue's continuing to support the collective development of pedagogic expertise is an example of high level monitoring. However, the group struggles to bring Sue into the high level collective monitoring and exploring of content and pedagogy and eventually, the episode ends as Tana reverts back to a low level monitoring by referring to the time limit for their instruction.

Mar, the group member with a *flexible orientation* to collaboration but *simple beliefs* about teacher collaboration, reported not knowing how to cope with over-contributors, nevertheless assists Sue in this episode by attempting to connect her ideas into the project, and in the process helps move the project forward. However, as Mar takes fewer talk turns than either Sue or Tana, and only slightly more than Noni, her instances of heed may have had less impact on overall group heed. In this episode, Tana, the only group member who expressed both *expanded beliefs* and a collaborative *flexible orientation*, exhibits heed in advancing the lesson development, but fails to assist her group mate in developing deeper understanding of integrating pedagogy and content. Sue's over-contributing in the work sessions may have left the group with less time to develop collective knowledge content and pedagogy, as well as inhibited interaction among the group. The purpose of this example was to examine heed expressed by a group member with a *flexible orientation* to collaboration, but it also illustrates how individuals vary in heed, including variance across talk turns.

Summary of RQ1

In summary, analysis suggested that both students' beliefs about professional teacher collaboration, and their orientation toward collaboration influenced their heedful interrelating during the collaborative instruction project. Individual students with *expanded beliefs* about teacher collaboration, and students with a *flexible orientation* toward collaboration exhibited greater levels of heed in their richly Contributed content ideas, pedagogic instruction, and their Representations which probed for deeper understanding of both content and pedagogy. As groups progressed to the more creative open-ended phase of the task these members heedfully considered fit of content and pedagogy to their students. In contrast, individual students with *simple beliefs* about professional teacher collaboration or an *inflexible orientation* to collaboration less heedfully Contributed content ideas, pedagogic instruction and less often probed their own or their group mates' Representations of either content or pedagogy. And, in the third phase of the project these members rarely considered fit of content and pedagogy to their students. However, similar to Jordan and Daniel (2010), I noted that heed varied across discourse events, students, groups, and the phases of the project. But *expanded beliefs* about teacher collaboration, and a *flexible orientation* to collaboration, supported students efforts toward heedful interrelating.

Finally, all members of Group A, ranked as having the highest quality collaborative instruction project, had three members who expressed both *expanded beliefs* and a *flexible orientation*, with the fourth member having expressed only a *flexible orientation*. Conversely, none of the members of Group F, ranked as having the lowest quality collaborative instruction project, had either *expanded beliefs* or a *flexible orientation*.

The dichotomy between the two group is possible indication that these beliefs and orientations have an impact on overall group interaction. Both, Group A and F's patterns of heedful interrelating will be discussed further in the two-case study analysis used in addressing RQ3.

Results for Research Question 2

RQ2. How did preservice teachers' perspectives of the quality of their collaborative interaction change across phases of the collaborative project?

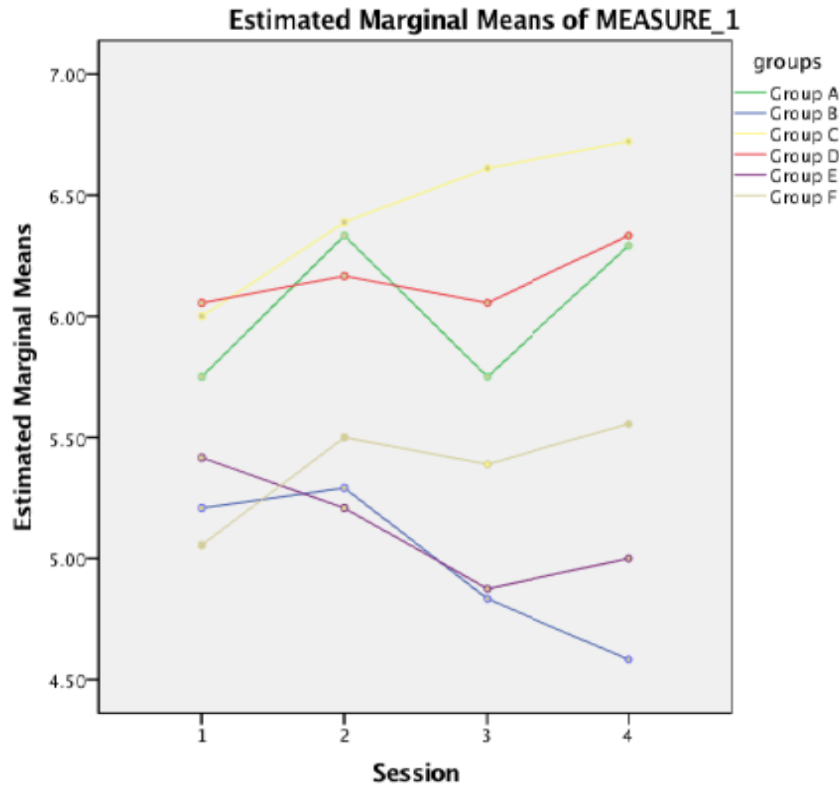
To address RQ2, the HICES scale was administered immediately following the first four collaborative work sessions. Data from the scale afforded comparison of students' perceptions of the quality of their heedful interrelating across the three phases of the task (i.e., Day 1 - development of content knowledge; Day 2 - development of pedagogic knowledge; Days 3-5 - design of collaborative instruction). Use of the scale was also intended by the instructor to help students reflect on their interactions in order to facilitate change and improvement in their collaborative skills (O'Donnell, 2006).

Analysis indicated that individual's perceptions of their heedful interrelating were fairly high across all phases of the project. Individual HICES scale totals for each session were as follows: Session One, $M=5.56$, $sd=.684$; Session Two, $M=5.78$, $sd=.707$; Session Three, $M=5.52$, $sd=1.03$; and, Session Four, $M=5.68$, $sd=.914$. Furthermore, there was no clear pattern of change in students' ratings of the quality of their heedful interrelating across the phases of the task, Wilks' Lambda = .86, $F(3, 22) = .96$, $p = .43$. Students indicated that they were contributing, representing, and subordinating with high levels of heed whether they were discussing content, considering pedagogy, or designing their instructional project.

While beyond the initial proposed examination of how students' heed might change across the phases of the project, it became pertinent to further examine the HICES data for effects of group on heed. This further examination was implicated as the discourse analysis indicated variance in heed among groups. Therefore, a mixed ANOVA with a between subject factor of group, was conducted to assess whether group influenced students' perceptions of their heedful interrelating across the sessions, also indicated no statistically significant difference in groups' combined responses to the scale across the four sessions, $F(3,45) = .848, p = .475$, partial $\eta^2 = .054$. Additionally, there was no statistically significant interaction between the data collection time point and group on how students responded to the scale, $F(15,45) = .775, p = .697$, partial $\eta^2 = .205$.

Although there were no changes within groups across time, some groups were significantly different from each other in their members' patterns of response. The main effect of group showed that there was a statistically significant difference in between group responses to the HICES survey, $F(5, 15) = 5.709, p = .004$, partial $\eta^2 = .656$. Since group was found to be significant, a Tukey HSD test was conducted to compare individual groups. Group B responded lower on average than Group C, $p = .011$, $SE = .359$, and Group D, $p = .048$, $SE = .359$, with mean differences of -1.45 and -1.17 respectively. In Group E responded lower on average than Group C, $p = .024$, $SE = .359$, with a mean difference of -1.31. No other groups were found to be significantly different from each other, $p > .05$. See Figure 1 for changing group means across time.

Figure 1
Changing HICES Group Means Across the Four Sessions



Content analysis of student interviews converged with the initial HICES analysis to indicate that students’ perceived their interactions of high quality across the phases of the task. Though interviews were conducted with each student only once, coding across interviews indicated that students believed the quality of their heed in interaction to be fairly high regardless of the project phase in which the interview was conducted. After her phase one interview, Sue (Group E) stated, “Today we did a great job of selecting ideas for our lesson. We each had ideas, but it was easy for us to get on the same page about what to teach.” After a phase two interview, Ida (Group B) noted, “We are making great progress. We all put in instruction strategies and started putting ideas together for teaching. It’s easy to work with other preservice teachers.” After a third

phase interview, Noni (Group E) said, “We did great at staying on task. I think we will have a great presentation because we brought good ideas to the table and then adapted them to suit our instruction.”

Content analysis of the post-project written reflections also corroborated students’ perception of high quality interaction among their groups. Cora’s (Group D) post-project written reflection noted, “The interaction in my group was very good, everyone offered ideas throughout the project. We were able to represent what we were thinking, and add to the ideas of others when timing was appropriate.” Another student, Abby (Group C) wrote in her post-project reflection, “I felt we had good interaction. We all contributed our ideas, and subordinated well when it came down to deciding what to do for each section of the instruction.”

Corroborating the HICES mixed ANOVA, findings from the qualitative discourse analysis (discussed in the next section) also noted variance in quality of heed among groups. Both analyses indicated variance in heedful interrelating related to the particular group. However, the discourse analysis was more sensitive to how group interaction varied, extended findings of variance by group to indicate differences in level and focus of heed, and surfaced complexities in groups’ perception of heedful interaction.

Summary for RQ2

Results from the quantitative analysis of the HICES data and the content analysis of student interviews and post-project written reflections indicated no significant change in students’ perspectives of the quality of their groups’ heedful interrelating across the phases of the project. These preservice teachers’ tended to perceive the quality of their

collaborative interactions as heedful across the phases of the collaborative project. This was true for all six groups.

However, although all groups' mean scores were high across all phases of the project, there were differences between groups in terms of how heedful members perceived their interrelating, with some groups' responses falling consistently below those of other groups. The discourse analysis also found a distinction between groups, but moved beyond the quantitative results to indicate ways in which groups varied from each other in their level and focus of heed. While mentioned here in relation to the extended examination of the HICES data, these variances in the quality of group heed and its relation to the quality of the collaborative product are discussed in greater depth through the analysis of the two-case study presented in the next section.

Results for Research Question 3

RQ3. How is the reported and observed quality of heedful interrelating among members of two focal groups related to the creation of their collaborative instruction projects?

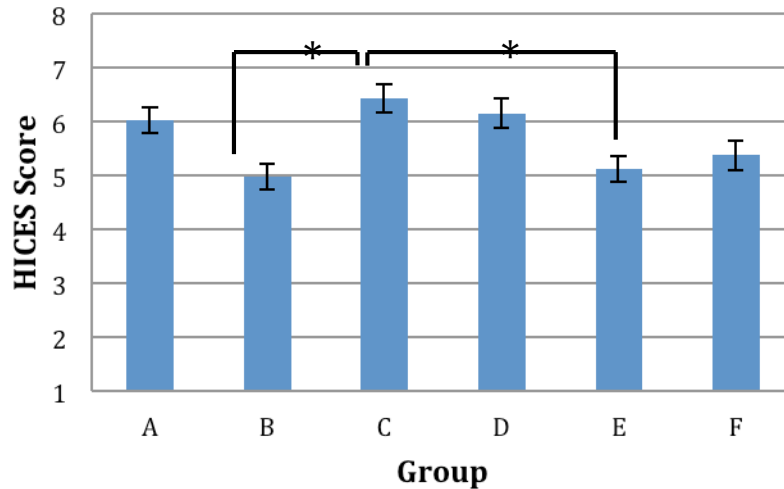
To address RQ3, a two-case study was embedded in the overall mixed methods design to illustrate how the quality of heedful interrelating among the members of two focal groups influenced the collaborative instruction they created together. In trying to characterize the relationship between the quality of each focal group's collaborative instructional project and the heedfulness of their interrelating, this analysis concentrated on the qualitative data sources. Specifically, a discourse analysis based on Jordan and Daniel's (2010) coding of heedful interrelating was used to characterize the observed quality of heedful interrelating that occurred in each group. Other qualitative data

sources that contributed to the two-case study included student interviews, and post-project written reflections, which are reflected throughout the two-case study analysis.

Student responses to HICES group-adapted scale were also collected in attempting to identify how the quality of heedful interrelating among groups influenced collaborative outcomes. The post-project version of the scale had been adapted to capture both individuals' perspectives of their own quality of heedful interrelating, as well as the quality of their group mates heedful interrelating throughout the collaborative project. Across the four HICES data collections, as well as on this post-project collection, individuals rated the quality of their own heed in collaboration using the higher points of the Likert-scale. Similarly, students also rated the quality of their group mates heed in this post-project collaboration using the higher points of the Likert-scale.

In assessing whether students' perceptions of the quality of their interrelating was related to the quality of their collaborative instructional project, statistical descriptive analysis of group interaction assessed by the HICES scale adapted for group perspective indicated no significant correlation between group members' reported quality of interaction and their projects' rank order. Thus, a composite HICES score was calculated for each group. This score was an average of the four HICES scores taken over four sessions. To assess the relationship between group ranking according to qualitative criteria, and the composite HICES score, a Spearman's rank-order correlation was used. Results from the Spearman's correlation failed to show a significant relationship between the ranked groups and average HICES score, ($r_s(23) = -.08, p = .72$). The HICES score for each group ranged from 4.98 to 6.43 is presented in Figure 2.

Figure 2
Combined HICES Score Mean for Each Group



As noted in Figure 2, the focal groups in the two-case study, Group A and Group F, reported similar perceptions of the quality of their group interactions on the HICES, though members of Group A rated their heed in interaction slightly higher ($M = 6.03$) than did the members of Group F ($M = 5.42$). Both focal groups rated the quality of their interaction lower than the quality of group interaction reported by Groups C ($M = 6.43$) and D ($M = 5.92$); but, Groups A and F reported the quality of their interactions as higher than the quality of interaction reported by Groups E ($M = 5.13$) and B ($M = 4.98$). Likewise, a comparison of students' final HICES group-adapted responses with group project ranking indicated no significant relationship.

However, qualitative analyses indicated that the quality of group heed was related to the ranking of the group project, and that the level and focus of group heed influenced the quality of the groups' collaborative projects. Thus, we turn to the qualitative analyses for indications of whether observed quality of heedful interrelating was related to the quality of groups' collaborative projects.

For each of the two focal groups, the members comprising the group are briefly described. Then the quality of their collaborative instructional project is broadly characterized, explaining how it came to be ranked relative to other groups' projects. Their overall heedful interrelating activity across the project is described. Finally, group heedful interrelating in each of the three phases of the task is described, by developing illustrative examples drawn from the discourse analysis that show how each group's quality of interrelating influenced their progress on their collaborative instruction project across each phase of the task.

In the next sections, illustrative examples are provided of both focal groups' (Group A and Group F) discourse in episodes drawn across the phases of the project. The collaborative project was designed to guide students through the same process professional teachers use to develop effective instruction. Therefore, to create effective high quality collaborative instruction, group members needed to develop a deep understanding of their content, in order to evaluate group pedagogic choices, and transform the information through selected pedagogic strategies into instruction their students could grasp (Shulman, 1987). Thus, to understand how the quality of interrelations among the groups of the two-case study was related to the creation of their collaborative instruction required examining heedful episodes from each of the three phases of the project (See Table 2). In the following sections, the relationship between the quality heedful interrelating, and the quality of the collaborative instructional project for two groups is described, beginning with Group F (lowest ranked) and followed by Group A (highest ranked).

Table 2
Phases of the Collaborative Instructional Project

Day 1	Day 2	Days 3-5
Focus on Content of the chapter and the lesson [share and come to consensus]	Focus on Pedagogy and possibilities of instructional strategies [jigsaw]	Design Creating the lesson [explore new resources, brainstorm, select, and refine instructional strategies]

Qualitative Case Study of Group F - Lowest Rank on Collaborative Instruction

Group F received the lowest rank among all the groups for their collaborative instructional project. As described in the analyses section, rank order was based on Shulman's (1989) model of effective instruction and was assessed by both the instructor and researcher. However, this assessment and rank order was for purposes of the research and did not contribute to students' grades. The group was comprised of four members: Dani, Erin, Halle, Kenn. All members of this group were white females, juniors, and all interested in teaching middle elementary school grade levels. All members of this group had *simple beliefs* about professional teacher collaboration or, an *inflexible orientation* toward collaboration as identified through analyses for RQ1.

Quality of Group F's Collaborative Instructional Project

Reseracher observational notes of Group F's enactment of their collaborative instruction project indicated that the group did not interact much among themselves, or

with their classmates. Part of their instruction included asking class members to play a computer game in which progression through game required answering questions about celebrities. This activity took up about 15 minutes of their lesson. The group walked around the room, but rarely interacted with their students during the game. Students engaged in the game as the Teachers walked past. The rest of lesson mainly consisted of various individual instruction activities, which were supported by informative questions written on the whiteboard about their lesson content. Whiteboard information enhanced understanding of the content, otherwise the activities were much less connected to content. Instruction delivered as a series of individual activities highlighted the less hybrid nature of their project. Notes from the instructor's qualitative assessment critiqued these elements of their instruction:

They were obviously quite organized, but the lesson did not delve very deeply into issues of the chapter, and pedagogically, although they did various activities, the discussion it generated and the points it made felt "thin". They seemed have found a computer game, liked it, but then did not connect it well to the concept of abstract thinking. The conversation around the game was shallow, and did not delve into the issues associated with the chapter, though I know these Teachers had at least an inkling of those issues because of the questions they wrote on the board.

Summary of Group F's Heedful Interrelating

As noted in Figure 2, the focal groups in the two-case study, Group F, reported relatively high perceptions of the quality of their group interactions on the HICES and Figure 1 shows that there was little change in their perception of

group heed across the phases of the collaborative project. Though, members of Group F rated their heed in interaction slightly lower than did the members of Group A, the group whose instructional project was ranked as the highest quality. Likewise, though, Group F received the lowest rank order on their collaborative project, their perception of group heed in interaction was almost as high as the group receiving the highest rank order (Group A). Not only was this indicated in their responses on the quantitative measures but also was reflected in their interviews.

Student interviews of Group F members indicated a fairly high overall perception of their group interaction with little change across the phases of the task. Group members were interviewed after Work Sessions 2, 3, 4, and 5. Across the work sessions, Group F's members described their group as working well together. In an interview with Kenn after Work Session 2, she described the group as, "one of best groups I've ever worked with. Everyone comes prepared, and pulls together on the project." In Erin's interview after Work Session 3, she also described the group as, "getting along very well. The project is coming together, and because we are working together, it's better than if we were working alone." Between Work Sessions 4 and 5, Dani noted in her interview that, "this is definitely one of the best groups I've worked with. I think working with preservice teachers who think like I do means we can get on the same page early on, and work more efficiently." Halle's interview was conducted after Work Session 5. She also described the group as, "one of the best I've worked with because everyone does their part. No one takes over, and we don't leave anyone out." Post-project written reflections from members of Group F continued to describe the group's interaction as high quality

(i.e., Halle: “Throughout the project, I would rate the quality of our group heedfulness as very high. . . We each contributed our part to the lesson.” and, Dani: “Overall, I think my group had great social interactions throughout the project. . . We split up parts of the lesson so we could work on it better ”) Thus, across members and across time, a common perception was that group members described their group interrelating with high quality.

In the next sections, I provide illustrative examples of Group F’s discourse in episodes drawn across the phases of the project. For each work session, four chairs are arranged around a square table, so that each group member faces a group member seated across the table (all groups have the same seating arrangement). Group F sometimes shares one laptop, the only group where this collective behavior was noted. At other times, all members have a laptop. Members of this group spend more time in parallel work than Group A, and laptops are the focus for their parallel work that includes searching for activities for their lesson. My observation and discourse analysis indicated that this group had fairly balanced interaction, with no particular member that over-contributed, or under-contributed. In addition to observations, Group F members reported in interviews that no particular member over-contributed, or under-contributed. For example, Halle noted in both her interview and her post-project reflection that they all contributed, and that “no one takes over, and we don’t leave anyone out.” Erin in her interview noted that, “no one talks too much, or doesn’t talk at all. Although, I probably talk the least because I am the one who posts everything.”

Phase One, Work Session 1: Developing collective content knowledge

During Work Session 1, groups began to select content for their collaborative instruction. Preparation for this work session included each group member arriving to class having read the groups' assigned chapter and with a notecard recording three ideas from the chapter that they thought were most important to teach their peers. During this session, each group's task was to share their individual points and to reach consensus on three points evaluated by the group as the most important content to share with classmates through their collaborative instruction. The excerpt below begins with the instructor providing class-wide mentoring for the collaborative work session. In this talk sequence all members of Group F interact. They decide on content by counting the frequency with which it is mentioned, rather than justifying content relevance to their classmates and spend little time in developing a shared conceptual knowledge of the content.

Excerpt 3: Group F, Phase 1, Work Session 1 – Selecting Content for Collaborative Instruction

1) Instructor (addressing the class before the work session began): ...so as you're planning your instruction, think about what's the problem you are trying to solve. In other words, what is your purpose, how and why these ideas you've selected are the most important ideas that your classmates need to know from your chapter. Post as group, no need for everyone to post.

- 2) Dani: *(to group members)* Ok, so we're supposed to give our three ideas that we wrote down and then choose which ones we're using for the lesson, and post them online... [*R - CPPF, remind group members of teachers expectations*]
- 3) Erin: Okay, I put down: Why is it hard for students to understand abstract ideas? [*C - IO, supports previous speaker*]
- 4) Halle: Me too. I wrote: You have to expose students to lots of ideas to help them understand abstract ones. [*C - IO, contributing to sentence program*]
- 5) Kenn: I forgot where I wrote mine... Found it. I put: It's hard to understand abstract ideas, and hard to apply them in new situations. [*C - IO, contributing to sentence program*]
- 6) Dani: *(referring to her notes)* There's also a section about knowledge transfer, how it's hampered by difficulty in mapping. [*C - IO, contributing to sentence program*]
- 7) Erin: Yeah, I had down that to understand new ideas you have to get them to think first about old ideas. [*C - IO, contributing to sentence program*]
- 8) Kenn: *(refers to book)* Wait, what was that knowledge mapping thing? [*C - AQ, connect activities to project*]
- 9) Dani: I think he talks about it near the end of the chapter. [*S - answers group mate's question*]
- 10) *Group pauses, each individually looking at notes and/or book.*
- 11) Kenn: Okay, Halle did you put that one down, that one about the abstract ideas are hard? [*R - AQ, asking for clarification, converges toward group goal*]
- 12) Halle: Yeah, I think that's big one. [*C - IO, supports previous speaker*]

13) Dani: Okay, that should definitely be one of our points. [*C - converge toward group goal*]

14) Erin: Right, shall I put it down. . . [*C - connecting activities to group project*]

15) Dani: So, we all put down the one about abstract ideas are hard, right? [*C - AQ, fit concept into project design*]

16) Kenn: Sounds like that's our first one? Are we all supposed to post it? [*C - AQ, check representation of assignment*]

17) Erin: No, just one of us. I started it already. How do we want to write it? . . . [*C - connecting activities to group project, and R - AQ, does not assume she knows what group thinks*]

18) Dani: (*leaning to look on Erin's laptop, then up at group*) Why is it hard for students to understand abstract ideas, right? [*R - trying to anticipate the responses of group members*]

19) Halle: That works. [*C - IO, supporting previous speaker*]

Work Session 1 begins with Dani stating the tasks to be completed during this collaborative session (line 2). She has less heedfully Represented the instructions. Her talk describes the more close-ended aspects of the project (i.e., give, choose and post), and thus, shifts the focus away from the more open-ended problem solving, purposeful, and justifying that the instructor has recommended. No members of the group question Dani's Representation. Therefore, her less heedful Representation appears to guide their content Contributions. Members of the group add various content Contributions (lines 2-7). While their Contributions converge around building the content for the lesson, the group does not elaborate much on the content itself. There are no attempts to develop

deeper content knowledge by broadly or richly Representing the concepts with examples, connections to past experiences, or further discussion of details. Instead, content is habitually referred to as “thing” (line 8), “it” (lines 14, 16 and 17) or “one” (lines 11, 12, 13, 15 and 16). There are pauses (5 seconds to 1.5 minutes) in discourse as group members actively search homework notes, the book chapter, and refer to laptops (lines 6, 8, 10 and 18). These are behavioral Contributions that may indicate heed in careful homework preparation, referencing the book for content, and conferring over Blackboard posting content. However, while the members of Group F’s behavioral and discursive Contributions converge around building the content for the lesson, their content selection occurs less heedfully, and habitually as they count how frequently content was mentioned rather than evaluating the importance of the content for inclusion in their instruction. As they post their content (lines 17-19), Dani’s Representation of the content does not fully describe the breadth of details they have Contributed, but similar to their simple acceptance of her earlier Representation of the instructor’s guidance for this work session, they do not correct, clarify or probe the content further. However, they do clarify who should post (lines 16, and 17), and Dani attempts to clarify what they are posting (line 18). Any further selection of content does not proceed until posting is completed.

As this work session moved forward, selection of their content remained as habitual as in this segment, with little clarification or probing of content to develop shared knowledge. The members of Group F spent several minutes of the work session posting content to the interactive site, as they checked for type errors, and order of the content posts (e.g. Oops, don’t forget to fix the typo in “knowledge”, and “Shouldn’t we

list: why is abstract knowledge hard, before we list: knowledge mapping?’’). The important goal of this work session was for the group to develop shared understanding of content knowledge. From the discourse analysis it appears that these group members selected content, but failed to conceptually develop the content in a way that might indicate deeper individual understanding of the content, or development of collective content knowledge. In later work sessions, lack of shared content knowledge, appears to hinder their attempts to fit content and pedagogy together. No members of the group were available for interviews after Work Session 1.

Phase Two, Group F, Work Session 2: Developing pedagogic knowledge

The collaborative tasks for this work session included teaching group mates about a pedagogic strategy, and then as a group, decide which strategies best suited the group’s select content, and were most appropriate for their classmates. Prior to the excerpt below, three group members had already Contributed their learning about direct, interactive, and experiential instruction. Each time a group member taught their strategy, their teaching Contribution was followed by brief comments from group mates, such as, “Thanks, that was interesting”, with the turn of teaching a strategy then taken up by another group member. So far, two of the pedagogic strategies were shared by providing a definition of the strategy and a list of methods. Dani’s teaching about experiential learning included an extensive example she found on YouTube, involving olive production in a Middle Eastern school. After Dani’s teaching, Halle asked, “What was that site called? Teacher Channel?” Dani likely considered this teaching Contribution heedful as it included an extensive example that connected to the pedagogy. However, the example was approximately five minutes long. Further, the example of olive

production was not likely related to any these group members' experiences. After Dani affirmed that she had found the example on the Teacher Channel site, the instructor, who had been visiting with other groups, now joined Group F. She reminded them that the pedagogic strategies they are teaching, and learning will likely suit their content and aid them in their lesson development. Her intention was to provide mentoring. After the instructor's mentoring, the group shifts from less heedful, habitual listening to attempting more heedful interaction. The excerpt below followed immediately after the instructor's urging the group to consider how they might incorporate pedagogical strategies into their own instructional plans.

Excerpt 4: Group F, Phase 2, Work Session 2 – Teaching Pedagogy to Group Mates

- 1) Kenn: So mine's indirect instruction: mainly student centered, with a high level of student involvement,role of teacher shifts from director to supporter and a resource. Methods are: case study, reading for meaning....concept attainment, concept mapping and CLOSE method. Students should do them alone. [*C - connecting activity with phase of project*]
- 2) Dani: Can they do it with other students? [*R - AQ, asks for clarification of idea*]
- 3) Kenn: Yeah, with other students is fine, just not involving the teacher. [*S - answers question, WW- mirrors and add phrase builds on concept*]
- 4) Halle: It's student based. [*C - WW, clarify idea by adding phrase*]
- 5) Kenn: Yeah, like students can talk and reflect with other students about what they think. They can gather information and discuss it with others. [*C - WW, continuing to enlarge concept by adding phrases*]

6) Dani: So they could reflect with each other after some activity, or experience? [*R - AQ & WW, check her representation with that of group mates by mirroring the concept*]

7) Halle: Yeah, so like they experience something and then they reflect on it. [*S - respond to question by rephrasing previous idea*]

8) Kenn: Yeah, I think so, because reflective discussion is on the list (reads from notes) “encourages student to think and talk about what they have observed”. [*C - CPPF, refers to homework notes*]

9) Erin: That’s like interactive too, because it’s discussion based and sharing. [*C - CPPF, refers to her previous discussion of interactive learning*]

10) Dani: I wonder if there is a clear line between them? (*pause*) They’re kind of similar. [*R - probing to clarify idea*]

11) Erin: Sure, but I think in interactive it’s important for the teacher to set a good tone for the group with roles and rules. [*S - responds to question by enlarging concept, and CPPF, recalls previously discussed idea*]

12) Dani: The teacher outlines questions. (*pause*) The teacher asks questions but the students should feel free to ask each other for help? [*R - WW, checks her representation with previous speaker*]

14) Erin: Okay, now we need to post it? [*C - connecting activity to phase of task*]

Kenn’s Contribution is not substantively different from the habitual pedagogic instruction previously provided by her group mates. Her teaching is a brief definition followed by a minimal list of methods (line 1). However, Dani’s question prompts more heedful instances than has occurred prior to this episode. She asks a question to clarify

her Representation of the definition of indirect instruction (line 2). Kenn and the others add phrases that enlarge or dovetail with the concept to clarify and add phrases that help enlarge the Representation of the concept (lines 3 - 5, and 7). The group continues to Subordinate to Dani's questions (line 6), and Halle mirrors the concept for her (line 7). Kenn Contributes a reference to the text (line 8). Erin attempts to broaden the Representation of indirect instruction by connecting it to the previously discussed concept of interactive learning (line 9). Dani, still attempting to enlarge her own Representation of the links among pedagogical strategies, suggests that the two strategies are similar (line 10). Erin Subordinates to Dani question, and responds by adding information about interactive instruction, which she likely recalls from her earlier presentation about interactive learning (line 11). As Dani attempts another Representation, Halle ends the episode by bringing the focus back to posting (line 14).

Unlike the episode from Work Session 1, where content is simply referred to as 'it' or 'thing', in this episode the group attempts to more richly Represent indirect instruction. Their Contributions in this episode provide some exact language and details. Other pedagogic strategies presented were not enriched among the group. This is the only pedagogic strategy the group discussed with any depth. However, even in this episode the focus is on adding facts to the definition. The group does not move beyond the more basic definitions into deeper connections through personal experiences in other classes or in their intern experiences, or how any of the methods listed might be used to teach the course content associated with their assigned instructional project. Erin does connect indirect and interactive instruction, but the information she repeats is from her teaching about interactive learning. She does not attempt any further connections of

enrichment in her Representation. With the exception of Dani's example of experiential learning, which did not hold interest for the group, Group F did not connect content knowledge or pedagogic strategies to examples or experiences that might have helped them better understand either content or pedagogy. Work Session 2 ended as the group spent several minutes parceling out a new reading assignment. Kenn in her interview that occurred after Work Session 2, describes the group's focus:

"I'm so lucky to be in this group, everyone is really prepared. Last time, we all came with our topics ready to discuss, and this time we all did our type of instruction. That way we can probably start putting the lesson together next time. We post everything together, but Erin does a great job of reminding us, to keep us on track and make sure everything gets posted."

This excerpt is representative of the interaction that occurred in Group F, during first two work sessions. Their discourse revolves around topics related to the project, and everyone interacts, with no significant imbalance in talk turns or behavior. However, the group focuses on the close-ended tasks of the collaborative project, such fulfilling requirements that each member teaching their pedagogy, or selecting the lesson content points. Yet, they spend less time on the weightier matters of developing collective content knowledge and pedagogic expertise; which, by turns, also constitute the open-ended, and more collaborative problems of the project. Work session discussions of requirements and deadlines, or dividing tasks among group, and posting on the interactive site are common. Conversely, their discourse less often attempts collective knowledge development, or collective development of pedagogic expertise. Contributions and

Representations of both content and pedagogy are habitual, and less heedful, with thin details or connections. They do not include familiar examples or connections to experiences that might help members develop shared language and knowledge.

Phase Three, Work Sessions 3, 4 and 5: Designing and Creating Collaborative

Instruction

Phase three in the collaborative project included three Work Sessions; 3, 4, and 5. During Work Session 3, Halle was absent. However, Dani, Kenn and Erin continue working and divide the lesson by pedagogy. This decision places responsibility on each group member for using a different type of pedagogy to present a portion of the content. At this point, group members begin to refer to pedagogy and content as, “yours” and “mine”. They have been, and continue to refer to the group as “we”, and the lesson as “ours”, but there is now a distinction between the overall project and the segments of content and pedagogy. Content is still frequently referred to as a ‘thing’ or ‘it’, these habitual references do not encourage opportunities to delve deeper into understanding of content (e.g. “I found a website that had really good problems for that transfer *thing*, maybe it could work for *your* type of learning. I’ll send the link.”). Sometimes, apparently their references are too vague, and they ask each other for clarification about the content (e.g., Dani: “The problem is we need to find something that’s a transfer, and then do it twice.” Kenn: “Wait, what’s transferring, knowledge or the game?”)

As Work Session 3 continued, group members who were present spent time working in parallel as they searched for activities for the lesson segments. They are, however, careful to update each other on their progress. (e.g., Erin: “Hey, look, I found a video. Maybe we could show it for the abstract idea one. It’s about integers and uses those chips like from our math class.” Dani: “ I found something like the peg problem.”) Kenn’s interview after Work Session 2 noted above, alluded to the fact that the group was prepared and focused on accomplishing tasks. This theme continues, as exemplified in

Erin's interview after Work Session 3, "We work well together, and don't waste time. It's good when everyone cooperates, does their part, because as a group we can get a lot done in less time." Erin voices a tendency of this group to value cooperative, parceling out the work, and the efficiency this may provide.

By Work Session 4, Halle had returned. Dani and Kenn brought her current on the project (e.g. Kenn: "So, Halle to fill you in from what we did last time, we've been looking for activities to fit our types of learning...."). After bringing Halle current, the group spent some time ordering the sequence for their instruction (e.g. Erin: "So we should build the lesson around the three significant points, and we're starting with transferring knowledge.") Their pattern of parallel work with frequent updates on progress, and sharing of ideas continues throughout Work Session 4. They continue to fill segments of the lesson with the activities they find as they work in parallel, but not as a collective (e.g. Kenn: "I found another game, that could go with my type of learning."). As they are aware of the group members topics and progress, when they find share ideas that can be shared with their group mates, they do that (e.g., Erin addressing Kenn: "I found some questions that look useful for your discussion, do you want me to shoot the link over?").

Based on discourse analyses conducted across all recorded groups, I interpreted that most groups increased in heed at least through Work Session 4. Analyses of Group F's discourse convinced me that this group continued to increase in heed through Work Session 5. Having selected activities for their lesson and developed a sequence of activities for their lesson, during Work Session 5 the group spends almost no time in parallel work. During this work session, their time is spent together developing an

outline for moving between the activity sequences. While the group has often heedfully provided updates on parallel work progress, and heedfully, cooperatively shared activities with fellow group mates, the following episode is representative of their group interrelating as they evaluate an introduction for one of the activities to be used in delivery of their instruction.

Excerpt 5: Group F, Phase Three, Work Session 5 - Designing Instruction

- 1) Kenn: Maybe we should reword that question. If someone asked me, “How did you answer the question?” I’d be like, I just used the link it gave me....Well maybe not. You either have to use the link or your previous knowledge. [*R - WW, fit previous idea into current state of project*]
- 2) Erin: (*typing to post their lesson format for the instructor*)... “Did you use the link or previous knowledge to answer the question?” [*C - connecting activity to project*]
- 3) Dani: Then you could say like, “Why?” [*C - IO, contributing to sentence program*]
- 4) Halle: What do you mean, why? [*R - AQ, ask group member to probing idea*]
- 5) Dani: Did you use the link or previous knowledge to answer the questions, then why... an extended why. [*R - WW, mirroring phrases*]
- 6) Halle: So you’re asking, (*pause*) does that, (*pause*) What are you referring to when you ask, “does that relate any previous knowledge?” [*R - AQ, asking for clarification*]
- 7) Dani: Maybe the process? [*R - AQ, expresses uncertainty*]
- 8) Kenn: The process of answering questions? [*R- IO, interject an appropriate phrase to more richly represent the idea*]

9) Halle: Maybe we should be more specific on that. Maybe we say in the process of answering the questions (*pause*), You know? I guess I am confused on what we are asking. [*R - AQ, checking representation with group members, and expressing confusion*]

10) Kenn: Like if the question is about a president, did any previous knowledge you had about presidents help you answer the question. [*C - WW, clarifying by chaining idea into concept*]

11) Erin: No, I think she's saying, how did they get the answer. Did you use that process to search for information before? Or did you just know the answer? [*R - WW, bring forward a phrase and making language exacting*]

12) Halle: Yeah, because I think all of us have gone through both processes before, you know? [*R - AQ, checking representation*]

13) Dani: Yeah, yeah, definitely. So, reword it. "If you used the link have you ever used another source to find your answer, and if so elaborate on your experience." [*S - subordinates to previous comment by attempting rephrase question*]

14) Kenn: How about we ask, "Where was their previous knowledge from, not have you ever had to use previous knowledge to answer a question." [*S - co-producing, supplementing other group members' comments*]

15) Erin: Does that sound good to everyone? [*C - connecting activity with project*]

In this episode the group is evaluating a question as part of their pedagogic strategy. In prior work session they have sometimes considered how their students might respond to their lesson (e.g. Kenn: "I don't think online discussion will work. I know

preservice students will just say one quick thing, not explain it, and then move on. Or they'll just be like, I agree and drop it"). However, until this episode as a group they have rarely considered fit of content and pedagogy. Kenn begins the episode with a heedful instance of Contributing as she images how she as a student might respond to a computer game that asks questions about various topics, and attempts to reword their transition into this activity (line 1). Dani and Halle (lines 3-7) attempt Representations that refine the transitional question. Halle attempts a Representation of the question, but fails and then expresses confusion (line 9). Kenn, then Contributes an example of how previous knowledge might supply answers to questions (line 10). Erin notes that it is not only previous knowledge content, but the process of how to search for knowledge that is important to the activity (line 11). Dani attempts another Representation of the question (line 12). Kenn rephrases the Representation of the question (line 13) to ask their students to reflect on the source of their knowledge. Erin posts Kenn's Representation of their transitional question (lines 13 and 14).

This episode represents the highest level of interrelating, and consequently heed exhibited by Group F that I identified through analysis. However, their lack of collective knowledge about their selected content is evident in that they struggle to Represent their selected content through this transitional question. In turn, without collective knowledge of content and pedagogy it was difficult for them to design and create truly collaborative instruction.

Summary for Group F

Their heed throughout the collaborative project is of a lower quality, as exhibited in their less heedful content selection, pedagogic instruction and their frequent parallel

work. Additionally, their heed throughout the project is directed more toward task particulars and requirements, than in attempting heed for developing shared understanding and hybrid creation of the lesson. Less heed was directed toward the development of instruction with more time spent in less collaborative activities, such as separate parallel work and dividing labor. Their heed throughout the collaborative project is directed more toward task requirements, like posting or reviewing due dates, than heedfully developing collective knowledge, and collectively creating hybrid instruction. Lower level of heed focused on task specifics, also coincides with lower levels of socially shared metacognitive regulation, which include proposal on how to approach the task at hand, seeking and adding information and checking that task requirements are met. These activities were common in Group F. It is also possible this lower level of heed and group regulation combined to create the groups' lack of shared knowledge of content, and pedagogy, which in turn shifted the group toward their more parallel work style, and piecing their instruction together with separate individual contributions.

Qualitative Case Study of Group A - Highest Rank on Collaborative Instruction

Group A received the highest rank among all the groups for their collaborative instructional project, based on Shulman's (1989) model of effective instruction and was assessed by both the instructor and researcher. The group was comprised of four members: Cruz, Eva, Nikki, and Zack. All members of this group were juniors interested in teaching in upper elementary school grade levels. Two members of this group were white females, one was a Hispanic female, and one was a white male. All

members of this group had *expanded beliefs* about professional collaboration and/or a *flexible orientation* toward collaboration, as determined through my analyses for RQ1. Specifically, three members expressed both a *flexible orientation* and *expanded beliefs* (Eva, Nikki, Zack), and one member expressed a *flexible orientation* toward collaboration, but only *simple beliefs* about teacher collaboration (Cruz).

Quality of Group A's Collaborative Instruction Project

Field note observations of this group's enactment of their collaborative instruction project noted that the group interacted frequently, and heedfully with classmates, and among themselves. Classmates were engaged in their simple but effective activities. The hybrid nature of the project and group understanding of concepts was evident in the easy flow between instruction, discussions and thoughtful answers to student questions. All three concepts were addressed clearly, and the three pedagogic strategies for teaching their concepts were simple yet effective in involving their classmates. Notes from the instructor's qualitative assessment support this interpretation:

Best organization, best coordination, good flow, rigorous treatment of content, thoughtful pedagogical decisions that "worked." They coordinated very well DURING the lesson - both between each other and in being responsive to their audience, seemed to me that they all had good understanding of the all the concepts they were discussing and were very aware of what their group members were doing.

As noted in Figure 2, Group A, reported relatively high perceptions of the quality of their group interactions on the HICES, and Figure 1 illustrates that there was little change in members perception of group heed across the phases of the collaborative

project. Though, members of Group A rated their heed in interaction slightly higher than did the members of Group F. Group A rated the quality of their interaction lower than the quality of group interaction reported by Groups C and D; but, higher than the quality of interaction reported by Groups E and B. This group received the highest rank order on their collaborative project. Yet, though their perception of group heed in interaction was high, it was similar to the group receiving the lowest ranking on their collaborative project. This was indicated not only on the quantitative measures but was also reflected in their interviews.

Interviews of Group A's members indicated a fairly high overall perception of their group interaction with little change across the phases of the task. Group members were interviewed after Work Sessions 1, 3, 4 and 5. Across the work sessions, Group A's members described their group having fun and as working well together. In an interview with Nikki after Work Session 1, she noted, "We've only had one work session together, but already I feel like this is a great group. Everyone came prepared, but the best part was how we tossed the concepts around and challenged each other's thinking about it. It made me think more deeply, and I felt like I came away with a much better understanding than I had going into it." In Zack's interview after Work Session 3, he described the group as, "...one of the best collaborative experiences I've had so far. It's not so much that we're all prepared and share the work, I've been in other groups that do that. It's more, how we talk about ideas, learn from each other, but we also laugh and have a good time at it." Between Work Session 4 and 5, Eva noted in her interview that, "I think this group is going great, especially because I feel like we have come up with some really creative ideas for our lesson. Things we would not have thought of alone". Cruz's

interview was conducted after Work Session 5. She also described the group as, “We work so well together. We all bring different strengths and ideas to the table. But it works, because we need to look at all those ideas... so we can adapt them into something that works best for the lesson”.

In the next sections, I provide illustrative examples of Group A’s discourse in episodes drawn across the phases of the project. For each work session, four chairs are arranged around a square table, so that each group member faces a group member seated across the table. Members of Group A frequently lean toward each other with head in hands, especially Nikki. Each member of this group has a laptop on the table in every work session, though it may remain closed when not in use. Interactions in this group are shared among the group, with no particular member who over-contributes, or under-contributes. However, unlike the infrequent and quiet interaction of Group F, Group A talks and laughs a lot.

Phase One, Work Session 1: Developing collective content knowledge

The collaborative activity of Work Session 1 was to consider content for inclusion in the group’s collaborative instruction and develop group knowledge of the content selected for the project. Group A begins this work session in a style of brainstorming in which they share various ideas they brought for consideration as content for the lesson. Their Contributions are more heedful than Group F’s. This is indicated by the examples they share with the group, the connections to shared experiences, group chaining and probing of ideas, and their heedful attempts to engage the group in co-production of content. Concurrently, as the group brainstorms ideas for content, they also start tying

content to pedagogic experiences from classes or experiences, and other concepts from the chapter.

Excerpt 6: Group A, Phase 1, Work Session 1 - Selecting Content for Collaborative Instruction

[Segment A – Brainstorming ideas for inclusion in instruction.]

1) Cruz: Here's one to consider: Repetition makes learning work, but repetition alone doesn't make it stick. Like in math, repetition is what made it work for me, like times tables games? Did you guys do that? [*C – WW, CPPF and AQ, chaining ideas and building on suggested content, and referring to shared experiences*]

2) Eva: Yeah, Like how memorizing the periodic tables for a test. [*C – WW, adding phrase to enlarge the concept*]

3) Zack: How about this one? Organize a lesson like a story. So lots of times when a teacher is up there, I don't think about why I'm learning if. But if they put a story to it, I can remember by thinking back to the beginning, middle and end. I move through the story to remember information. [*C – CPPF, continuing to build ideas for content, and adds personal experience*]

4) Nikki: I'm tossing this one in: Memory isn't what you want or try to remember, it's what you think about. So that's why a teacher's goal should be to get student to think about meaning. [*C and R, avoids assuming others understand her Contribution, so she tries to clarify*]

5) Cruz: So, like if they don't think about stuff deeply, they won't remember it? [*R – WW, checking her understanding of Nikki's Contribution*]

6) Eva: I can relate to this one: Memory depends on emotion. I remember lots of things from my childhood because they were fun or happy. [*C – IO and CPPF, continuing to build on their ideas for content by connecting to personal experience*]

7) Zack: But what if it isn't emotional stuff - like math? [*R – AQ, probing and attempting to clarify*]

8) Nikki: Here's another one: Should teachers adapt meaning to student interest. What did you guys think about that? [*C – AQ, adds another idea for content, and asks group to evaluate idea*]

[Segment B: At this point the group shifts from brainstorming content to evaluating content.]

1) Eva: You mean does (adapting material to student interest) work? [*C - IO, adds a phase that refines the previous idea*]

2) Zack: The author said it doesn't work. [*R - avoids assuming what others think*]

3) Cruz: I agree and disagree....my sister loves soccer. I think she'd listen and be more engaged if soccer was part of a lesson, but I also think she'll focus more on soccer than whatever's being taught. [*C - CPPF, relating to experiences with children*]

4) Nikki: I asked my intern teacher what she does to relate to her students. She said she relates content to everything their interested in, but she has to find their interests. [*C - connecting to expertise of intern teacher*]

5) Eva: Upfront, it seems like it should work for anyone. You know, to get their attention. [*R - WW, rephrase to check representation*]

- 6) Nikki: But, if they're not interested, they aren't going to pay attention, and their brain clicks off. [*R - WW, refine and correct previous idea*]
- 7) Zack: (*refers to book*) (Author) says here that, "students are perfectly capable of learning things they're not interested in or didn't know they were interested in." [*C - IO, builds and enriches previous idea by connecting to expertise of author*]
- 8) Cruz: So we're back to finding meaning in content, not interest. [*R - WW, rephrases authors' idea, to check representation*]
- 9) Eva: Like (the book author) talked about building content around a story structure. [*R - WW, chaining into idea of finding meaning in content*]
- 10) Cruz: Yeah, so I'm thinking it's not like you never talk about things they are interested in, just tie their interests in sometimes. Bits and pieces, just not all the time. [*R - WW, bring forward phrases while making language exacting*]
- 11) Nikki: And...even if you wanted to, you couldn't do that every time for every student. Seems like big part of that is you don't want cut them off from things they didn't know they were interested in. [*R - WW, enriching previous comment by dovetailing*]
- 12) Zack: Totally, you don't want to restrict their learning by not pulling in new things. [*R - WW, rephrasing to clarify idea*]
- 13) Eva: Should we consider "adapting material" as one of our topic points? [*C - CPPF, talking lesson into being*]
- 14) Nikki: It's important and interesting. Do we think about (our classmates), will they enjoy it? [*C - CPPF, considering students for whom lesson is intended*]

15) Zack: We all the same, and we were engaged in it. [*C - CPPF, considering students for whom lesson is intended*]

16) Cruz: Agreed. Let's put this one in the lesson. [*C - converging to build the project*]

After the group spends time considering ideas for inclusion in the lesson content, they begin to deeply explore content. Only after brainstorming, and exploring various ideas for content, do they begin to select topics they feel are particularly interesting to them and their classmates, without emphasis on who presented the idea. Their entire work session is spent in either brainstorming content for inclusion in the lesson, or in developing collective content knowledge. In fact, the group spent so much time involved in these activities they lost track of time, and almost forgot to post their content before leaving the class. During the last two or three minutes they were scrambling to complete this part of the assignment.

This approach was very different from every other group in the class. Other groups including, Group F, less heedfully, habitually expressed content ideas, counted for the ideas inclusion in the collaborative lesson, and spent little time in developing group knowledge of content. There was a stark contrast on this work day between Group A and Group F. Group A heedfully Contributes and Represents their recommendations for content. They develop patterns of high quality interaction that are responsive, and adaptive in probing concepts that support knowledge development among group members. They heedfully scrutinize and evaluate content for inclusion in the lesson, but focus much less heed on the project requirement of posting content. While, Group F

habitually lists, and less heedfully tallies ideas for inclusion in their project, they spend little time in attempting group knowledge development, but very carefully and heedfully focus on the project assignment of posting content to the interactive site. As noted above, Nikki's interview after work session one described how the group 'tossed concepts around' which she believed helped develop her understanding of the content. She also described this idea exchange as, "the most important part of collaboration. I find that others thinking challenges or expands my own, which makes my knowledge stronger. I try to put my ideas out there as well, because it may help someone else, like others help me." The heedful content exploration, connections and justification expressed in the discourse of Group A during Work Session One likely contributed to the development of collective content knowledge they group display in their collaborative instruction.

Phase Two, Work Session 2: Developing pedagogic knowledge

Collaborative activity in Work Session 2 included teaching group members about a pedagogic strategy, and deciding as a group how to apply these strategies to the selected content in ways that were appropriate and interesting to their students. In contrast to the approach of Group F, as members of Group A taught their pedagogic strategies, each provided more than definition and a brief list of methods. They included experiences from their past or examples gleaned from recent classes or their intern experiences. (e.g., Eva: I had direct instruction....its like, oh yuk, a lecture, but I was thinking about how a math teacher describes a formula or method and then goes through examples. It's actually pretty good way to get some types of information across.") The group does not necessarily elaborate on each method, but the individual presentations have pertinent

connections to prior classes, individual experiences or examples of how the methods might be applied. The overall collective approach of connecting pedagogy to examples and experiences underpins support for their understanding of the pedagogic strategies. The excerpt below shows how Zack connects methods of indirect instruction to their current classes. In this session, as in Work Session One, they are so busy talking that as the work session ends, again for a second day, they are pressed for time to fulfill the posting requirement.

Excerpt 7: Group A, Work Session 2 - Teaching Pedagogy to Group Mates

- 1) Zack: I had indirect instruction where the teacher shifts from being teacher and director to more of a guide and facilitator, and the students take control of their own learning. There were a bunch of methods listed. Like reflective discussion where students talk about concepts, so what we're doing right now is indirect instruction. Then case study, and concept mapping. Do you remember// [*C - CCPF, sharing pedagogy by connecting to common experiences*]
- 2) Nikki: //wait, like last week in our other class, the bubble mapping thing? [*C - IO, interjects appropriate comment to build on concept*]
- 3) Cruz: Oh yeah, the brainstorming with the big sheets of paper where we were trying to connect our ideas? [*R - AQ, checking representation of concept*]
- 4) Zack: Yep, and then there's concept attainment, where you teach a new concept and then introduce a bunch of different examples and some of them fit the concept and some don't. Like a basic example is, say you introduce the concept of vegetables. A vegetable

has (pause) what's the definition// (*checking laptop*) [R - WW, *uses examples to avoid assuming others understand*]

5) Eva: //It doesn't have a core. [C - IO, *enriches and encourages speaker's ideas*]

6) Zack: Yeah, it doesn't have a core and// [C - CCPF, *talking the idea into being*]

7) Cruz: //It's grown from a root. [C - IO, *enriches and encourages speaker's ideas*]

8) Zack: (*Nods head*) yep, so then you write on the whiteboard carrots, corn, apples and
// [C - CCPF, *talking the idea into being*]

9) Cruz: //avocado [C - IO, *enriches and encourages speaker's ideas*]
(*Laughter*)

10) Zack: Yeah, and students have to use the concepts they just learned to sort them in the right area.... Then, there is something called CLOZE, its an acronym for something, don't remember (pause, looks on laptop) [C - *continues sharing pedagogy*]

11) Nikki: (*refers to laptop*) Yeah, I saw that too, but don't see what it means. [C - IO, *supports speaker's ideas*]

12) Zack: Anyway, it's basically a fill in the blanks activity. So like, anyone heard of Mad Libs? [R - CCPF, *refers to related experiences*]

13) Cruz: Yeah, Mad Libs is great. [C - IO, *supports speaker's ideas*]

14) Eva: I love Mad Libs, so would students fill in missing words on a sentence or something? [R - WW, *adds phrase to check representation*]

15) Nikki: Do you guys see this as related to experiential learning? [R - AQ, *checks representation and probes related concept*]

16) Zack: Well, indirect, interactive and experiential all seem to overlap, not so much with direct, but, yeah I think so. . . [R - WW, *chaining concepts together*]

17) Eva: Me too. . .student involvement gets their brain moving. [*R - IO, enriching through dovetailing*]

In comparing this discourse segment to Group F's segment of Work Session 2, there is a significant difference in the level of heed between Kenn and Zack's teaching. Zack's Contribution of the definition of indirect learning is brief. However, whereas Kenn, from Group F, has likely taken her definition directly from the recommended website, Zack's more heedful Contribution re-phases his pedagogic definition with shared group experiences (line 1). He Contributes examples, and narratives that help create shared meaning and connects them to the group's recent experiences (line 1). He heedfully Represents the methods with games with which they are familiar and appear to enjoy (lines 4 and 11). The rest of the group is responsive and Representations of the concepts are talked into being (lines 2,3; 5-10; and 12-15). Their patterns of interaction are adaptive, responsive allowing shared language and meaning to emerge. However, despite Kenn's less heedful, more habitual teaching of her pedagogic strategy, Group F heedfully develops a definition of her pedagogy. But, Kenn is the last to teach her pedagogy, so this is the Group's only attempt at developing pedagogic understanding. In addition, unlike the more adaptive and responsive interactions of Group A, Group F discusses only a narrow description of indirect instruction, with fewer connections to experiences or exploration of methods. Group F's lower level of heed is focused on adding facts to the definition, not on exploring conceptual understanding, and their patterns of interaction are less adaptive and less responsive than Group A, indicating a lower quality of heed around their pedagogic strategies.

Both groups attempted heedful connection between two pedagogic methods. When Nikki recognizes similarities with her pedagogy, she checks with her group to see if they also see a similarity (line 15), and Zack and Eva are supportive of the attempt to connect the two concepts, and they Represent their current understanding of the connection between the two pedagogies (lines 16 and 17). This is a higher quality of heed than occurs in Group F. When Erin attempts to draw a heedful connection between her pedagogy and Kenn's, the group does not support or sustain much further interaction on the subject, and Erin ends the episode by drawing the group focus back to the daily assignment of posting. Group A, on the other hand, spends the work session discussing pedagogy and like the first work session they must hurriedly make posts to the Blackboard site as class is ending.

In Work Sessions 1 and 2, both groups continue the patterns of interaction established in Work Session 1. The level of heed in Group F's interaction is of a lower quality level than in Group A. Group F's patterns of interaction are less responsive, less adaptive and less often attempts shared understanding of content or pedagogy. Group F tends to focus heed on the less demanding aspects of the collaborative assignment, such as posting. They are more habitual, less convergent, less complex, and the group less often demonstrates attempts at shared conceptual understanding of content or pedagogy. The higher quality level of heed among is Group A is exhibited in their more responsive, adaptive, convergent patterns of interaction, their more frequent attempts to develop shared language and understanding of content, and pedagogy, use of narrative skills to help develop knowledge. Thus far, Group A has focused their heed and attention on

developing collective understanding of content and pedagogy, and while they fulfill task requirements, it is a lower priority for them than for Group F.

Phase Three, Work Sessions 3, 4, and 5: Designing and Creating Collaborative Instruction

Work Sessions 3, 4, and 5 were devoted to designing and creating the collaborative instruction. The excerpts below occur as, first, the group evaluates a particular pedagogic strategy; and, second, as the group attempts to structure their collaboration instruction.

Excerpt 8: Group F, Phase 3, Work Session 3 - Evaluating Pedagogy and Student Fit

1) Zack: So we talked about a debate as experiential learning. But, (*reading instructor's Blackboard mentoring*) she says “work out well ahead of time what your students might debate. How will you encourage your students to justify and explain their reasoning?”

[*C - CPPF, reminding group to check teacher's expectations*]

2) Cruz: Do we really think a debate is appropriate? Maybe we should have a plan B.

What if everyone agrees? [*C - CCPF, imaging students for who lesson is intended, and imaging reactions to project*]

3) Eva: I think it's a good idea, we all liked debating about it, right? [*R - CCPF, reminds group of activity from previous session, and attempts fit previously initiated idea into project plan*]

4) Zack: Yes, but Cruz is also right, if they don't respond, it'll be awkward, so now what? [*R - expressing doubt to probe idea*]

- 5) Nikki: Maybe if we discuss examples before hand, something to get the debate started. [R - WW, *enlarge and build on previous idea*]
- 6) Eva: Ask questions like, “what do you think and why?” [C - IO, *enriches idea through dovetailing*]
- 7) Zack: We could discuss the pros and cons after. [C - *contribute to sentence program of building lesson plan*]
- 8) Cruz: I still think we need a plan B just in case everyone agrees; you know what I’m saying? [R - AQ, *expressing doubt*]
- 9) Eva: Honestly, I think at our age people will have opinions and examples for their answers, but if not we could add questions like Nikki said, “why do you think that way?” You know what I mean? [R - CPPF, *imagining students and talking lesson into being*]
- 10) Nikki: Yeah, we can’t just ask them to debate without background. It needs to be interactive, it has to engage them or it’s boring. [R - WW, *continuing to enlarge, chain to build lesson*]
- 11) Cruz: Okay. So we’re thinking of doing this toward the end of the lesson? [S - *agrees to plan even though ambivalent*]
-

In this episode, Group A evaluates the appropriateness of this pedagogic design for their students. Unlike group F, they do not describe content or pedagogy as the responsibility of a particular group member. In fact, Eva who did not suggest the debate as a pedagogic strategy now becomes its major advocate (lines 3 and 9), and Cruz who did Contribute the idea expresses concern that it may not be an appropriate fit (line 2), though she eventually Subordinates to the group (line 12). As a group they evaluate the

pedagogy. They are responsive to the concerns expressed (line 4) and Contribute ways to adapt and talk the design into being (lines 6 -7 and 9-10), though this means Cruz Subordinates to the group. Zack discussed Cruz's Subordination in his interview after Work Session Three: "I think Cruz was really worried about the debate idea flopping. Probably I didn't help with that, but I had some concerns too, until we talked about it more. I think the topic is important; we hear about it a lot. But moving toward professional positions we need to start thinking more about why we do things." In her post-project reflection, Eva also talked about Subordination among the group. "We all presented ideas and opinions, and then had to subordinate. I had to overcome my ideas about interest-related content. For Cruz it was the debate. Zack was worried about the debate, and Nikki, had to shift her ideas about the memory game. But we used it to our advantage, it made the lesson better." This is an example of a hybrid solutions the group created for they collective instruction. Nevertheless, at the end of Work Session Three the group still only has a sketchy plan of their instruction.

Moving into Work Session 4, Group A begins to create a structure for their instructional project.

Excerpt 9: Group A, Phase 3, Work Session 4 - Collaboratively Designing Instruction

- 1) Nikki: You know, we could play a memory game, first thing, and then at the end and see what they remember. [*C - CPPF, talking lesson into being*]
- 2) Eva: That's a cool idea! [*C - IO, supporting speaker's idea*]
- 3) Cruz: Yeah, like it, but what's the idea behind it? [*C - AQ, asking for clarification*]

- 4) Nikki: Kind of like, shows what they remember from the lesson. Wait, maybe repeat it a couple of times and see what they remember. Like repeating it across the lesson to see how much they remember? [*R - AQ, clarifying own representation and trying to richly represent for others*]
- 5) Zack: I get it, like a game to get something into memory? [*R - AQ, checking own representation of idea*]
- 6) Cruz: Should we start with a recap of the chapter? You know like, some of them may have read the chapter along time ago, a small recap to help refresh it? [*R - CPPF, imagine students*]
- 7) Eva: That sounds good, so recap the chapter first. [*C - IO, supports previous speaker*]
- 8) Zack: Always good to have a road map of what we're going to talk about. [*C - IO, supports speaker and enriches idea*]
- 9) Eva: Okay, so we summarize the chapter, and then start off with the memory game. [*R - WW, fits the initiated idea into current stage of lesson plan*]
- 10) Cruz: I'll look for a memory game. (*opens laptop*) [*C - connect activities to phase of task*]
- 11) Zack: Hey, for the meaning part, what if we did a short sentence in Spanish and asked them to repeat it. Then do the same in English... it's like the difference between meaning and no meaning. If you don't understand Spanish you're not gonna grasp either the words or meaning, like when you hear English. [*R - CPPF, talking lesson into being through common experiences*]
- 12) Eva: Good idea, for the meaning section. . . (*writing on laptop*) [*C - IO, supports speaker, and connects her activity to lesson plan by taking notes*]

13) Nikki: I like it too. [*C - IO, supports speaker*]

14) Cruz: Also, we still need to think about the debate. [*C - CPPF, reminding group of previous idea*]

15) Zack: Yeah, so I was also thinking about that. Can I get you guys input on some ideas?.... [*S - supplementing anthers ideas*]

16) Cruz: I think this is going to be a cool lesson. It's creative and interactive... [*C - shares confidence in their success*]

17) Nikki: So we have the order, right? We're recapping the chapter, then the introduction. . . [*S - co-producing, enlarging project*]

[Segment B: In this segment, also from Work Session Four, Eva proposes each group members delivers a specific section of the collaborative instruction.]

1) Eva: So, do we each want to do an idea? Does someone want to do a specific idea? That way we can kind of elaborate on the plan. And start thinking more in-depth, you know, be focused on a certain part. [*R - talking lesson into being, but refines idea, does not assume others know what she means*]

2) Cruz: Yep, it's group work, but we have to work it out so it's organized, not crazy. [*C - IO, supports previous speaker, and builds on idea*]

3) Zack: Yeah, even if one of us takes an idea, it's not like the rest of us have to be silent. Like, what if someone forgets something? It's not like they have to be the only one to talk about that topic. [*R - AQ, expresses concern, refines comment, does not assume others know what he means*]

4) Nikki: Sure, we can all help with that, and still do our specific part. [*C - IO, supports previous speaker, while also connecting to previously initiated idea*]

As this episode begins the group is in the process of creating the structure for the lesson plan. As a group they discuss and evaluate activities (lines 1 - 5, and 11 -15), plan a sequence for the lesson (lines 6 - 9, 17), by focusing on the larger overall structure of the lesson. It is possible that having developed collective content and pedagogic understanding, planning the structure of the lesson was easier, and they felt less need of specific questions or statements for their delivery. In her interview after Work Session Four, Eva indicates that developing collective knowledge was an important component in their collaborative instruction. "I really felt like we dove into our chapter content. We challenged and argued about ideas, and had to support them, but it gave us common ground. It would be hard to plan a lesson without that."

Indeed, it is only after the lesson structure is created that they turn to consider whether individual group members should take responsibility for a particular section. In Segment B of Work Session 4 Eva suggests this approach to organizing their instruction and as a group they decide which group member will present specific sections. However, they also agree that all members must be capable of helping with group content, in case someone forgets something or freezes. This approach is very different Group F, who during their lesson planning focused on the careful wording and ordering of questions for the presentation. Whereas Group A focused on collective knowledge and planning for more collective delivery of instruction, Group F focused on cooperative, but parallel preparation and delivery of sequential individual lessons.

Summary of Group A

In summary, Group A's patterns of interaction were heedful, adaptive and responsive. During the first two work sessions they developed collective knowledge of

their selected content, and pedagogy. Their heed was expressed through evaluating and critiquing content ideas and pedagogic strategies. In the first work session they not only heedfully, and collectively selected the content for inclusion in their lesson by determining interest and importance for their classmates, but they also spent time developing collective content knowledge. The heedful style of work the group established in their first work session of probing ideas, was also noted in their more heedful approach to developing pedagogic expertise by connecting pedagogy to experiences or examples. As they approached creation and design of instruction they collectively selected and evaluated activities and pedagogic fit. This groups' heedful patterns of interaction supported emergence of high level shared metacognitive regulation. They provided conceptual justification as they planned and adapted content and pedagogy for their instruction. The collectively monitored meaning by asking questions, proposing explanations that enhanced group understanding, and justified and evaluated their choices for content and pedagogic selection and adaption. The heedful patterns and higher level of socially shared metacognitive regulation they enacted across the phases of the project, allowed them to create the most hybrid and collective instruction.

Chapter Six: Discussion

The purpose of this study was to investigate the quality of heedful interrelating among preservice teachers' working together to design and deliver collaborative instructional projects. I focused on how preservice teachers interrelate - heedfully or not - as they developed a project of collaborative instruction. Specifically, I focused on identifying how students' past experiences in collaboration, and their beliefs about their future professional collaboration may influence the quality of their current collaborative interactions, how the quality of those interactions might change across the phases of the collaborative project, and how the quality of their interactions may have shaped and influenced the project they created together.

My interest in preservice collaboration stems from my belief that learning and practicing collaboration during teacher preparation programs may influence preservice teachers' future collaboration as professional teachers, when the outcomes of collaboration are critical not only for themselves, but also for their own students. As teacher collaboration has been associated with greater teacher retention, better teaching practices, and improved student outcomes; collaborative practice in teacher preparation programs should include activities similar to those of the professionals these students hope to become (Dobber, et al., 2014). Preservice course work may include collaborative activities yet lack a focus on collaboration as the learning objective. Nevertheless, how preservice teachers think about collaboration and the skills involved may influence their collaborative efforts with classmates now and with professional colleagues in the future

Little research has investigated how preservice teachers learn and practice the collaborative skills needed for their profession. This inquiry extended the study of preservice teachers' collaboration in educational contexts by examining how the quality of preservice teachers' collaborative interaction (i.e., as described by heedful interrelating) influenced their design and delivery of collaborative instruction. It also examined how the heedfulness of their current collaboration was influenced by past collaborative experiences and beliefs about future collaboration as professionals, and how heed among groups changed across the phases of the collaborative project.

This parallel convergent mixed methods research design combined one quantitative and one qualitative strand research. The quantitative strand consisted of scaled data collected and analyzed through quantitative methods, and a quantitative ranking of the collaborative projects. The qualitative strand included naturalistic observation, semi-structured interviews, and written reflections analyzed through qualitative methods of content analysis, conversational discourse analysis, and interaction analysis. I observed assignments of collaborative instruction at the very beginning of students' teacher preparation track to gain insight into how novice preservice teachers approach the complexities they face in learning to collaboratively design and deliver instruction.

I begin with a discussion of what my research contributes to understanding how preservice teachers collaborate as they design and deliver instruction together. Then, I summarize the results and findings of the mixed methods analyses, interpreting them through the lens of the theoretical frameworks that guided this research: social interdependency theory, socially shared metacognitive regulation and most especially,

heedful interrelating. Next, I identify limitations of the study. I then discuss implications for educational practice. Finally, I discuss theoretical implications and directions for future research related to preservice teacher collaboration.

Summary and Interpretation of Results

Research Question 1 investigated the relationship between preservice teachers' heedful interrelating, beliefs about professional teacher collaboration, and their perceptions of their past collaborative experiences. Analyses identified that some students had more *expanded beliefs* about professional teacher collaboration than their peers who had simpler beliefs, and that some students had a *flexible orientation* to their own collaborative experiences, in contrast to their peers with an *inflexible orientation*. Both *expanded beliefs*, and a *flexible orientation* were related to higher quality of heedful interrelating during collaborative work sessions.

Students with *expanded beliefs* and a *flexible orientation* focused on the actual problems of teaching; developing comprehensive content knowledge, pedagogic expertise, and collective evaluative interactions in careful consideration of adapting both content and pedagogy to meet the instructional needs of their students. Their interactions with their group members were indicative of their beliefs about professional collaboration as including the collective assessment and evaluation they described in written reflections or interviews. In addition, these students also facilitated their group members' endeavors toward heedful interrelating. Again, it appeared that the roots of their interaction could be traced to students' orientation to collaboration as activities of integrating one's interaction into both the group interrelating and the task at hand. In addition, the careful heedful efforts, and interactions of these group members supported the emergence of both

promotive interactions, and socially shared metacognitive regulation within their groups. Emergence of these interactional processes sustained higher quality evaluation of content and pedagogy, therefore likely supporting more effective instruction. This does not always mean that groups' composed of members with *expanded beliefs* and a *flexible orientation* will produce effective instruction, but analyses of discourse indicated that students who were more willing and able to integrate themselves into the collective mind (i.e., heedful interrelating), also facilitated the development of collective knowledge, and the more collective hybrid instruction.

These behaviors are in contrast to group members who did not express *expanded beliefs* or *flexible orientation*. Interactions of group members with *simple beliefs* about teacher collaboration and an *inflexible orientation* to collaboration were more habitual, less heedful, and these group members were less likely to situate themselves within the group interrelating, and the task at hand. More habitual and less heedful interactions were less likely to support the emergence of promotive interactions, and socially shared metacognitive regulation, which in turn, inhibited development of collective understanding, thereby designing less effective, and less collaborative instruction. Therefore, group members without either *expanded beliefs* about professional teacher collaboration and/or a *flexible orientation* towards their own collaborative experiences focused on the more cooperative, and simpler types of collaboration, such as stitching individually prepared parts of a lesson into a larger lesson. These students were also less likely to integrate themselves, and their adapt their interactions within the group interrelating, nor focus the product as collaborative. This may have influenced their

approach to the project as a series of tasks to be completed, and placed emphasis on division of labor for parallel work.

Research Question 2 investigated students' perceptions of the quality of their own heedful interrelating across the three phases of the collaborative instructional project. My original tentative hypothesis was that different activities (understanding content, gaining knowledge about pedagogy, and designing instruction) might induce different levels of heed, with the more ill-structured activities of designing and creating leading to greater levels of heedful interrelating. Analyses of the HICES data indicated that participants did not perceive that the quality of their interrelating changed over the phases of the project. Further statistical analyses comparing the collective HICES scores of each group nonetheless indicated that groups collectively differed significantly in their perceptions of their group's overall quality of heedful interrelating throughout the collective project. Thus, this is evidence that the HICES was capturing distinctions in group members' perceptions of their interactional experiences.

Interestingly, visual examination of Figure 1 indicates that the highest ranked (Group A) and lowest ranked (Group F) groups were similar in their group members' collective perceptions of the quality of their heedful interrelating, both falling between the other groups. This result is difficult to interpret. However, it might partially be explainable in that both groups had a kind of "balanced" interaction. Neither of these focal groups had a member who failed to actively participate in group collaboration, through discourse or behavior, nor was there a member who tended to over- or under-contribute to group interrelating, as was the case in Group B and in Group E. Both, Group B and E, rate the quality of their interactions lower than the other groups

(determined in part through statistical analysis and in part through visual examination of the data). It could be that groups in which interaction clearly does not fit a model of effective collaboration (i.e., groups with clear under- and/or over-contributors) are likely to perceive a “signal” that the quality of interrelating is not what it should be. To the contrary, without such clear difficulties, group members may be limited in their ability to distinguish more subtle distinctions in quality of interrelating.

Research Question 3 investigated the relationship between perceived heedful interrelating, observed heedful interrelating, and the quality of collaborative instructional projects. Based on statistical analysis, no relationship could be found between perceived heedful interrelating as operationalized through students’ HICES responses and the rank order of their groups’ instructional projects. However, qualitative case study analysis did indicate differences between the highest ranked group (Group A) and the lowest ranked group (Group F) in the quality of their interrelating during group work sessions. I identified Group A as heedfully interrelating toward a more collaborative instructional project, whereas Group F less heedfully interrelated and produced a less collaborative instructional project. Thus, at least for the two-case study groups, I drew the conclusion that the quality of heedful interrelating during collaborative work sessions does influence the quality of the collaborative instruction that preservice teachers are able to design together. In trying to understand why students’ perceptions of their heedful interrelating differed from my observations of their interrelating as enacted through their discourse, I came to believe that Group A and Group F had different perceptions of collaboration.

Group F had no members with *expanded beliefs* or a *flexible orientation*. Members of this group only expressed *simple beliefs* about teacher collaboration and an

inflexible orientation toward their own collaboration. Their perception, or model, of collaboration implied a simple version of parallel, cooperative work meant to quickly, and efficiently produce results. This group focused their efforts on dividing work among the members, and then, like working on sections of a jigsaw puzzle, they pieced their sections of work together to create their instruction. Because Group F's focus was on accomplishing daily tasks of selecting content, teaching their pedagogic strategies and piecing together instruction, this shifted the group attention away from developing collective, hybrid instruction (i.e., the more complex, creative, cognitively challenging aspects of collaborative instruction), toward a less collective, and more sequentially delivered instruction (i.e., easier and more efficient, but possibly less effective type of group instruction). Because, their focus had been on completing task assignments rather than developing depth of collective understanding of content or pedagogy, as they approached the design and creation phase their lack of collective understandings likely influenced their struggles with developing hybrid instruction. This likely influenced their approach to dividing the project into sections of content and pedagogy that individuals had originated during the first two work phases. This resulted in the serial style of presentations that constituted the implementation of their instructional project. However, it was the group's perception that their jigsaw style was an effective and efficient method of fulfilling and completing the project, and again, from their perspective, a method to which all had successfully contributed. They rated their interaction as high quality because their cooperative jigsaw work style fit their perceptions of collaborative interaction, and the collaborative assignment.

Group F's model of collaboration appeared to be one of efficiency. They interactions were all about the business of completing the project parameters quickly and efficiently, rather than collaboratively, and all group members seemed to share this efficiency model of collaboration. Therefore, to the extent group members share the same model of collaboration, and members interactions fit that shared model of collaboration, then group members would likely perceive and rate their interactions as heedful and of high quality. This group's simple cooperative model focused on lower level planning and monitoring (i.e., low level socially shared metacognitive regulation) of project tasks, and completing them quickly and efficiently which over the phases of the project produced lower quality interactions, and less effective collaborative instruction less suited to their students.

Conversely, my interpretation of Group A's mid-range perception of their group's quality of interaction, implicates their shared model of collaboration as a more complex and adaptive model, one that includes collective minding around challenging open-ended problems attempting hybrid products. As this model of collaboration involves the more cognitive and difficult processes of collaboration (i.e., high level socially shared metacognitive regulation) the types of interactions that fit the model are also more complex. Because Group A's focus was on developing effective instruction for their students, the group focused on developing knowledge and pedagogy with the aim of collective, hybrid instruction (the more complex, creative, cognitively challenging aspects of collaborative instruction). Because they had developed collective understanding of both content and pedagogy early in the project, they were also able to approach the design and creation phase through the collective minding (Weick &

Roberts, 1993) needed to create a cohesive, and effective instructional project. This resulted in the collaborative, hybrid style of presentation that characterized the implementation of their instructional project. As was true for Group F, the extent to which the members of Group A shared the same model of collaboration, and members interactions appeared to fit that shared model of collaboration, then group members would likely perceive and rate their interaction as heedful and of high quality. Using this hypothesis both groups might rate their interactions as heedful, and as befitting the groups' model of collaboration. However, the different models or approaches produced different types of instruction, with Group F's approach creating the less effective, less collaborative instruction, and Group A's approach creating the more effective, more collaborative instruction.

Another possible explanation for Group A's mid-range rating of their heedful interrelating, relates to the emergence of socially shared metacognitive regulation. This frequently engaged in this type of high quality interaction in which group members shared cognitive regulatory process of learning both content and pedagogy. These high quality interactions and cognitive regulatory functions are less frequently noted in student groups (De Backer, Van Keer, & Valcke, 2014), and members of Group A noted they have rarely experienced collaboration of this nature. One conjecture is that the group was less certain of how their complex and evaluative interactions fit into any model of collaboration, and thus increased group members' hesitancy to describe interactions as high quality. However, as the group post-project written reflections described their experience in this group as excellent, and the quality of the interactions across the phases were not rated as *un*-heedful, their mid-range ratings may simply reflect a realization that

interacting with high quality heed is difficult, requiring effort and frequent adjustments in skills.

In further summarizing and interpreting the findings across the three research questions, I contend that *expanded beliefs* about teacher collaboration and a *flexible orientation* toward collaboration supports heedful interrelating, promotive interactions, and socially shared metacognitive regulation toward development of collective mind across the phases of developing instruction, which may also result in development of effective collaborative instruction. This hypothesized model is depicted through Figure 3 and Figure 4.

Figure 3 depicts a model of how students' *expanded beliefs* and *flexible orientation* influenced a higher quality of interactions across the phases of the task in production of more effective collaborative interaction. In Group A, group members' *expanded beliefs* and a *flexible orientation* supported more heedful preparation, and in turn, the emergence of promotive interactions during the first two phases of the task, which underpinned the development of collective content and pedagogic knowledge and expertise. As these group members entered the third creative phase of the task, their collective knowledge afforded heedful collective evaluation of content and pedagogic fit for their students (i.e. socially shared metacognitive regulation). Overall, the higher quality heed produced the more effective collaborative instruction.

Figure 3

Model of Relationships among Heed, Expanded Beliefs, Flexible Orientations and Effective Collaborative Instruction

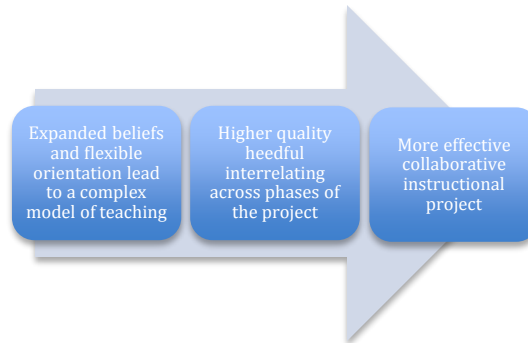
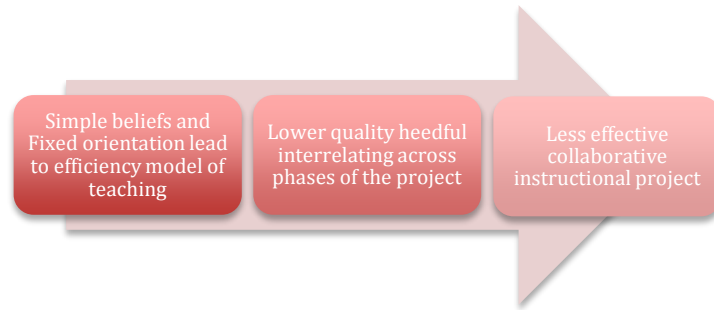


Figure 4 depicts a model of how students' *simple beliefs* and an *inflexible orientation* influenced a lower quality of group interactions across the phases of the task and produced less effective collaborative interaction. In Group F, all members *simple beliefs* and *inflexible orientation* produced less heedful, habitual preparation of content and pedagogy, and consequently hindered the emergence of promotive interactions and the development of collective content and pedagogic knowledge during the first two phases of the task. As Group F entered the third creative phase of the task, their lack of collective knowledge impeded collective evaluation of content and pedagogic fit for their students, and likely shifted the focus of their heed to fulfilling lower level task parameters, and production of parallel individual work. Overall, their lack of heed over the phases of the project produced the least effective collaborative instruction.

Figure 4

Model of Relationships among Lower Heed, Simple Beliefs, Fixed Orientations and Least Effective Collaborative Instruction



Limitations

Situating the research very early in the teacher education track was intended to capture early perspectives of collaboration from novice preservice students. However, the early nature of the assignment may have come with a price. In interviews some students mentioned that a collaborative project so early in the semester made collaborative interactions difficult, as most of their classmates were unknown to them. Others students mentioned they would have preferred to select their own groups based on the friendships they had developed from previous year's course work. Past research has indicated that quality collaboration often relies on the development of positive interdependence and trust, which takes time to develop (Achinstein, 2002). Lack of trust and positive interdependence among group members may have impeded some groups in their efforts to heedfully interrelate. However, it is also true that as professional teachers students may be asked to participate in, and benefit from a variety of collaborative circumstances with people or colleagues with whom they are not acquainted (Dobber, et al., 2014), much less having developed a trusting relationship (e.g., change of schools, across departments, or community members). As novice preservice teachers their discomfort with new colleagues might be expected, yet at some point these novices will

have need of the collaborative skills necessary to work effectively in a variety of collaborative settings and with various people.

Though concerns about the TCS survey were addressed in the methods section, these concerns should be re-examined here. My literature review did not reveal a survey meant to examine preservice perspectives of their own collaboration, or that of professional teacher collaboration. Selecting specific subscales may have limited students' responses and their learning about teacher collaboration. The TCS survey and the three pedagogic questions were administered before written reflections, due to course timing, and the intentional pedagogic method. As a pedagogic strategy, this early administration was likely helpful. The TCS survey provided important information for these preservice teachers about ways in which professional teachers collaborate. This supposition is supported as many students' written responses closely aligned with the concepts represented in the TCS survey. But, the three TCS subscales used in the research more frequently represent professional collaboration as sharing and cooperation, and less often represented the collaborative assessment, evaluation and analysis required for improvement of teaching, or selection of effective pedagogy and teaching theory. The few students who mentioned this type of collaboration in written reflections or interviews either made note of this type of collaboration from the survey (including the three pedagogic questions) or had some previous exposure to the expanded views of teacher collaboration as including collective assessment, evaluation and analysis. However, as these activities are important components of professional collaboration in contributing to improved teaching and learning outcomes, a survey used as a pedagogic strategy ideally would include items addressing this type of collaboration. It would have

been preferable to use an instrument that described collaboration through both concepts, and found reliable and validated in measuring more complete observations of preservice perspectives on professional teacher collaboration.

Another issue of concern with the TCS survey developed around the stem selected for use in the research. As the scales were originally developed for professional teachers, the stem was not appropriate for preservice teachers. Three students reported having difficulty understanding the selected stem. Since the TCS survey was not used in the pilot study, this problem was not encountered until administering the survey in the actual research program. The stem was phrased, “To what extent do professional teachers collaborate in the following ways?” The students, who expressed confusion, asked if they should answer the questions regarding what professional teachers actually do, or what students believe they should do. These two perspectives might yield very different responses to the survey. As noted only three students asked questions about the stem, but it is possible that other students had similar questions.

Lincoln and Guba (1985) have noted the importance of member checking in establishing research creditability, and ensuring that the perspectives of study participants have been accurately represented. Methodologically, heed would sometimes have been better analyzed by viewing the tapes with group members. This is a technique recommended by Jordan and Henderson (1995), but due to students time constraints this would have been very difficult. Making arrangements with students for even a twenty-minute interview was often problematic. Two students requested only a ten-minute interview between classes (one of them interviewed for the full twenty minutes).

However, as interaction analysis suggests, reviewing recordings with group members is

more likely to ensure that research reliably captures the participants' experience.

Therefore, as I was not able to do member checking with all students, my interpretations of observations could be different from those of the study participants I observed.

Implications for Practice

The flexible and inflexible orientations to collaboration are reminiscent of the concept of *mindset* developed by Dweck (2006). *Mindset* is a belief about the self that influences individual attitudes and behavior. A *fixed mindset* is the belief that intelligence, and personal traits or characteristics are fixed and unchangeable. A *fixed mindset* limits potential by inhibiting efforts toward change and development. A *growth mindset* is the belief that while individuals differ, intelligence, traits and characteristics are developed. A *growth mindset* enables success through the belief that change and development are possible with effort and experience. Dweck indicates that being aware of a *fixed mindset* is key to changing it. Correspondingly, the *inflexible orientation* and *simple beliefs* about collaboration inhibited heedful interrelating, whereas the *flexible orientation* and *expanded beliefs* facilitated heedful interrelating and more effective instruction. Being aware of and changing one's *inflexible orientation* and *simple beliefs* may be a first step toward improved heedful interrelating in collaboration, while the second step is learning and practicing the skills needed for high quality preservice and teacher collaboration. To the extent both preservice students believe that skills of collaboration can be learned and developed, they be more willing to persist in efforts to learn and practice.

Limited availability of a validated and reliable instrument for assessing preservice perceptions of professional teacher collaboration indicates a need for such an instrument.

Examining preservice perspective of professional collaboration at the beginning of their teacher preparation track can inform teacher education, and examining these perceptions at the end of students teach preparation may indicate the effectiveness of preservice education. As professional collaboration involves the critical elements of collective analysis and evaluation for improving instruction, preservice students should understand and prepare for the various types of profession collaboration that extend beyond collective sharing and planning. Two new possible scales were discussed with high reliability were proposed in the research. An instrument found reliable and validated that describes professional collaboration as both cooperative sharing and complex analysis and evaluation may prove valuable as a pedagogic strategy.

Results of this study also suggest there may be a need for instructors to incorporate more reflection on the quality of collaboration during the collaborative projects used in teacher preparation. Research has noted that the practice of reflecting on one's interactions and skills may lead to adaptation and improvement (Hayden & Chiu, 2015; Daniel & Jordan, in press; O'Donnell, 2006). In the current research project, students reflected about their own interactions in the task through the use of individual HICES scale and through individual post-project written reflection. In interviews, student described the HICES as valuable method of reflecting on their own collaborative interactions, toward improving their interactions during subsequent work sessions. However, students were not asked to collectively reflect on group collaborative interaction. As collective reflection and evaluation of teaching strategies, is considered an important part of professional teachers' collaborative efforts toward improve teaching

(Dearman & Alber, 2005; Little, 2003), preservice collaboration should also benefit from the inclusion of collective reflection and evaluation.

Lack of member checking through review of audio/video recordings with participants was discussed above as a methodological concern for the research program. Here, review of member checking through review of audio/visual recordings as recommended in interaction analysis might also be considered as a pedagogic strategy for collective reflection and evaluation. In reviewing recordings together groups and instructors might reflect on and evaluate successes and failures with an eye toward improvement both for students and instructors. Some nursing preparation programs have begun to participate in interdisciplinary collaborative simulation (e.g., Sennette, O'Malley, & Hendrix, 2013). Nursing and teacher collaboration share some commonalities including challenging situations with critical outcomes. Collaborative nursing simulation includes audio/video recording of students collaborative work, followed by instructors and students together viewing of recordings to reflect on and evaluate both successes and failures toward improvement of outcomes and instruction. Given the critical nature of effective teaching, perhaps teacher preparation programs should explore the value of collaborative simulation for improving the quality of preservice teachers' heedful interrelating

That their teacher preparation program used a cohort model had important implications in this research. Student interviews characterized the cohort as support for positive interdependence and a growing sense of professional community. Students indicated that sharing classes and professional interests provided a strong sense of "being in this together," and "sinking or swimming together". They also noted that working

with various colleagues across the cohort fostered a sense of, “we’re all trying our best to do what professionals do.” This stated positive interdependence was indicated in their preparation for work sessions during the research. During the first two work sessions, observations noted that all participants came prepared with content and pedagogic information. In addition, in interviews several students mentioned that since they move from class to class together, time between classes could be spent chatting with friends about other interests and events. They noted this contributed to their ability to capitalize on devoting their valuable class time to learning course content. While there were some notable exceptions, observations corroborated this, as students were generally focused and on task.

Conversely during interviews, and also noted in the student discourse, many students reported struggling to keep up with the pressure of classes required by the cohort teacher preparation program. Students described working in simultaneously in various collaborative groups across courses. Some noted that it was difficult to keep track of the many homework assignments and their other collaborative projects, or project presentations occurring on the same day. A sense of feeling overwhelmed may contribute to the “efficiency” model of collaboration noted in Group F. If students feel overwhelmed with assignments and projects, the desire to simply complete an assignment may be strong. This may also make a case for university professors to cooperate and share information about when they are using collaborative work in their courses in an attempt to stagger assignments as a way of relieving some student stress.

Conclusions and Future Research

Student interviews noted various influences of the teacher preparation cohort, an influence that supported emergence of positive interdependence in their collaboration. However, as the student participants in this research were in their very first semester of their teacher preparation track, the influence of the cohort may change across the two years of students' professional preparation. As research has noted, professional teachers sometimes develop cliques that exclude some colleagues, and hinder the collaboration needed for improvement of instruction (Achinstein, 2002). Perhaps after two years together preservice teachers may also develop cliques within their cohorts. Therefore, examining and evaluating the cohort influence at various points during the teacher preparation track is implicated.

As noted in other research (e.g., Khosa & Volet, 2014) it is speculative as to why groups with similar structure (i.e., grade level teaching interest) do not always produce heedful interrelating. However, the implications of the current research indicate that beliefs about future collaboration and orientations to collaborative interaction have an impact. A model was presented that may help future examinations explore the relationship between of the influence of *expanded beliefs* and a *flexible orientation* to collaboration, the emergence of heedful interrelating and/or socially shared metacognitive regulation, and the quality of the collaborative product.

Other implications for future research involve general practices of collaboration in education. Students' descriptions of past experiences that happened in grade school and middle school coupled with the many students who described an *inflexible orientation* to collaboration, indicates that these past experiences have a persistent impact on the quality

of students' heedful interrelating. Possibly, indicating a particular need for early elementary teachers need to carefully instruct and guide students as they engage in collaborative endeavors. Research has indicated that it can be difficult for teachers implement, and therefore suppose that students might benefit from specific collaborative methods (O'Donnell, 2006). Findings from this research would indicate that less effectual collaborative experiences may hinder the development of more heedful, adaptive and flexible collaborative perceptions or strategies. To the extent that students maintain and practice fixed, less heedful approaches to collaboration they may continue less heedful interrelations in their current collaborative experiences as preservice teachers, and in the future professional careers as teachers.

Finally, in various interviews students expressed a desire for courses designed to teach the collaborative skills needed as professional teachers. Students reflected that business communication courses are required for their friends enrolled in business colleges, and as noted above, various nursing colleges provide courses and simulation in collaboration. Several students stated they lacked skills in areas of communication and collaboration, and took the position that teacher preparation should also include such courses. In addition, research has indicated the importance of teaching the skills needed for heedful interaction, and effective collaboration (Weick & Roberts, 1993; Daniel & Jordan, in press, Friend & Cook, 2013). Future research might extend this prior work and continue to examine how instruction and practice of collaborative skills might prepare preservice teachers for the critical collaboration required of them as future professional teachers.

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APPENDIX A

TIMELINE OF RESEARCH ACTIVITIES

DAY/WORK SESSION:	TIMELINE ACTIVITY:	DATA COLLECTION:
Day 1 of class	Pre-task data collection	Consent forms Written reflections, teacher collaboration and past experiences
Days 2 & 3	Instructor intros task & group assignment based grade level teaching interest and consent for participation	Audio-video recording - began for purpose desensitize participants to equipment
Day 4, Work session 1	Collab as valuable for develop deep flexible knowledge & improving instruction Content for collab instruction, share and evaluate Instructor mentors groups	Audio-video recording HICES
Day 5, Work session 2	Collab negotiation of roles and responsibilities Design as creation process Pedagogic strategies, share Instructor mentors	Audio-video recording HICES
Day 6, Work session 3	Intro heedful interrelating Design of collab instruction Instructor mentors	Audio-video recording HICES
Day 7, Work session 4	More heedful interrelating Continue design and creation of instruction Instructor mentors Peer evaluation session	Audio-video recording HICES
Day 8, Work session 5	Challenges of collaborative communication Continue design and creation of instruction Instructor mentors	HICES
Day 9 – Day 12	Delivery of collaborative instructional projects	HICES group adapted Post written reflection, self and group interaction

APPENDIX B

TCS SUBSCALES AND THREE PEDAGOGIC QUESTIONS

1 Strongly Disagree	2 Disagree	3 Slightly Disagree	4 Neither Disagree nor Agree	5 Slightly Agree	6 Agree	7 Strongly Agree
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To what extent do professional teachers collaborate in the following ways?

JPA 4. Teachers collectively analyze their teaching practices.

JPA 10. Teachers cooperate and collaborate across departments (e.g. grade levels, content areas, special-ed)

JPA 11. Teachers praise or criticize each other's teaching.

JPA 17. Teachers jointly plan and prepare teaching strategies and procedures.

JPA 23. Teachers actively participate in meetings.

JPA 29. Teachers collectively agree to test an idea or a new approach in teaching.

JPA 35. Teachers jointly approve new programs and practices.

SIE 5. Teachers ask each other for suggestions about specific discipline problems.

SIE 12. Teachers discuss strategies about school improvement.

SIE 18. Teachers argue about (evaluate) educational theories, philosophies or approaches.

SIE 24. Teachers encourage each other to contribute ideas and suggestions.

SIE 30. Teachers ask each other about classroom management ideas and suggestions.

SIE 36. Teachers in this school do not feel comfortable about discussing their students' problems.

SR 7. Teachers lend and borrow materials like worksheets and lesson plans.

SR 14. Teachers share journal articles and educational books.

SR 38. Teachers share materials related to their subject teaching.

Three Pedagogic Questions (PQ):

PQ 17. Teachers accept shared responsibility for student learning across their school.

PQ 18. Teachers collectively analyze data about student learning.

PQ 19. Teachers observe each other teaching as part of sharing and improving instructional practices.

Teacher Collegiality Scale. (Shah, 2011). Subscales used: Joint Planning and Assessment (JPA), Sharing Ideas and Expertise (SIE), and Sharing Resources (SR)

APPENDIX C

HICES GROUP-ADAPTED SURVEY

	Name (Self)	Name	Name	Name
Helped to clarify the idea of another group so that we would all understand her/his idea	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Re-phased what a group member said to check understanding of his/her idea	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Asked a group member to elaborate on his/her idea in order to understand what he/she was saying	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Carefully explained a concept to a group member who did not understand the concept	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Carefully contributed relevant examples to the group	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Tried to connect own ideas to ideas offered by other group members	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7

APPENDIX D

WRITTEN REFLECTION QUESTIONS

Question concerning beliefs about collaborative group work -

1. In general, how important do you believe it is for professional teachers to collaborate with each other? Please explain and elaborate on your answer.

Question concerning past collaborative experiences -

2. Consider your past experiences with collaborative group work: How effective were these experiences for your learning? Describe one past experience of group work you feel has influenced your attitudes about group work. Be specific and give concrete details. In what ways might your past experiences effect your current efforts?

Questions concerning the collaborative instruction project -

1. Research has shown that teachers' quality of reflection on their own practice is one of the strongest influences on their students' learning. Reflect on the success of your groups' collaborative instruction.

- What did you notice about how your preservice teacher colleagues responded to your lesson? What surprised you about how they responded? What do you think they learned? How do you know (what is your evidence that they learned)?
- What, if anything, would you change if you taught this lesson again? What instructional strategies will you be sure to include in other lessons you design in the future?
- Based on your experience, what "rules of thumb" would you suggest for teachers designing lessons - and why?

2. Teachers often work in collaborative teams as part of their professional practice. Professional collaboration is important but it's not easy. Success requires shared monitoring of team goals.

- Overall, how would you rate the quality of social interaction in your group? Did group members work hard to contribute (offer ideas), represent (figure out what others are thinking rather than assume they know), and subordinate (step back for the good of the group)? Please give a concrete specific example.
- The next time you collaborate with teaching colleagues, what would you change about your own communication to improve the group's process?

3. As we discussed in class, collaborative activities are beneficial for learning when students have substantive interactions. But communicating in collaborative groups is challenging for children and adults.

- What was the biggest communication challenge you faced in your group? What strategies did you use to address those challenges?
- What did you learn from this collaborative experience? How did your experiences in this group change your perspective on collaborative group work? If you have changed your views about collaborative learning experiences, what do you think caused the change?

APPENDIX E

INTERVIEW PROTOCOL

The following statements and questions are examples of the kinds of questions and prompts that may be used in semi-structured interviews.

Quality of Interaction within the Collaborative Group -

- *How did it go in your group today?*
- Tell me about how your group interacted.
- Did you think the group was on the same page today?
- What's one specific thing that went great?
- What was the greatest success the group had today? Why?
- What's one specific thing that went badly?
- What was the main/biggest problem or challenge the group faced today? Why?
- What did you do as a group to over come the problem/challenges?
- What were the group interactions that made it..... Great.....Poor
- Did someone assume leadership?
- Does everyone in your group interact/contribute equally?
- Or does someone dominate?
- Is there someone who does not contribute?
- Does the group discussion consistently focus on issues relevant to the instructional project?
- Does the group discussion focus on other things, like home problems, other classes, etc?
- How does the group get back to discussing the project?
- Were group decisions about the instructional project a result of group discussions?
- When your group had a disagreement, was it welcomed and discussed?
- How did the group decide about which ideas to include in the instructional unit?
- Were some things discussed that did not get further attention?
- Did group your group reflect on group interactions and analyze or evaluate your interactions?

Individual interactions within the Group –

- *How well do you think you related or interacted with your group today?*
- Did you have any difficulty in the group today?
- What did you personally do to overcome any challenges?

Questions related to *contributing*

- What was the best thing you contributed to the group today?
- What was the most important thing you added to the group work session today?
- Do you think that at any point you said or did something that took the group off topic?
- Was there anything you considered thinking, saying, doing that you did not?
- What did you do?

Questions related to *representing*

- Was there a time when you did not understand what a group member was trying to say? What did you do about that? Was there a time when you wondered if a group member misunderstood an idea?

Questions related to *subordinating*

- Was there a time in which you modified your participation a group based on “mindful attention” to the group?
- Was there ever a time you felt that modifying your participation might be helpful to the group, but you did not do so?
- Was there a time when you compromised your ideas to accommodate group goals?

Interactions Among Group Members –

Questions related to *contributing*

- *What was the best thing another group member contributed today?*
- *What was the worst thing a group member did today?*
- Did a group member hinder interaction today?

Questions related to *representing*

- Was there a time where you thought someone else in the group did not understand what someone else was trying to say?
- Was there a time when one group member tried to clarify an idea that another group member did not understand?

Questions related to *subordinating*

- Was there a time when you thought a group member was willing compromise (find a solution) to help the group move toward completing the project?

Prompting questions -

- What do you mean when you say?
- Tell me about how the group
- I noticed that you had a High Point... A problem...
- Can you tell me what you were thinking or feeling?
- Can you tell me more about that
- Can you give me a specific example?

APPENDIX F

IRB CONSENT FORM

Dear Student:

I am an Assistant Professor in Mary Lou Fulton Teacher College at Arizona State University. I am conducting a research study to understand how students in EDP311 learn to become designers of effective collaborative instruction. I am inviting your participation in this study. Your agreement allows me to retain your assignments related to the first collaborative instruction project you complete in this class. This includes your Blackboard discussion posts, written reflections, reflective surveys or questionnaires and artifacts related to the following:

- your collaborative instruction
- your story of motivation and learning, and
- your collaborative instruction for your fellow preservice teachers.

For group assignments, I will only collect assignments for which every member of the group has given consent.

These will be kept until after the end of semester and grades are posted to analyze your responses for themes, insights, and opinions of selected course concepts. I am also requesting your permission to use audio-video recorded data from your participation during whole-class and small-group discussions.

Your participation in this study is voluntary. You may decline to allow your assignments to be retained and analyzed. You may also decline to allow your audio-video recorded participation to be transcribed and analyzed. If you choose not to participate or choose to withdraw from the study at any time, there will be NO penalty, nor any effect on your grade(s).

You may also be asked to participate in an individual 20-minute interview about your learning experiences in the class. Interviews will be audio-recorded with your permission. The interview portion of the study is voluntary; not all students participating in the study will be interviewed. Interviews will be coordinated and conducted by Denise Brown. They will be scheduled at a time and place of your choosing. Students who agree to be interviewed will be allowed to choose whether they would like to receive a \$5.00 Starbucks gift card or ten extra credit points toward their course grade. Alternative extra credit assignments are included in the course should you choose not to participate in the interview.

Although there is no benefit to you, possible benefits of your participation include the opportunity to enhance the learning experience of future students enrolled in this and other courses. There are no foreseeable risks or discomforts to your participation. Confidentiality will be maintained by the removal of all identifying information from your assignments and prior to any analysis of the data set. Transcripts will be made of audio-video recordings, and all names will be replaced with pseudonym immediately. Only participation of students who have given permission to have their recorded data used in the study will be transcribed.

Your responses will be kept confidential and only pseudonyms will be associated with participants. Study results may be used in reports, presentations, or publications but your name will not be known or used or connected to the assignments because identification will have been removed.

A research assistant will be removing your name and any identification from any and all assignments and organize and store the recorded data. Her role is to maintain students' anonymity and provide a data set where all names and identifications are removed from the assignments.

Once she collects your permission forms, she will be the only one to know who has agreed to allow their assignments to be used and those who didn't allow their assignments to be used for this research. Using these forms, she will then be able to identify the set of assignments that will be used in the research. If the assignments are available on Blackboard, the research assistant will download, remove all forms of identification, and place in a folder, which will host the identification-free data set of course assignments. If the assignments are handed in, she will copy and remove identification from those students' assignments that are part of the study. Once this is completed, she will hand back the whole set of papers to me for distribution back to students. She will make sure to mix the papers so that I cannot determine who is or isn't participating in the study. The research assistant will not share with me who is part of the study and who is not until the end of the semester after grades have been posted.

If you have any questions concerning the research study, please contact the researcher at 480 965 9633 or email her at michelle.e.jordan@asu.edu. If you have any questions concerning your consent form or identification removal of your assignments, please email Denise Brown at denisembrown@asu.edu. If you have any questions about your rights as a participant in this research, or if you feel you have been placed at risk, contact the Chair of the Human Subjects Institutional Review Board, through the ASU Research Compliance Office, at (480) 965-6788.

Thank you for your consideration,
Dr. Michelle Jordan, Principal Investigator

There are two options for participation in this study about how preservice teachers learn to design effective learning environments. Please check and sign below if you are willing to have your design project assignments included in the study and if you are willing to have your video-audio recorded class participation used in the study.

_____ Yes, I will participate in the study. The researchers have my permission to retain and analyze my assignments.

_____ Yes, the researchers have my permission to transcribe and use my video-audio recorded class participation.

_____ Yes, I will participate in a 20-minute audio-recorded interview outside of class time. I understand that the interview is voluntary; I can decline to be interviewed and still participate in the rest of the study. I understand that I may choose to receive ten extra credit points toward my grade or a \$5.00 Starbucks gift card in exchange for my participation in the interview.

_____ I am 18 years or older.

Signature

Date

PRINTED NAME: _____

Please fill out the following demographic data. It will be reported in aggregate form only.

Demographic Data

Gender

_____ Female _____ Male

_____ Age

Please check your program of study

____ Elementary Education Major

____ Dual Certification Major (elementary/special education)

____ Early Childhood Education Major

____ Secondary Education Major in content area _____

____ Educational Studies Major

____ Other (please explain) _____