2013

Quasi-experimental Study: The Effects Of Virtual Covert Audio Coaching On Teachers' Transfer Of Knowledge From Professional Development To Classroom Practice

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QUASI-EXPERIMENTAL STUDY:
THE EFFECTS OF VIRTUAL COVERT AUDIO COACHING ON TEACHERS' TRANSFER OF KNOWLEDGE FROM PROFESSIONAL DEVELOPMENT TO CLASSROOM PRACTICE

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Education
in the College of Education
at the University of Central Florida
Orlando, Florida

Summer Term
2013

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ABSTRACT

A quasi-experimental multiple time series design was used to analyze and compare the impact of two types of instructional coaching, face-to-face and virtual covert audio provided with Bluetooth technology, on teacher transfer of knowledge learned in professional development into classroom practice. Teacher transfer across baseline, intervention, and maintenance phases was analyzed.

The study was conducted at a public elementary school in a Florida suburban school district with approximately 750 students. Twelve teachers were randomly selected from teachers who volunteered to attend professional development. Six teachers (one from each grade level K-5) in the treatment group received virtual covert audio coaching. Six teachers (one from each grade level K-5) in the control group received face-to-face coaching.

Professional development was on RallyCoach™, a Kagan cooperative learning structure, which allows students to interact and practice procedural learning such as calculating math algorithms, defending a point of view, or editing writing. This structure was chosen to provide teachers with an instructional tool to teach and provide students practice for the speaking and listening strand of the Common Core State Standards. RallyCoach™ was also chosen to increase student engagement.

Data analysis included descriptive statistics and visual analysis methods. Both the control and treatment groups increased the mean (level) percentages of RallyCoach™ components implemented across time from baseline to intervention and from intervention to maintenance. There was an increasing trend line for implementation of RallyCoach™

components across phases for both study groups. The decreasing standard deviation across phases represented a decreasing variability of data and can be considered to show a treatment affect for both types of coaching. Teachers who received both types of coaching continued increased implementation into the maintenance phase when the coaching intervention was removed.

Data analysis revealed an increasing percentage of student pairs providing positive student-to-student interaction with an increasing trend line and a decreasing standard deviation (reduced variability) across time over phases. Face-to-face and virtual coaching had a positive impact on student-to-student positive interaction.

ACKNOWLEDGMENTS

Writing this dissertation and completing doctoral coursework has been a challenging and rewarding experience which I could not have completed without the support of many individuals. First, I would like to thank my husband, Toby, who encouraged me to start this process and continued to support and encourage me along the way. I would also like to thank my sons, Chris, Glenn, Jared, and Joshua, who are the catalysts for me to strive to be the best person that I can be. I want to thank my parents, Floyd and Ann Clevenger, for serving as role models for me and providing me with unconditional love.

Special thanks to my dissertation committee chair, Dr. Rebecca Hines, and other committee members – Dr. David Boote, Dr. Glenda Gunter, Dr. Leslie Sena, and Dr. Donald Boulware. I am fortunate to have had the opportunity to work and learn from each of you. Dr. Hines, thank you for giving guidance but allowing me to choose my path to discovery even if it was not the most direct. Dr. Boote, I am indebted to you for all your teaching within my coursework and acting as my champion throughout the dissertation process. Dr. Gunter, I am so honored to have been your student. Thank you for your direction to obtain support for editing. Dr. Sena, you have been a friend and confidant throughout the dissertation process. Thank you. Dr. Boulware. That you agreed to serve on my committee was humbling. Your feedback on my data collection and analysis is greatly appreciated. I am grateful to Dr. Mary Ann Lynn for support with editing.

I would also like to thank all the Volusia County School staff who served as part of my data collection team. Your help and support was invaluable through this process. A special thanks to the teachers and students who allowed me to work with them during the research study.

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CHAPTER 1
INTRODUCTION

Statement of the Problem

Student achievement and learning is the focus and goal of public education. Teachers should strive to continually improve instructional practices to result in the goal of student achievement and learning. Teacher professional development is the main vehicle available for teachers to learn, improve, and reflect on their craft of teaching (Blank & de las Alas, 2010; Villegas-Reimers, 2003; Wei, Darling-Hammond, Andree, Richardson, & Orphanos, 2009; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007).

Review of the literature provided an overview of the components of effective teacher professional development (Guskey, 2000; Joyce & Showers, 2002; Marzano, Pickering, & Pollock, 2003; Villegas-Reimers, 2003; Wei et al., 2009). Researchers noted the difficulty teachers can experience in transferring knowledge received in professional development into practice in the classroom. Coaching emerged in the literature as the most effective method to elicit teacher transfer of knowledge from professional development to a change in classroom practice to promote teacher effectiveness. (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007; Marzano el al., 2003; Villegas-Reimers, 2003; Wei et al., 2009). The current study was conducted to investigate the effect of virtual covert audio coaching to improve teacher transfer of knowledge learned in professional development to implementation in the classroom.

Rationale for the Study

Teacher professional development is one of the key elements in many educational reforms including legal reforms such as, No Child Left Behind (U. S. Department of Education, 2004), Race to the Top (U. S. Department of Education, 2009), and Individuals with Disabilities Education Improvement Act (U. S. Department of Education, 2010). Given the current standards-based movement in education, the focus has been placed on student achievement. Teacher professional development provides teachers with opportunities to learn new teaching practices and to improve their teaching craft (Blank & de las Alas, 2010; Villegas-Reimers, 2003; Wei et al., 2009; Yoon et al., 2007).

The work of previous researchers has established a research based, interconnected path to student achievement that includes the following discoveries: improving teacher practice can lead to improved student achievement (Darling-Hammond, 2000; Rivkin, Hanushek, & Kain, 2005; Sanders & Horn, 1998; Stronge, Ward, & Grant, 2011; Stumbo & McWalters, 2011; Wilson et al., 2008) professional development is one way to improve teacher practice (Blank & de las Alas, 2010; Killion & Harrison, 2006; Villegas-Reimers, 2003; Yoon et al., 2007; Wei et al., 2009); and coaching after professional development increases teacher implementation (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007). The current study was grounded in these research discoveries and was conducted to investigate the impact of virtual covert audio coaching on teacher implementation of a cooperative learning structure learned in professional development.

The Impact of Teacher Effectiveness on Student Achievement

Researchers have supported the notion that teacher effectiveness impacts student achievement (Darling-Hammond, 2000; Rivkin et al., 2005; Sanders & Horn, 1998; Stronge et al., 2011; Stumbo & McWalters, 2011; Wilson et al., 2008). In their seminal study, Sanders and Horn (1998) reported teacher effectiveness as the major determinant of student academic progress, more so than race, socioeconomic level, class size, and classroom heterogeneity. Darling Hammond (2000) reported that teacher effectiveness was more strongly related to student achievement than reduced class size, educational funding, and teacher salary.

Rivkin et al. (2005) used an extensive data set of information from Texas consisting of one-half million students in 3,000 schools to analyze the impact of educational factors on student achievement. The results of the study highlighted the importance of teacher effectiveness on student achievement by suggesting that moving a teacher's effectiveness score up one standard deviation on a teacher quality scale had a higher effect on student achievement than costly class size reductions (Rivkin et al., 2005).

Otto (2008) in a National Academy of Education white paper emphasized the impact of teacher effectiveness on student achievement with the following statement: "Good teaching matters. There is persuasive evidence that students benefit from high quality instruction and that these benefits are cumulative for students who have good teachers for several years" (p. 1). One recommendation made by Otto (2008) to establish

teacher quality was that districts, states, and the federal government should take steps to improve teacher access to high quality professional development.

Stronge et al. (2011) analyzed research on teacher effectiveness and determined that although studies that examined teacher impact on student learning explored teacher practice in different approaches, there was one common finding: teacher practice has a measurable impact on student learning. Stronge et al. (2001) conducted a study of teacher effectiveness using achievement data of 307 fifth-grade teachers from three public school districts in the southeast United States. A regression-based methodology, hierarchical linear modeling (HLM), was used to estimate the growth for all students. Using the analysis of student data, two teacher groups were formed with 17 teachers of the top-quartile students in one group and 15 teachers of the bottom-quartile students in a second group. Using multiple observation instruments, the teacher groups were rated by trained observers on 15 teacher effectiveness dimensions. The results showed that the top-quartile teachers were rated higher on all 15 teaching dimensions than the bottom-quartile teachers. The differences in student achievement in mathematics and reading between the top- and bottom percentile teachers exceeded 30 percentiles.

Stumbo and McWalters (2011) explained the shift of focus from teacher quality to teacher effectiveness in recent legislation such as Race to the Top, Investing in Innovation, and the School Improvement Grants. Teacher quality refers to how well teachers know content or teaching pedagogy as measured by courses they have taken or certification examinations they have passed. Teacher effectiveness refers to how well a

teacher has addressed student needs and achieved student learning gains. Based on this finding, teacher effectiveness should be the goal of teacher professional development.

Professional Development Can Improve Teacher Effectiveness

Established in research is the premise that improving teacher effectiveness is an important factor leading to increased student achievement. Professional development is reported in the research as the course of action used to improve teacher effectiveness (Blank & de las Alas, 2010; Killion & Harrison, 2006; Villegas-Reimers, 2003; Wei et al., 2009; Yoon et al., 2007).

Villegas-Reimers (2003) reviewed studies that reported that professional development has positive impacts on teacher beliefs and practices, student achievement, and educational reforms. The National Commission on Teaching and America's Future report included the following statement about the impact of professional development on student achievement: "Investments in teachers' knowledge and skills net great increases in students' achievement, more than other uses of educational dollars" (Darling-Hammond, 1999, p. 32). Killion & Harrison (2006) added that as district and school administrators identify teachers who need support to improve instruction "professional development is the only practical tool available to increase teacher effectiveness of current classroom teachers" (p. 8).

Yoon et al (2007) identified over 1,300 studies that claimed to address the impact of professional development on student achievement. Of the 1,300 identified studies, only nine met the U.S. Institute of Education Sciences' What Works Clearinghouse

(2011) evidence standards. Of these nine studies, teachers who received an average of 49 hours of professional development were able to boost student achievement scores by about 21 percentile points (Yoon et al., 2007).

In a report prepared for the National Staff Development Council (NSDC), Wei et al. (2009) proposed that improving teacher professional development is a critical element of improving student academic performance. Wei et al. compared the components of effective professional development programs in countries across the globe. Recommendations were made that professional development in the United States should be improved to include opportunities for learning within professional learning communities, job embedded learning opportunities, and ongoing learning and follow up through practices like instructional coaching (Wei et al., 2009).

In a meta-analysis of the effects of teacher professional development on student achievement, Blank & de las Alas (2010) reported that student achievement was higher for teachers receiving professional development in mathematics instruction than for students of non-participating teachers. Based on the results of the meta-analysis, it was recommended that scientific research design should be employed to measure the effect of specific teacher professional development and the impact it had on student achievement (Blank & de las Alas, 2010).

Providing effective professional development follow up techniques that lead to changes in teacher practice is imperative. Coaching emerged in the literature as the most effective method to elicit teacher transfer of knowledge from professional development to a change in classroom practice (Guskey, 2000; Joyce & Showers, 2002; Marzano el al.,

2003; Villegas-Reimers, 2003; Wei et al., 2009). The present study was focused on the effect of virtual covert audio coaching on accuracy of implementation of a cooperative learning structure, RallyCoach™, in the classroom after professional development.

Quality Teacher Professional Development

Review of the literature on quality teacher professional development revealed one of the strengths in this field was that components of effective professional development had been identified (Guskey, 2000; Joyce & Showers, 2002; Marzano et al., 2003; Villegas-Reimers, 2003; Wei et al., 2009). Providing follow-up support for professional development through coaching was determined to have the most effective impact on teacher practice (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007). Guskey (2000) described coaching (direct observation) as the follow-up technique that yields the most relevant information about professional development implementation.

Joyce and Showers (2002) compared professional development components by the percentage of participants that attained the outcomes of knowledge, skill, and implementation. Coaching resulted in the highest percentage of participant attainment for all three outcomes. A total of 95% of teachers who received coaching showed mastery of knowledge, skill and implementation of the content of the professional development (Joyce & Showers, 2002). According to Killion and Harrison (2006), school districts have utilized school-based coaches to conduct and provide follow up coaching support of professional development to improve teacher and student learning.

Knight (2007) analyzed professional development research, revealing that traditional one-shot professional development failed to have a significant impact on the instructional practice of teachers. Knight's professional development approach that used instructional coaching was employed by the Pathways to Success project in Topeka, Kansas and has rendered an 85% implementation rate.

Virtual Covert Audio Coaching (CAC)

Coaching is a process used to support others to improve a set of skills and the effective use of those skills (Knight, 2009). Coaching emerged in the literature as the most effective method to elicit teacher transfer of knowledge from professional development to a change in classroom practice to promote teacher effectiveness. (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007; Marzano et al., 2003;Villegas-Reimers, 2003; Wei et al., 2009).

Covert audio coaching (CAC), which is occasionally referred to as bug-in-the-ear (BIE), uses technology tools to provide coaching. CAC technology includes an earpiece such as a two-way radio headset (Bennett, 2010) or wireless Bluetooth technology (Rock et al., 2009b; Wade, 2010) used by the person being coached and a wireless microphone used by the coach to communicate with the ear piece. This allows the coach to provide coaching and feedback that only the individual being coached can hear. CAC can be conducted with the coach and the individual receiving coaching at the same location (Bennett, 2010; Goodman, 2005; Scheeler, Congdon, & Stansbery, 2010; Scheeler, McAfee, & Ruhl, 2006) or through a virtual format with the coach and trainee or teacher

at a different location (Rock et al; 2009b**).** The present study employed the virtual CAC format that allowed a district instructional coach to provide coaching from a centralized office to teachers in their classrooms. Just as virtual or online learning provides access to learning across geographical locations, virtual CAC allows access to coaching that is not bound by geographical location. Recent studies have examined the effectiveness of CAC on teacher acquisition and demonstration of knowledge and skills (Bennett, 2009; Goodman, 2005; Oliver, 2008; Rock et al., 2009c; Scheeler et al., 2006; Scheeler et al., 2010; Wade, 2010; Wadsworth, 2001).

Wadsworth (2001) reported the use of several communication media tools for virtual coaching that included: e-mail, collaborative web forum, instant text chat, help desk, progress reporting database, and synchronous text chat space. The use of advanced technological communication tools such as Bluetooth technology has been utilized with virtual CAC to support pre-service and in-service teachers to receive feedback on implementation of research based instructional practices (Rock, Gregg, Gable, & Zigmond, 2009a; Rock et al., 2009b, 2009c; Scheeler et al., 2010; Wade, 2010).

The present study was conducted to provide additional insight into the effectiveness of virtual covert audio coaching to support teacher implementation of skills and knowledge learned through professional development. The goal of this study was to build on prior research related to the use of Bluetooth technology for virtual CAC of teacher implementation of a cooperative learning structure.

Purpose of the Study

The purpose of this study was to determine if using virtual covert audio coaching (CAC) through bug-in-the-ear (BIE) Bluetooth technology to provide teacher prompting and feedback increased transfer of learning about a cooperative learning structure into effective classroom implementation. Transfer of learning deals with transferring knowledge and skills from one situation to another. Within teacher professional development, this transfer or implementation involves taking the knowledge and skills learned in the training situation and applying and using them in the classroom with students. This is often accomplished by providing effective feedback for teachers engaged in changing their teaching practice.

Transfer of Learning

Perkins and Salomon (1992) presented a foundational explanation of a low road/high road transfer of learning theory that described two types of transfer: reflexive or low road transfer and mindful or high road transfer. Low road transfer happens when the transfer context is similar to the learning context. Low road transfer occurs with teacher transfer of educational strategies when the teacher has some prior knowledge or experience with the educational strategy being learned or if it has similarities to other educational strategies the teacher already uses. Perkins and Salomon (1988) suggested that generalization of low road transfer can be obtained by repetition and practice. Virtual CAC requires teachers to implement and practice the educational strategy learned in professional development. High road transfer is required when the transfer context is

dissimilar from the training context (Perkins & Salomon, 1988). High road transfer would be required when the teacher has no prior knowledge or exposure to the educational strategy being learned or the educational approach is much different from the teacher's current teaching methods. Perkins and Salomon (1998) suggested that generalization of high road transfer requires reflective thought on application of the process and making connections with previous practice as well as reflections with others about the transfer. Virtual CAC can provide teachers immediate, corrective feedback on implementation of a new educational strategy that can support high road transfer. In the present study, the transfer of a cooperative learning structure, RallyCoach™ from professional development to classroom implementation was analyzed. The type of transfer required, low or high, depended on the teacher's current classroom practice and knowledge of cooperative learning. As suggested by Perkins and Salomon (1988), regardless of the level of transfer required, virtual CAC can provide the support for transfer including immediate effective feedback.

Effective Feedback

Effective feedback has been described in the literature to elicit change in teacher practice, lead to transfer of knowledge, or result in generalization of teaching behaviors (Bennett, 2009; Goodman, 2005; Oliver,2008; Rock et al.,2009a; 2009b; 2009c; Scheeler, 2008; Scheeler et al., 2010; Scheeler & Lee, 2002; Scheeler, Ruhl, & McAfee, 2004; Wade, 2010).

Scheeler and Lee (2002) implemented a study to examine the effects of immediate feedback on pre-service teacher completion of a three-part teacher to student interaction that included a teacher prompt or question, a student answer, and teacher feedback. Results revealed that immediate feedback was more effective than delayed feedback to improve pre-service teacher implementation of the three-part sequence. Scheeler and Lee (2002) discussed that immediate feedback may be more effective because the pre-service teachers did not practice incorrect or ineffective implementation that may occur with delayed feedback.

Scheeler et al. (2004) conducted a literature review to identify attributes of feedback that would result in a change of specific teaching behaviors. Scheeler and associates classified feedback attributes as either effective or promising. Immediate feedback was the only attribute that emerged as effective. Feedback attributes that were identified as promising were specific, positive, and corrective (Scheeler et al., 2004).

An underlying theory of CAC is immediacy of feedback. Scheeler (2008) carried out a literature review on providing immediate feedback through CAC. Results of the review showed that teacher feedback through CAC promoted acquisition of skills and generalization as well as the transfer to using the skills within classroom instruction.

The purpose of the current study was to determine if virtual CAC increased teacher accuracy of implementation of cooperative learning structure learned in professional development. Coaching methods utilized in the current study, virtual CAC provided to the treatment group and face-to-face coaching provided to the control group,

were implemented with real time (in the moment) coaching that provided immediate feedback to teachers as they implemented the cooperative learning structure.

Research Questions

This study examined the effectiveness of virtual CAC to improve teacher implementation of a cooperative learning structure through instructional coaching that provided prompting and immediate feedback via Bluetooth technology. Two research questions were addressed:

1. Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback, in improving teacher accuracy of implementation of a cooperative learning structure learned in a face-to-face professional development session?
2. Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback, in guiding the teacher to increase student-to-student positive interactions?

During both types of coaching, virtual CAC and face-to-face, the teacher was provided immediate feedback on implementation of the cooperative learning structure by using "real time" in the moment coaching. This real time coaching was provided within the virtual CAC by the teacher receiving immediate feedback during instruction via the Bluetooth headset from the coach. Real time coaching was provided during the face-to-face coaching by the coach providing immediate feedback to the teacher while the students were participating in the cooperative structure with a partner.

Significance of the Study

Joyce and Showers (2002) documented the impact of coaching on changing teacher practice after professional development. Transfer of executive implementation was zero; professional development was only 5% with guided practice but increased to 95% with coaching. The potential impact of providing immediate feedback to teachers with virtual CAC can increase the ability of teachers to transfer knowledge from professional development into classroom practice.

Funding can be a major barrier to providing follow up coaching after teacher professional development. Guskey (2000) described coaching (direct observation) as the follow-up technique that yields the most relevant information about professional development implementation. However, Guskey stated the most significant drawback of coaching (direct observation) was the cost. Virtual CAC could address both the barriers of time and funding. Providing virtual CAC from a central location could save travel time to and from school sites to provide face-to-face coaching. The coach could utilize the time saved to coach more teachers. For districts that provide travel reimbursement to coaches, virtual CAC could result in monetary savings since travel reimbursement would not be necessary.

Recent reform of teacher evaluation systems require that teachers self assess their own practice. Therefore, teacher reflection and self-assessment should be an integral part of coaching (Killion & Harrison, 2006; Knight, 2007). This study incorporated a teacher self-assessment piece that allowed teachers to begin to practice self-assessment as part of professional development follow up.

Research Design

The faculty of a K-5 elementary school in Volusia County, Florida received two days of Kagan Cooperative Learning Structures professional development. Teachers were grouped by their school based professional learning communities (PLC) for the professional development. A quasi-experimental research design was utilized by randomly selecting teachers for either a treatment group or a control group. A total of 12 teachers participated in the study. Six teachers, one from each grade level K-5, were randomly selected for the treatment group that received bug-in-ear virtual coaching. Six teachers, one from each grade level K-5, were randomly selected for the control group that received face-to-face coaching.

Teachers chosen for the treatment group received training on how to use the equipment for virtual CAC. The researcher collaborated with the school's principal and media specialist as well as district management information system (MIS) staff to be sure equipment was installed and working properly in each participant's classroom.

The researcher used four forms for data collection during coaching sessions.

1. Professional Development Implementation Observation Form (Appendix A) was used by data collectors to record data on implementation of the steps of RallyCoach™. Data collectors were trained by the researcher on using the form with the data collection protocol (Appendix B). Data collectors were the researcher/coach, the principal and assistant principal of participating school, one teacher at participating school, district staff, and other trained observers. Inter-rater observation agreement was calculated.

2. The Kagan Coaching Form for RallyCoach™ (Appendix C) used by researcher/coach to provide feedback to the teachers on implementation steps of RallyCoach™ was distributed to teachers.
3. The Kagan Coaching Running Record Form (Appendix D) was used by the researcher/coach to keep a running log of feedback provided for the teachers.
4. The Teacher Self-assessment Form (Appendix E) was used by the teacher participants during coaching sessions to record student implementation steps.

During virtual coaching sessions, the researcher provided immediate verbal feedback via Bluetooth technology to the teachers in the treatment group on implementation of RallyCoach™. The researcher also provided verbal feedback during face-to-face coaching to the teachers in the control group for the implementation of RallyCoach™. The teachers in the treatment group received an electronic copy of the Kagan Coaching Form for RallyCoach™ with written positive feedback and coaching statements. Teachers in the control group received the original hard copy of Kagan Coaching Form for RallyCoach™ that provided written positive feedback and coaching statements. The researcher documented, using the Coaching Observation Form, the steps of RallyCoach™ that were implemented correctly prior to coaching feedback, teacher implementation of coaching feedback, and future areas to coach. These data were analyzed across sessions for each teacher to determine effectiveness of virtual CAC on implementation.

Limitations of the Study

The quasi-experimental design can be considered a limitation of the current study. The methodology used to study professional development has been reported as a weakness in the field. Lawless and Pellegrino (2007) reported that using true randomized experiments or quasi-treatment designs were rare in the literature for teacher professional development. Marzano et al. (2003) explained that true treatment conditions can be difficult to apply to teachers in classroom settings where educational interventions are implemented. A true experimental design was not implemented in this study because students cannot be randomly assigned to classrooms. However, the teachers were randomly assigned to the treatment or control groups, making the study quasi-treatment. The number of participants was limited due to the time frame allowed for the study. The researcher was the only coach this was a limitation.

Definitions

Definitions Related to Coaching

Covert audio coaching (CAC): Bennett (2009) defined covert audio coaching, also known as bug-in-the-ear (BIE) as:

> CAC technology consists of a two-way radio system, whereby the trainer, or coach, has a radio and the individual being supported has a radio with an attached earpiece. This allows the coach to deliver feedback at a distance and in such a way that only the target person can hear. (p. 19)

Instructional coaching: Knight (2009) described instructional coaching as the "collaborative work of teachers and coaches to incorporate research based instructional practices into classroom instruction in help students learn more effectively" (p. 13).

Immediate Feedback: Scheeler, Ruhl, & McAfee (2004) reported that coaching feedback that leads to change in teaching practice should be immediate, positive, specific, and corrective. The control group teachers received immediate feedback from the coach being present in the classroom and having one on one coaching conversation with the teacher while students performed the steps of RallyCoach™. This is sometimes referred to as real time coaching. The treatment group teachers received immediate feedback from the coach who was located at a district office via a Bluetooth earpiece while students performed the steps of RallyCoach™.

Modeling: When verbal coaching prompts were not sufficient to promote teacher implementation, the coach provided modeling to the control group teachers by performing the RallyCoach™ steps in the classroom as the teacher observed the coach. Modeling was provided to the treatment group via watching a video of another teacher performing the RallyCoach™ steps with students. Teachers were also coached to provide modeling of the steps for the students.

Real Time Coaching: Kagan (2006) used the term "real time coaching" to describe in the moment coaching that happens immediately after or during instruction. Real time coaching was provided during the face-to-face coaching by the coach, who was present in the classroom, providing immediate feedback to the teacher while the students were participating in the cooperative structure with a partner.

Virtual covert audio coaching (Virtual CAC): Virtual covert audio coaching is a form of CAC where the coach and the person receiving coaching are not at the same geographical location. Internet technology is used for the interaction between the coach and trainee. This term was coined by the author to distinguish the difference between CAC that occurs with coach and trainee at same location and CAC that occurs with coach and trainee at different locations.

Virtual coaching: Wadsworth (2001) reported that using an internet-based communication technology for coaching can assist geographically separated trainees to practice learned skills, and provide constructive feedback free of space and time constraints.

Definitions Related to the Intervention

Cooperative learning: Johnson, Johnson, and Holubec (1994b) defined cooperative learning as "the instructional use of small groups so that students work together to maximize their own and each other's learning" (p. 13).

Implementation: For the purpose of this study, implementation was defined as the accuracy of delivery in which teachers used RallyCoach™ in the classroom with students after they received professional development. Implementation demonstrates teachers moving from knowledge to instructional practice.

In-service professional development: In-service professional development consists of the professional learning activities that teachers participate in after they receive their professional certification.

RallyCoach™: RallyCoach™ is a Kagan cooperative learning structure that promotes procedural learning. Students interact to acquire and practice skills and procedures.

Teacher professional development: Guskey (2000) defined professional development "as those processes and activities designed to enhance the professional knowledge, skills, and attitudes of educators so that they might, in turn, improve the learning of students" (p. 16). Wei et al. (2009) defined professional development as "both externally-provided and job-embedded activities that increase teachers' knowledge and change their instructional practice in ways that support student learning" (p. 1).

Definitions Related to Technology

Bluetooth: Bluetooth is a short-range wireless radio technology that allows electronic devices to connect to and communicate with one another without being connected by wires.

Bluetooth adaptor: A Bluetooth adaptor is a device that enables a personal computer to communicate with other Bluetooth devices; most new computers have embedded Bluetooth capability and do not need an adapter.

Bluetooth earpiece: a Bluetooth earpiece is a type of wireless hands-free headset.

Bug-in-the-ear (BIE): Scheeler et al. (2006) defined bug-in-the-ear as an inexpensive portable radio communication system (earpiece and microphone components) used to deliver immediate feedback to teachers delivering classroom instruction. Rock et al (2009a) developed a bug-in-the-ear system composed of the following components: Bluetooth headset, Bluetooth adapter, webcam, and Skype (a free Internet-based telephone–Voice-over-IP--[VoIP] system). Bug-in-the-Ear (BIE) is sometimes referred to as covert audio coaching).

Summary

This chapter has presented information related to the purpose of the study and its clarifying components. The impact that coaching can have on teacher transfer of knowledge learned in professional development on a change in classroom practice has been discussed. Although this impact is documented in the research (Guskey, 2000; Joyce & Showers, 2002; Marzano et al., 2003; Villegas-Reimers, 2003; Wei et al., 2009), many teachers do not receive coaching due to time and funding restraints of school districts. Virtual CAC can allow coaches to use technology to provide immediate feedback and coaching without having to use funds to travel to the location of the teacher. The goal of this study was to build on prior research on the use of Bluetooth technology in covert audio coaching and focus on use of the technology in virtual covert audio coaching of teacher implementation of a cooperative learning structure.

CHAPTER 2
REVIEW OF THE LITERATURE

Introduction

In this chapter, the research and scholarship on several topics related to the current study are discussed. These include quality teacher professional development, methodology used to study teacher professional development, teacher professional development evaluation, types of coaching, and cooperative learning. Particular attention has been focused on the research and scholarship supporting virtual covert audio coaching (CAC), specifically, the effects of using virtual CAC in professional development implementation. Although, researchers have shown that virtual CAC can improve teacher implementation of effective instructional practices (Goodman, 2005; Rock et al., 2009a, 2009b, 2009c; Scheeler et al., 2006; Wade, 2010), their work has not focused on the effectiveness of implementation of cooperative learning structures. This study was conducted to provide additional insight into using virtual CAC to elicit and sustain teachers' accuracy of using a cooperative learning structure after professional development. Previous studies have been focused on the impact of CAC on the practices of pre-service teachers (Rock et al., 2009a, 2009b, 2009c) and special education teachers (Wade, 2010). The current study was designed to add to the literature by examining the impact of CAC on the practices of Kindergarten through fifth-grade teachers with varied experience levels teaching within a general education classroom.

Search Process

The author conducted multiple literature searches between September of 2008 and April of 2012 using the following search terms: teacher professional development, follow-up for teacher professional development, teacher in-service, virtual professional learning, virtual coaching, bug-in-the ear, covert audio coaching, instructional coaching, cognitive coaching, executive coaching, real time coaching, praise, positive student interaction, and cooperative learning. Searches were conducted in the following databases: Eric--EBSCOhost, Educational Research Abstracts Online, Dissertations & Theses, Google Scholar, and Ulrich International Periodicals Directory. Additional studies were located searching the reference sections of studies located within searches. The inclusion criteria required that the study must address teacher professional development, a form of coaching, positive student interaction (praise), or cooperative learning. Both seminal works and current research were included in the review.

Quality Teacher Professional Development

Review of the literature on quality teacher professional development revealed that one of the strengths in this field is that the components of effective professional development have been identified (Guskey, 2000; Joyce & Showers, 2002; Marzano et al., 2003; Villegas-Reimers, 2003; Wei et al., 2009). Providing follow-up support for professional development is one of those components, and the professional development component with the most effective impact on teacher practice has been coaching (Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007; Wei et al., 2009).

The National Staff Development Council (NSDC), recently renamed Learning Forward, is a non-profit organization whose purpose has been to provide research, information, and opportunities for professional development to teachers. In a technical report written for the NSDC in 2009, Wei et al. (2009) defined quality teacher professional development by three types of standards: content (what is learned); context (organization, culture, setting where it is learned); and process (the way it is learned and implemented).

The content standards for quality teacher professional development focus on providing teachers with research based instructional strategies for teaching and assessing student learning, ways to meet the needs of diverse learners, and skills to work with families (Wei et al., 2009). The content standards recommend that teacher professional development be provided within adult learning communities, offer opportunities for collaboration among teachers and support from school administrators. The process standards also proposed that teachers collaborate to learn and implement research based instructional practices and use student data to reach instructional decisions (Wei et al., 2009).

The following components of quality professional development were presented by Joyce and Showers (2002)

1. Experiences to promote knowledge and understanding of a skill that include lectures, readings, and discussions.
2. Modeling to allow students to see the skill in action which can be provided by live demonstrations or videos.
3. Guided Practice of skill imbedded within the professional development session(s).

4. Peer Coaching during implementation within the classroom. Teachers observe and are observed and provided time to collaborate to discuss problems encountered. (pp. 73-74)

Table 1 shows the impact of professional development components reported by Joyce and Showers (2002) in their research. Joyce and Showers (2002) have been conducting research in the field of teacher professional development since the 1980s and the impact of coaching on knowledge, skill, and transfer from professional development is widely accepted.

Table 1

Components and Attainment of Outcomes by Percentage of Participation

	Attainment of Outcomes		
Components	Knowledge (thorough)	Skill (Strong)	Transfer (Executive Implementation)
Study of theory	10	5	0
Demonstrations	30	20	0
Practice	60	60	5
Peer coaching	95	95	95

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Villegas-Reimers (2003) made the following recommendations for quality professional development based on the consistency of the findings reported in literature from many countries, in varied settings, and multiple contexts:

1. There is not one model of professional development that is best in all situations of teacher professional development and the professional developer provider should consider the social contest of the school, current reforms and curriculum already in place at the school, as well as, the size, population, and

demographics of the school to determine what the best model of professional development might be.
2. Professional development should be a long term ongoing process based on constructivism and collaboration in which teachers are active learners and reflective practitioners.
3. Professional Development should be integrated with current school based reforms and curriculum.
4. Professional development providers must model the constructivist approach when planning and presenting professional development.
5. Follow up support is an important component of professional development.
6. Technology should be used as a means of presenting, supporting, and providing follow up for professional development. (p. 13)

However, Villegas-Reimers (2003) also reported that there was not one model of professional development that was best in all instances. Instead, she recommended that professional development providers should consider the social context of the school, current reforms and curriculum already in place at the school as well as its size, population, and demographics to determine the best model of professional development. She also recommended that technology be utilized to a greater extent to present and provide follow up support for teacher professional development. This was a timely suggestion given the increased use of technology throughout the U.S. culture and the lack of funding and time constraints for face-to-face teacher professional development (Guskey, 2000; Killion & Harrison, 2006; Villegas-Reimers, 2003).

Methodology Used to Study Teacher Professional Development

In contrast to the identification of its components, the methodology used to study effective professional development has been reported as a weakness in the field. Lawless and Pellegrino (2007) reported that using true randomized experiments or quasi-treatment designs were rare in the literature for teacher professional development. Marzano et al.

(2003) explained that true treatment conditions can be difficult to apply using teachers in classroom settings where educational interventions are implemented. However, he also reported that case studies have been effective in analyzing the study of changes in teacher practice and student achievement as a result of professional development. Therefore, Marzano et al. (2003) suggested that teachers not be discouraged to engage in research just because it cannot be a true treatment methodology. Conversely, in an international literature review, Villegas-Reimers (2003) identified several types of studies appropriate for teacher professional development. Included was (a) quantitative research including treatment using random samples with control and treatment groups, (b) quasi-treatment, and (c) qualitative research including case studies. The following quotation from Wei et al. (2009) taken from the most recent National Staff Development Council (NSDC) technical report summarized the importance of striving to conduct and report a range of research methodologies for studying professional development:

> This review of research includes studies that use a range of research methodologies. We chose not to limit our review to those studies that utilized experimental treatment methods only, as there are important and valid research studies that draw on qualitative and case study methodologies. In these cases, we note that the inferences that can be drawn from such research should be treated as suggestive rather than conclusive. (p. 3).

A true experimental design was not implemented in the current study because students could not be randomly assigned to classrooms. However, the current study does utilize a quasi-experimental design.

Teacher Professional Development Evaluation

There are some weaknesses in the research on teacher professional development evaluation. Guskey (2000) reported that though teacher implementation or a change in teacher practices is the most significant outcome for professional development, most professional development evaluation is based on surveys of participants that measure teachers' perceptions of an intervention, not if they actually learned and implemented the intervention. According to Guskey (2000), a change in teacher practice or implementation of new skills is what leads to the greatest impact on student learning as a result of professional development. Direct observation with feedback is a recommended way to evaluate teachers' use of knowledge and skills learned in professional development (Guskey, 2000; Killion & Harrison, 2006; Knight, 2007). Coaching involves ongoing support through modeling, classroom observations, and feedback on practice. Killion and Harrison and Knight described teacher observation and feedback as a key component of coaching. In this study, coaching was utilized to evaluate teacher implementation of a cooperative learning structure after professional development.

Theoretical Base of Coaching

Effective coaching practices are grounded in multiple theories of learning including social cognitive theory (Bandura, 1997; Gredler, 2009) and the partnership principal theory (Knight, 2007).

Bandura (1997) developed the social cognitive theory that proposed that individuals can learn through both behavior consequences and observation of modeled

behavior within their environment (Gredler, 2009). The behavior consequences element of the social cognitive theory is present when feedback is provided to teachers in the coaching process. The observation of modeled behavior element of the social cognitive theory occurs during initial training preceding coaching or as coaches model for teachers as part of the coaching process. After the initial development of the social cognitive theory, Bandura realized the importance of self-efficacy and incorporated the element into his theory. Self-efficacy influences the choices individuals make, the effort they put forth, how long they persist when confronting obstacles (including failure) and how they feel (Pajares,2002). Coaching incorporates teacher self-efficacy through teacher self-assessment opportunities and collaborative conversations between coach and teacher. The current study incorporated a teacher self-assessment within the coaching process.

Knight (2007) proposed that instructional coaching was grounded in the theory of partnership principles that he had developed from his study of coaching across multiple disciplines and industries. Knight's theory of partnership principles includes seven principles of interaction between teachers and coaches: equality, choice, voice, dialogue, reflection, praxis, and reciprocity (Knight, 2007).

Types of Coaching

Coaching is used to improve the performance of individuals in many areas including job performance, life skills, and interpersonal relationships. Instructional coaching used as follow-up coaching for teacher professional development is grounded in the implementation of various types of coaching in other fields including executive

coaching and cognitive coaching (Knight, 2007). The current study investigated the use of virtual CAC as a form of instructional coaching,

Executive Coaching

Executive coaching is a form of coaching used in the business world for career coaching and life coaching to develop effective leadership within industries (Otto, 2008). Otto provided the following definition for executive coaching:

> Executive coaching is an experiential and individualized leader development process that builds a leader's capability to achieve short- and long-term organizational goals. It is conducted through one-on-one and/or group interactions, driven by data from multiple perspectives, and based on mutual trust and respect. The organization, an executive, and the executive coach work in partnership to achieve maximum impact. (Otto, 2008, p. 19)

In further explaining executive coaching, Goldsmith, Lyons, and Frees (2000), as cited in Knight (2007), stated:

> An executive coach establishes and develops healthy working relationships by surfacing issues (data gathering), addressing issues (through feedback), solving problems (action planning), and following through (results) – and so offers a process in which people develop and through which obstacles to obtaining business results are removed. (Knight, 2007, p. 9)

The actions of an executive coach described by Goldsmith et al. (2000) are the same coaching actions that instructional coaches can use to assist teachers.

Cognitive Coaching

Cognitive coaching guides coaches to support individuals with the processes of planning, reflecting, and problem solving (Costa & Garmston, 2012). Costa and Garmston defined cognitive coaching as "a set of strategies, a way of thinking and a way

of working that invites self and others to shape and reshape their thinking and problem solving capacities" (p. 1). Cognitive coaching is based upon the Costa and Garmston's assumption that a change of practice (behavior) results from a change in belief and that individual reflection is a key to coaching (Knight, 2007).

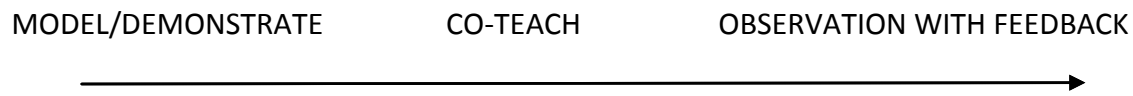
The current study incorporated three levels of cognitive coaching. The first level was coach-to-teacher, and cognitive coaching was incorporated as part of the instructional coaching process. The second level of cognitive coaching in the current study was teacher-to-student as the teacher transferred knowledge of a cooperative learning structure into classroom practice with students. Student-to-student coaching during the RallyCoach™ structure was the third level of cognitive coaching in the current study. This third level also encompassed the student-to-student positive interaction incorporated into the steps of Rally Coach and was the focus of the second research question in the current study.

Instructional Coaching

As the researcher reviewed the information on cognitive and executive coaching, it became evident that aspects of both these types of coaching were foundational to instructional coaching. The cycle of data analysis, action planning, implementation with feedback, and more data analysis of executive coaching are incorporated into instructional coaching. The reflective aspect of cognitive coaching is a component of instructional coaching.

Knight (2009) described instructional coaching as "the collaborative work of teachers and coaches to incorporate research based instructional practices into classroom instruction in help students learn more effectively" (p. 13). Knight emphasized the importance of confidentiality in coaching so that it is a learning experience and not evaluative. In the Pathways to Success Project in Topeka, Kansas, Knight (2007) reported that instructional coaching rendered an 85% implementation rate.

Killion and Harrison (2006) suggested using a continuum of support for coaches to use to support classroom implementation from professional development: Figure 1 shows that continuum



Note: Reproduced with permission from *Taking the lead: New roles for Teachers and School-based Coaches*, by J. Killion and C. Harrison, p. 53. Copyright by National Staff Development Council.

Figure 1. Continuum of Coaching Support

Covert Audio Coaching

Bennett (2009) defined covert audio coaching, also known as bug-in-the-ear (BIE), as follows:

> CAC technology consists of a two-way radio system, whereby the trainer, or coach, has a radio and the individual being supported has a radio with an attached earpiece. This allows the coach to deliver feedback at a distance and in such a way that only the target person can hear. (p. 19)

Previous researchers have documented the positive effects of CAC on teacher practice. (Bennett, 2009; Goodman, 2005; Oliver, 2008; Scheeler et al., 2006; Scheeler el al., 2010). Goodman (2005) completed a dissertation study to investigate the effects of providing immediate feedback with CAC (Bug-in-the-Ear) on teacher-student interaction for three special education teachers with less than three years experience. Interaction was defined as a learn unit that included: teacher antecedent (question); student behavior (response); and consequence (reinforcement or correction). CAC coaching was provided by the coach who was in the back of the classroom using a radio transmission system that consisted of a Motorola two-way radio, model number T4500, and single ear bud/microphone. Goodman's results indicated that "feedback delivered using CAC increased effective teacher-student academic interactions"(p. 58). Goodman recommended further research to include using CAC to improve the skills of in-service teachers and varying the teacher behaviors to be coached.

Scheeler et al. (2006) reported that CAC was an efficient and nonintrusive way to provide immediate feedback to pre-service teachers providing instruction in the classroom. A CAC device, consisting of a personal FM system with a transmitter and portable receiver, was used to coach pre-service special education teachers on specific teaching behaviors for providing direct instruction to small groups of students. The researcher sat in the back of the classroom to provide immediate coaching feedback. Targeted teaching behaviors improved during the coaching phase and through the maintenance phase. Scheeler et al. (2006) reported that one advantage of using CAC was that classroom instruction did not have to be interrupted to provide immediate feedback.

The teacher was the only one who heard the feedback, and the lesson and student engagement were not disrupted.

Oliver (2008) used a multiple baseline design to investigate the impact of using CAC to provided immediate feedback to three parents to prompt their child with autism to improve performance of routine tasks in the individual home setting. An individual routine task was selected for each child through parent interviews and pre-baseline observations by the researcher. The CAC system utilized by Oliver consisted of Motorola two-way radios, model T-6500 with a single ear bud for mothers to wear, and a single ear bud/microphone system for the coach (researcher). Covert audio coaching was performed with the coach and data recorder in the room with the parent and child, but they were not visible to the child. Results indicated that the need for prompting decreased for all three parents from baseline to generalization, and all three parents reduced the use of ineffective verbal prompts and increased the use of gestural prompts, visual supports, and praise. Results also showed that the children with autism increased their performance on their individual specific household tasks for which their parents received CAC, and the increased performance continued through the generalization phase.

Bennett (2009) studied the effect of CAC to support three adults with disabilities to improve job performance. The participants' ages ranged from 22 to 42 with an IQ range from 38 to 69. All three participants had previously participated in supported employment and were not learning a new job task. Bennett's objective was to measure the impact of CAC on improving the participants' fluency, independence, and accuracy

of currently performed job tasks including sweeping, cleaning windows, and stacking grates. Bennett (2009) used an experimental design that consisted of baseline, intervention, and follow-up phases. The CAC equipment included two-way radios: Midland, Model LXT276VP; and Midland X-tra Talk Adventure Headsets, Model AVP-H4. Observations were conducted on-site at the participants' job locations by the researchers and two other trained observers. CAC feedback was delivered by the researcher on location at participants' job sites. The researcher stood far enough away from participants (at least 15 feet) so that feedback could be heard only through the ear bud. Results of Bennett's study revealed that all three participants increased accuracy of the job task and maintained the accuracy through the follow-up phase after the CAC intervention was removed .The participants improved fluency of job tasks but still did not reach the rate of fluency for an employee without disabilities. Bennett suggested that CAC can improve work skill performance of adult with disabilities.

Scheeler et al. (2010) studied CAC as a collaboration tool that allowed in-service co-teachers to provide immediate feedback to their teaching partners on implementation of an instructional technique, three-term contingency (TTC) trials, during instruction. A TTC trial consists of a three-sequence interaction between teacher and student during instruction. Scheeler et al. (2010) defined a TTC trial as a: "presentation of the antecedent (A) by the teacher, response [R] by the student, and the follow-up feedback on the response or consequence (C) by the teacher" (p. 33).

The CAC device used included a Personal FM System (Williams Sound, Model 300), a portable transmitter (capable of transmuting over 150 feet), and a receiver. The

co-teacher who was teaching wore a receiver and earpiece. The other co-teacher who provided peer coaching wore a headset and transmitter to provide direct feedback on implementation of TTC trials to the partner providing instruction. After 10 to 20 minutes of instruction, the co-teachers traded roles so that the instructing teacher became the peer coach, and the peer coach became the instructing teacher. The exchange of equipment was accomplished quickly without affecting the pace of the lesson. This procedure was implemented to actively engage both members of a co-teach team in providing classroom instruction.

Scheeler et al. (2010) implemented a multiple baseline across participant design that included the three phases of baseline, intervention, and maintenance/generalization. Baseline included the six participating teachers (three co-teach teams) receiving training and practice of TTC trials using CAC equipment and feedback statements. During intervention, research assistants videotaped the three co-taught classrooms as co-teachers implemented TTC trials and used the CAC devices to provide immediate feedback through peer coaching. The researchers coded the data from the videotaped sessions. Data analysis revealed that all six teachers increased the accuracy and use of TTC trials from baseline to intervention. Accuracy and frequency of TTC trials were maintained through the generalization phase when CAC was faded. On a social validity questionnaire, teachers reported that CAC was beneficial to improving instruction and they enjoyed both receiving and providing feedback with their co-teachers. Some participant recommendations for further use of CAC included: (a) improving other teaching skills (providing student feedback, questioning, and pacing of a lesson); (b)

using it with students, and (c) using it with paraprofessionals. Scheeler et al. (2010) demonstrated teacher practice could be improved using CAC through peer coaching and also suggested CAC as an intervention to equalize the teaching role between co-teaching partners.

Virtual Covert Audio Coaching (Virtual CAC)

Virtual covert audio coaching is a form of CAC where the coach and the person receiving coaching are not at the same geographical location. Internet technology is used for the interaction between the coach and trainee. This term was coined by the author to distinguish the difference between CAC that occurs with coach and trainee at the same location and CAC that occurs with coach and trainee at different locations. Virtual CAC has been studied in previous research but has been referred to as bug-in-the-ear (BIE) coaching. Previous researchers have documented the positive effects of CAC on teacher practice. (Rock et al., 2009c; Wade, 2010)

Rock et al (2009b) reported that using advanced CAC with Bluetooth technology and internet video conferencing was an effective way to provide immediate real time feedback to pre-service teachers. Rock et al (2009c) reported that a major barrier to the use of CAC was the limited range of the FM radio frequency devices used in prior studies. This limitation required observers, coaches, or researchers to be in the classroom to use CAC to provide feedback to teachers. Rock and colleagues developed a CAC system that consisted of "mobile devices and internet technology and included four components: webcam, Bluetooth USB adapter, Bluetooth headset, and Skype" (p. 68).

This advanced CAC technology allowed the researcher to coach from a remote location, a central office at the university, and virtually observe and provide immediate feedback to in-service teachers in their classrooms. The quantitative results of the study showed an increased rate of teacher praise to students and improved teacher use of effective instructional practices that led to increased on task behavior of students. Similar to the findings of Scheeler et al. (2006) with on-location CAC, Rock et al (2009c) found that virtual CAC allowed teachers to receive feedback with limited interruption to instruction through coaching from a remote location.

In her dissertation research, Wade (2010) utilized virtual CAC consisting of a combination of Bluetooth technology, a computer, a microphone, and SKYPE to examine the effects of virtual CAC on the rate of specific teacher feedback to students during reading instruction. This virtual CAC format allowed Wade to provide coaching and immediate feedback from her university office to teachers in their classrooms. She (2010) reported that virtual CAC allowed for immediate feedback and coaching to teachers without classroom instruction being interrupted by the physical presence of the researcher. Participants in the study were special education teachers providing instruction within inclusive general education classrooms. Wade (2010) reported that teachers who received feedback through virtual CAC increased the rate of specific feedback during reading instruction. The teachers maintained the higher rates of specific feedback during the maintenance phase of the study (Wade, 2010).

Real-Time Coaching

Providing immediate feedback was one of the benefits reported by previous research on CAC (Bennett, 2009; Goodman, 2005; Oliver, 2008; Scheeler et al., 2006; Scheeler et al., 2010) and virtual CAC (Rock et al., 2009c; Wade, 2010). Both CAC and virtual CAC provide immediate feedback through in-the-moment coaching.

Kagan (2006) used the term "real time coaching" to describe in the moment coaching that happens immediately after or during instruction. Kagan described traditional coaching as

> three-step coaching models that involve 1) a pre-conference (teacher and coach meet to establish what will be observed, how it will be shared, and the role of the coach); 2) an observation session (coach observes the teacher, often taking notes on pre-determined behaviors); and 3) a post-observation session (feelings about and perception of the lesson are shared along with observations and/or coaching tips)" (para. 4).

Feedback is usually given during the post observational meeting of traditional coaching which could be hours or days after the observation. Thus, the format of traditional face-to-face coaching sometimes does not allow for immediate feedback. Kagan (2006) has trademarked a form of real time coaching called Kagan Coaching. To define Kagan Coaching, Kagan (2006) compared Kagan Coaching to traditional coaching. Kagan's comparison is presented in Table 2.

Table 2

Traditional Coaching Versus Kagan (Real Time) Coaching

Element	Traditional	Kagan Coaching™
Unit of Observation	Broad (Whole Lesson)	Focused (One Structure)
Time Expended	Hours (Pre, Ob, Post)	Minutes (Brief Visit)
Documentation	Complicated	Simple
Relevance of Feedback	Potentially Irrelevant	Relevant
Immediacy of Feedback	Delayed	Immediate
Immediacy of Correction	Delayed	Immediate
Implementation	Questionable	Assured
Principal/Site-Based Instructional Leader	Not Empowered	Empowered

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The current study provided immediate feedback during both face-to-face and virtual CAC sessions. During both types of coaching, virtual CAC and face-to-face, the teacher was provided immediate feedback on implementation of the cooperative learning structure by using "real time" in-the-moment coaching. This real time coaching was provided within the virtual CAC by the teacher receiving immediate feedback during instruction via the Bluetooth headset from the coach. Real time coaching was provided during the face-to-face coaching by the coach providing immediate feedback to the teacher while the students were participating in the cooperative structure with a partner.

Cooperative Learning

There is a body of research that supports cooperative learning as an effective instructional practice (Johnson, Johnson, & Holubec, 1994a; Johnson et al., 1994b; Johnson, Johnson, & Stanne, 2000; Kagan & Kagan, 2009; Marzano et al., 2003). In fact, Kagan and Kagan (2009) concluded that "cooperative learning is the most extensively researched innovation of all time" (p 3.1). Johnson et al. (1994a) proclaimed, "Cooperative learning has a rich history of theory, research, and actual classroom use, which makes it one of the most distinguished of all instructional practices" (p. 13).

Kagan and Kagan, (2009) suggested a structural approach to cooperative learning. Structures are composed of a series of prescribed steps that organize cooperative learning instruction. Structures can be used with any content and incorporate four basic principles of cooperative learning: 'Positive Interdependence, Individual Accountability, Equal Participation, and Simultaneous Interaction" (p. 5.9). Kagan and Kagan (2009) coined the mnemonic, PIES, to help teachers learn, remember, and implement these principles. Although, Kagan structures have PIES built into the sequence of steps, teachers can use the principles to analyze any group activity to ensure research based implementation of cooperative learning (Kagan & Kagan, 2009).

Kagan & Kagan (2009) described that teachers can use cooperative learning in the classroom to address four major societal crises: Achievement Crisis, Achievement Gap Crisis, Race Relations Crisis, and Social Skills Crisis. The achievement crisis is the lack of excellence in learning in U.S. schools that is evident in educational reports such as *A Nation at Risk* (1983), The Trends in International Mathematics and Science Study

(TIMMS, 2003), and reports by the Organization for Economic Cooperation and Development (OCED, 2003). These reports describe the academic performance of U.S. students as ranking lower than many other countries (Kagan & Kagan, 2009). Marzano et al. (2003) conducted meta-analysis studies that showed a .28 percentile improvement in academic performance with cooperative learning. Studies with Kagan structures (Cline, 2007; Howard, 2006; Mele, 2001; Murie, 2004) have shown an increase of academic performance with the implementation of Kagan cooperative learning structures.

The second crisis is the achievement gap or the lack of educational equity. Kagan and Kagan (2009) presented National Assessment of Education Progress (NAEP) data from the National Center for Educational Statistics, indicating both a race achievement gap and economic achievement gap in the U.S. The race achievement gap was evident by lower percentages of black and Hispanic students scoring at proficiency in reading and mathematics than white students. Discrepancies in achievement between students in low and high social economic status supported the economic achievement gap. Positive interdependence, individual accountability, and equal participation are underlying principles of cooperative learning that attempt to provide equity of learning in classrooms (Johnson et al., 1994a, 1994b; Kagan & Kagan, 2009)

Kagan and Kagan (2009) asserted that the third societal crisis that cooperative learning could address was race relations. Although strides have been made in civil rights, recent racial tensions are still evident in the U.S., as evidenced by riots, white supremacy, gang involvement, and hate crimes (Roberts, Zhang, and Truman, 2012).

Heterogeneous groups formed with racial diversity can lead to improved race relations (Kagan & Kagan, 2009).

Urbanization, divorce rates, single family homes, family size and mobility, and negative media influence are some factors leading to the social skills crisis for students in American schools (Kagan & Kagan, 2009). Every Kagan cooperative learning structure has social skill implementation, instruction, and practice embedded in it. Teaching and practicing social skills through Kagan cooperative learning can improve students' social skills (Kagan & Kagan, 2009).

Marzano et al. (2003) conducted eight meta analyses on the effectiveness of cooperative learning. The meta analyses including almost 1,000 research studies that resulted in high effect sizes. The average of the eight effect sizes was .62. Only two of Marzano et al.'s eight meta analyses had an average effect size less than .5. The mode of the common effect sizes was .78, the average effect size of three of Marzano's eight analyses (p. 86). The high effect size of Marzano's meta analysis studies indicated that cooperative learning can be an effective instructional practice.

Johnson et al. (2000) conducted a meta-analysis review of 164 studies investigating eight highly researched cooperative learning methods in order to examine the effect that cooperative learning had on student achievement. "Results showed all eight cooperative learning methods had a significant positive impact on student achievement" (p. 1). Johnson et al. (2000) reported that Kagan structures were one of the top 10 cooperative learning methods that have received attention. However, Kagan was not one of the top eight researched cooperative learning methods. The current study was

conducted to add to the body of literature by conducting a quasi-experimental research study using a Kagan Structure.

Johnson et al. (1994a, 1994b) explained that there are three major theoretical foundations for cooperative learning: social interdependence theory, cognitive development theory, and behavioral learning theory. Social interdependence theory is based on the work of theorists Kafka, Lewin, and Deutsch and posits that group outcomes are determined by the type of social interdependence (cooperation or competition) between group members. Cognitive development theory is based on the work of Vygotsky and asserts that knowledge is social and constructed by interacting with others. The basis of the behavioral learning theory is Skinner's work and suggests rewards and/or reinforcers will improve learning. (Johnson et al., 1994a, 1994b). Kagan & Kagan (2009) supported the idea that student-to-student praise is the reinforcer to motivate students to learn.

RallyCoach™

RallyCoach™ is a Kagan cooperative learning structure that allows students to interact and practice procedural learning such as calculating math algorithms, defending a point of view, or editing writing. The RallyCoach™ steps, listed by Kagan & Kagan (2009), are displayed in Table 3

Table 3

RallyCoach™ Steps

Roles: Partners take turns, one solving a problem while the other coaches.

Setup: Each pair needs one set of high-consensus problems and one pencil.

1. Partner A solves the first problem (using think and talk out loud strategy)
2. Partner B watches, listens, check, coaches if necessary, and praises. (Partner A writes an answer only after an approval from coach.)
3. Partner B solves the next problem. (using thin and talk out loud strategy)
4. Partner B watches, listens, check, coaches if necessary, and praises. (Partner B writes an answer only after an approval from coach.)
5. Partners repeat taking turns solving successive problems.

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Kagan & Kagan (2009) reported several research studies that resulted in positive student outcomes from RallyCoach™ implementation:

> Murie (2004) implemented RallyCoach™ in a college math class that yielded increased engagement and student communication and students performed better in math section taught with Kagan structures than other sections taught with traditional strategies. (p. 3.15)
>
> Cline (2007) incorporates RallyCoach™ into fifth grade math instruction. Results showed that the class taught with Kagan structures scored higher on tests and quizzes than the control class (88.5% to 79.2%). (p. 3.15)

Student-to-Student Positive Interaction

Importance

Forty-five states, the District of Columbia, four territories, and the Department of Defense Education Activity have adopted the Common Core State Standards (Common Core State Standards, 2010). These standards incorporate listening and speaking standards such as the examples below taken from Common Core State Standards (2010):

> CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments (p.6 | Standards for Mathematical Practice).
>
> CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively (p. 22 | K-5 | Speaking and Listening).

With the adoption of these standards, RallyCoach™ is a cooperative learning structure that can serve as a research based instructional tool for teachers can use to teach and provide opportunities for students to practice speaking and listening with peers.

Researchers have shown that positive student-to-student interaction (praise) has positive effects on student academic performance, intrinsic motivation, development of school connectedness, and reducing student behavior problems and violence. (Choi, Johnson, & Johnson, 2011; Frey, Ruchkin, Martin, & Schwab-Stone, 2009; Kagan, 2007; Kagan & Kagan, 2009; Maddox & Prinz, 2003; Reinke, Sprick, & Knight, 2009; Shochet, Dadds, Ham, & Montague, 2006).

Kagan (2009) discussed the support provided by brain researcher, McGaugh, on the principle of retrograde memory enhancement for the use of student-to-student positive interactions. McGaugh (2003) researched the relationship between memory and emotions and concluded that when instruction was presented in a way that elicits student emotions, the content is remembered better.

Kagan (2007) had earlier addressed the debate over the impact of positive student-to-student interaction (reward/praise) on student motivation. After analyzing the seminal research of Deci (1971, 1972a, 1972b) and Ryan, Mims, & Koestner (1983) and the meta-analysis on student motivation of Deci, Koestner, and Ryan (1999), Kagan recounted that the researchers reported "rewards can have either a positive, neutral, or negative effect of intrinsic motivation, depending on the type of reward and how it is given" (para 3). Table 4 displays Kagan's (2007) view of the relationship between rewards (positive student-to-student interaction) and intrinsic motivation. RallyCoach™, the Kagan cooperative learning structure utilized in the current study, provided students structured interaction to give each other positive feedback and praise.

Table 4

Rewards and Intrinsic Motivation

Type of Reward	Effect on Intrinsic Motivation
Engagement-contingent, tangible rewards	Decreased intrinsic motivation
Completion-contingent, tangible rewards	Decreased intrinsic motivation
Competitive Rewards	Decreased intrinsic motivation
Unexpected rewards	No change
Rewards for otherwise boring tasks	Usually no change
Rewards not contingent on task performance	No change
Positive feedback and praise	Increased intrinsic motivation

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Reinke et al. (2009) reported that increasing positive interactions in the classroom can have positive effects on student outcomes. Student praise was recommended by Reinke et al. (2009) as a classroom management strategy to reduce disruptive behaviors and increase student intrinsic academic motivation.

Twenty-first century schools have continued to be plagued with school violence. The 2011 NCES report, Indicators of School Crime and Safety revealed that school violence, bullying, racial tensions, sexual harassment, and verbal abuse of teachers continue to be discipline problems on school campus in America (Roberts et al., 2012). Statistics in this report included:

> During the 2009-10 school year, 85 percent of public schools recorded that one or more crime incidents had taken place at school (p. iv).

> During the 2009-10 school year, 23 percent of public schools reported that bullying occurred among students on a daily or weekly basis (p. 32).
>
> In 2009, about 9 percent of student ages 12-18 reported being targets of hate-related words at school during the school year and 29 percent of students reported seeing hate-related graffiti at school (p. 40).

Disconnectedness to school, peers, or family has been shown to be one influencing factor on students committing acts of violence (Frey et al., 2009; Maddox & Prinz, 2003; Shochet et al., 2006). Shochet et al. defined school connectedness as " the extent to which students feel accepted, valued, respected and included in the school" (p. 170).

Frey et al. (2009) conducted a student self-reporting study with results that showed students who reported a low attachment to school also had low academic motivation and high ratings of violent behavior and aggressive beliefs. Students who ranked themselves with high school attachment gave themselves lower ratings on violent behavior and aggressive beliefs but showed higher academic motivation (Frey et al., 2009).

Shochet and colleagues (2006) studied the relationship between school connectedness and mental health symptoms of adolescents. Their study revealed a strong negative correlation of school connectedness with symptoms of depression and anxiety. Using hierarchical linear modeling, Shochet et al. (2006) showed that school connectedness was also predictive of depressive symptoms in adolescents.

In a review of the literature on school bonding, Maddox and Prinz (2003) reported a positive association with school connectedness, self esteem, and academic performance and a negative association between school disconnectedness and antisocial behavior and

delinquency. Schocet et al. (2006) reported Maddox & Prinz's 2003 work indicated "that school bonding mediates the effects of parental attachment on substance use, risky behavior, and delinquency" (p. 171).

Reviewing the research of the impact of school connectedness on the academic and social success and mental health of students, it is important for teachers to find ways to build and improve students' school connectedness. Shochet et al. (2006) reported the following factors to improve school connectedness: "involving students in classroom decisions, avoiding any form of discrimination, rewarding effort rather than achievement, and building strong (student-to-student and teacher- to-student) relationships" (p. 178).

Choi et al. (2011) conducted a study to examine the characteristics of dominant students. Via teacher and student surveys, dominant students were categorized as collaborative, competitive, or individualistic. Choi et al. concluded, "The students in the cooperative cluster tended to be highly prosocial and rarely engaged in harm-intended aggression. The students in the competitive cluster tended to engage in physical, relational, and verbal aggression and rarely engaged in prosocial behavior" (p. 450). Based on their findings, Choi et al. (2011) posited that cooperative learning opportunities may decrease aggression and bullying but also increase prosocial behaviors at the same time.

Researchers have shown that positive student-to-student interaction (praise) has positive effects on student academic performance, intrinsic motivation, development of school connectedness, and reducing student behavior problems and violence. (Frey et al., 2009; Kagan, 2007; Kagan & Kagan, 2009; Maddox & Prinz, 2003; Reinke et al., 2009;

Shochet et al., 2006). Based on this body of research, it can be inferred that if teachers identify and implement classroom interventions that promote student-to-student positive interaction, it will be of benefit to students.

Cooperative Learning and Positive Student-to-Student Interaction

The positive effects of cooperative learning on student academic performance and social skill acquisition in documented in research (Kagan & Kagan, 2009; Marzano et al., 2003). Cooperative learning has also been recommended as an intervention to increase student-to-student positive interaction (Kagan & Kagan, 2009; Wright, 2011).

Within his work on interventions to motivate students, Wright (2011) reported that providing students with motivation via access to peer praise can provide the short term "pay off" needed to increase effort on academic tasks. Wright suggested incorporating cooperative learning activates that promote student-to-student interaction into classroom instruction to provide motivation for students.

Positive student-to-student interaction has been a major component of many of the Kagan Cooperative Learning structures including RallyCoach™. Positive student-to-student interaction is a social skill that must be taught. Kagan & Kagan advocated using a structured student-to-student interaction sequence and positive gambits to teach students how to provide positive statements and feedback to each other.

Most Kagan structures follow a set of instructions that include one or more steps to guide students in making positive statements to each other. For example in RallyCoach™, the student who is taking on the coaching role provides positive

statements and feedback once the student pair come to consensus on an answer (Kagan & Kagan 2009, p. 6.32).

Kagan & Kagan (2009) defined gambits as modeling what a positive statement "sounds like and look likes" (p.11.13). Two types of positive gambits recommended by Kagan and Kagan were copycat response gambits and complete the sentence gambits. Following are examples: "Copycat response gambits: Thanks for sharing; You are interesting to listen to. . . ." and "Complete the sentence gambit: "Your most interesting idea was. . . . ". (Kagan & Kagan, 2009, p. 6.38). Positive gambits can be generated by the teacher or by students and provide a model for students to learn positive statements to give to peers.

Researchers have addressed implementation of Kagan's (2009) cooperative learning structures. After their research with Kagan's structures, several have noted increased student-to-student positive interaction.

> Howard (2006) implemented the Kagan structures, Quiz-Quiz-Trade and Timed Pair share within high school Journalism classes that produced favorable results on a student attitudinal study.
>
> Murie (2004) used six different structures in a college math class that yielded increased engagement and student communication.
>
> Major & Robinson (2004) incorporate various Kagan structures in an adult math class that resulted in increased engagement in class and enthusiasm for the content.
>
> Mele (2001) implemented various Kagan structures into high school chemistry classes and generated teamwork and positive (peer) relationships. (Kagan & Kagan, 2009, p. 315)

It was the intent of the current researcher to build on prior implementation research in regard to the Kagan cooperative learning structure, RallyCoach™, in elementary

classrooms and to explore further the potential increase in student-to-student positive interactions.

Contribution to the Literature

The results of recent studies have indicated that virtual CAC can improve teacher implementation of effective instructional practices (Goodman, 2005; Rock et al., 2009a, 2009b, 2009c; Scheeler et al., 2002, 2004, 2006, 2010 ; Wade, 2010). These studies have not, however, focused on the effectiveness of implementation of cooperative learning structures. In the current study, the researcher explored the extent to which teacher effectiveness impacted student achievement and the extent to which teacher effectiveness was improved by virtual CAC after professional development.

This study provided additional insight into using virtual CAC to elicit and sustain teachers' accuracy of implementation of a cooperative learning structure after professional development. Previous studies have focused on pre-service teachers (Rock et al., 2009a, 2009b, 2009c) and special education teachers (Wade, 2010). The current study was designed to add to the literature by using virtual CAC with Kindergarten through fifth-grade teachers with varied experience levels teaching within a variety of instructional settings.

Summary

Review of the literature provided an overview of the components of effective teacher professional development (Guskey, 2000; Joyce & Showers, 2002; Marzano et

al., 2003; Villegas-Reimers, 2003; Wei et al., 2009). Coaching emerged in the literature as the most effective method to elicit teacher transfer of knowledge from professional development to a change in classroom practice (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007; Marzano et al., 2003; Villegas-Reimers, 2003; Wei et al., 2009).

Although researchers have supported the positive effects of coaching on teacher effectiveness, many teachers have not received coaching due to time and funding restraints (Guskey, 2000). Bug-in-the-ear (BIE) technology has proven to be a viable tool in coaching that eliminates the need for the coach to travel to the location of the teacher, thereby saving time and money. Previous researchers have shown BIE is effective in improving teacher-student interactions and increasing specific teacher praise, but the focus of previous BIE research was on its use with pre-service and special education teachers. Thus, there was a need to investigate the potential effect of providing immediate feedback to in-service teachers through bug-in-the-ear coaching to improve teacher instructional practices, such as cooperative learning.

CHAPTER 3
METHODOLOGY

Introduction

Researchers have supported the premise that teacher effectiveness impacts student achievement (Darling-Hammond, 2000; Rivkin et al., 2005; Sanders & Horn, 1998; Stronge et al., 2011; Stumbo & McWalters, 2011; Wilson et al., 2008). Professional development is the method that has frequently been used to improve teacher effectiveness (Blank & de las Alas, 2009; Killion & Harrison, 2006; Villegas-Reimers, 2003; Wei et al., 2009; Yoon et al., 2007). Therefore, concentrating on effective professional development techniques that lead to a change in teacher practice would seem to be imperative to improve student achievement. There is a body of research that supports cooperative learning as an effective instructional practice (Johnson et al., 1994a, 1994c, 2000; Kagan & Kagan, 2009; Marzano et al., 2003). This study was conducted to investigate virtual covert audio coaching as a professional development technique to elicit teacher transfer of knowledge about cooperative learning acquired through professional development to classroom practice.

Coaching emerged in the literature as the most effective method to elicit teacher transfer of knowledge from professional development to a change in classroom practice to promote teacher effectiveness (Guskey, 2000; Joyce & Showers, 2002; Killion & Harrison, 2006; Knight, 2007; Marzano et al., 2003; Villegas-Reimers, 2003; Wei et al., 2009). Virtual covert audio coaching can provide immediate feedback during

implementation that can lead to positive effects on teacher practice. (Rock et al., 2009c; Wade, 2010).

A second purpose of this study was to analyze the impact of virtual covert audio coaching to help teachers to increase student-to-student positive interactions through implementation of a cooperative learning structure. Researchers have shown that positive student-to-student interaction can improve student academic performance, intrinsic motivation, development of school connectedness, and reduce student behavior problems and violence. (Choi et al., 2011; Frey et al., 2009; Kagan, 2007; Kagan & Kagan, 2009; Maddox & Prinz, 2003; Reinke et al., 2009; Shochet et al., 2006).

Research Questions

It has been suggested by various researchers that professional development evaluation should address the impact of the professional development of both teacher practice and student achievement (Darling-Hammond, 2000; Rivkin el al., 2005; Sanders & Horn, 1998; Stronge et al., 2011; Stumbo & McWalters, 2011; Wilson et al., 2008). The first research question in this study addressed the impact of professional development on teacher practice. The second research question addressed the impact of professional development on student achievement as measured by student-to-student positive interaction.

1. Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback, in improving teacher accuracy of

implementation of a cooperative learning structure, RallyCoach™, learned in a face-to-face professional development session?

2. Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback to guide the teacher, in increasing student-to-student positive interactions?

Research Design

The research design for this study was a quasi-experimental multiple time series design using a control group with observations before and after intervention (Johnson, 2012). The time series design was chosen because it has been recommended to study the impact or effect of educational interventions in studies with small sample sizes (Box & Jenkins, 1976; Creswell, 2008; Johnson, 2012).

Creswell (2008) explained that a time series design consists of multiple pre-tests or pre-observations (baseline) after which an intervention is introduced (interrupting baseline) for a period of time with multiple post-tests or post-observations. Johnson (2012) described the multiple time series design as adding a control group to the time series design. The control and treatment groups receive repeated pre-observations. The treatment group then receives the intervention being studied (covert audio coaching), and the control group receives no treatment or some standard treatment (face-to-face coaching). Both groups receive multiple post-observations after the intervention has been introduced. Table 5 provides a tabular representation of the multiple time series design.

Table 5

Multiple Time Series Design

Group	Pretest Observations (BASELINE)				Treatment Observations (INTERVENTION)				Posttest Observations (MAINTENANCE)			
Treatment	0_1	0_2	0_3	0_4	X_1	X_2	X_3	X_4	0_5	0_6	0_7	0_8
Control	0_9	0_{10}	0_{11}	0_{12}	X_5	X_6	X_7	X_8	0_{13}	0_{14}	0_{15}	0_{16}

This design utilized strategies recommended by Robson, Shannon, Goldenhar, & Hale (2001) to control for internal validity. These strategies included establishing a control group and observations of the treatment and control group before and after the independent variables (phases) were introduced. The study progressed across the following three phases: baseline, intervention, and maintenance.

An A = baseline, B = intervention, A = maintenance design was utilized to measure changes in teacher transfer of knowledge over time. The baseline phase measured teacher transfer of knowledge learned in professional development to classroom practice with no instructional coaching. The intervention phase allowed comparison of teacher transfer of knowledge learned in professional development with two different types of instructional coaching, face-to-face and virtual covert audio. The maintenance phase measured if the impact of coaching made permanent changes in teacher practice over time once the coaching was discontinued. The research was initiated only after gaining approval for the study from the University of Central Florida's Institutional Review Board (Appendix F).

Independent Variable

The independent variable for this study was the type of coaching. The researcher manipulated the type of coaching by providing virtual covert audio coaching to the treatment group and face-to-face coaching to the control group.

Dependent Variables

This study had two dependent variables, one for each research question. The dependent variable for Research Question 1 was the accuracy of teacher implementation of a cooperative learning structure, RallyCoach™, which was learned in face-to-face professional development. The dependent variable for Research Question 2 was the percentage of student pairs who gave positive reinforcement to each other during the implementation of RallyCoach™.

Setting

This study was conducted at one public elementary school in a medium sized city within a suburban area of a large school district on the east coast of central Florida. The school had approximately 750 students with demographics consisting of 76% white, 11% Hispanic, 4% black, and 9% Other Ethnicities. A total of 23% of the school's population was eligible for free/reduced-price lunches. Of the school's 52 teachers, 74% held a bachelor's degree, and the remaining 26% had earned a master's degree or higher. In regard to experience, 42% of the teachers had five or less years of teaching experience. The overall school grade, B, assigned by the state of Florida indicated that this school

performed on average better than many other schools across the state on the Florida Comprehensive Assessment Test (FCAT).

Participants

Participating teachers were randomly assigned to a treatment group or control group. Participants were selected from a limited population of teachers who attended professional development and taught at one targeted elementary school. A quasi-experimental research design was most appropriate for the current study, because the researcher could not randomly assign students to the classrooms of teacher participants.

Selection of Participants

Twelve teachers were selected from the target elementary school from a limited population of teachers who had volunteered to attend professional development. Six teachers, one from each K-5 grade level, were randomly selected for the treatment group to receive virtual covert audio coaching. Six teachers, one from each K-5 grade level, were randomly selected for the control group to receive face-to-face coaching. Random selection was made using an online random selection tool.

Description of Participants

The 12 teacher participants for the study were all white females. Nine of the 12 participants were in the age range of 21-39 years old and three participants were in the age category of 40-59 years old. In the control group three of the six participants were in the age range of 21-39 and three participants were in the age range of 40-59. All six

participants in the treatment group were in the 21-39 age range. This data revealed that the treatment group had a younger average age than the control group.

Two of the twelve participants had obtained a Master degree while the remaining ten participants had earned a Bachelor degree. The two Master degree participants were in the treatement group. Although the treatment group had a younger average age, it contained two teachers with advanced degrees.

Data on participant teaching experience revealed that the control group had more years of teaching experience (9.3) than the treatment group (5.3), more years of teaching experience at the current grade level (6) than the treatment group (5), and more years of teaching at the current school (8) than the control group (5.3). The control group had an older average age which could be why they had a more years of teaching experience. Participant demographics are displayed in Table 6.

Table 6

Participant Demographics

Descriptors	Control (n = 6)	Treatment (n = 6)
Gender		
Male	0	0
Female	6	6
Age		
21-39 years	3	0
40-59 years	3	6
Highest Degree		
Bachelor's	6	4
Master's	0	2
Mean Years of Experience		
Total Years	9.3	5.3
Years at Current Grade	6.0	5
Years at Current School	8.0	5.3

Equipment

The equipment used for virtual covert audio coaching of the treatment group included (a) a computer, (b) a Logitech 2000 Web camera, (c) Plantontics 2xx Blue tooth headset, and (d) Safari Live to provide meeting rooms for observation and recording of virtual sessions

Research Team

This research study was conducted by a doctoral candidate at the University of Central Florida. The researcher had earned a master degree in exceptional student education and a specialist degree in educational leadership. The researcher was experienced in developing and conducting teacher professional development as well as conducting ongoing instructional coaching in K-12 classrooms.

Guidelines from *What Works Clearinghouse* require that 20% of data collected in a study be measured by more than one observer for the study to be considered to meet evidence standards (Kratochwill et al., 2010). In order to ensure that the study met this recommended requirement, the researcher recruited data collection observers to code data.

The four data collection observers for the control group were school-based staff consisting of three administrators and one teacher, all of whom were physically present in the classroom when coding observations. The six data collection observers for the treatment group were district-based instructional coaches and staff who coded while viewing recorded observations in Safari Live after observations had occurred. The

researcher coded data in real time for both face-to-face and during virtual coaching sessions.

Instrumentation

Table 7 describes the data collection instruments used in the current study including the purpose and participants who completed the instruments. Effective feedback has been described in the literature to elicit change in teacher practice, lead to transfer of knowledge, or result in generalization of teaching behaviors. (Bennett, 2009; Goodman, 2005; Oliver, 2008; Rock et al.,2009a, 2009b, 2009c; Scheeler, 2008; Scheeler & Lee, 2002; Scheeler et al., 2004, 2010; Wade, 2010). Coaching methods utilized in the current study, i.e., virtual covert audio coaching provided to the treatment group and face-to-face coaching provided to the control group, were implemented with real time (in-the-moment) coaching that allowed the coach/researcher to provide immediate verbal feedback to teachers as they implemented the cooperative learning structure. In addition to immediate verbal feedback, participants in both the control and treatment groups were provided with written feedback using the RallyCoach™ Kagan Coaching Form. Permission for use of all Kagan copyrighted materials used in this study is contained in Appendix G.

Table 7

Data Collection Instruments

Name	Appendix	Purpose	Completed By
Professional Development Implementation Observation Form (PDIOF)	A	Record and code implementation data of teacher and student components of RallyCoach™ during all observations	Research Team
Teacher Self-Assessment	E	Record and code implementation data of student components of RallyCoach™ during maintenance observations	Study Participants
Kagan RallyCoach™ Coaching Form	C	Provide teacher feedback on implementation of teacher and student components of RallyCoach™ during all observations	Researcher/Coach
Kagan Coaching Running Record Form (Log)	D	Keep a running record of teacher feedback provided	Researcher/Coach
Participant Survey for Virtual Coaching	J	Collect demographic participant data and participant perception data	Treatment Participants
Participant Consent Form	H	Obtain participant consent to participate in the study	Study Participants

Professional Development, Participant Selection, and Obtaining Consent

In August of 2011, professional development on Kagan Cooperative Learning was provided to the faculty of the target elementary school. From the population of teachers who attended the professional development, 12 teachers were randomly selected to participate in the study. One teacher from each grade, K-5, was randomly selected to be assigned to the control group. One teacher from each grade, K-5, was randomly selected to be assigned to the treatment group. Teachers were notified and given the opportunity to accept or decline the invitation to participate. If a teacher declined to participate in the study, another teacher from that grade level was randomly selected.

Each of the 12 teachers who agreed to participate in the study gave consent to participate by reading and agreeing to the Participant Consent Form (Appendix H). The six teachers in the treatment group received training and practice in using Bluetooth technology. Equipment for virtual coaching was installed in the classrooms of the six teachers in the treatment group.

Design Phases

The researcher and the data collection observers used the Professional Development Implementation Observation Form (PDIOF) (Appendix A) to record data on teacher implementation of teacher and students components of RallyCoach™ during all phases of the study. The observation schedule is contained in Appendix I.

Phase I: Baseline

During the baseline phase of the time series design, both the control and treatment groups received multiple pre-observations before the intervention of face-to-face or virtual covert audio coaching was introduced. Since the baseline phase occurred after participants received professional development but before they received a coaching intervention, these data represented teacher implementation without any coaching intervention. No coaching intervention was provided during the baseline phase.

Phase II: Intervention

The coaching intervention of face-to-face coaching for the control group and virtual covert audio coaching for the treatment group was introduced in this phase of the study. Control group participants received real time face-to-face coaching with immediate feedback and coaching prompts to implement RallyCoach™ with the researcher/coach and data collectors in the classroom. Treatment group participants received real time virtual covert audio coaching with immediate feedback and coaching prompts provided via Bluetooth technology with the researcher visiting the classroom virtually. Data collection observers coded data for the treatment group by viewing recorded virtual coaching sessions in Safari Live.

The intervention phase was divided into two sub-phases. In intervention phase A, teachers received weekly coaching intervention. During intervention phase B, teachers received bi-monthly coaching intervention. Intervention data were calculated both as a

combined intervention phase and as separated phases for intervention phase A and intervention phase B.

During intervention phase B, participants were directed by the researcher to use the Teacher Self-Assessment Form (Appendix E) to collect data on student implementation components in-the-moment during coaching sessions. Teachers were instructed by the coach to self-assess implementation of several pairs of students before providing teacher coaching or redirecting students. The Teacher Self-Assessment Form, along with instructions to complete the form, was emailed to all participants before every intervention phase B coaching session.

The data collected in the intervention phase were used to compare the effectiveness of two types of instructional coaching, face-to-face and virtual covert audio, on the transfer of teacher knowledge from professional development to classroom practice.

Phase III: Maintenance

Procedures for the maintenance phase were similar to procedures established for the baseline phase. Participants were observed implementing RallyCoach™ and components implemented were recorded on the PDIOF. However, no coaching was provided. Procedures for teachers to complete the Teacher Self-Assessment Form were the same in the maintenance phase as in intervention phase B. The data collected in the maintenance observations were used to determine if any changes in teacher practice that

had occurred during coaching intervention sessions continued after the coaching intervention was discontinued.

Each participant was asked to complete the Virtual Study Participant Survey (Appendix J) during the maintenance phase of the study. Several questions on the survey were used to measure social validity, i.e., the participants' perceived usefulness of the coaching types.

Coding Data

The research team used the Professional Development Implementation Observation Form (Appendix A) to collect and code data. The data were coded following the procedures in the data collection protocol (Appendix B). Inter-rater reliability was established for the Professional Development Implementation Observation Form (PDIOF) among data collectors. A statistical measure of inter-rater reliability was calculated using Cohen's Kappa and SPSS software.

Data Analysis

Descriptive Statistics

The following means were calculated for both control group and treatment group for each phase of the study and graphically displayed: percentage of teacher components of RallyCoach™ implemented, percentage of student components of RallyCoach™, and percentage of RallyCoach™ components requiring coaching.

Visual Analysis

Visual analysis of graphed data calculated for within phase and across phase comparisons to determine the effect of an intervention has been suggested as part of evidence-based practice. (Horner & Spaulding, 2010; Kazdin, 2010; Swoboda, Kratochwill, & Levin, 2010; Tawney & Gast, 1984). In regard to visual analysis, Horner et al (2005) recommended when the research participant is a group, that the group can be represented by a single score for each measurement period by calculating a group mean from individual member scores. The group mean could then be graphed for visual analysis. In the current study, group means for the percentage of intervention components implemented for each phase were calculated and graphed for visual analysis. Phase comparisons were made between the control group means and treatment group means.

Visual inspection of graphic representations of qualitative data was used to analyze group performance over time (Kazdin, 2010). As recommended by Horner, Swaminathan, Sugai, & Smolkowski (2012), visual data analysis was used to examine changes in means, trends, and variability within phases.

Qualitative data were collected for the following three measures: mean percentage of teacher components implemented, mean percentage of student components implemented, and percentage of both teacher and student components coached. The following visual analysis calculations displayed in Table 8 were revised from Cerasale (2010).

Table 8

Visual Analysis Calculations

Analysis	Methods of Calculation
Level and Stability	
Step 1	Phase level change was calculated by finding the difference between the data values of the first and last session of each phase.
Step 2	Phase change level was compared between phases.
Trend	
Step 3	Compute the trend line of each group phase (baseline, intervention, and maintenance) using the ordinary least-squares regression function available in *Microsoft Excel TM*.
Step 4	The phase trend was calculated using the ordinary least-squares regression function in *Microsoft Excel TM*.
Step 5	Trend direction was examined for any changes between phases.
Variability	
Step 6	Calculate the standard deviation score of phases.
Step 7	Compare standard deviation scores between phases.
Step 8	Calculate the range of phases.
Step 9	Compare ranges between phases.

Statistical Analysis

Parker (2009a) recommended that statistical analysis be used to support visual analysis of time series data. The current study had a sample size of 12 (6 in the intervention group, 6 in the treatment group). The researcher attempted to use statistical tests such as a *t* test or the Whitney Mann test to compare the performance of treatment and control group. A post-hoc power analysis calculated for the parametric statistical t-

test with a large effect size of .8 (chosen because it required a lower sample size than a small or medium effect size), a power level of .08, and an alpha of .05 revealed that the current study would need a sample size of 52 (26 in the intervention group, 26 in the treatment group) for a test of statistical significance to be valid. A post-hoc power analysis calculated for the nonparametric statistical Whitney Mann test with a large effect size of .8, a power level of .08, and an alpha of .05 revealed that the current study would need a sample size of 32 (16 in the intervention group,16 in the treatment group) for a test of statistical significance to be valid. The sample size required to use such statistical tests was larger than feasible for the time and resources available to the researcher. Therefore, statistical testing was not used to analyze the data.

Qualitative Analysis

Qualitative data were coded and organized by coaching prompts and teacher actions in a tabular display and discussed. These data were analyzed for trends that led to increased teacher transfer of knowledge. Data were analyzed to determine if the amount of coaching required by teachers decreased compared to the type of coaching, face-to-face or virtual covert audio, which was provided.

Coaching Levels

With instructional coaching, there are always different levels of coaching that are required by different teachers. These levels may result for various reasons. This study did not address the reasons behind teachers needing different levels of coaching.

However, the level of coaching for each observation for each participant was determined from data across phases based on the percentage of teacher and student components that was implemented. Three levels of coaching were determined as follows:

Minimum Coaching: Teacher implemented 80%-100% of teacher components. Minimum coaching required coach to provide the teacher verbal prompts to implement both teacher and student components.

Moderate Coaching: Teacher implemented 60-79% of teacher components. Moderate coaching required coach to provide the teacher verbal prompts and some modeling of steps to implement both teacher and student components.

Extensive Coaching: Teacher implemented 59% and below of teacher components. Extensive coaching required coach to provide teacher verbal prompts, modeling, and co-presenting steps to implement both teacher and student components.

Summary

This chapter presented the elements of a quasi-experimental multiple time series design that were implemented to conduct this study. This design used the phases of baseline (pre-observations), intervention, and maintenance (post-observations) to compare the effectiveness of coaching interventions to elicit teacher change in practice after professional development. The research design permitted the investigation of the effectiveness of face-to-face and covert audio coaching of teachers to implement a cooperative learning structure, RallyCoach™. Also explored was the extent to which student-to-student interaction was improved within the classroom. The elements of the

research design discussed included variables, setting, participants, phases, data analysis, and coaching levels.

CHAPTER 4
RESULTS

Introduction

The primary purpose of this study was to analyze and compare the impact two types of instructional coaching, face-to-face and virtual covert audio, provided with Bluetooth technology, on teacher transfer of knowledge learned in professional development into classroom practice. A secondary purpose of this study was to analyze and compare the impact of face-to-face and virtual covert audio instructional coaching on teacher implementation of a cooperative learning structure, RallyCoach™, to increase positive student-to-student interaction.

The research design was a multiple time series design using a control group with observations before and after intervention (Johnson, 2012) to conduct a quasi-experimental study to compare the results of the control group that received face-to-face coaching to the results of the treatment group that received virtual covert audio coaching. The time series design was chosen because it has been recommended as a viable strategy to study the impact or effect of educational interventions in studies with small sample sizes (Box & Jenkins, 1976; Creswell, 2008; Johnson, 2012).

Both quantitative and qualitative data were collected, and the results of the analyses of all data are discussed in this chapter. This chapter presents discussion on observations, data analysis for research questions as well as the fidelity, reliability, and validity of the study.

Observations

All 262 observations (161 face-to-face and 101 virtual covert audio) were conducted in 13 session dates for the control group and 15 session dates for the treatment group. Each observation form (Appendix A) coded by an observer was counted as an observation. Thus, a single teacher session could result in multiple observations. Of the control group observations, 38% were coded by more than one observer as compared to 20% of the treatment group observations that were coded by more than one observer. The researcher/coach observed and coded data for all control and treatment coaching sessions. Table 9 displays a the total observations for the control group and the treatment group disaggregated by (a) the number of observations for baseline, intervention, and maintenance phases; (b) the number of cancelled sessions; and (c) the number of teacher self-evaluations. The number of data collection observers for each group is also displayed.

Table 9

Observations Across Phases

Descriptors	Control Group (Face-to-face)		Treatment Group (Video covert audio)	
	Observations	Sessions	Observations	Sessions
Total	161	69	101	57
Baseline	22	13	12	10
Intervention: Weekly	43	21	21	16
Intervention: Bi-Weekly	27	11	13	9
Maintenance				
Short –Term Bi-weekly	16	8	14	8
Long-Term Monthly	18	16	17	14
Cancelled Sessions				
Technology	N/A		8	
Absences/Other		9		13
Teacher Self-assessment	26 (16%)		3 (.05%)	
Data Collection Observers	5		7	

Percentage of Observations Across Phases

As shown in Figure 2, the percentage of observations across phases were similar for the control group and treatment group with the highest number of observations occurring in the intervention phase for both groups and the lowest number of observations occurring in the baseline phase. The control group had a higher number of total observations due to data collection observers being on campus and more accessible.

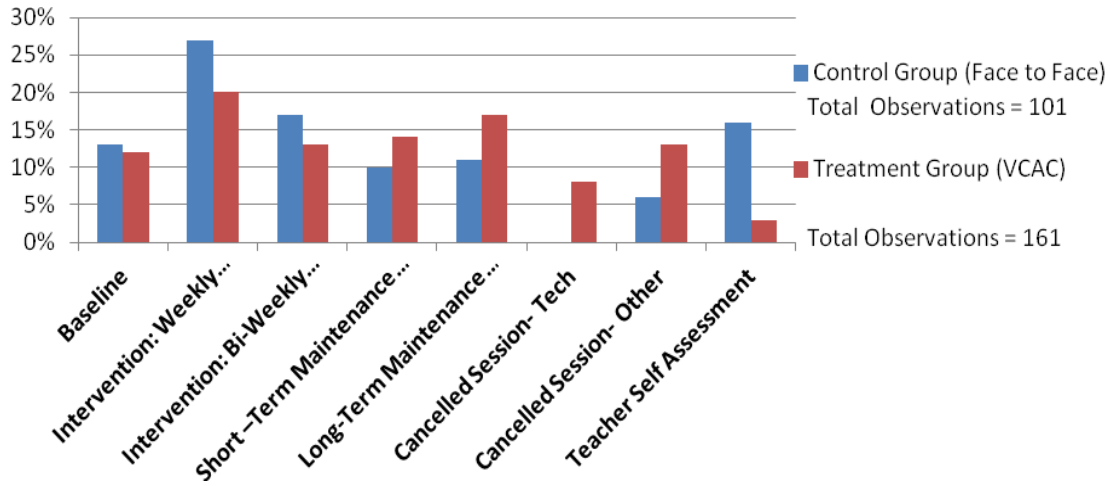


Figure 2. Observations Across Study Phases

Difficulties with Observations and Coding Data

Six data collection observers were recruited to assist the researcher in observing and coding data. The researcher trained the treatment group data collectors to observe and code data using recorded virtual covert audio coaching sessions which were recorded in Safari Live. The screen could be enlarged as the researcher performed the observation sessions, but the screen could not be enlarged in the recorded version. The small screen made it difficult for observers to see the implementation of the components, especially the student components. The audio of the recordings was also difficult to hear. These technical difficulties, along with no compensation provided for observation time, deterred treatment group data collectors from observing and coding sessions.

The researcher/coach experienced difficulty hearing the interaction of specific pairs of students in coding implementation data during virtual covert audio coaching sessions. The researcher and teachers experimented with adjusting the volume of

Bluetooth headsets, adjusting placement of webcam, adjusting placement of student pairs, and placing Bluetooth headsets in front of student pairs for brief periods of time to address this audio issue.

Teacher Challenges During Observations

Treatment group participants received one training session on procedures for connecting and using the webcam and Bluetooth headset, although no practice sessions were conducted. As a result, three of the treatment group teachers encountered some difficulties connecting and using the equipment for the first two virtual covert audio coaching sessions. Five of the six teachers quickly mastered the technology once very specific and detailed instructions for use of the equipment were sent via an email. These directions are displayed in Appendix K. One treatment teacher continued to experience difficulties even after the researcher visited the classroom to model use of the equipment. This teacher missed a total of seven coaching sessions, three due to audio difficulties and four due to absences or forgetting about the virtual covert audio coaching session. It is recommended that instructional coaches who provide virtual coaching provide practice sessions for using the technology, as well as, identify strategies to motivate teachers to prevent session cancellations.

Cancelled Observation Sessions

The control group who received face-to-face coaching had a lower number of session cancellations than the treatment group who received virtual covert audio

coaching. This could be a result of teacher lack of familiarity or comfort with use of technology. However, treatment group session cancelled for technology issues (8) were less than sessions cancelled for other reasons (13) such as teacher absence, field trip, or a teacher forgetting to log into the virtual room for the coaching session. Also, half of the teachers who received virtual covert audio coaching had no cancellations due to technology. Teachers in the treatment group had a higher number of cancellations for non-technology reasons than teachers in the control group. It is more difficult for a teacher to cancel a coaching session when a coach is coming directly to the classroom as compared to a teacher being responsible for logging into a virtual room for coaching. Instructional coaches using virtual coaching need to identify ways to motivate teachers to participate in virtual coaching sessions and identify those teachers who need support learning to use the technology and developing a comfort level with the technology.

Teacher Self- Assessment

Teachers were asked to complete the Teacher Self-Assessment Form (Appendix C) for implementation of student components of RallyCoach™ during intervention B and maintenance phases of the study. Teachers were encouraged to complete the Teacher Self-Assessment Form in several ways. First, the Teacher Self-Assessment Form was developed directly from the Kagan Coaching Form: RallyCoach™ (Appendix D). Second, the researcher provided directions and an instructional sequence (Appendix C) for the completion of the Teacher Self-Assessment Form, and the form itself, via email to both control group and treatment group teacher participants. Face-to-face participants

also were provided a paper copy of the self-assessment form for teachers at each baseline, intervention, and maintenance session.

Observation data in Figure 3 indicates that a low percentage of teachers completed the Teacher Self-Assessment Form. Teachers in the control group, however, completed more self-assessments than teachers in the treatment group. Only 16% of teachers in the treatment group and less than 1% of teachers in the control group completed self-assessments. Teachers in the control group could complete the self-assessment while the coach was in the classroom and hand it to the researcher, whereas teachers who received virtual coaching had to print their own assessment forms and email them to the researcher. This added responsibility could have resulted in fewer teachers completing self-assessments.

A couple of assumptions could be made about the low number of self-assessments completed by the teacher participants. Teachers may not feel comfortable with self-evaluating their own practice. They may need to learn how to build self-evaluation into their teaching. With the emphasis being placed on teacher self-evaluation in new teacher evaluation protocols, it will be imperative that instructional coaches who provide coaching assist teachers in incorporating self-assessment into their teaching practice.

Inter-Observation Reliability

Guidelines from *What Works Clearinghouse* require that 20% of data collected in a study be measured by more than one observer for the study to be considered to meet evidence standards (Kratochwill et al., 2010). The current study met this recommended

requirement with 20% of the treatment group observations coded by more than one observer and 38% of the control group observations being coded by more than one observer. Each data collection observer attended a training session on how to code the PDIOF (Appendix A).

A percentage (or proportional) agreement method was used to calculate inter-observer reliability (Swoboda et al., 2010). The researcher calculated the percentage of RallyCoach^{TM} components recorded by each observer for each date. Reliability was calculated for each pair of observers for each date. As suggested by De Allen (2010), the smaller percentage (S) was divided by the larger percentage (L) and multiplied by 100 (S/L x 100). An acceptable level of agreement was 80% (Kazdin, 2010).

The inter-observer level of agreement for the teacher components of RallyCoach^{TM} for both the control group and treatment group were above the 80% score suggested by Kazdin (2010). However, the validity of the 100% inter-observer level of the baseline phase of the treatment group was a concern, because there was only one observation in this phase that had multiple observers.

Student components of the RallyCoach^{TM} level of agreement for the control group observers was above the 80% reliability score for baseline and maintenance. However, the level of agreement for intervention was just below the 80% score at 78%. The treatment group observers scored a level of inter-observer agreement above 80% for the intervention and maintenance phases and below the 80% score for baseline (63%). This baseline inter-observer level may not be a true representation, because there was only one coaching session in this phase that was coded by multiple observers.

Participants were asked to complete self-assessment of their implementation of student components during intervention B and maintenance phases. With the exception of the maintenance phase for the treatment group, the inter-observer level of agreement between the coach and teacher participants was above 80% for all phases for both control and treatment groups. Once again, however, validity in that phase was a concern, because there was only one teacher session in which a teacher self-assessment was completed.

Using the inter-observer calculations, it could be interpreted that there was reliability for multiple observers in the current study. The sessions not meeting the recommended 80% level of agreement were sessions that could be considered invalid due to the low number of observations with multiple observers in that phase. The control group intervention phase that did have many multiple observed sessions was very close to meeting the 80% with a 78% level of agreement. The inter-observer reliability for all study participants and phases of current study are displayed in Table 10.

Table 10

Inter-Observer Reliability

Participants	Baseline	Intervention	Maintenance
Teacher			
Control Group	93%	85%	91%
Treatment Group	100%	95%	85%
Student			
Control Group	83%	78%	88%
Treatment Group	63%	85%	93%
Teacher/Coach			
Control Group	N/A	88%	84%
Treatment Group	N/A	94%	69%

Introduction to Data Analysis

A multiple time series design was used to compare the change of teaching behavior of the control group (face-to-face coaching) to the change in teaching behavior of the treatment group (virtual covert audio coaching) across baseline, intervention, and maintenance phases. Data analysis included two types of data analysis procedures for multiple time series design recommended in the literature: descriptive statistics and visual inspection (Gast, 2009; Horner, 2012)

The time that a teacher spent in each phase was determined by a pre-set observation schedule (Appendix J). The observation schedule was developed to enable the completion of all phases of the study, except long term maintenance, in the fall semester of the 2011-2012 school year. Groups were compared on the implementation

components of the RallyCoach™ cooperative learning structure. The components for teachers and students are displayed in Table 11.

Table 11

Teacher and Student Components of RallyCoach™

Implementation Components
Teacher
1. 1 paper, 1 pencil per two students.
2. Shoulder partners (side-by-side).
3. If one extra student, form one team of three (only counted if team of three).
4. Teacher states/reviews oral directions for structure.
5. Teacher provides model.
6. Teacher circulates, assesses, and assists.
7. Teacher provides specific directions to team of three (only counted if team of three).
Student
1. Partner A does first problem, talking out loud his/her thinking (no writing).
2. Partner B watches and gives OK.
3. Partner B coaches if needed.
4. Partner A writes answer.
5. Partner B provides positive reinforcement (Positive student-to-student interaction).
6. Partners switch roles for each problem.

Data Analysis for Research Question 1

Is virtual coaching as effective as face-to-face coaching to improve teacher accuracy of implementation of a cooperative learning structure, RallyCoach™, learned in a face-to-face professional development session?

Research Question 1 addressed the primary purpose of this study which was to analyze the impact of two types of instructional coaching, face-to-face and virtual covert

audio provided with Bluetooth technology, on teacher transfer of knowledge learned in professional development into classroom practice

Two measures were used to answer Research Question 1. The first measure was the teacher transfer of knowledge measured by accuracy of teacher implementation of teacher and student components of the cooperative learning structure, RallyCoach™, learned in professional development. The second measure was the percentage of teacher and student components that required coaching across phases for both groups. An increase in the mean percentage of RallyCoach™ components implemented and a decrease of the mean percentage of components requiring coaching provided evidence of teacher transfer and demonstrated a positive impact of coaching.

Descriptive Statistics

RallyCoach™ Component Implementation

Phase means for implementation were calculated for control and treatment groups for teacher and student components. This was accomplished by averaging the performance of individual participants in a phase and averaging the individual means of all group members to arrive at the group mean for the phase (Horner, 2005). Control group phase means were compared to treatment group phase means. Figure 3 displays group phase means for RallyCoach™ teacher components for baseline, intervention, and maintenance phases.

Both the control group and the treatment group increased the percent of teacher components implemented from baseline to intervention by sixteen percentage points,

with the control group increasing from 66% to 82%, and the treatment group increasing from 67% to 83%. The control group and the treatment group increased the percent of teacher components implement from intervention to maintenance by seven percentage points, with the control group increasing from 82% to 89% and the treatment group increasing from 83% to 90%.

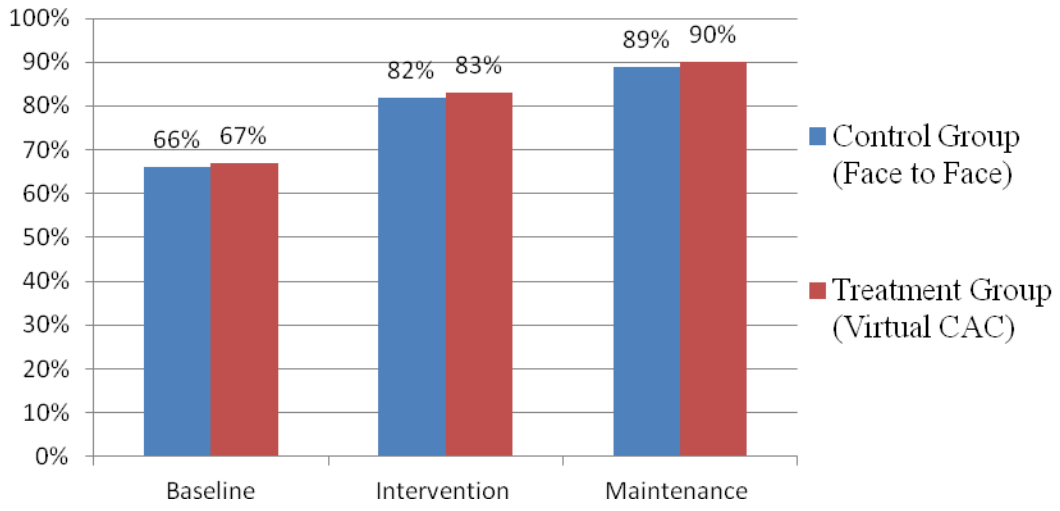


Figure 3. Teacher Components of RallyCoach™ Implementation

Group implementation percentages for student components of RallyCoach™ across baseline, intervention, and maintenance phases are displayed in Figure 4. Both the control group and the treatment group increased the percentage of student components implemented from baseline to intervention. The control group increased 13%, from 50% to 63%, and the treatment group increased 19% from 59% to 78%. Both the control group and the treatment group increased the percentage of student components

implemented from intervention to maintenance. The control group increased from 63% to 75%, a 12% increase, and the treatment group increased 10%, from 78% to 88%.

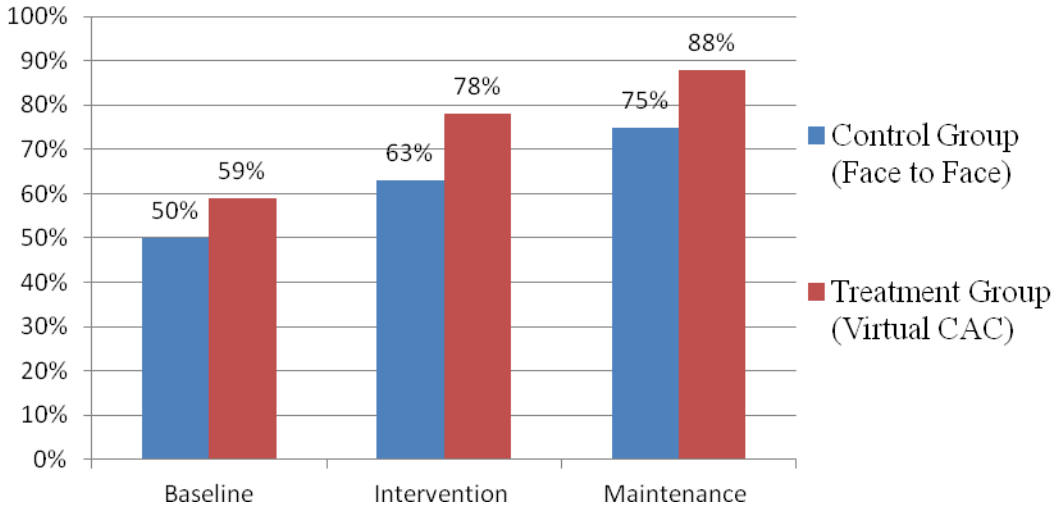


Figure 4. Student Components of RallyCoach™ Implementation

The increase in the percentage of RallyCoach™ components implemented across phases for teachers in both groups showed improved teacher transfer of knowledge from professional development to classroom practice. Baseline phase represented the implementation rate of attending teacher professional development with no coaching provided. Coaching was provided during intervention phases. During intervention, both the control group and the treatment group increased the percentage of teacher and student components of RallyCoach™ implemented. Data reflected in Figure 4 shows that face-to-face and virtual coaching can have a positive impact on teacher transfer of knowledge as measured by implementation accuracy. The maintenance phase measured implementation after coaching ceased. This phase showed the positive impact of face-to-

face and virtual coaching on teacher transfer of knowledge from professional development across time.

Coaching of Components

The percentage of teacher and student components that required coaching was calculated from baseline through maintenance as one measure across the study from beginning to end. Both face-to-face participants and virtual covert audio participants required more coaching with student components than with teacher components. The teacher components included teaching actions such as giving specific directions, modeling, and circulating and assisting students. These were similar to teaching practices already used by many teachers and therefore required low road transfer. The student components required teachers to guide students to work effectively with a peer to watch, listen, coach, and give positive feedback. These components may have required high road transfer because practices may not have been similar to students' and teachers' prior classroom experiences.

The control group that received face-to-face coaching required more coaching than the virtual treatment group on both teacher and student components. This was because the control group scored a lower baseline percentage for implementation and, therefore, needed more coaching of components. Because the control group and the treatment group both increased implementation after instructional coaching, however, it could be interpreted that the virtual covert audio coaching was as effective as face-to-face

coaching to increase teacher transfer of knowledge from professional development to classroom practice. These data are presented in Figures 5 and 6.

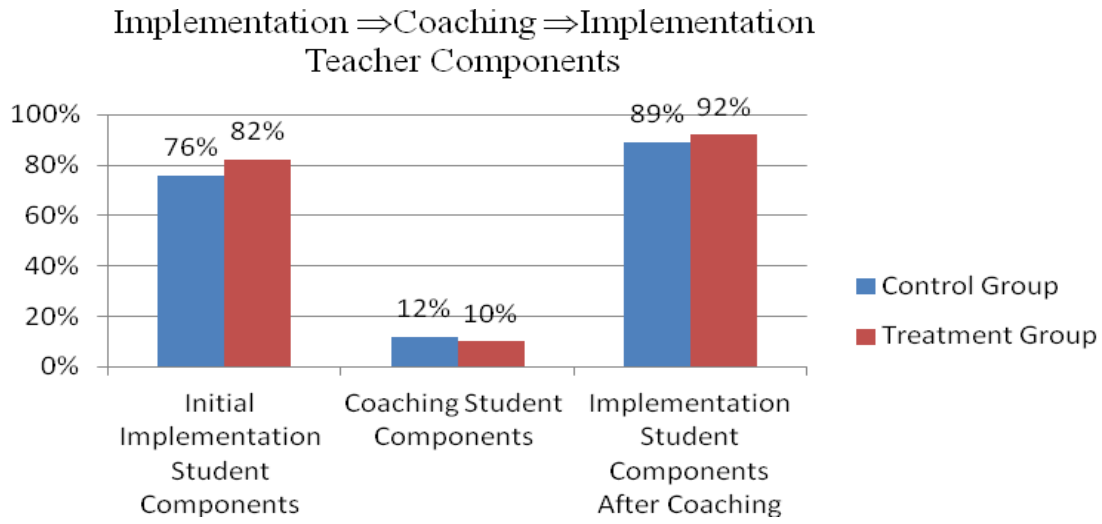


Figure 5. Coaching: Teacher Components

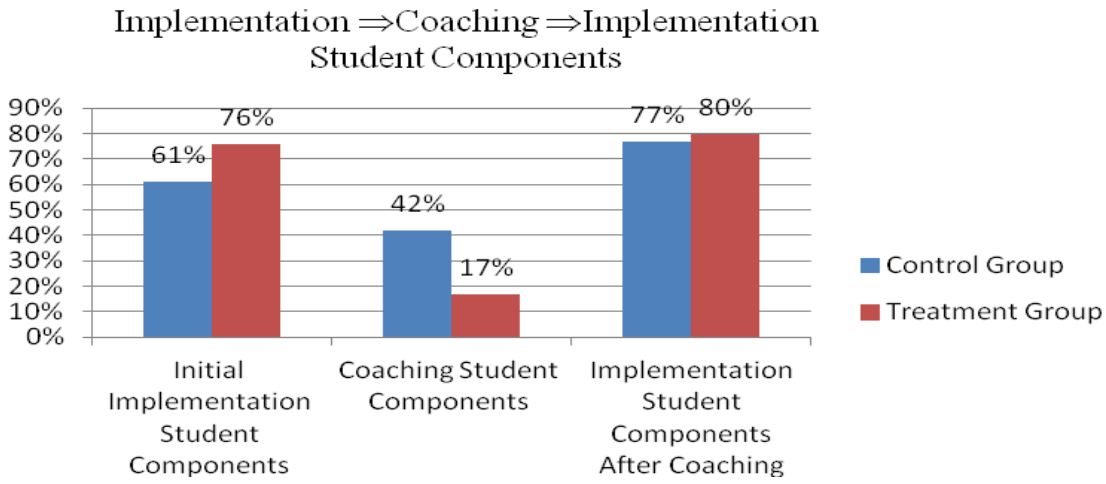


Figure 6. Coaching: Student Components

Visual Analysis

Visual inspection of graphed qualitative data was used to analyze participant performance over time (Kazdin, 2010). Visual data analyses, according to Horner (2005), require the examination of changes in level, trend, and variability over time. To measure performance over time in the study, the mean performance of a group was calculated by averaging all the performance percentages of all participants in the group for each observation date. This calculation provided a single data point for each group for each observation date. These data points were graphed on a trend line across phases. Visual data were analyzed for RallyCoach™ component implementation and the coaching of components.

RallyCoach™ Component Implementation

Data on implementation of RallyCoach™ components were analyzed by observation session dates (13 for the control group and 15 for the treatment group) across study phases. The researcher averaged all the data collected by all data collectors for each observation date to arrive at a single data point (mean percentage) for the group for each observation date. Both intervention phases, weekly coaching sessions, and bi-monthly coaching sessions (every other week), were averaged together. The two maintenance phases, short term maintenance (bi-monthly) and long term maintenance (monthly), were averaged together. Data on implementation of teacher components are displayed in Figures 7 and 8. Data on implementation of student components are displayed in Figures 9 and 10.

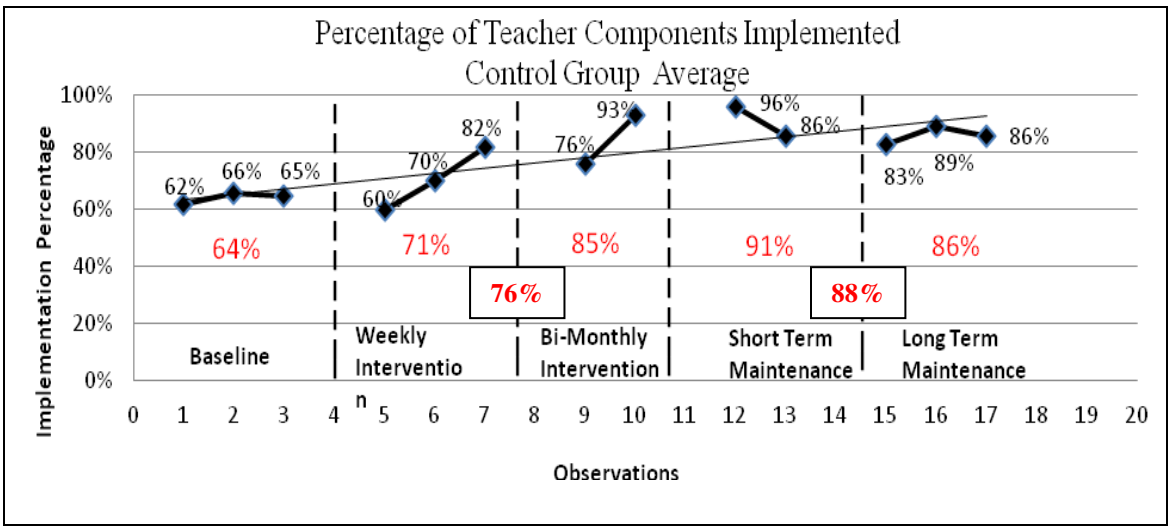


Figure 7. Percentage of Teacher Components Implemented: Control Group

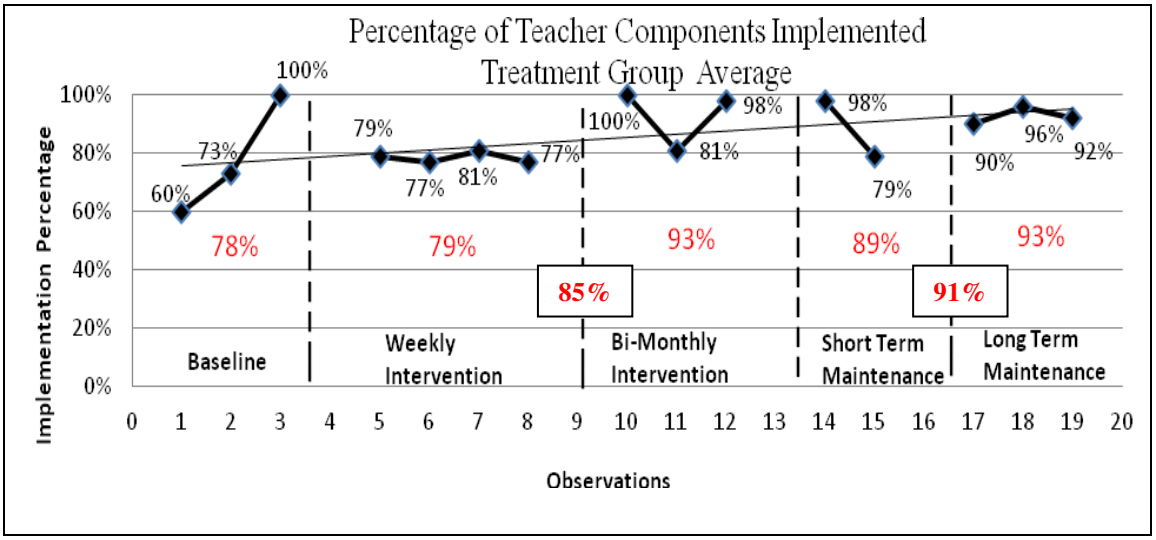


Figure 8. Percentage of Teacher Components Implemented: Treatment Group

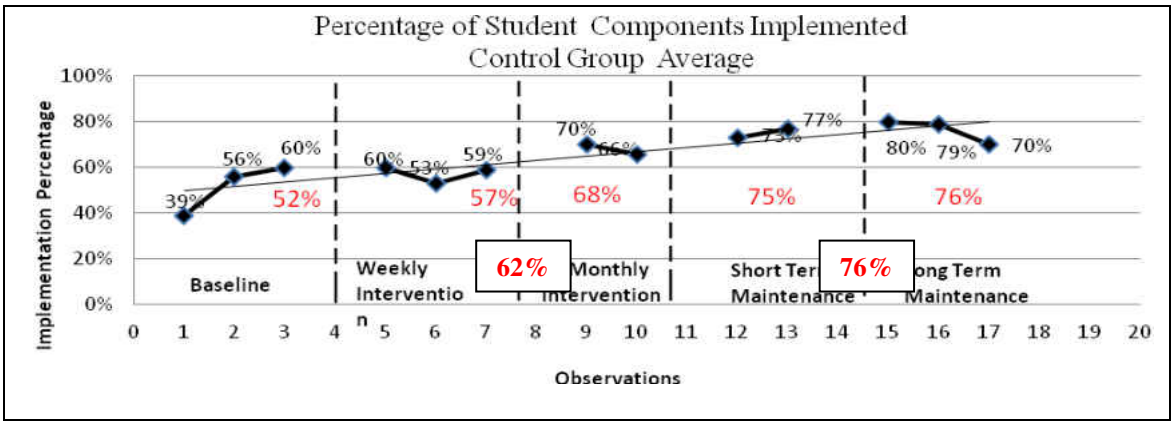


Figure 9. Percentage of Student Components Implemented: Control Group

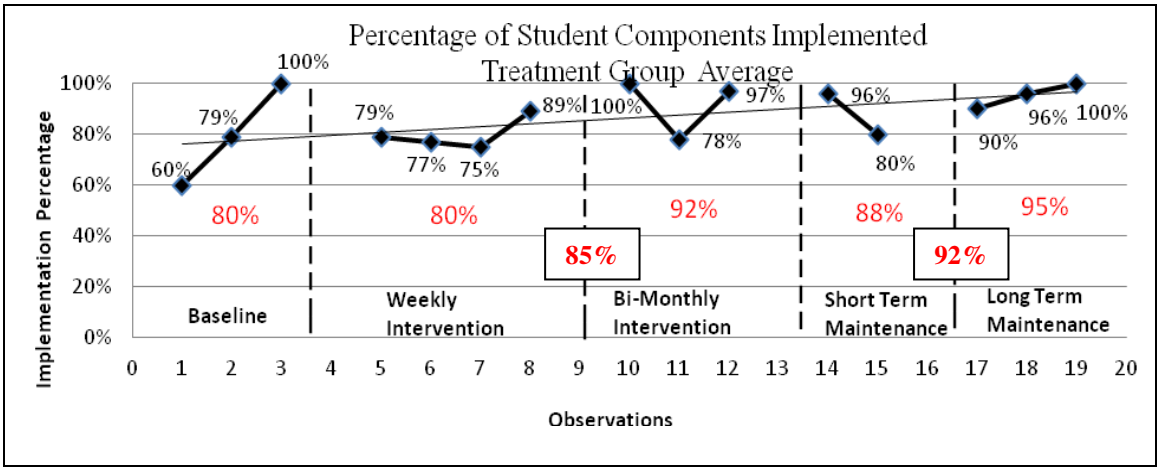


Figure 10. Percentage of Student Components Implemented: Treatment Group

Level

The level of the data refers to the "position" of the data point on the Y-axis. The level for this study was the mean percentage of teacher implementation of RallyCoach™ components. The change in mean implementation was analyzed across phases. When

plotting implementation percentage, movement to a higher position on the Y-axis represented improvement in teacher transfer.

The researcher calculated level change as the percentage of RallyCoach™ components implemented. The data on the mean percentage of teacher implementation across phases is displayed in Table 12 and revealed a 12% to 24% level increase. Horner (2012) proposed that positive changes in level indicate an effect size. Increased teacher implementation of RallyCoach™ components can represent a positive effect of face-to-face and covert audio coaching on the transfer of knowledge to classroom practice by participants of the study. The face-to-face participants started at a lower baseline percentage of implementation and, therefore, had a higher increase in implementation. The virtual audio coaching participants started at a higher baseline percentage and continued to have a higher maintenance percentage for implementation of components. Both the face-to-face group and the virtual audio coaching group increased implementation of RallyCoach™ components. It could, therefore, be interpreted that virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

Table 12

Component Implementation Level

Components	Baseline	Intervention	Maintenance	Total Change	Direction
Teacher					
Face-to-face (Control)	64	76	88	+24	Increase
Virtual (Treatment)	78	85	91	+13	Increase
Student					
Face-to-face (Control)	52	62	76	+24	Increase
Virtual (Treatment)	80	85	92	+12	Increase

Trend

Horner (2012) stated that an increase in the linear trend between phases supports an effect size. Linear trend of implementation of RallyCoach™ components for each study phase was calculated using the trend function in Microsoft Excel™. The linear trend increased from baseline to intervention and from intervention to maintenance for face-to-face and covert audio coaching for teacher and student components of RallyCoach™. This could be interpreted, as both types of instructional coaching having a positive effect on teacher transfer of knowledge.

Horner (2012) reported that the closer the linear trend is to one, the stronger is the effect size. The maintenance linear trends for both the control group and treatment group approached one (.92, .89, .75, and .84) to indicate a strong positive effect size of the coaching interventions on teacher transfer of knowledge. The treatment group that

received virtual audio coaching had a linear trend closer to one than the control group that received face-to-face coaching in all phases except maintenance for the teacher components. It could, therefore, be interpreted that virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Linear trend data are presented in Table 13.

Table 13

Linear Trend for Component Implementation

Components	Baseline	Intervention	Change	Direction	Maintenance	Total Change	Direction
Teacher							
Face-to-face (Control)	.60	.66	.06	Increase	.92	.26	Increase
Virtual (Treatment)	.66	.78	.12	Increase	.89	.11	Increase
Student							
Face-to-face (Control)	.46	.58	.12	Increase	.75	.17	Increase
Virtual (Treatment)	.56	.69	.13	Increase	.84	.15	Increase

Variability

According to Horner (2012), the variability is the deviation of scores around the trend line. The trend line was calculated in Microsoft Excel™ from the mean percentages of component implementation. Standard deviation represented the spread of data from the mean score. Therefore, the standard deviation was a measure of the variability of the data. Horner (2012) reported that variability between phases is a

potential indicator of a treatment effect even if no changes in level and trend are observed. The decrease of the standard deviation across phases represented a decrease in variability of data and showed a treatment affect for both types of coaching. Standard deviation scores of the treatment group were lower than those of the control group for most phases. Thus, it was interpreted that virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

Gast (2009) explained that the smaller the range of data points, the more stable the data. Data for this study appeared stable, as evidenced by the range of data points growing smaller across phases. However, the data range from intervention to maintenance for the treatment group on teacher components of RallyCoach™ did increase, but the range still remained smaller than at baseline. The smaller the range, the less variability there is in the data. Horner (2012) suggested that a decrease in range demonstrating a decrease in data variability can be interpreted as an effect size. Both face-to-face coaching and virtual audio coaching resulted in a decreased range of scores. This was indicative of a positive effect of teacher implementation percentages and transfer of knowledge. The treatment group that received covert audio coaching had smaller ranges than the control group that received face-to-face coaching. Data interpretation was that the virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Standard deviation and range data are presented in Table 14.

Table 14

Variability for Component Implementation

	Standard Deviation			Range (n)		
Components	SD_B	SD_I	SD_M	R_B	R_I	R_M
Teacher						
Face-to-face (Control)	19.4	14.2	10.8	62-65 (3)	60-93 (33)	83-96 (13)
Virtual (Treatment)	15.7	6.2	11	0-100 (43)	77-100 (23)	79-98 (19)
Student						
Face-to-face (Control)	17.4	12.6	7.3	39-60 (21)	53-70 (17)	73-80 (7)
Virtual (Treatment)	9	5.2	2.1	65-100 (35)	70-100 (30)	80-100 (20)

Note: SD_B = Baseline Standard Deviation; R_B = Baseline Range
SD_I = Intervention Standard Deviation; R_I = Intervention Range
SD_M= Maintenance Standard Deviation; R_M = Maintenance Range

Coaching of Components

Visual analysis of the mean percentage of RallyCoach™ components coached was conducted on the data to determine the required coaching levels for participants across phases of the study. With instructional coaching, there are always different levels of coaching that are required by different teachers. The three levels of coaching for this study were minimum coaching (80%-100% of components implemented), moderate coaching (60%-79% of components implemented), and extensive coaching (59% or less of components implemented). As recommended by Horner (2005), group trends were calculated to arrive at a single data point for coaching levels of minimum, moderate, and

extensive coaching for each coaching date across phases of the study. Visual representations of coaching level data for control and treatment groups for both teacher and student components are presented in Figures 11, 12, 13, and 14.

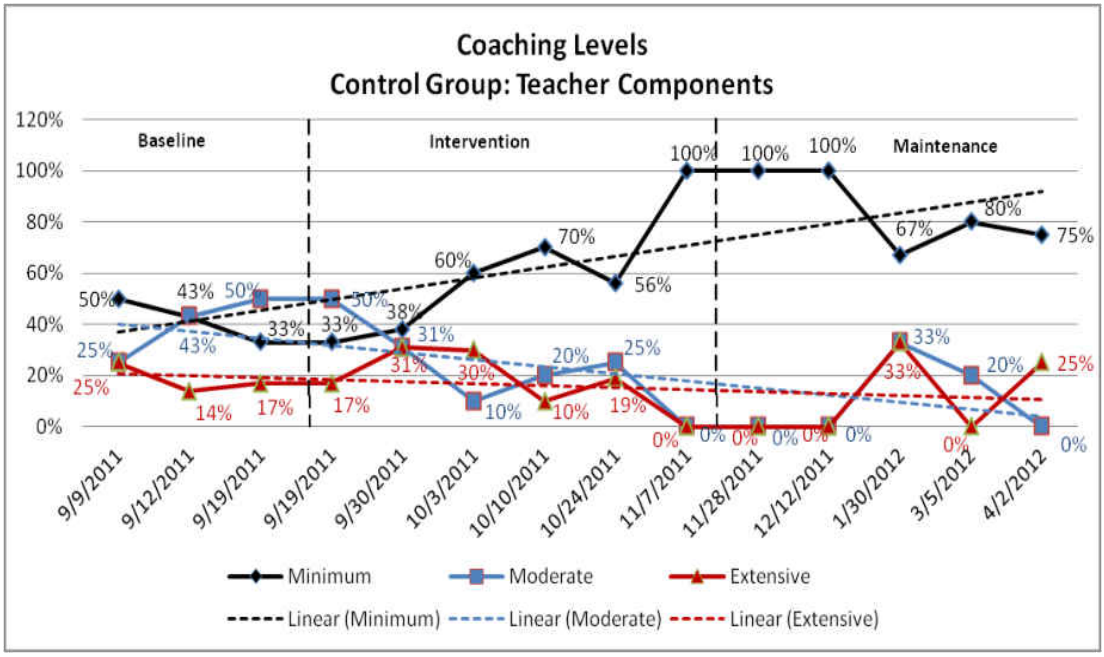


Figure 11. Control Group Coaching Levels: Teacher Components

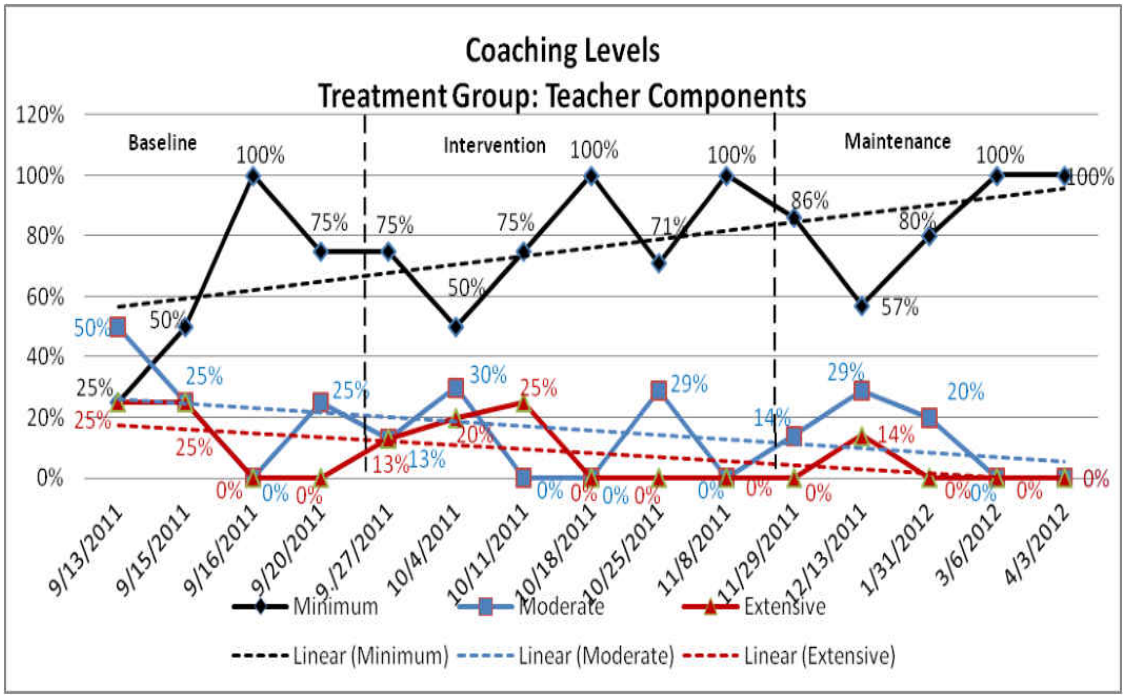


Figure 12. Treatment Group Coaching Levels: Teacher Components

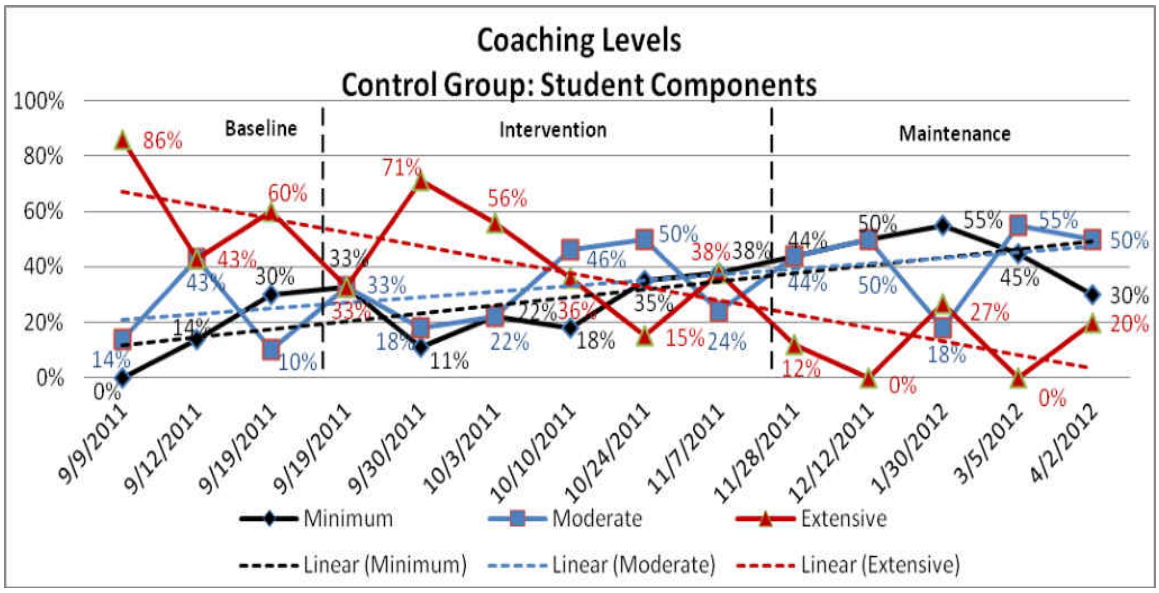


Figure 13. Control Group Coaching Levels: Student Components

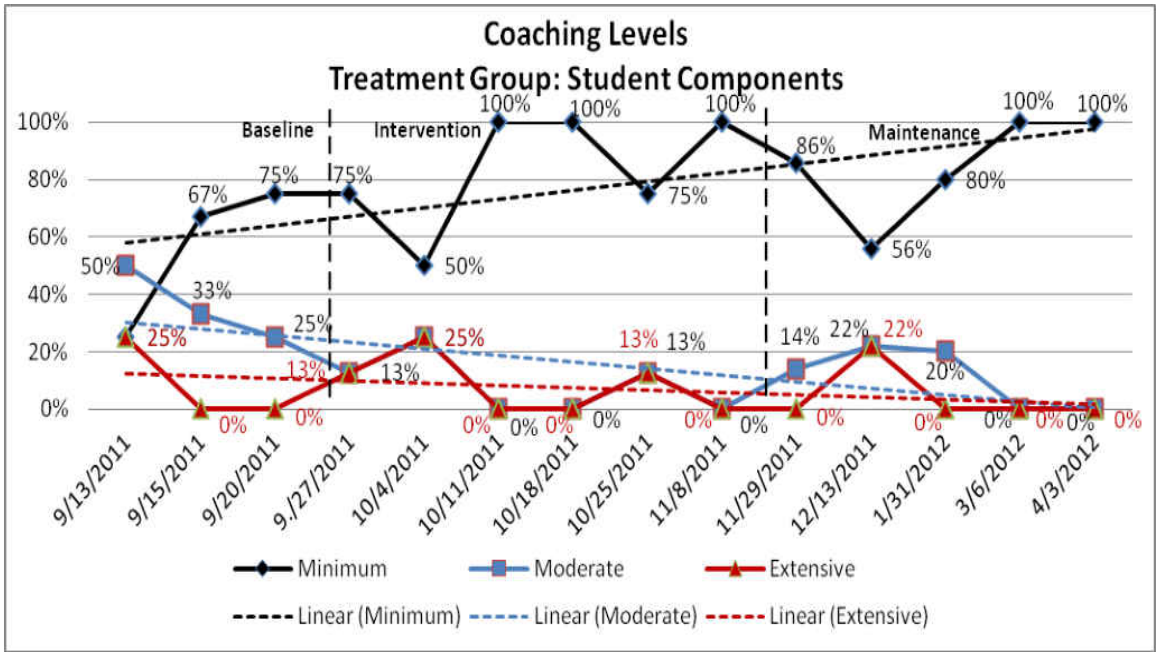


Figure 14. Treatment Group Coaching Levels: Student Components

Level

The mean percentage of participants requiring the three coaching levels (minimum, moderate, or extensive) was calculated for each group for each phase of the study. Coaching effectiveness would result in a decrease of extensive and moderate coaching and in an increase in minimum coaching over time.

The control group that received face-to-face coaching and the treatment group that received virtual covert audio coaching both (a) decreased the percentage of teachers that required extensive and moderate coaching and (b) increased the percentage of teachers that required minimum coaching over time from baseline to intervention and from intervention to maintenance. This decrease in the percentage of teacher components that required extensive or moderate coaching demonstrated the effectiveness of both types of instructional coaching. The control group (42%) and the treatment group (48%) were similar in the decreased percentages of teachers needing more coaching. Thus, it could be interpreted that virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Table 15 displays the data on coaching level changes.

Table 15

Comparison of Required Levels of Coaching: Control and Treatment Groups

Group	Baseline	Intervention	Maintenance	Difference	Direction
Control					
Extensive	33%	19%	8%	25%	Decrease
Moderate	28%	25%	11%	17%	Decrease
Minimum	39%	57%	81%	42%	Increase
Treatment					
Extensive	17%	9%	7%	10%	Decrease
Moderate	50%	15%	12%	38%	Decrease
Minimum	33%	76%	81%	48%	Increase

Trend

Coaching was only provided during the intervention phase of the study. Coaching was not provided during the baseline or maintenance phase. However the "need" for coaching exhibited by the participants was measured by the implementation rate of RallyCoach™ components across all phases. The linear trend of the coaching level of RallyCoach™ components for each study phase was calculated using the trend function in Microsoft Excel™. The direction of the trend for 24 phase transitions across time for all RallyCoach™ components was analyzed for a change in the coaching level. A decreasing trend for extensive coaching and an increasing trend for moderate and minimum coaching over time demonstrated coaching effectiveness.

Both face-to-face and covert audio coaching rendered a decreasing trend for extensive coaching for 75% (3 of the 4) of extensive coaching transitions for all RallyCoach™ components. Face-to-face coaching resulted in an increasing trend for moderate coaching for 75% of phase transitions, and covert audio coaching resulted in an

increasing trend for moderate coaching for 50% of phase transitions. Both face-to-face and covert audio coaching rendered an increasing trend for minimum coaching for 75% of phase transitions. Trend data presented in Table 16 could be interpreted as showing that both types of instructional coaching had a positive effect on teacher transfer of knowledge by resulting in a decreasing trend for extensive coaching and increasing trends for moderate and minimum coaching. It could also be interpreted to show that virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

Table 16

Linear Trend for Component Coaching

Group/Level	Baseline	Intervention	Difference	Direction	Maintenance	Difference	Direction
Control - Teacher							
Extensive	.23	.33	.10	Increase	.02	.31	Decrease
Moderate	.27	.27	.00	Same	.07	.20	Increase
Minimum	.51	.41	.10	Decrease	.98	.57	Increase
Treatment - Teacher							
Extensive	.28	.20	.08	Decrease	.06	.14	Decrease
Moderate	.44	.17	.27	Decrease	.24	.07	Increase
Minimum	.32	.63	.31	Increase	.70	.07	Increase
Control - Student							
Extensive	.76	.53	.23	Decrease	.09	.14	Decrease
Moderate	.24	.26	.02	Increase	.40	.38	Increase
Minimum	.00	.20	.20	Increase	.51	.31	Increase
Treatment - Student							
Extensive	.21	.15	.06	Decrease	.09	.03	Increase
Moderate	.49	.15	.34	Increase	.21	.13	Decrease
Minimum	.31	.70	.39	Increase	.70	.00	Same

Variability

A decrease of the standard deviation across phases represents a decrease in variability of data and can be considered to show a treatment effect (Horner, 2012). Standard deviation scores of the treatment group decreased across phases from baseline line to intervention and intervention to maintenance for all three coaching levels for teacher and student components, indicating an effect for virtual covert audio coaching.

Standard deviation scores of the control group increased for teacher components across all phases for all three coaching levels. Although, according to Horner (2012), this could show that face-to-face coaching did not have a treatment effect, this increase in standard deviation could be explained by the extreme coaching levels for minimum and extensive coaching for teacher components for the control group. On multiple dates toward the end of the intervention phase and within the maintenance phase, 100% of the control group teachers required only minimal coaching which resulted in a score of 0% of teachers needing moderate or extensive coaching. Although these extreme percentages may have skewed the standard deviation, it is the desired outcome of coaching to move teachers to the minimum level of coaching and away from moderate and extensive levels of coaching. The standard deviation of the control group for student components increased from baseline to intervention but decreased from intervention to maintenance to a standard deviation lower than baseline.

Visual analysis of standard deviation of coaching levels revealed that both face-to-face and virtual audio coaching had an effect by lowering the level of coaching

required by teachers. Virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Standard deviation data for coaching levels are presented in Table 17.

Horner (2012) suggested that a decrease in range demonstrating a decrease in data variability can be interpreted as an effect size. The treatment group decreased the data range for all coaching levels across phases for teacher and student components, demonstrating an effect size for virtual covert audio coaching. The control group had unstable ranges with some increasing and some decreasing for coaching levels for both types of implementation components. Virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Range data for coaching levels are presented along with standard deviation in Table 17.

Table 17

Variability of Coaching Levels: Teacher and Student Components

	Standard Deviation			Range		
Group/Level	Baseline	Intervention	Maintenance	Baseline	Intervention	Maintenance
Control - Teacher						
Extensive	5.68	22.82	14.98	33-50 (23)	0-31 (31)	0-33 (33)
Moderate	12.89	12.31	15.22	25-50 (25)	0-31 (31)	0-33 (33)
Minimum	8.54	13.24	16.13	14-25 (11)	38-100 (62)	67-100 (33)
Treatment - Teacher						
Extensive	14.43	11.25	6.26	0-25 (25)	0-25 (25)	0-14 (14)
Moderate	20.41	14.46	12.68	0-50 (50)	0-30 (30)	0-29 (29)
Minimum	32.27	19.06	17.74	25-100 (75)	50-100 (50)	57-100 (43)
Control - Student						
Extensive	21.65	21.69	12.00	86-43 (43)	15-56 (41)	0-27 (27)
Moderate	18.00	13.27	14.72	10-43 (33)	18-50 (32)	18-50 (32)
Minimum	15.01	26.16	9.36	0-30 (30)	11-38 (27)	30-50 (20)
Treatment - Student						
Extensive	14.43	10.29	9.83	0-25 (25)	25-50 (25)	25-75 (50)
Moderate	12.76	10.29	9.51	50-100 50)	0-25 (25)	0-25 (25)
Minimum	55.66	20.41	18.13	56-100 (43)	0-22 (22)	0-22 (22)

Qualitative Analysis

Data obtained from coaching statements provided to teachers by the coach are presented in Table 19. The coaching statements provided most often for teaching components of RallyCoach™ were related to (a) modeling the structure steps and (b) students sitting side-by-side. The coaching statements provided most often for student components of RallyCoach™ were related to (a) teachers providing students with praise gambits to increase positive student-to-student interaction and (b) coaching gambits to improve student-to-student coaching. Control group participants were frequently provided co-presentation opportunities with the coach. However, many times teachers requested that the coach co-present Rallycoach™ with them. The treatment group did not have the opportunity to request co-presentation because of the virtual setting.

Table 18

Coaching Statements Across all Phases: Teacher and Student Components

Coaching Statement	Control	Treatment
Teacher Components		
Coach Model	1	N/A
Video Model	N/A	1
Coach Model w/Teacher	4	N/A
Model Structures Steps	2	8
Guided Practice of Structure Steps	0	1
Teams of 2	2	0
Side-by-side	6	4
Team of 3 directions	0	1
One Pencil and Paper	2	0
Total	17	15
Student Components		
Coach Model	5	N/A
Video Model	N/A	1
Coach Model w/Teacher	9	N/A
Model Structure Steps	4	6
Guided Practice of Structure Steps	4	3
Provide Praise Gambits	8	6
Think/Talk Out loud	5	1
Wait for OK to Write	1	
Provide Coaching Gambits	1	8
Total	37	25

Teacher actions performed after receiving coaching statements are presented in Table 20. These data indicated that coaching statements resulted in teachers implementing the RallyCoach™ components learned in professional development. Transfer of learning was promoted with the coaching statements.

Modeling RallyCoach™ components was one effective coaching action to promote teacher implementation. Teachers in the control group had an opportunity to watch the coach model implementation or the opportunity to implement side-by-side with

the coach. Treatment group teachers did not have these opportunities because the coach was not physically in the room. The coach did provide a video model of implementation for teachers in the treatment group. Both types of models, classroom and video, resulted in improved teacher implementation of RallyCoach™ components.

Table 19

Control Group and Treatment Group Actions Following Coaching Statements

Components	Control Group Actions	Treatment Group Actions
Teacher		
Teams of 2	Moved students to form teams of 2 with on one team of 3 if student numbers were not even.	Moved students to form teams of 2 with on one team of 3 if student numbers were not even.
Side-by-side	Moved students side-by-side.	Moved students side-by-side.
Team of 3 directions	Provide direction for team of 3 to keep paper or text in center and students rotate seats.	Provide direction for team of 3 to keep paper or text in center and students rotate seats.
One Pencil and Paper	Remove one paper or pencil.	Remove one paper or pencil.
Student		
Model Structure Steps	Teacher model steps. Display visual representation of structure steps.	Teacher model steps.
Guided Practice	Step by Step implementation with the entire class.	Step by Step implementation with the entire class.
Provide Praise Gambits	Student generated praise of the day. Teacher provided verbal and visually displayed praise gambits, i.e., you are smarter than I thought. You are as smart as Einstein. Super Duper.	Teacher provided verbal and visually displayed praise gambits. Teacher prompted praise.
Think/Talk Out loud	Teacher model with a student.	Teacher stopped students and redirected to talk out loud and show work with manipulates.
Wait for OK to Write	Teacher provided a specific content prompt for students to say. i.e."Do you agree a prism comes next?" Yes, I agree a prism comes next. No, I do not agree a prism comes next because….	Put pencil down until you get an ok to write. Teacher redirected student coach to listen to partner before saying an answer.
Provide Coaching Gambits	Teacher provided verbal and visually displayed coaching gambits.	Teacher provided verbal and visually displayed coaching gambits.

Data Analysis of Research Question 2

Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback, to guide the teacher to increase student-to-student positive interactions?

Research Question 2 addressed the second purpose of this study which was to analyze the impact of the type of instructional coaching on positive student-to-student interaction. The dependent variable for Research Question 2 was the percentage of student pairs that gave positive reinforcement to each other during the implementation of RallyCoach™. This measure was calculated by dividing the total number of student pairs by the number of student pairs that provided positive reinforcement to each other within each coaching session. These data were collected from item 12 of the Professional Development Implementation Observation Form. An increase in the percentage of student pairs that implemented student positive statements demonstrated coaching effectiveness.

Descriptive Statistics

Positive interaction was defined as any positive statement from a student to another student that could include positive feedback, i.e., "Yes, I agree subtraction is the correct operation," praise, i.e., "I like how you used complete sentences in your word problem," or a positive statement, i.e., "Your brain is on fire." Figure 15 displays the percentage of student pairs that implemented student-to-student positive interaction across study phases for control and treatment groups. Students in the treatment group

started at a higher rate of positive student interactions and ended at a higher rate of positive student interactions than students in the control group. However, students in both the control and treatment groups increased positive student-to-student interactions across baseline to intervention to maintenance phases. An increase in student-to-student interaction across phases was similar for both groups. Positive student-to-student interactions from baseline to intervention increased 10% for students in the control group and 13% for students in the treatment group. Positive student-to-student interactions from intervention to maintenance increased 17% for students in both groups. These data indicated that both face-to-face coaching and virtual covert audio coaching can support teachers to guide students to improve student-to-student positive interactions.

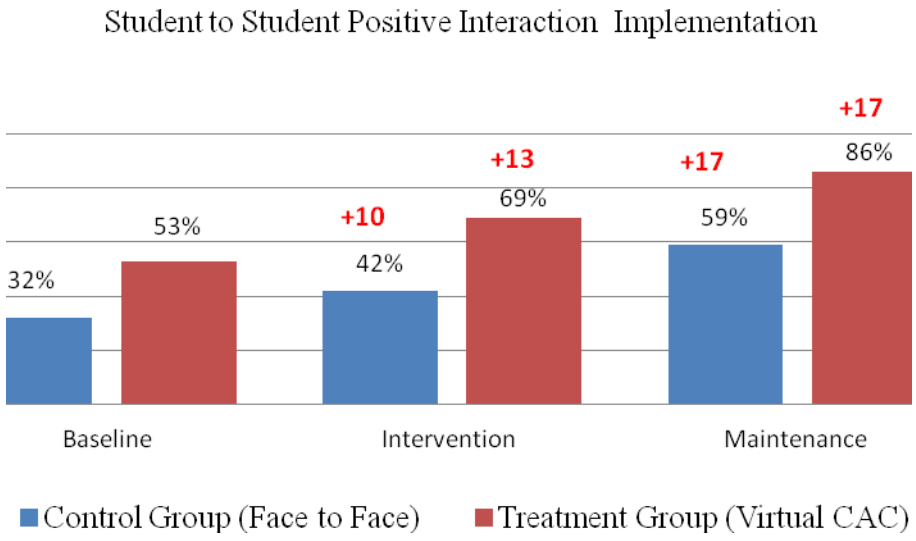


Figure 15. Implementation of Student-to-Student Positive Interaction

Visual Analysis

Teacher transfer of knowledge was measured by an increase in the number of student pairs that implemented the sixth student component, providing positive student-to-student interaction. A group mean for implementation of positive student-to-student interaction was calculated for each observation date. These data points were graphed, and level, trend, and variability of data points were analyzed for performance over time. Figures 16 and 17 display control and treatment group implementation percentages for student-to-student positive interaction across baseline, intervention, and maintenance phases.

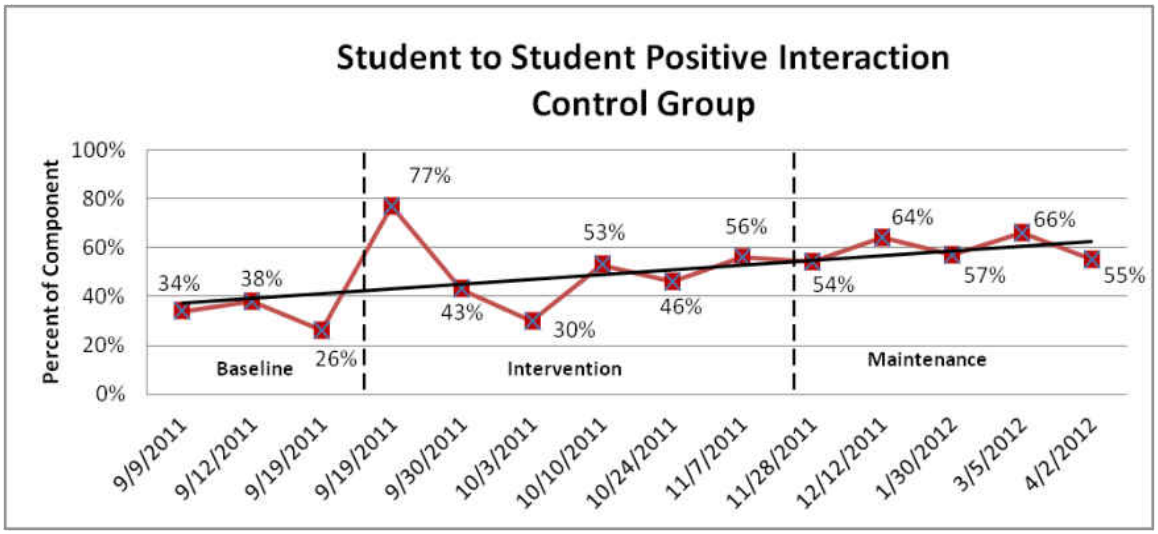


Figure 16. Student-to-Student Positive Interaction: Control Group

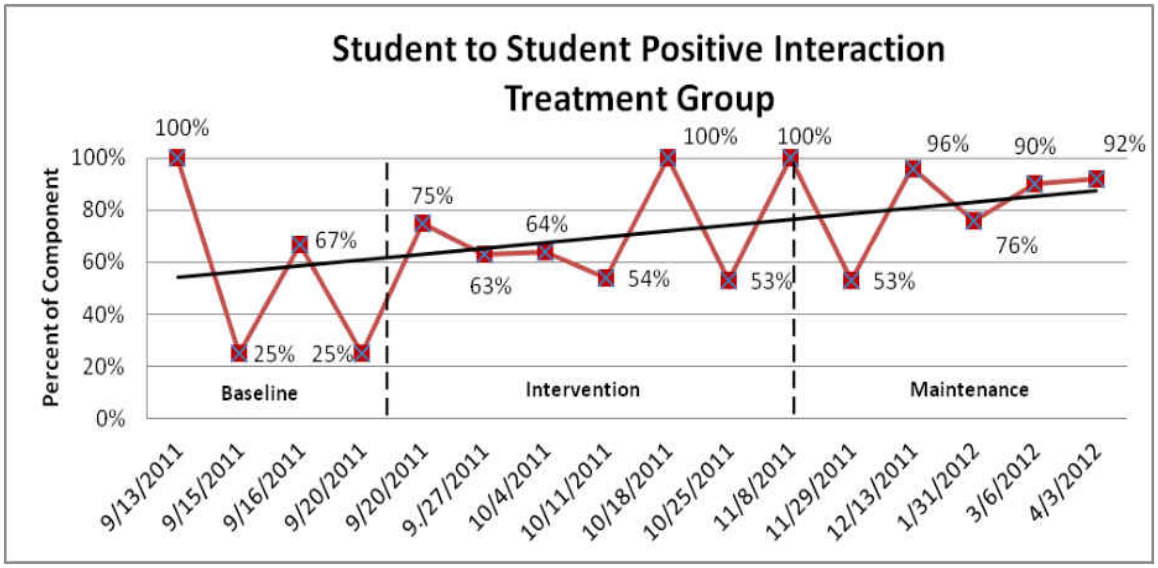


Figure 17. Student-to-Student Positive Interaction: Treatment Group

Level

The level of the data relates to the "position" of the data point on the Y-axis. The level for student-to-student positive interaction was the mean percentage of student pairs implementing the component. A change in mean implementation was analyzed across phases. When plotting implementation percentage movement, higher positions on the Y-axis represent improvement in teacher transfer.

Horner (2012) proposed that positive changes in level indicated an effect size. Both the control and treatment groups increased the percentage of student pairs implementing student-to-student positive interaction from baseline to intervention and from intervention to maintenance. The control group increased positive student-to-student interaction by 26% compared to the treatment group's 27% increase. Student-to-student positive interaction implementation data are presented in Table 21. Face-to-face

and virtual coaching had a positive impact on student-to-student positive interaction. Virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

Table 20

Student-to-Student Positive Interaction: Control and Treatment Groups

Groups	Baseline	Intervention	Maintenance
Control			
Level	33%	51%	59%
Trend	.36	.56	.58
Variability			
Standard Deviation	6.1	15.71	5.44
Range	26-34 (8)	30-77 (47)	54-66 (12)
Treatment			
Level	54%	73%	81%
Trend	.82	.63	.67
Variability			
Standard Deviation	36.36	20.91	17.57
Range	25-100 (75)	53-100 (47)	53-96 (43)

Trend

Horner (2012) stated that an increase in the linear trend between phases supports an effect size. Linear trend of implementation of student-to-student positive interaction for each study phase was calculated using the trend function in Microsoft Excel™. The linear trend increased from baseline to intervention and from intervention to maintenance for the control group. The linear trend increased from intervention to maintenance for the treatment group for student-to-student positive interaction. However the linear trend for the treatment group decreased from baseline to maintenance. The first baseline session

included only one teacher whose students implemented positive to positive interaction at 100%. This outlier skewed the baseline trend for the treatment group. Both types of instructional coaching had a positive effect on teacher transfer of knowledge. Linear trend data for student-to-student interaction is included in Table 21.

Variability

According to Horner (2012), the variability is the deviation of scores around the trend line. Two measures, standard deviation and range, were used to analyze the variability of data for student-to-student interaction for the control group and the treatment group. Horner (2012) reported a decrease of the standard deviation across phases represented a decrease in variability of data and can be considered to show a treatment affect. The standard deviation of data points for student-to-student interaction decreased from the beginning of the study to the end of study for both the control group (6.1 to 5.44) and treatment group (36.36 to 17.57). The decreasing deviation of both the control and treatment group demonstrated that both face-to-face and virtual audio coaching had a positive effect on student-to-student positive interaction.

Horner (2012) suggested that a decrease in range demonstrating a decrease in data variability can be interpreted as an effect size. The treatment group had a decrease in the range of data points for student-to-student positive interaction across phases. However, the control group had an increase in the range of data points. It could, therefore, be that the virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional

development to classroom practice. Standard deviation and range data for student-to-student positive interaction are presented in Table 21.

Qualitative Analysis

Data on coaching statements provided to teachers by the coach to increase implementation of RallyCoach™ components have been presented in Table 19. One of the most frequently provided coaching statements was for the teacher to provide students with praise gambits to teach them positive statements to say to one another.

Kagan & Kagan (2009) defined gambits as modeling (what a positive statement) "sounds like and look likes" (p. 11.13). Two types of positive gambits recommended by Kagan & Kagan are copy cat response gambits such as "Thanks for sharing; You are interesting to listen to" (p. 638) and complete the sentence gambits such as "Your most interesting idea was. . ." (p. 638). Teachers in this study were coached to use positive gambits. Students of teachers in both the control group and the treatment group increased the percentage of student pairs that provided positive student-to-student statements. Both face-to-face and virtual coaching supported teachers in guiding students to improve student-to-student positive interactions.

Social Validity: Teachers' Perception of the Intervention

Each teacher participant was asked to complete the Virtual Study Participant Survey (Appendix F) during the maintenance phase of the study. Several questions on the survey were used to measure the social validity, i.e., the participants' perceived

usefulness, of the coaching types. All teachers (100%) for both control and treatment groups either strongly agreed or agreed that the type of coaching they received provided immediate feedback and was beneficial in assisting them to implement RallyCoach™. The majority of participants of the control group (100%) and the treatment group (83%) either strongly agreed or agreed that coaching was non-intrusive to instruction. However, only 33% of participants for both groups agreed that they would like to have additional coaching. Thus, though a majority of the participants supported coaching as being beneficial, a low number of participants wanted additional coaching. This finding indicates that though teachers' perception of the usefulness of instructional coaching has been improved, there is room for progress to improve the willingness of teachers to view instructional coaching as something to be desired. Teacher self-reported data on the usefulness of coaching is presented in Figures 18 and 19.

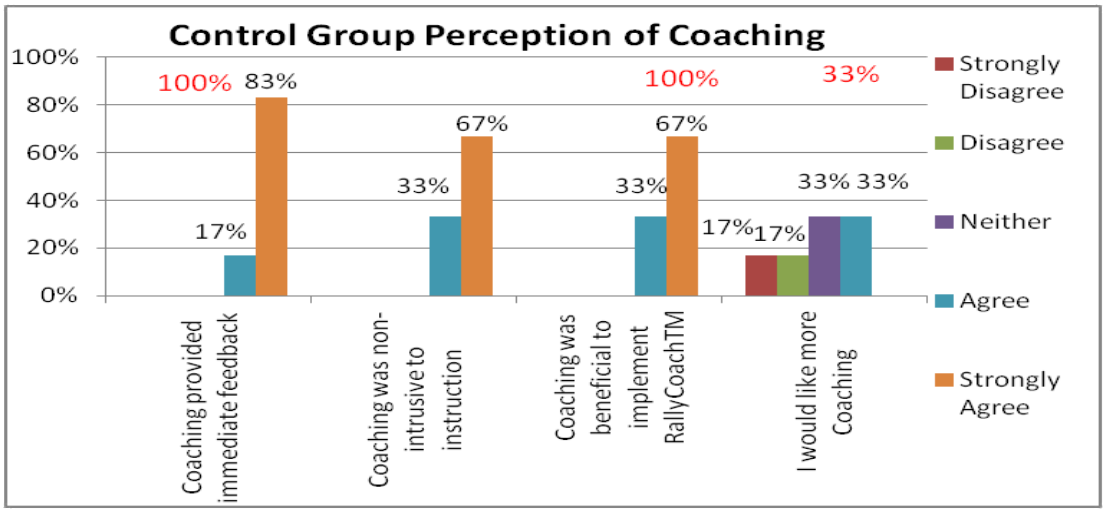


Figure 18. Participants' Perceived Usefulness of Coaching: Control Group

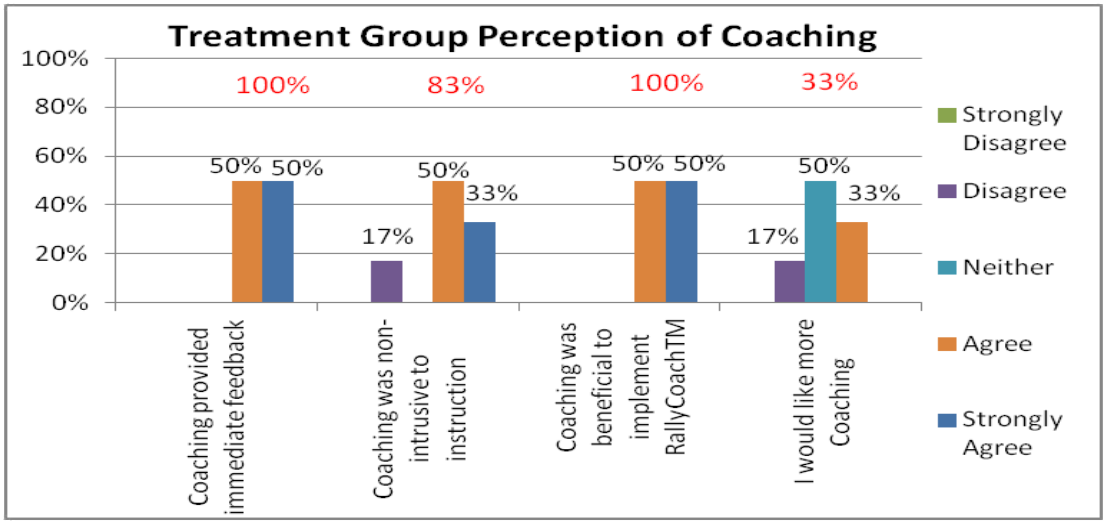


Figure 19. Participants' Perceived Usefulness of Coaching: Treatment Group

Fidelity of Treatment

Several procedures were established by the researcher to ensure fidelity of treatment. To ensure that multiple observers were recording observation data in the same manner, the PDIOF observation form (Appendix A) was developed. All observers received training that included modeling and practice in recording data on the observation form. A percentage or proportional agreement method was used to calculate inter-observer reliability (Swoboda et al., 2010). The inter-observer calculations could be interpreted as ensuring reliability of multiple observers in the current study. The sessions not meeting the recommended 80% level of agreement (Kazdin, 2010) were sessions that could be considered invalid due to the low number of observations with multiple observers within that phase. The control group intervention phase that had many multiple observed sessions approached the 80% with a 78% level of agreement.

Treatment group participants received one training session on how to use technology for virtual covert audio coaching. The researcher also developed a set of steps outlining actions needed to use the technology. This information was forwarded to teacher participants before virtual coaching sessions. These procedures are presented in Appendix K.

To ensure fidelity for the teacher self-assessment process a set of procedures were developed (Appendix C). These procedures were provided to all teachers on an ongoing basis via email before intervention B and maintenance phases.

Internal Validity

Internal validity is defined as "the extent to which observed differences on the dependent variable in a study are the result of the independent variable and not some uncontrolled extraneous variable or variables" (Ary, Jacobs, Razavieh, & Sorensen, 2006, p. 634). Internal threats to validity for the current study included history, instrumentation, and observation.

Ary et al. (2006) explained the internal threat of history as events that are unrelated to the independent variable but may demonstrate a change in the dependent variable. The current study utilized strategies recommended by Robson et al. (2001) to control for threats to internal validity that included establishing a control group and conducting multiple observations of the treatment and control groups before and after the independent variable was introduced.

Differences in the way data are recorded by different observers can impact internal validity. To address this threat, the researcher developed the PDIOF (Appendix A) observation form for all observers to use. All observers received training which included modeling of how to complete the PDIOF. For the teacher self-assessment included in the study, the researcher provided specific directions to all participants on how to conduct the self-assessment procedure (Appendix C). This procedure was shared with all participants in an email before intervention B and maintenance observations.

Reliability

Creswell (2008) explained that when the research results can be applied to others beyond the study participants, it can be assumed to be reliable. Assuring that research is conducted with clear methods and procedures so that it can be replicated is also an important element in establishing the reliability of any research project (Creswell, 2008). The reliability of this study can only be established by others replicating the study to see if similar results are obtained. The researcher established a study design, instruments, and procedures that could be utilized by others to replicate a similar study. The inter-observer reliability of the current study ensured that multiple observers used the study observation instrument with an acceptable level of agreement. This finding shows that others could use the instrument to replicate the study.

Summary of Analysis

A multiple time series design was used to compare the change of teaching behavior of the control group (face-to-face coaching) to the change in teaching behavior of the treatment group (virtual covert audio coaching) across baseline, intervention, and maintenance phases. Data analysis included two types of data analysis procedures for multiple time series design recommended in the literature: descriptive and visual inspection (Gast, 2009; Horner, 2012).

Research Question 1

Research Question 1 asked, "Is virtual coaching as effective as face-to-face coaching to improve teacher accuracy of implementation of a cooperative learning structure, RallyCoach™, learned in a face-to-face professional development session?" This question addressed the primary purpose of this study which was to analyze the impact of two types of instructional coaching, face-to-face and virtual covert audio provided with Bluetooth technology, on teacher transfer of knowledge learned in professional development into classroom practice

Data analysis revealed that for both control and treatment groups, there was an increased mean (level) of the percentage of RallyCoach™ components implemented across time from baseline to intervention and from intervention to maintenance. There was an increasing trend line for implementation of RallyCoach™ components across phases for both study groups. The decreasing standard deviation across phases represented a decreasing variability of data and was considered to show a treatment affect

for both types of coaching. Both the face-to-face and the virtual audio coaching increased participant implementation of RallyCoach™ components. Virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

A second measure of the effectiveness on teacher transfer for face-to-face and virtual covert audio coaching was the required coaching level for participants across phases of the study. Three levels of coaching for this study were minimum coaching (80%-100% of components implemented), moderate coaching (60%-79% of components implemented), and extensive coaching (59% or less of components implemented). Data analysis revealed a decrease in the percentage of teacher components that required extensive or moderate coaching over time across phases for both the control group and the treatment group. Both the face-to-face and the virtual audio coaching increased participant implementation of RallyCoach™ components. Virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice.

Research Question 2

Research Question 2 asked, "Is virtual covert audio coaching as effective as face-to-face coaching, with both providing immediate teacher feedback, to guide the teacher to increase student-to-student positive interactions?" This research question addressed the second purpose of this study which was to analyze the impact of the type of instructional coaching on positive student-to-student interaction. Data analysis revealed an increasing

percentage of student pairs providing positive student-to-student interaction with an increasing trend line and a decreasing standard deviation (reduced variability) across time over phases. Face-to-face and virtual coaching had a positive impact on student-to-student positive interaction. Virtual covert audio coaching was as effective as face-to-face coaching in increasing teacher transfer of knowledge from professional development to classroom practice.

Qualitative Findings

Qualitative data were coded and organized by coaching prompts and teacher actions in a table format and analyzed for trends that led to increased teacher transfer of knowledge. The coaching statements provided most often for student components of RallyCoach™ were for the teacher to provide students with (a) praise gambits to increase positive student-to-student interactions and (b) coaching gambits to improve student-to-student coaching. Quantitative data revealed that student-to-student positive interaction increased across phases for both groups. Thus, the praise gambits had a positive effect.

Modeling RallyCoach™ components was one effective coaching action to promote teacher implementation. Teachers in the control group had an opportunity to watch the coach model implementation or the opportunity to implement side-by-side with the coach. Treatment group teachers did not have these opportunities because the coach was not physically in the room. The coach provided a video model of implementation for teachers in the treatment group. Both types of models, classroom and video, resulted in improved teacher implementation of RallyCoach™ components.

CHAPTER 5
DISCUSSION

Purpose of the Study

The purpose of this study was to determine if using virtual covert audio coaching through bug-in-the-ear (BIE) Bluetooth technology to provide teacher prompting and feedback was as effective as face-to-face coaching to increase transfer of knowledge learned in professional development about a cooperative learning structure into effective classroom implementation. A secondary purpose of this study was to analyze the impact of virtual covert audio coaching to increase positive student-to-student interaction.

Summary of Findings

The main finding of the study was that virtual covert audio coaching was as effective as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice. Visual analysis of level, trend, and variability of implementation data revealed that both face-to-face and virtual audio coaching had a positive effect on teacher transfer of knowledge from professional development to classroom practice as well as increasing student-to-student positive interaction. Virtual covert audio coaching was as effective, if not slightly more effective, as face-to-face coaching to increase teacher transfer of knowledge from professional development to classroom practice and to increase positive student-to-student interaction. These results aligned with research documenting the effectiveness of covert audio coaching on teacher acquisition and demonstration of knowledge and skills (Bennett,

2009; Goodman, 2005; Oliver, 2008; Rock et al., 2009c; Scheeler et al., 2006; Scheeler et al., 2010; Wade, 2010; Wadsworth, 2001).

Findings That Confirmed Previous Literature

The call in the literature for more professional development follow-up with direct observation with feedback as a recommended way to evaluate teachers' use of knowledge and skills learned in professional development (Guskey, 2000; Killion & Harrison, 2006; Knight, 2007) was confirmed. The results of the current study indicated increased teacher transfer of knowledge with both the face-to-face and virtual covert audio coaching.

This study supported recommendations from the literature that technology be utilized to a greater extent to present and provide follow up support for teacher professional development (Guskey, 2000; Killion & Harrison, 2006; Villegas-Reimers, 2003). The results of the study revealed that virtual coaching was as effective as face-to-face coaching.

The qualitative findings of this study indicated that modeling was the most required coaching action. This finding confirmed the suggestion of Killion and Harrison (2006) for coaches to use a continuum of support for classroom implementation that includes modeling.

In the current study, the majority of participants of the control group (100%) and the treatment group (83%) either strongly agreed or agreed that coaching was non-intrusive to instruction. These findings confirmed the results of previous research that

reported both on-location covert audio coaching (Scheeler et al., 2006) and virtual covert audio coaching (Rock et al., 2009c; Wade, 2010) allowed for immediate feedback and coaching to teachers without classroom instruction being interrupted.

Findings That Contradicted Previous Literature

In the prominent 2002 Joyce and Showers study, it was reported that only 5% of teachers would transfer knowledge from professional development into classroom practice without coaching. For the current study, the percentage of transfer without coaching was much higher. The percentage of RallyCoach™ components implemented across the baseline phase represented transfer of knowledge to classroom practice without coaching. For the teacher components of RallyCoach™, this initial transfer without coaching was 66% for face-to-face control group and 67% for virtual treatment group. For the student components of RallyCoach™, this initial transfer without coaching was 50% for face-to-face control group and 59% for virtual treatment group. However, both groups increased implementation with coaching.

Findings That Expanded Previous Literature

A weakness reported in the field, the methodology used to study effective professional development (Guskey, 2000; Marzano, 2003;Villegas-Reimers, 2003; Lawless and Pellegrino, 2007; Wei et al., 2009), was addressed in this study by using a quasi-experimental design to study the effectiveness of professional development.

The findings of the current study indicated that the implementation of the Kagan cooperative learning structure, RallyCoach™ increased positive student-to-student interactions. With the adoption of Common Core State Standards, many teachers are looking for ways to address the speaking and listening standards. Results of the current study suggest that RallyCoach™ is a cooperative learning structure that can serve as a research-based instructional tool for teachers can use to teach and provide opportunities for students to practice speaking and listening to address the requirements of the Common Core State Standards.

Guskey (2000) reported that although researchers have supported the positive effects of coaching on teacher effectiveness, many teachers have not received coaching due to time and funding restraints. No previous studies were located that presented a cost analysis of the savings of using virtual audio coaching in the review of literature. In the current study, the cost analysis of savings for travel reimbursement and time for the researcher was $75 savings per day and savings totaling $975 for the 13 coaching days of the study. Once cost of equipment was subtracted, the final savings was $555. This information is reflected in Table 21.

Table 21

Cost Analysis: Virtual Coaching Savings

Savings	Per trip	(13 trips/days of coaching)
Travel reimbursement	$27 (13.50 x 2)	$351
Per hour pay for travel time	$48 (1.5 x 32)	$624
Total	$75.00	$975
Possible Onetime Setup Cost	Per teacher	Total (6 teachers)
Bluetooth Headset	$20	$120
Webcam	$50	$300
Total		$420
Final Savings of $975 - $420 = $555		

At first glance, this savings may not seem substantial. However, when one considers that most district coaches travel to schools daily, this savings would be increased. Also, many district coaches travel to more than one school each day, increasing the savings further. For example in a cost analysis scenario in which 20 district coaches traveled four days a week to one school the monthly savings for virtual coaching would be estimated at $1,500 per coach ($75 x 16 days),or $30,000 for 20 coaches ($1,500 X 20). This example, displayed in Table 22, shows how quickly the savings for using virtual coaching could multiply and provide a substantial saving of district funds.

Table 22

Cost Analysis: Simulated Monthly Savings for Virtual Coaching

Simulated Coaching Scenario for 16 Coaching Days per Month	
Savings per Coach	Total Savings (20 Coaches)
$1,500 ($75 x 16 days)	$30,000 ($1,500 x 20)

Implications for Practice

Virtual audio coaching proved to be as effective as face-to-face coaching to assist teachers to improve instruction by transferring knowledge learned in professional development into classroom practice. Virtual audio coaching can be the vehicle to provide coaching to more teachers while saving time and funding for coaching staff. Analysis of the implementation data of virtual audio coaching throughout this study has led the researcher to identify several implications for practice.

Teachers in the treatment group had a higher number of coaching session cancellations than teachers in the control group. It is more difficult for a teacher to cancel a coaching session when a coach is coming directly to the classroom as compared to a teacher being responsible for logging into a virtual room for coaching. Instructional coaches using virtual coaching will need to identify ways to motivate teachers to participate in virtual coaching sessions and identify those teachers who will need support learning to use and developing a comfort level with the technology.

There were technical difficulties with sound and viewing of recorded virtual coaching sessions in the current study. Instructional coaches using virtual coaching

should identify online formats and equipment that will allow for clarity of audio and visual communication during virtual coaching sessions.

With instructional coaching, there are always different levels of coaching that are required by different teachers. Virtual instructional coaching may be sufficient for teachers needing minimal coaching. However, a blended coaching approach that provides a combination of face-to-face and virtual coaching may better meet the needs of teachers needing moderate or extensive levels of instructional coaching.

Recent reform of teacher evaluation systems requires that teachers self assess their own practice. Therefore, teacher reflection and self-assessment should be an integral part of coaching (Killion & Harrison, 2006; Knight, 2007). This study incorporated a teacher self-assessment piece that allowed teachers to begin to practice self-assessment as part of professional development follow up. However, participants actually completed the self-evaluation component for a low percentage of the coaching sessions. Participants receiving face-to-face coaching completed self-evaluations for 16% of the sessions, whereas, participants receiving virtual coaching completed self-assessments for less than 1% of the sessions. With the emphasis on teacher self-evaluation within new teacher evaluation protocols, it will be imperative for instructional coaches who provide virtual coaching to guide teachers to incorporate self-assessment into their teaching practice.

The use of student praise gambits led to an increase in positive student-to-student interactions in the current study. Instructional coaches can utilize gambits to guide teachers to improve a range of student social skills.

Limitations

The most significant limitation to the current study was sample size. The sample was comprised of 12 teachers from one targeted elementary school. Although the number of students impacted was about 240 students, data were not collected for individual students. This sample size was a reasonable sample for the time and resources available to the researcher to conduct this study.

The lack of a stable baseline was a limitation of the current study. There were not enough observations in the baseline phase to establish stability. The time line of the study dictated the length of the phases. The small number of baseline observations created some skewed baseline data for some participants. In future studies, stability of baseline should be established.

In order for the reliability of this study to be established, it would need to be replicated in other settings with larger numbers of teachers. The absence of a staggered baseline could also be considered a limitation of the current study. Implementation of a staggered baseline could decrease the internal threat of history.

Recommendation for Future Research

Bandura (1997) and (Pajares, 2002) described the importance of self-efficacy to change behavior. Cognitive coaching is based upon the Costa and Garmston's assumption that a change of practice (behavior) results from a change in belief and that individual reflection is a key to coaching (Knight, 2007). Based on the Bandura's social learning theory, new teacher evaluation systems include a component of teacher self

assessment. The current study incorporated teacher self-efficacy through teacher self assessment within the coaching process. However, only 16% of teachers in the face-to-face treatment group and less than 1% of teachers in the virtual control group completed self-assessments. These results indicated that future research is needed in the area of teacher self assessment to increase teacher knowledge, skill, and motivation to participate in self assessment.

The reliability of this study could only be established by others replicating the study to see if similar results are obtained. Future study of virtual audio covert coaching should be conducted with a staggered, stable baseline. Virtual audio instructional coaching should be researched in a variety of K-12 classrooms for a variety of purposes. It can be researched in any classroom setting that requires instructional coaching of teacher practice.

Conclusion

Identifying and implementing ways to provide instructional coaching to teachers is an ongoing dilemma to improve teacher effectiveness. The main finding of this study indicated that virtual covert audio coaching is as effective as face-to-face coaching to increase teacher transfer of knowledge learned in professional development to classroom practice. Virtual covert audio coaching may be a tool that can save time and money and allow more teachers to receive instructional coaching. Additional studies of virtual covert audio coaching are recommended. Instructional coaches must also provide the technology training and support to empower teachers to utilize this tool.

APPENDIX A
OBSERVATION FORM (PDIOF)

Professional Development Implementation Observation Form				
Teacher:	**Date:**			
Observer:	**# Instructional days since last Observation:**			
Type of Observation: Virtual or Face to Face:				
Teacher Component Codes: *Component Implemented:* *Coaching for Missing Elements: Y/N for only N for Implemented* *Teacher Action: short description: remove 1 pencil, provide model* *Component Implemented After Coaching: Y/N*	Component Implemented	Coaching	Teacher Action after Coaching	Component Implemented After Coaching
Teacher Implementation Components				
1. 1 paper, 1 pencil per two students				
2. Shoulder partners (side by side)				
3. If 1 extra student, Form 1 team of 3 (only counted if team of 3)				
4. Teacher states / reviews oral directions for structure				
5. Teacher provides model				
6. Teacher circulates, assesses, and assists				
7. Teacher provide specific directions to team of 3 (only counted if team of 3)				
Total	__/__ = __%	__/__ = __%	N/A	__/__ = __%

Student Component Codes: *# Student Pairs Observed/# Implementing: Actual numbers* *Coaching: Y/N* *Teacher Action: short description: remove 1 pencil, provide model* *Component Implemented after Coaching: Y/N*	Tallies	# Student Pairs Observed/ # Implementing	Coaching	Teacher Action after Coaching	Component Implemented After Coaching
Student Implementation Components					
1. Partner A does first problem, talking out loud their thinking (no writing)		__/__ = __%			
2. Partner B watches and gives OK		__/__ = __%			
3. Partner B Coaches if needed		__/__ = __%			
4. Partner A Writes Answer		__/__ = __%			
5. Partner B provides positive reinforcement (Positive student to student interaction)		__/__ = __%			
6. Switch Roles for each problem		__/__ = __%			
Total	N/A		__/__ = __%	N/A	__/__ = __%

Revised from Kagan Structure Coaching Form: RallyCoach™, 2010

APPENDIX B
DATA COLLECTION PROTOCOL

Data Collection Protocol

Data collectors will:

1. Write the identifying information on the top of the data collection sheet
2. Use the teacher component codes to record data for items 1-7.
   - During the first 5 minutes of the observation, scan the room to observe each student pair, code if component is present(Y) or not (N).
3. Use the student component codes to record data for items 8-13.
   - Once students begin working in pairs, scan the room to observe each student pair, record a tally for each pair that is implementing the component.
   - Count the tallies and divide by total number of pairs in room.
4. Stop the observation after 15 minutes or when RallyCoach™ Structure ends, whichever comes first.
5. Determine and record percentages.

APPENDIX C
TEACHER SELF-ASSESSMENT FORM

Teacher Self Assessment of Implementation for RallyCoach™

Grade Level: _____ Virtual or Face to Face: _____

Coaching Date: _____

Student Component Codes: *# Student Pairs Observed/# Implementing: Actual numbers* *Coaching: Y/N* *Teacher Action: short description: remove 1 pencil, provide model* *Component Implemented after Coaching: Y/N*	Tallies	# Student Pairs Observed/ # Implementing
Student Implementation Components		
1. Partner A does first problem, talking out loud their thinking (no writing)		__/__ = __%
2. Partner B watches and gives OK (agrees)		__/__ = __%
3. Partner B Coaches if needed		__/__ = __%
4. Partner A Writes Answer (waits for ok or agreement)		__/__ = __%
5. Partner B provides positive statement		__/__ = __%
6. Switch Roles for each problem		__/__ = __%
Total	N/A	

TEACHER SELF-ASSESSMENT SEQUENCE

1. Teacher gives directions, reviews steps, models, and answers questions for RallyCoach™.

2. Students begin RallyCoach™ with their partner.

3. Teacher circulates room to observe and record student implementation on self-assessment form. Take about 5 minutes to do this. DO NOT coach student pairs during this self-assessment time.

4. Record student implementation on the self-assessment form. Remember that each pair is awarded only one tally for each step. If you see one partner in the pair implement the step, then the pair is awarded a tally. Indicate how many total pairs that you observed.

5. Once you have recorded the steps that the pairs you have observed implemented, then you can begin coaching pairs.

APPENDIX D
KAGAN RallyCoach™ COACHING FORM

Kagan

Structure Coaching Form

RallyCoach

Teacher _____ Date _____

Subject _____ Lesson _____

Coached by _____

▶ Setup

- ❒ 1 paper, 1 pencil per two students
- ❒ Shoulder partners (not upside down)
- ❒ If 1 extra student, make 1 team of 3
- ❒ No music

▶ Steps

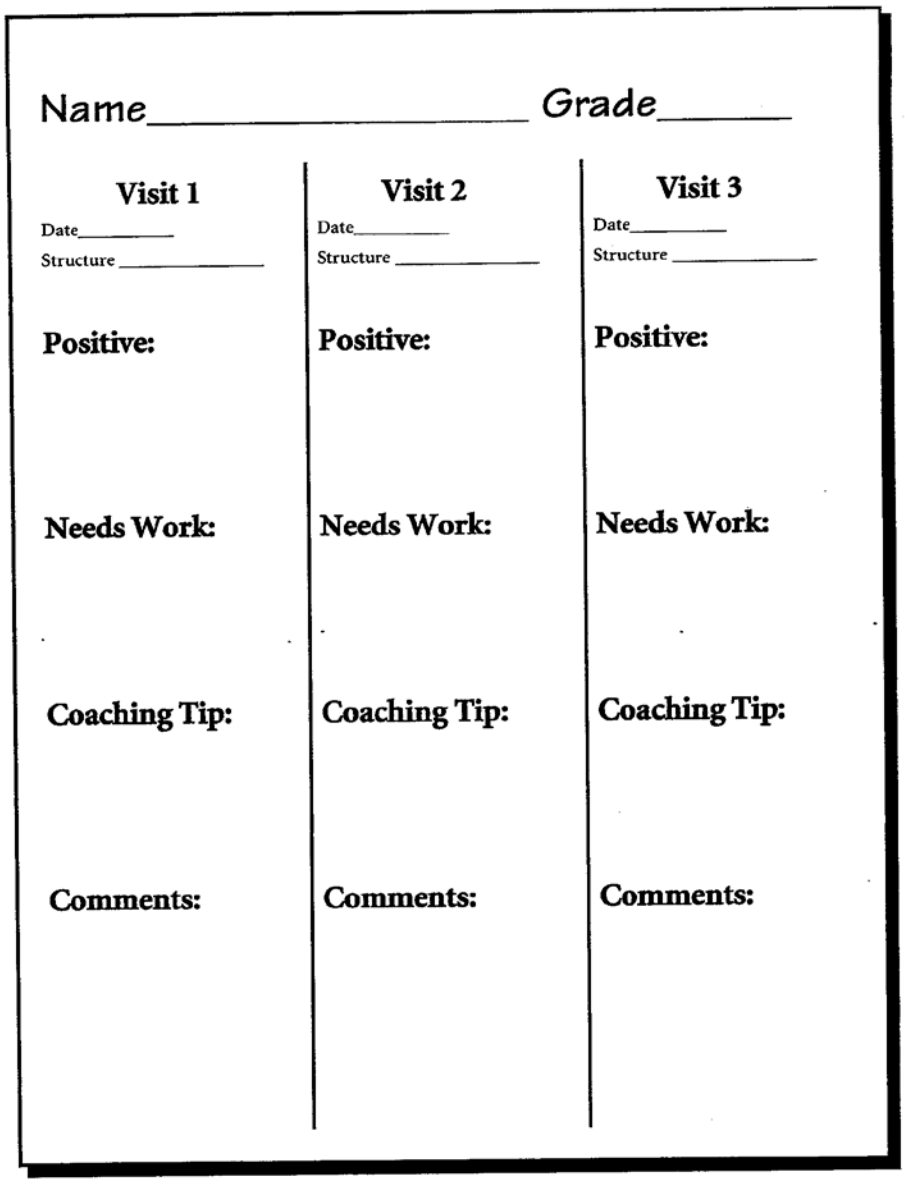
- ❒ "A" does the first problem, talking outloud their thinking (no writing).
- ❒ "B" watches, gives OK, or coaches.
- ❒ "A" writes answers.
- ❒ "B" praises (specific praise).
- ❒ Switch roles and "B" does the 2nd problem.
- ❒ Continue until worksheet is complete.

Do students know how to "Coach" and not just tell answers?

▶ Note:

Source: Kagan, 2010

APPENDIX E
KAGAN RUNNING RECORD FORM (COACHING LOG)



Name_____ Grade_____

Visit 1	Visit 2	Visit 3
Date_____ Structure _____	Date_____ Structure _____	Date_____ Structure _____
Positive:	**Positive:**	**Positive:**
Needs Work:	**Needs Work:**	**Needs Work:**
Coaching Tip:	**Coaching Tip:**	**Coaching Tip:**
Comments:	**Comments:**	**Comments:**

Kagan Coaching

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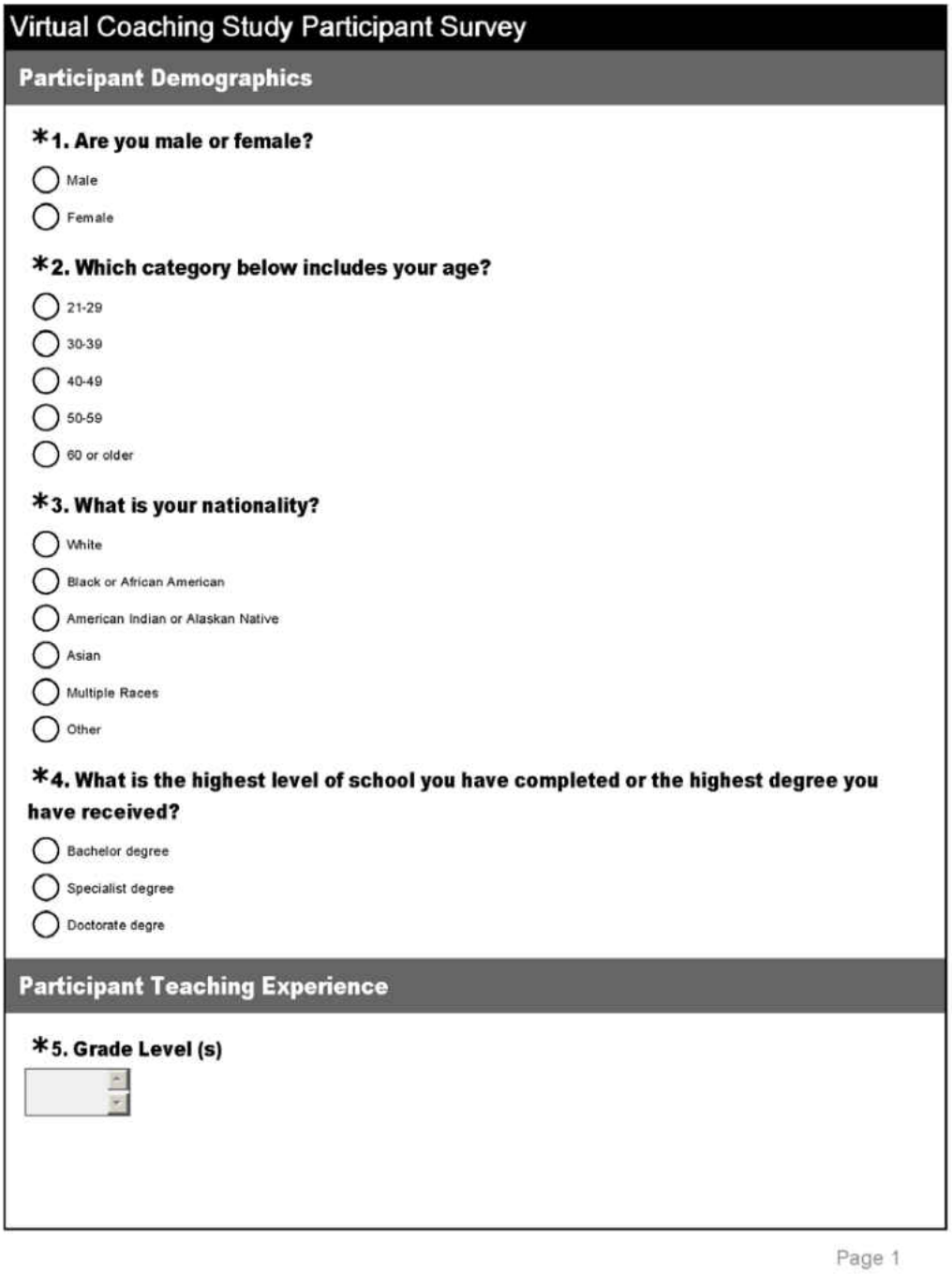
Observations 7

Source: Kagan, 2010

APPENDIX F
PARTICIPANT SURVEY FOR VIRTUAL COACHING

(Revised from Kagan Implementation Survey, 2008)



Virtual Coaching Study Participant Survey

Participant Demographics

***1. Are you male or female?**

- ◯ Male
- ◯ Female

***2. Which category below includes your age?**

- ◯ 21-29
- ◯ 30-39
- ◯ 40-49
- ◯ 50-59
- ◯ 60 or older

***3. What is your nationality?**

- ◯ White
- ◯ Black or African American
- ◯ American Indian or Alaskan Native
- ◯ Asian
- ◯ Multiple Races
- ◯ Other

***4. What is the highest level of school you have completed or the highest degree you have received?**

- ◯ Bachelor degree
- ◯ Specialist degree
- ◯ Doctorate degre

Participant Teaching Experience

***5. Grade Level (s)**

Page 1

Virtual Coaching Study Participant Survey

***6. How many years of teaching experience do you have?**

***7. Total years teaching at current grade level?**

***8. How many years have you been teaching at current school?**

***9. How many years have you taught in current county?**

Study Participation

***10. I am a member of the _____ group.**

- ◯ Face to Face Coaching
- ◯ Virtual Coaching

***11. Coaching type that I received was beneficial to my implementation of Rally Coach.**

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neither Disagree or Agree
- ◯ Agree
- ◯ Strongly Agree

***12. The type of coaching I received was non-intrusive to instruction.**

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neither Disagree or Agree
- ◯ Agree
- ◯ Strongly Agree

Virtual Coaching Study Participant Survey

***13. The type of coaching I received allowed me immediate feedback on implementation.**

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Neither Disagree or Agree
- ◯ Agree
- ◯ Strongly Agree

Kagan Implementation

***14. Implementation**

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
My students' desks are arranged in teams full time.	◯	◯	◯	◯	◯
Structures are easy to implement.	◯	◯	◯	◯	◯
I would like additional training.	◯	◯	◯	◯	◯
I would like coaching or additional coaching.	◯	◯	◯	◯	◯
Most of my fellow teachers are committed to using Structures.	◯	◯	◯	◯	◯
Administration supports my use of Structures.	◯	◯	◯	◯	◯

***15. As a result of Kagan**

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
My students are more actively engaged.	◯	◯	◯	◯	◯
My students are learning more academically.	◯	◯	◯	◯	◯
My students are developing positive social skills (cooperation, teamwork).	◯	◯	◯	◯	◯
My discipline problems have lessened.	◯	◯	◯	◯	◯
My students are improving communication skills.	◯	◯	◯	◯	◯
I am more successful reaching some students.	◯	◯	◯	◯	◯

Virtual Coaching Study Participant Survey

***16. Motivation and Liking**

	Strongly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
My students enjoy doing Structures.	○	○	○	○	○
My students enjoy my class more.	○	○	○	○	○
My students enjoy school more.	○	○	○	○	○
I enjoy teaching more.	○	○	○	○	○
Being a successful teacher is easier.	○	○	○	○	○

***17. Classroom Management**

	Stronly Disagree	Disagree	Neither Disagree or Agree	Agree	Strongly Agree
My students respond to a quiet signal within 3-5 seconds.	○	○	○	○	○
Student voice levels are not too loud.	○	○	○	○	○
Numbered seats help with management.	○	○	○	○	○
A//B partners help with management.	○	○	○	○	○

18. Are there any other components of Kagan Cooperative Learning Structures that assist you with classroom management?

Which response best fits your classroom?

***19. Students sit**

- ○ always in a row
- ○ mostly in a row
- ○ mostly in teams
- ○ always in teams

Virtual Coaching Study Participant Survey

***20. Teams are formed**

- [ ] randomly
- [ ] by interest
- [ ] student selected
- [ ] heterogeneously

21. I form teams every

- [ ] 4 weeks
- [ ] 6 weeks
- [ ] 9 weeks

Other (please specify)

***22. Average number of students in teams**

- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5

Other (please specify)

***23. I do teambuilding/classbuilding**

- ◯ never
- ◯ monthly
- ◯ twice weekly
- ◯ weekly
- ◯ daily

Virtual Coaching Study Participant Survey

***24. I have been using the structures with students for**

- ◯ Not yet
- ◯ Less than 3 months
- ◯ Kagan Implementation Survey
- ◯ 3 to 6 months
- ◯ 6 to 9 months
- ◯ 9 months to a year
- ◯ 1 to 2 years
- ◯ 2 to 3 years
- ◯ 4 or more years

***25. Student Fluency**

Of the structures I've used with my students, how many can they do only with help?	
About how many structures can my students do without any explanation?	
About how many structures do my students know so well they could teach others?	

Virtual Coaching Study Participant Survey

26. How many times per week do you use these structures?

Quiet Signal	
Fan-n-Pick	
Find Someone Who	
Find The Fiction	
Inside/Outside Circle	
Match Mine	
Mix Pair Share	
Numbered Heads Together	
Pairs Compare	
Quiz Quiz Trade	
RallyRobin	
RallyTable	
RallyCoach	
RoundRobin	
RoundTable	
Simultaneous RoundTable	
Stand Up, Hand Up, Pair Up	
Showdown	
Talking Chips	
Timed Pair Share	

27. Other structures used:

Page 7

APPENDIX G
PARTICIPANT CONSENT FORM

Participant Consent Form

Title of the Research Study: The Effects of Virtual Coaching Via Bug-In-the -Ear On Implementation of the Cooperative Learning Structure: Rally Coach

Researcher: Marilyn Jackson Lee

Purpose: To determine if virtual coaching via Bluetooth Bug in the Ear technology can increase teacher accuracy and frequency of implementation of a cooperative learning.

Procedures: This study will take place on your school campus. The study will start with school wide professional development for Kagan Cooperative Learning Structures in August 2011. Either face to face or virtual coaching for cooperative learning structure, Rally Coach, will be provided. Teachers randomly selected for virtual coaching will be trained on the use of the Bluetooth Bug-In-The-Ear technology. After training, teachers receiving virtual coaching will wear a Bluetooth headset to hear feedback from the coach observing via the internet for 15-20 minute sessions. Teacher receiving face-to-face coaching will be observed with the coach physically in the room for 15-20 minute sessions. You will receive audio feedback from the teacher and feedback documented on a coaching form. Data on teacher accuracy and frequency of structure step up and steps will be coded by an assigned number, and not teacher name, for confidentiality purposes. Data will be analyzed to see which method of coaching led to the highest level of accuracy and frequency. Coaching sessions will occur once a month September – December, 2011.

Risks: The risks involved with participation in this study are minor and include changing the teaching strategies you use in the classroom. A slight risk to your emotional state might occur with corrective feedback and thinking deeply about your teaching.

Benefits: Potential benefits you may receive from participation in this research study is increased knowledge of cooperative learning, to learn how to analyze any group activity for the basic principles of cooperative learning, and to reflect upon your teaching practices.

Data Collection & Storage: Results of this research study will be kept confidential and only the people working on analyzing the data will see the data which be coded by assigned number, not teacher name. The data collected will not be release in any way that might allow your identification.

Contact Information: For concerns or questions about your rights as a participant in this study The Center for Educational Research and Development (CERD) at the University of Central Florida can be contacted at: cerd.education.ucf.edu the researcher, Marilyn Jackson Lee can be contacted at : mjackso2@volusia.k12.fl.us or 386-562-7215

Consent Statement: I have read the preceding information describing this study. All of my questions have been answered to my satisfaction. I am 18 years of age or older and freely consent to participate. I understand that I can withdraw from the study at any time. I have received a copy of this consent form.

Signature of Participant: _____ Date: _____

Signature of Researcher Date:

APPENDIX H
INSTITUTIONAL REVIEW BOARD

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Marilyn Jackson-Lee**

Date: **July 26, 2011**

Dear Researcher:

On 7/26/2011, the IRB approved the following human participant research until 7/25/2012 inclusive:

Type of Review:	UCF Initial Review Submission Form
Project Title:	The Effects of Virtual Coaching On Professional Development Implementation
Investigator:	Marilyn Jackson-Lee
IRB Number:	SBE-11-07759
Funding Agency:	
Grant Title:	
Research ID:	N/A

The Continuing Review Application must be submitted 30days prior to the expiration date for studies that were previously expedited, and 60 days prior to the expiration date for research that was previously reviewed at a convened meeting. Do not make changes to the study (i.e., protocol, methodology, consent form, personnel, site, etc.) before obtaining IRB approval. A Modification Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at https://iris.research.ucf.edu .

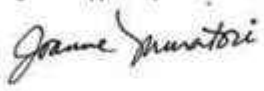
If continuing review approval is not granted before the expiration date of 7/25/2012, approval of this research expires on that date. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

Use of the approved, stamped consent document(s) is required. The new form supersedes all previous versions, which are now invalid for further use. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Participants or their representatives must receive a copy of the consent form(s).

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Kendra Dimond Campbell, MA, JD, UCF IRB Interim Chair, this letter is signed by:

Signature applied by Joanne Muratori on 07/26/2011 11:17:17 AM EDT



IRB Coordinator

APPENDIX I
RALLYCOACH™ COPYRIGHT PERMISSION

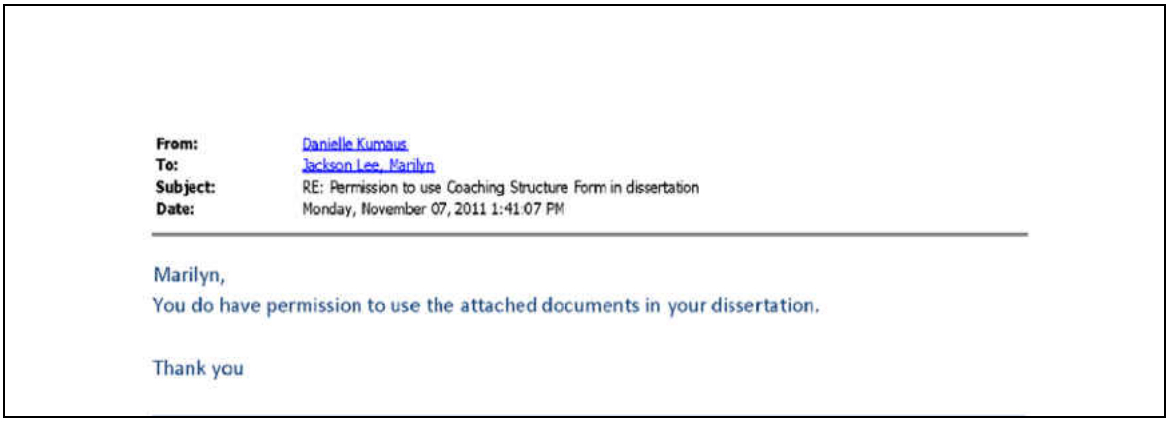
From: Jackson Lee, Marilyn **Sent:** Sat 11/5/2011 3:38 PM
To: Danielle Kumaus
Cc:
Subject: Permission to use Coaching Structure Form in dissertation
Attachments: Rally Coach.pdf.efa(2KB) Kagan Coaching log.pdf.efa(2KB)

Hi Danielle,

I hope life is treating you well.

Can you guide me to who I need to contact to ask permission to use the attached Kagan copyright documents in my dissertation?

Thanks for your help,
Marilyn



From: Danielle Kumaus
To: Jackson Lee, Marilyn
Subject: RE: Permission to use Coaching Structure Form in dissertation
Date: Monday, November 07, 2011 1:41:07 PM

Marilyn,
You do have permission to use the attached documents in your dissertation.

Thank you

APPENDIX J
OBSERVATION SCHEDULE

Observation Schedule

Date Tuesdays	Sept 13	Sept 15	Sept 20	Sept 27	Oct 4	Oct 11	Oct 18	Oct 25	Nov 1	Nov 8	Nov 15	Nov 22	Nov 29	Dec 6	Dec 13		Jan 31	Mar 6	Apr 3
Week	2	2	3	4	5	6	7	8	9	10	11	12	11	13	14		21	26	30
Session	1	2	3	4	5	6		7		8			9		10		11	12	13
Treatment Group Virtual CAC	Baseline: Observation **(Weekly)** 2 weeks		Intervention : Coaching and Observation **(Weekly)** 4 weeks					Intervention Coach/Obs **(Bi-Weekly)** 4 weeks		Intervention Coach/Obs **(Bi-Weekly)**		Thanksgiving Break	Maintenance Observation **(Bi-Weekly)** 4 weeks		Maintenance Observation **(Bi-Weekly)**	Winter Break	Maintenance Observation **(MONTHLY)** 3 months		
Date Mondays	Sept 9	12-Sep	Sept 19	Sept 30	Oct 3	Oct 10	Oct 17	Oct 24	Oct 31	7-Nov	14-Nov	Nov 21	28-Nov	5-Dec	12-Dec		Jan 30	Mar 5	Apr 2
Week	1	2	3	4	5	6	7	8	9	10	11		12	13	14		21	26	30
Session	1	2	3	4	5	6		7		8			9		10		11	12	13
Control Group Face to Face	Baseline: Observation **(Weekly)** 2 weeks		Intervention: Coaching and Observation **(Weekly)** 4 weeks					Intervention Coach/Obs **(Bi-Weekly)** 4 weeks		Intervention Coach/Obs **(Bi-Weekly)**		Thanksgiving Break	Maintenance Observation **(Bi-Weekly)** 4 weeks		Maintenance Observation **(Bi-Weekly)**		Maintenance Observation **(MONTHLY)** 3 months		

APPENDIX K
DIRECTIONS FOR USE OF EQUIPMENT

From: Jackson Lee, Marilyn **Sent:** Wednesday, September 28, 2011 1:38 PM
Subject: Thank you for an awesome day of virtual coaching sessions

Hello Teachers,
Yesterday was the best day we have had with technology working during the virtual coaching sessions. Thank you for your hard work to get the technology to work. I wanted to remind you of the steps to participate in a virtual coaching session in Safari Live:

Steps Safari Live Virtual Coach:

Day before Coaching

- Be sure the Bluetooth headset is charged

Coaching Day

- Connect webcam and headset to computer (these must be connected before entering the room)
- Plug Webcam into ISB port –
- Bluetooth must be turned on and it should synced directly to computer
    - Be sure Sound Playback and Sound Recording have Bluetooth selected as device
        - Right click on speaker icon on toolbar on bottom of computer screen
        - Click adjust audio properties, then click audio tab
    - Check sound by opening a sample music file.
    - If no sound, then check your "Adjust audio properties to be sure that it is set to Bluetooth.
    - Check Bluetooth connection on toolbar at bottom of the screen.
        - (blue oval with green writing) to make sure 2xx plantonic2 is lit up in green.
- Open email from Marilyn and click link to enter Safari Live Room
- Click I agree to legal notice
- Click close to getting started (you may read through this if you want)
- Click start broadcast and wait for Marilyn to authorize you
- Click lock icon beside talk button
- Make sure camera is placed so that there is a clear view of students and instructor in the room

Hearing Student Pairs

I need to better hear individual pairs of students. I hear everyone and everything in the classroom and can't hear individual students and pairs. Please try the following.

- Turn down the sound on the Bluetooth headset. There is a black button to click on opposite side of Bluetooth from the on/off button.
- Be sure Bluetooth is device that is playing and recording sound (described above)

Please complete the teacher self-assessment form as you circulate and assist during implementation.

See you next Tuesday online,
Marilyn

APPENDIX L
Post Hoc Data Analysis: Results from Participant Survey

Virtual Coaching Study Participant Survey Results

PARTICIPANT DEMOGRAPHICS

Q1; Are you male or female?

Answer Options	Response Percent	Response Count
Male	0.0%	0
Female	100.0%	12

Q2: Which category below includes your age?

Answer Options	Response Percent	Response Count
21-29	33.3%	4
30-39	41.7%	5
40-49	16.7%	2
50-59	8.3%	1
60 or older	0.0%	0

Q3: is your nationality?

Answer Options	Response Percent	Response Count
White	100.0%	12
Black or African	0.0%	0
American Indian	0.0%	0
Asian	0.0%	0
Multiple Races	0.0%	0
Other	0.0%	0

Q4:What is the highest level of school you have completed or the highest degree you have received?

Answer Options	Response Percent	Response Count
Bachelor degree	83.3%	10
Specialist degree	16.7%	2
Doctorate degre	0.0%	0

Q5: What grade level (s) have you taught?

Participant	Response Text	
1	1	
2	K & 2	
3	k	
4	3	
5	2	
6	5	
7	3	
8	1st	
9	K &5	
10	K	
11	4	
12	4	

Q6: How many years of teaching experience do you have?

Participant	Response Text	
1	8	
2	17	
3	7	
4	14	
5	2.5	
6	4	
7	11	
8	4	
9	2	
10	2	
11	6	
12	11	
Average	7.375	

Virtual Coaching Study Participant Survey Results

PARTICIPANT DEMOGRAPHICS

Q7: Total years teaching at current grade level?

Participant	Response Text
1	7
2	3
3	7
4	13
5	2
6	4
7	10
8	4
9	1
10	2
11	6
12	7
Average	5.5

Q8: How many years have you been teaching at current school?

Participant	Response Text
1	8
2	13
3	7
4	10
5	2
6	4
7	11
8	4
9	1
10	2
11	6
12	11
Average	6.58333333

Q9: Total years teaching in current school district?

Participant	Response Text
1	8
2	17
3	7
4	2.5
5	4
6	11
7	4
8	4
9	2
10	2
11	6
12	11
Average	6.541666667

Q10. I am a member of the _____ group.

Answer Options	Response Percent	Response Count
Face to Face	50.0%	6
Virtual Coaching	50.0%	6

Virtual Coaching Study Participant Survey Results

SOCIAL VALIDITY OF TYPE OF COACHING

Q11. Coaching type received was beneficial to my implementation.

Answer Options	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Disagree	0.0%	0
Agree	41.7%	5
Strongly Agree	58.3%	7

Q12. The type of coaching I received was non-intrusive to instruction.

Answer Options	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	8.3%	1
Neither Disagree or	0.0%	0
Agree	41.7%	5
Strongly Agree	50.0%	6

Q13. The type of coaching I received allowed me immediate feedback on implementation.

Answer Options	Response Percent	Response Count
Strongly Disagree	0.0%	0
Disagree	0.0%	0
Neither Disagree	0.0%	0
Agree	33.3%	4
Strongly Agree	66.7%	8

Q14. Implementation

Answer Options	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	Response Count
Desks are arranged in teams full time.	0	1	3	2	6	12
Structures are easy to implement.	0	0	0	10	2	12
I would like additional training.	1	3	3	5	0	12
I would like coaching or	1	2	5	4	0	12
Most of my fellow teachers are using Structures.	0	2	1	9	0	12
Administration supports my using structures	0	0	0	4	8	12

Virtual Coaching Study Participant Survey Results							
STUDENT OUTCOMES							
Q15. Student Classroom Behaviors							
Answer Options	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Rating Average**	**Response Count**
My students are more actively engaged.	0	0	1	7	4	4.25	12
My students are learning more academically.	0	0	1	9	2	4.08	12
My students are developing positive social	0	0	1	5	6	4.42	12
My discipline problems have lessened.	0	1	5	6	0	3.42	12
My students are improving communication	0	0	1	8	3	4.17	12
I am more successful reaching some students.	0	0	1	8	3	4.17	12
Q16: Student Motivation							
Answer Options	**Strongly Disagree**	**Disagree**	**Neither**	**Agree**	**Strongly Agree**	**Rating Average**	**Response Count**
My students enjoy doing Structures.	0	0	2	5	5	4.25	12
My students enjoy my class more.	0	0	3	7	2	3.92	12
My students enjoy school	0	0	4	6	2	3.83	12
I enjoy teaching more.	0	0	2	7	3	4.08	12
Being a successful teacher is easier.	0	0	2	8	2	4.00	12

Virtual Coaching Study Participant Survey Results							
STUDENT OUTCOMES							
Q17. Classroom Management							
Answer Options	Stronly Disagree	Disagree	Neither	Agree	Strongly Agree	Rating Average	Response Count
My students respond to a quiet signal within 3-5	0	0	1	5	6	4.42	12
Student voice levels are not too loud.	0	0	1	8	3	4.17	12
Numbered seats help with management.	0	1	3	3	5	4.00	12
A//B partners help with management.	0	1	1	4	6	4.25	12

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