

USING TELE-COACHING  
TO INCREASE BEHAVIOR-SPECIFIC PRAISE DELIVERED BY SECONDARY  
TEACHERS IN AN AUGMENTED REALITY LEARNING ENVIRONMENT

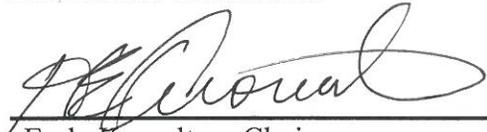
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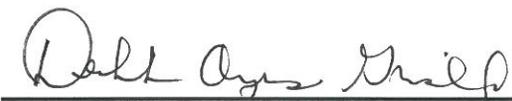
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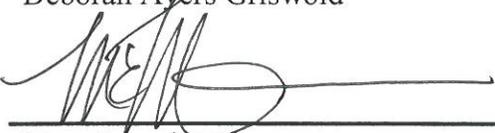
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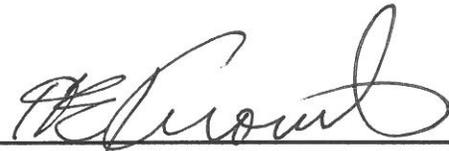
  
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Earle Knowlton, Chairperson

Date Approved: 23 Apr 13

## Abstract

This study analyzes the effects of real-time feedback on teacher behavior in an augmented reality simulation environment. Real-time feedback prompts teachers to deliver behavior-specific praise to students in the TeachLive KU Lab as an evidence-based practice known to decrease disruptive behavior in inclusive classrooms. All educators face the challenge of managing students' disruptive behaviors. Because of the complex nature of inclusive classrooms, many educators struggle to find evidence-based practices that successfully minimize disruptions and increase student engagement. Research suggests that student disruptions decrease as teachers' behavior-specific praise increases. Despite this evidence, behavior-specific praise is infrequently used as a classroom management strategy, particularly in secondary classrooms. Examination of teacher preparation and professional development has revealed a body of research that addresses the delivery of immediate feedback to both pre-service and in-service teachers using wireless technology. This technology, known as bug-in-ear (BIE) or Tele-Coaching, provides a way to provide immediate feedback to teachers. It has proven effective for producing desired teacher behavior by delivering immediate feedback for pre-service, novice, and in-service teachers. The purpose of this alternating treatment single-case design study is to extend the existing research by evaluating the effects of Tele-Coaching using bug-in-ear (BIE) technology in an augmented reality environment (TeachLive KU) for coaching four teachers with secondary teaching experience to deliver behavior-specific praise, an evidence-based classroom management practice that minimizes disruptions. Specifically, compared to baseline, what is the effect of BIE coaching for behavior-specific praise on the rate of behavior-specific praise delivered by teachers while interacting with students in an augmented reality simulation environment?



## DEDICATION

With deep gratitude and humility, this is dedicated to my mother, Helen, who loves to learn, and to my daddy, Clarence, who taught me how to shoot a lay-up and how to persevere.

## ACKNOWLEDGMENTS

*For we are God's handiwork, created in Christ Jesus to do good works,  
which God prepared in advance for us to do.*

~ Apostle Paul (Ephesians 2:10)

I once heard a radio story that ended with this phrase, "if you ever see a turtle on a fence post, you know for sure, it did not get there by itself." This dissertation is my turtle on the fence post moment; I know I did not get here by myself. One page cannot provide adequate space for those I want to thank for helping me get to this place. I am humbled by every contribution so many people have made to help me complete this important journey. If I wrote every name and told every story, this document would triple in length.

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## CHAPTER I

### INTRODUCTION

#### **Background and Need for the Study**

Classroom management permeates conversations and creates concern for both pre-service and in-service teachers. Whether talking to veteran teachers, or teachers in their first three years, or pre-service teachers who have just finished their practicum, the subject of classroom management always surfaces. As reflected in professional and research journals, the education community widely agrees that a teacher's ability to manage student behaviors is a key component to producing desired educational outcomes (Emmer & Stough, 2010). Although pre-service educators enter the last stage of their professional preparation with high expectations and pedagogical knowledge, as well as a sincere desire to meet the needs of their students, proficiency in classroom management creates uneasiness. In a study conducted by Beeth and Adadan (2006) classroom management was listed as the number one concern of 42 pre-service teachers as they reflected on their field experience.

Classroom management creates concern for in-service teachers, as well. Disruptions and negative behaviors rob both teachers and students of valuable instructional time. Whether elementary, middle school or secondary, teachers across the country face the daily challenge of discovering ways to minimize disruptive behaviors and actively engage students in learning (Beeth & Adadan, 2006). Pressure to produce student achievement is compounded by the evidence that links teacher effectiveness and classroom management. A recent study concluded that effective teachers had "fewer classroom disruptions, better classroom management skills, and better relationships with their students" than those

teachers who were ineffective (Stronge, Ward, & Grant, 2011, p. 349). The energy and effort teachers dedicate to managing disruptive behaviors can lead them to doubt their effectiveness and their ability to manage a classroom.

Teachers' self-efficacy is connected to how well teachers manage the classroom, so poor management diminishes a teacher's belief that he or she can control how well he or she manages student behaviors. According to Brouwers and Tomic (1998) teachers' perceived self-efficacy beliefs are formed based on their performance, including the way they managed disruptive student behaviors. The cycle of poor management leads to lower self-efficacy that in turn produces poorer classroom management. "When teachers have little confidence in their ability to maintain classroom order, they will likely give up easily in the face of continuous disruptive student behavior" (Brouwers & Tomic, 2000, p. 249). Not surprisingly, classroom management rates high as one of the leading causes of teacher burn out (Brouwers & Tomic, 2000; Tschannen-Moran & Woolfolk Hoy, 2001). Because classroom management is such a concern for pre-service and in-service teachers, it is reasonable to examine evidence-based classroom management practices that produce positive results in order to increase teachers' self-efficacy.

Teachers experience positive results when they apply evidence-based classroom management practices; one such practice is the rate of praise. Research shows that when praise increases, disruptions decrease. "Historically, teacher praise has been shown to be an effective strategy in classroom management," (Sutherland, Wehby, & Copeland, 2000, p. 2). Studies conducted from the late 1960s to the present show that praise increases the appropriate behavior in disruptive students, as well as increasing the on-task behavior of students in general education classrooms (Brodin, Bruce, Mitchell, Carter, & Hall, 1970;

Hall, Lund, & Jackson, 1968; Sutherland et al., 2000). When teachers increase the amount of praise they give to students, students become more compliant and are less likely to engage in disruptive behaviors.

Over the past 30 years, research has revealed that behavior-specific praise is more effective than general praise. General praise statements such as “good job” and “well done” produce positive results, however the use of behavior-specific praise increases academic and appropriate social behaviors and decreases inappropriate behaviors (Beaman & Wheldall, 2000; Duchaine, Jolivete, & Fredrick, 2011; Sutherland et al., 2000). Unfortunately, teachers do not use general or behavior-specific praise very often. In a direct observation study conducted by Wehby, Symons and Shores (1995), the rate of praise delivered by teachers ranged from 1.6 to 2.8 times per hour. Although such studies provide evidence that increased rates of teacher praise and behavior-specific praise have positive effects on academic outcomes and classroom behavior, secondary teachers deliver behavior-specific praise statements as infrequently as once or twice per hour.

### **Statement of the Problem**

Addressing the problem of classroom management requires investigating teacher behavior. Behavioral research and demonstration studies have revealed that teacher behavior is a powerful influence on individual students and entire classes (Beaman & Wheldall, 2000). Teacher behaviors, such as delivering behavior-specific praise, can be developed through coaching, much like an athlete is coached to improve performance. Changing teacher behavior using coaching that includes performance feedback has been proven effective for producing a change in teacher behaviors. Feedback is considered essential to learning, and coaching that incorporates immediate feedback is more effective than coaching using delayed

feedback (Scheeler, Bruno, Grubb, & Seavey, 2009). Immediate feedback delivered through Bug-in-Ear (BIE) coaching has been effective for pre-service teachers, novice special educators, and in-service teachers (Goodman, Brady, Duffy, Scott, & Pollard, 2008; Rock et al., 2009; Scheeler, Congdon, & Stansbery, 2010; Scheeler, Ruhl, & McAfee, 2004). Therefore, if BIE coaching can be used to change teacher behavior to increase the rate of behavior-specific praise that is known to minimize disruptions, classroom management will be reduced to a lesser concern for teachers.

### **Purpose of the Study**

The purpose of this study is to extend the research on Bug-in-Ear coaching as a means to increase behavior-specific praise statements delivered by secondary teachers. This study explores the use of Bug-in-Ear coaching in an augmented reality simulation environment called TeachLivE KU to determine if Bug-in-Ear coaching affects the rate of behavior-specific praise of secondary teachers in this environment. Additionally, this study examines the social validity of using TeachLivE KU as a setting for developing and practicing evidence-based strategies for classroom management.

### **Research Questions**

1. Does real-time coaching delivered through Bug-in-Ear technology change teacher behavior in the frequency and specificity of behavior-specific praise statements (BSPS) delivered to middle school students in an augmented reality environment known as TeachLivE KU?
2. Does the frequency and specificity of BSPS delivered by secondary teachers change the rate of student disruptions occurring in the TeachLivE KU Lab?

3. Does the TeachLivE KU Lab provide an appropriate environment for developing and practicing evidence-based strategies for classroom management?

The dependent variables for this investigation include one teacher variable: the rate of behavior-specific praise statements, and one student variable: the occurrences of disruptive behavior. The independent variable is Tele-Coaching in the TeachLivE augmented reality environment using bug-in-ear technology to provide participants with opportunities to deliver behavior-specific praise statements and to deliver immediate feedback. Social validity measures include responses from survey data, open-ended questions, and written responses from study participants.

### **Definition of Terms**

In this research study, three key terms should be defined for clarity. The first term, behavior-specific praise, is defined as any verbal statement that indicated approval of a desired student behavior or acknowledged an attempt or effort to deliver a correct response. Examples include: “Sean, thank you for raising your hand,” or “Kevin, you really showed creative thinking.” The second term, student disruptions, is defined as any behavior that interrupts the delivery of instruction or interferes with the students’ opportunity to learn. Student disruptions are specifically orchestrated for the augmented-reality simulation environment (TeachLivE KU Lab); these include and are limited to the following off task behaviors: (a) answering or texting on a cell phone; (b) engaging in sidebar conversations; (c) interrupting; (d) excessive talking; (e) beat-boxing or inappropriate noises; or (f) yawning. Finally, the augmented-reality simulation (ARS) is an environment where a real-world physical space is supplemented by computer technology to add contextual data, such as

graphics, sound, and/or video to create an experience for the person emerged in the environment. According to Zhou, Duh, & Billingshurst (2008), augmented-reality “allows the user to interact with virtual images using real objects in a seamless way” (p. 193). In this case, the TeachLivE KULab, serves as an augmented-reality simulation of a middle school classroom.

## CHAPTER II

### LITERATURE REVIEW

Because No Child Left Behind (NCLB) (US Department of Education, 2003) has cast a spotlight on public education, an increased demand exists for highly qualified teachers who use evidence-based strategies. Since NCLB, considerable research has emerged addressing how teachers learn and how teacher education and professional development can be designed to fit these learning patterns (Dal Bello, Knowlton, & Chaffin, 2007). Teacher preparation programs have traditionally included course work, practicum, and student teaching. Professional development has traditionally included one-day workshops where teachers are presented with methods to use evidence-based strategies. Often teachers receive limited feedback from cooperating teachers, supervisors, and administrators about the level of fidelity with which they are implementing the evidence-based strategies. Substantial evidence exists to confirm that immediate, corrective feedback is a necessary and effective component of pre-service teacher preparation and in-service professional development (Farrell & Chandler, 2008; Giebelhaus, 1994; Scheeler, McAfee, Ruhl, & Lee, 2006; Scheeler et al., 2009; Scheeler & Lee, 2002).

The purpose of this literature review is, first, to summarize the research related to importance of (a) feedback in general; (b) feedback to teachers; (c) positive feedback; and (d) behavior-specific feedback for students. Second, this literature review examines studies that use bug-in-ear (BIE) coaching to deliver immediate feedback to pre-service and in-service teachers, and the social validity of this method of coaching. Finally, this literature review

introduces the research related to augmented reality simulation (ARS), by presenting the description and the uses for learning presented in the literature.

The process used to locate articles for this review included a systematic search of online databases including KU Libraries, Google Scholar, PsychInfo and Dissertation Abstracts. Search terms included the following key words: *immediate, corrective feedback, bug-in-ear, augmented reality simulation*. The next step was a categorical search of abstracts for articles that were relevant to the area of education. Finally, an ancestral search of bibliographies of selected articles broadened the review.

The results of the literature search are presented in three categories of relevant literature: (a) what is known about feedback as a variable in learning, (b) bug-in-ear as an intervention variable in teacher development, and (c) training applications of augmented reality simulation. Each of these categories is presented in the context of the purpose of this study, i.e. to explore the use of bug-in-ear coaching in an augmented reality simulation environment to determine if bug-in-ear coaching affects the rate of behavior-specific praise of secondary teachers in this environment.

### **Feedback**

In a synthesis of 500 meta-analyses, John Hattie (1999) established the importance of feedback. These meta-analyses included almost two hundred articles and nearly 7000 effect sizes. Feedback falls in the top five to ten highest influences on achievement. Clearly, feedback is a powerful influence on learning. Further examination reveals that not all feedback is equal. The most effective feedback possesses certain characteristics: 1) provides cues or reinforcement to learners; 2) is relevant to performance on a task; and 3) relates to the difficulty of the goal or task. In essence, “effective feedback must answer three major

questions asked by a teacher and/or by a student: Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?)” (Hattie & Timperley, 2007, p. 86). Furthermore, Hattie suggests that within these major questions, four distinguishable levels of feedback exist: 1) feedback about the task, 2) feedback about the process, 3) feedback about self-regulation, and 4) feedback about the self as a person. Each feedback level possesses its own benefit or strength. Process feedback and self-regulation feedback are the most effective of the four levels for deep processing and mastery; however task feedback is essential for improving strategy processing. Feedback about self as a person is the least effective because it is often delivered without specificity or relation to a task. To positively effect learning, feedback about self will lead to changes in student effort, engagement or efficacy when it is related to the learning task. When feedback answers the three major questions and is delivered appropriately for the type of reinforcement required, then Hattie posits that it bears the power to shrink the gap between where students are and where they aim to be (Hattie & Timperley, 2007).

Because feedback has proven to be so powerful for students, it is reasonable to suggest that feedback is equally powerful for teachers. Brophy (1981) suggests that knowledge of results, or feedback, is essential to learning efficiently. Hattie’s (2007) second level of feedback, feedback about the process, suits teachers’ needs to internalize what they need to do to reach their goals. The goal of No Child Left Behind (NCLB; U.S. Department of Education, 2002a) on improving student achievement challenges teachers to meet increasing standards of professional accountability, i.e. teacher effectiveness. Although the final measure of teacher effectiveness is delivered through standardized test scores, process

feedback and performance feedback offers teachers the opportunity to adjust teaching practices and modify their behaviors as needed in order to improve teaching effectiveness, thus reaching their ultimate goal. The value of feedback to teachers is demonstrated by the evidence “that teachers can and do adjust teaching practices when they receive constructive, systematic feedback about their teaching performance” (Greenwood & Malheady, 1997; Scheeler & Lee, 2002, p. 232). Providing feedback to teachers is equally powerful for shrinking the gap between knowledge and performance for teachers as it is for students.

### **Feedback to Teachers**

Teachers have been called knowledge workers (Knight, 2009). These are people who do intellectual work, solve problems, meet the needs of customers (in this case students), make decisions and collaborate in the course of their work (Davenport, Harris, & Cantrell, 2004). In order to meet the growing demands of doing their work, teachers require feedback to assess their effectiveness. Performance feedback has been shown to increase teachers’ effectiveness. Mortenson & Witt (1998) suggest that performance feedback provides information, knowledge or data to promote the acquisition or maintenance of new behaviors. Performance feedback for teachers, particularly delivered by a coach rather than an evaluator, incorporates these components: “(a) review of data on teacher performance, (b) praise for correct implementation, (c) corrective feedback on procedures used incorrectly or infrequently, (d) problem-solving, and (e) opportunities to address questions” (Myers & Simonsen, 2011, p. 38). A case study conducted by Colvin and his colleagues revealed promising results using a combination of classroom observation and performance feedback (Colvin, Flannery, Sugai, & Monegan, 2009). Research has established that feedback is essential for learning (Brophy, 1981; Hattie, 2009; Scheeler et al., 2004), therefore, for

teachers to consistently and effectively implement the newly acquired knowledge related to adjusting their teaching practices, and changing their behaviors, performance feedback is a key component.

Feedback can be delivered in a variety of ways: e.g., verbal, written, delayed, or immediate; however immediate feedback produces the best results. In a review of performance feedback studies, Scheeler and her colleagues (2004) examined ten empirical studies to determine the attributes of effective performance feedback. Results of this review revealed: “Immediate feedback resulted in faster acquisition of effective teaching behaviors at a higher level than delayed feedback” (Scheeler et al., 2004, p. 403). Furthermore, based on studies using wireless technology, such as Bluetooth™ earpieces to deliver immediate feedback, reinforcement or corrective feedback in real time has proven to be an effective way of changing teacher behavior (Scheeler, McAfee, Ruhl, & Lee, 2006; Scheeler & Lee, 2002). This immediate, performance feedback helps prevent the practice of ineffective, incorrect techniques, and it reinforces the correct, effective teaching behaviors.

### **Positive Feedback**

As previously established, feedback is essential for learning and powerful for moving students forward along the achievement continuum. In order for feedback to be especially effective, it should meet Hattie’s researched-based criteria, i.e. task specific, process descriptive, note self-regulatory, and build self-esteem. Hattie’s meta-analyses on feedback has roots in Brophy’s research about effective praise. Jere Brophy (1979) suggests that effective praise as a form of feedback is contingent, specific, and appropriately delivered. Additionally, the effects of positive feedback, or effective praise, on classroom management have also been established. Praise is so important to a positive learning environment that

research recommend the delivery of three to four praise statements for every correction or reprimand (Alberto & Troutman, 2003). Sutherland and his colleagues suggest teachers should deliver six praise statements per 15 minute observation (Sutherland et al., 2000). Teachers' delivery of praise effects students in meaningful ways: (a) minimizes disruptions, (b) increases appropriate behavior, (c) increases intrinsic motivation, and (d) establishes a positive classroom environment. According to Sutherland, et al. "the teacher who uses praise is seen by students as a fair, caring, trustworthy adult. Since many of the students we teach have had little success in school, praise from the teacher can be a valuable tool as we attempt to not only teach our students pro-social behaviors and academic tasks, but also to recognize the strengths they possess" (2001, p. 47). In a study done by Noels, Clement & Pelletier (1999), perceptions of teachers' communication style bore a correlation to the intrinsic motivation for students. The value of building a good teacher-student relationship by using non-evaluative language, e.g.: "I see you making progress;" "You found a new way to solve that problem," and avoiding criticism and negativity is as powerful for classroom management as immediate feedback is for increasing achievement.

### **The Need For Behavior-Specific Praise To Students**

In the same way immediate feedback is more effective than delayed feedback, specific praise is more effective than general praise. Research shows that when praise goes up, disruptions go down. "Historically, teacher praise has been shown to be an effective strategy in classroom management," (Sutherland et al., 2000). Studies conducted from the late 1960s to the present show that positive attention in the form of praise increases the appropriate behavior in disruptive students, as well as increasing the on-task behavior of students in general education classrooms (Brodén et al., 1970; Hall, Lund, et al., 1968; Hall,

Panyan, Rabon, & Broden, 1968; Sutherland et al., 2000). Although there is little empirical research exists specifically for the type and frequency of praise delivered by secondary teachers, a review of the literature by Beaman and Wheldall (2000) posits that key teacher behaviors such as “contingent praise/approval and reprimand/disapproval may be systematically deployed by teachers so as to increase both academic and appropriate social behaviors and to decrease inappropriate behaviors” (Beaman & Wheldall, 2000, p. 431). Positive feedback, such as specific and/or contingent praise, is one of five empirically supported features of effective classroom management (Simonsen, Fairbanks, Briesch, Myers, & Sugai, 2008). The extent to which teachers use praise is also one of six measures used to assess the teacher-student interactions that encourage learning (Cooley, Leinhardt, & McGrail, 2012). Teachers use positive feedback to reinforce desired behavior, both social and academic. Teachers also use feedback to provide students information about their learning (Conroy, Sutherland, Snyder, Al-Hendawi, & Vo, 2009). Positive feedback serves as a strategy for motivating appropriate behaviors, both social and academic, and for minimizing classroom disruptions.

The effects of positive feedback delivered as behavior-specific praise emphasize its importance as an effective teacher’s behavior. Behavior-specific praise is “one of the most important and continuing responsibilities of teachers” (Brophy, 1979, p. 270). Additionally, the consistently effective teacher behavior of delivering behavior-specific praise is associated with improved student behavior (Beaman & Wheldall, 2000; Sutherland et al., 2000). For example, delivery of behavior-specific praise for social behaviors has been associated with an increase in on-task behavior (Sutherland et al. 2000), student attendance (Broden, Bruce, Mitchell, Carter, & Hall, 1970), and student compliance (Wilcox, Newman, & Pitchford,

1998). Teacher praise has been found to be most effective when it is contingent, descriptive, personal and genuine (Chalk & Bizo, 2004). An example of this type of praise is: “Sean, the example you gave provided important details.” Evidence supports the use of behavior-specific praise as a teacher behavior that is effective for managing students and improving their behavior.

Despite the evidence for the power of feedback, specifically in the form of behavior-specific praise, teachers do not exhibit this behavior very often. “Classroom observations reveal that praise of good answers or good work typically occurs fewer than five times per hour, and praise of good conduct appears only once every 2-10 hours in the early grades and virtually drops out of sight thereafter” (Brophy, 1979, p. 271). A study conducted in by Gable, Hendrickson, Young, Shores and Stowitschek (1983), using direct observation of teacher behaviors in 14 classrooms, rates of behavior-specific praise ranged from 1.6 to 2.8 per hour (Sutherland, Alder, & Gunter, 2003; Sutherland et al., 2000). More recent studies indicate an increase in rates of “approval with description” (Chalk & Bizo, 2004, p. 337); however, as children increased in age, the rates of approval decreased in frequency (Alber, Heward, & Hippler, 1999). Sutherland (2000) reports that the rate of teacher praise in inclusive classrooms for students with learning disabilities and emotional behavior disorder was 4.4 praise statements per hour. Additionally, a review of 379 observations from 67 classrooms across four states revealed rates of praise statements between .02 and .04 per hour (Hawkins & Heflin, 2010; Wehby et al., 1995). Given the low rate of behavior-specific praise delivered to students, it is evident that this teaching behavior is one that teachers can be encouraged to implement.

## **Bug-in-Ear Coaching**

Understanding the importance of immediate feedback in the learning process has led researchers to explore ways to deliver immediate feedback to teachers, both pre-service and in-service. Teacher preparation programs for pre-service teachers and professional development for in-service teachers offer extensive course work and seminars on evidence-based practices. However a gap exists between what teachers learn and what they practice in both student teaching and professional positions. One means of filling the gap between learning and practice is to create authentic learning experiences for pre-service teachers that offer immediate, corrective and/or positive feedback while they are engaging in evidence based practice. Wireless technology, such as bug-in-the-ear (BIE) makes immediate feedback possible. This summary of research on using BIE coaching in teacher preparation programs and professional development for general education and special education teachers provides 1) evidence of its use in education during the last two decades, 2) evidence of change in teacher behavior resulting from BIE coaching, and 3) social validity for the intervention. An examination for the research reveals that BIE coaching as a means of delivering real-time feedback to pre-service and in-service teachers changes teacher behaviors in areas of classroom management and literacy instruction.

The research studies included in this review were selected through an electronic search using Google scholar database for the years 1990 to present. Key words included “bug in the ear” and “immediate, corrective feedback.” In addition to the electronic search, an ancestral examination of references cited in these articles was conducted. The search yielded thirty-five articles; of those, ten were eliminated because teachers were not the participants. An additional five were eliminated because they were unpublished manuscripts,

such as dissertation studies and masters theses. Of the twenty remaining, the sixteen articles selected for this literature review are limited to empirical research studies that appear in peer-reviewed publications. The studies were examined for specific characteristics: (a) research design, (b) data analysis, (c) number of subjects, (d) subject characteristics, (e) setting, and (f) length of time.

The results of this literature review can be organized into three key findings: 1) the uses of bug-in-ear coaching in education, and 2) the effect of immediate, corrective feedback on teaching behaviors, and 3) the social validity of using bug-in-ear coaching.

### **Uses in Education**

Bug-in-Ear coaching has been used in four areas in pre-service teacher preparation and professional development. The primary use has been for supervising teachers to provide immediate feedback to pre-service teachers (Farrell & Chandler, 2008; Giebelhaus, 1994; Goodman et al., 2008; Kahan, 2002; Scheeler et al., 2006, 2004). Included in that pre-service supervision are physical education and special education classrooms. In the research articles included in this review, the physical education pre-service teachers were coached for classroom management, and special education pre-service teachers were coached for literacy instruction. Peer-coaching, first in a physical education classroom and more recently in an inclusive classroom, offers the most recent use for that BIE coaching (Scheeler et al., 2010). This review of the selected literature focuses on these four areas of BIE coaching as it has been used in education in the last twenty years.

When BIE coaching was first used in pre-service supervision, it was used by physical education supervising teachers. Early technology included FM radios and BIE listening devices with FM receivers. In the research studies conducted by Giebelhaus (1994) and Kahan

(2002), supervisors for physical education student teachers used FM wireless devices to give clarity cues and immediate corrective feedback. In both studies, the supervising teacher was in close proximity, in the same room, during the observations. The student teacher and supervising teacher wore a bug-in-the-ear device (BIE) and an FM receiver. In a third study, conducted by Farrel and Chandler, (2008), two-way radios with a reception range of one mile were worn by the cooperating teacher and the student teacher. Both radios were equipped with ear buds that were used to deliver feedback to the pre-service teacher. Though the coaching method is called whisper-in-the-ear (WIME), but it is the same method with slightly more advanced technology as is used in Giebelhaus (1994) and Kahan (2002) studies.

These studies where the subjects were physical education pre-service teachers, represent three single-case research designs. In the first study, Giebelhaus (1994) examined twenty-two elementary physical education teachers and their cooperating teachers in three school districts. Over a nine-week period data were collected. Data are analyzed compared in an experimental research design for the effectiveness of audio-cuing using BIE. Analysis of covariance is used to examine pre-test, post-test, and delayed response follow-up scores for measuring clarity skills. The results of this study support the use of BIE intervention strategy as a means of providing appropriate feedback for student teachers. Student teachers who were cued by their cooperating teacher made immediate changes to their behaviors 88% of the time. However, the analysis of covariance showed no statistical significance between those teachers who received BIE cues and those who did not with regard to the fourteen discrete teacher clarity skills cued by the cooperating teacher. Giebelhaus suggests that clustering the discrete skills for the analysis may have reduced the power of the analysis, and this should be considered for future studies.

Kahan's (2002) research produces similar results to Giebelhaus' study although the research design is different. In this extensive AB<sub>1</sub>B<sub>2</sub>A reversal design case study, one physical education student teacher in an urban high school was paired with a cooperating teacher who had nineteen years of experience and who had previously supervised three student teachers. The study lasted sixteen weeks. The purpose of this study was to intermix the BIE and "thinking-out-loud" methods to determine what the methods of communication are between the cooperating teacher and the student teacher and how satisfied both participants are with the communication exchange and the BIE device. Because the communication in the Kahan study was two-fold, clarity cues and "thinking-out-loud", the communication was coded according to type and content. There were three types, (descriptive, prescriptive, and interrogative), and three content codes, (management, instruction and other). Results from Kahan's study indicate that there was no clear trend across the three types of communication, and the highest level of content communication centered on management. One interesting result in this case study is the way the student teacher quickly adopted the cooperating teacher's routines, classroom management, and methods for preventing off-task behaviors.

The third study that involves physical education pre-service teachers compares the preference of cooperating teacher to two different feedback methods, whisper-in-the-ear (WIME) and traditional, and whether the WIME improves the pre-service teachers' overall performance. In this case study, (Farrell & Chandler, 2008), a qualitative research design is used to examine the responses of eight cooperating teachers, all of whom had prior experience and each of whom supervised four pre-service teachers who were part of an undergraduate sophomore methods class for elementary physical education. Of the four pre-

service teachers, two were supervised using the traditional method, and two were randomly selected to be supervised using the WIME method. Each day during the eight-week duration of the study, the cooperating teachers made written notes about the supervisory experience. At the end of the eight weeks, the cooperating teachers responded to an eight-question survey. The researcher used the written notes and the answers to the survey questions to compile the results. Results show that although the pre-service teachers who received feedback in the traditional method and the pre-service teachers who received feedback using the WIME both concluded the field experience with the same level of competency, the WIME pre-service teachers progressed more quickly.

Results of these studies indicate that using BIE to deliver cues is at least as effective as traditional methods of coaching physical education pre-service teachers. Giebelhaus (1994) reported that teachers changed their behavior immediately 88% of the time when using BIE. Kahan (2002) reported that pre-service teacher quickly adopted the cooperating teachers classroom management styles, routines, and methods for dealing with student disruptions while being coached using BIE. A qualitative study conducted by Farrell & Chandler (2008) measured the reaction of the cooperating teacher to the method of coaching or supervision rather than measuring a change in pre-service teacher behaviors. Six of the eight cooperating teachers reported feeling a more professional connection to the pre-service teachers using the WIME (Farrell & Chandler, 2008). These three research studies involving physical education pre-service teachers indicate that using BIE to provide feedback to pre-service teachers yield positive effects.

Research involving special education pre-service teachers adds to the limited body of research involving BIE coaching for physical educators. The bulk of the research

investigating the use of BIE coaching for special education has been done by Scheeler et al. (Scheeler et al., 2010; Scheeler, Macluckie, & Albright, 2008; Scheeler et al., 2006, 2004; Scheeler & Lee, 2002). Additional research included in this review, also published in peer-reviewed journals, include studies conducted using video conferencing to be virtually present in the classroom instead of physically present while coaching teachers using BIE. The studies involving special educators is organized by first, examining the BIE coaching done by Scheeler and her colleagues, and second by examining the BIE coaching that includes additional technology, such as video conferencing. The studies conducted by Scheeler (2009; 2002; 2006), address questions about the BIE in two ways. The first question is examined here: Does immediate, corrective feedback effect teacher behavior when it is delivered via a wireless FM listening system such as BIE? The second question regarding how teachers accept the BIE as a method of intervention will be discussed later. These three studies use multiple baseline design across all the participants. The effectiveness of the intervention was measured by comparing the difference in completed three-term contingencies between the baseline and intervention phases of the experiment. Three-term contingencies consisted of (a) direct instruction by the teacher, (b) student response, and (c) teacher delivered consequence. The participants in all three studies are special education pre-service teachers and their supervising teachers. Thirteen pre-service teachers participated in the three studies, and all the participants delivered direct instruction primarily in reading to students who each had an individual education plan (IEP). Six of the participants were enrolled in a graduate special education certification program and the two participants in the first study were experienced general education teachers. All pre-service teachers had completed a practicum using direct instruction. The lessons being observed occurred in the

teachers’ classrooms. The teachers wore a one-way BIE device. The supervising teacher sat at least twelve feet away from the instruction area and spoke softly into a microphone to deliver the feedback so there was no disruption of instruction. The results of the three studies have been combined and are illustrated in Figure 1. All the pre-service teachers increased the targeted behavior during the intervention. The results of all three studies corroborate that immediate, corrective feedback delivered via BIE improve teachers’ delivery of direct instruction.

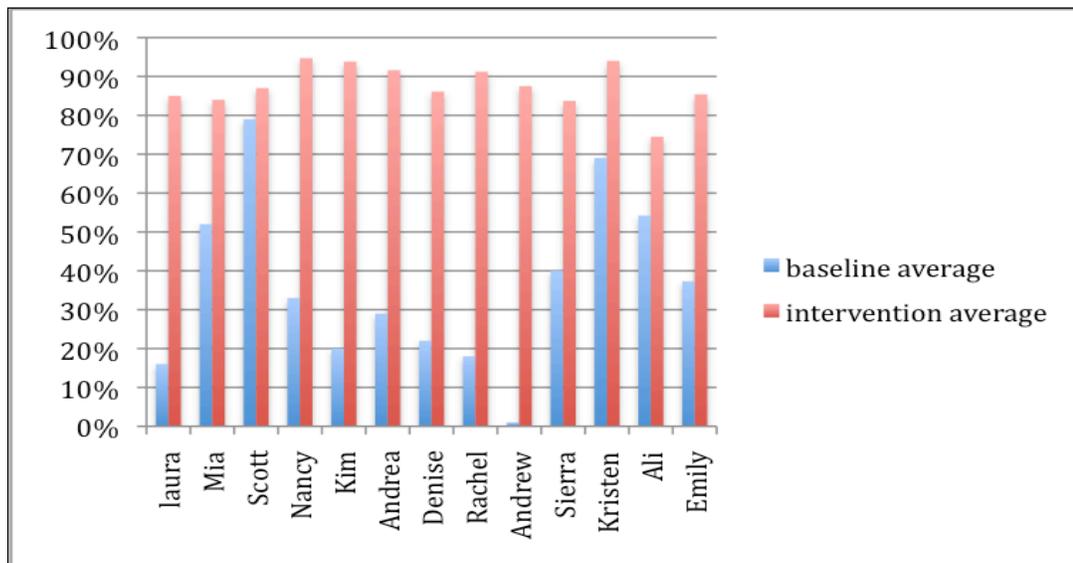
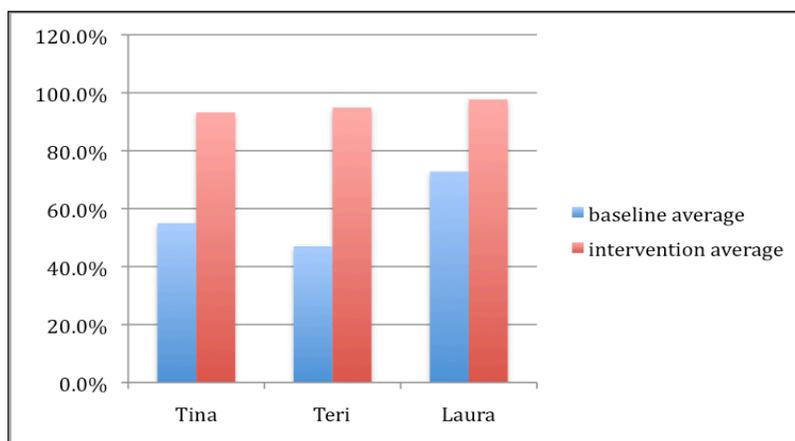


Figure 1. Teacher Behaviors: Baseline to intervention comparison of three-term contingency completion.

The fourth study in this section combines coaching, BIE, and an instructional practice called “learn units” (LU), which are the same as three-tiered contingencies (Scheeler & Lee, 2002) for coaching three novice (three or fewer years teaching) special education teachers (Goodman, Brady, Duffy, Scott, & Pollard, 2008). This research extends Scheeler and Lee’s research (2002) by asking these two questions: (1) “Would immediate prompts and feedback to novice teachers via BIE technology increase their accuracy and delivery rates of LUs

during instruction?” and (2) “If increases were observed, would these improvements in accuracy and rate continue when the BIE coaching was faded?” (Goodman, et al., 2008). The study lasted twenty-seven weeks and included opportunity to train with the BIE device and establish protocol between the coach and the teacher before baseline data was gathered. The coach gave specific, prearranged prompts to the teacher during the intervention phase. Using LU as the targeted behavior, coaches provided immediate, corrective feedback using BIE technology. The length of the baseline, intervention, fading and maintenance phases extended over different periods for each teacher. The results of multiple baseline design indicated an increased rate of LUs delivered by the teacher when the coach delivered feedback via BIE. The increase in targeted behavior is summarized in Figure 2.



*Figure 2.* Teacher Behaviors: Baseline to intervention comparison of learn unit completion.

The rate and accuracy improved for each teacher, and two of the teachers sustained those increases during the fading phase of the study. Only one teacher was able to extend the study to the maintenance phase, but she maintained accuracy of the targeted behavior

94% of the time. This result aligns with the results of Scheeler's (2009) most recent study discussed later in this review.

Another important component of this study is the additional communication by the teacher and the coach. Immediately after the instructional session, the teacher and the coach reviewed the lesson together; this provided an opportunity for the teacher to ask questions or clarify feedback. These sessions differed in quantity for each of the teachers, but all three teachers participated in at least nine post-instruction conferences. While the effects of this conference on the instructional practice are uncertain, it worth examining when considering the aspect of coaching as a means of improving instructional practice.

The previously examined studies have focused on one type of technology, the bug-in-the-ear (BIE) device. Some of the previous studies also used additional technology such as audio recording and video recording for inter-observer reliability. However, as new technology became available, so did the opportunity to study its effects. A recent study conducted by Dal Bello, Knowlton and Chaffin (2007) examined the use of interactive videoconferencing (IVC) in addition to BIE as a means of providing a situated learning experience for pre-service teachers to prepare them for working with students with disabilities who were included in general education classrooms. The use of IVC offers another technological approach that can be used to prepare pre-service teachers for the profession.

Interactive videoconferencing (IVC) is live two-way audio and video communication via computer network or phone between individuals in different physical locations. Because IVC connects people remotely, it is possible for students in a university classroom to observe a teacher and students during regular instruction in a school classroom across town, or from

even greater distances. In this qualitative study (Dal Bello, et al., 2007), a sample of fifteen students were surveyed concerning their learning experiences with IVC. The students were former or current general education students who had completed special education course that used IVC to introduce them to authentic learning situations among students with disabilities. The purpose of this study was to examine the effectiveness of IVC as a method of instruction for introducing pre-service teachers to the “realities of learning and behavioral diversity in schools” (Dal Bello, et al., 2007, p. 40). The results from this qualitative study are compiled according to the responses to nine survey questions that were answered via phone, in-person, electronically, or mailed-in hard copy interviews. “The 15 respondents endorsed IVC as a useful medium for teaching and learning in higher education teacher preparation. Generally their impressions overwhelmingly favored the technology” (Dal Bello, et al., 2007, p.45). Positive results from this study produced additional questions surrounding whether using IVC technology enhances preservice teachers’ learning experience.

In the second study that uses IVC, the researchers suggest that interactive video conferencing (IVC) enhances the learning experience and effectiveness of pre-service teachers. This article presents an overview of the uses of IVC and then describes three items, (a) effects on learning, (b) effects on student perception, and (c) use of IVC for mentoring, coaching and supervision involving pre-service special education teachers (Knowlton, et al., 2007).

For effects on learning, analysis of covariance analyzed the data comparing two learning methods: video conferencing and traditional lecture. Ninety-four undergraduate students enrolled in a Special Education survey course participated in this study. Results

indicate significant differences in favor of IVC were not achieved. For the effects on student perceptions, a comparison between practicum supervisors and practicum students was done. Six supervisors and twelve students completed a questionnaire dealing with logistics, effectiveness and efficiency before and after their practice, which featured IVC mentoring and supervision. Data revealed a significant relationship between exposure to IVC and students' willingness to use IVC in their practicum experience. The final research question in this study, use of IVC for mentoring, coaching and supervision, has not been fully explored, but the design and questions have been established and are worth noting. A single subject research design will evaluate the effectiveness of coaching on pre-service teachers and the effects of modeled practices on the students being taught by the pre-service teachers. This article explains the process and plans for this future study and the use of IVC and bug-in-the-ear technology to focus on modeling and prompting during instruction as well as feedback immediately after instruction.

As technology advanced, so did the examination of BIE coaching. In a study designed to explore the feasibility of online wireless BIE (Rock, et al., 2009), fifteen experienced teachers (ranging from 1 to 20 years) enrolled in a field-based graduate special education teacher preparation program received performance based feedback, or coaching, during a five-week period over sixty-four, thirty-minute sessions. The results of this mixed methods research design include three dependent variables for quantitative measurement and coded reflections written by the participants for qualitative data. The three dependent measures were: (a) changes in teaching behavior – defined as use of low-access and high-access instructional practices; (b) changes in classroom climate, defined as teachers' use of redirects, reprimands, and praise, as well as percentage of students engaged during whole

class reading instruction; and (c) level of disruption and benefit associated with the advanced online BIE technology and feedback. (Rock, et al., 2009). The matched-pairs *t* tests revealed statistically reliable results in each of the measured changes in teaching behavior. Changes in classroom climate was also positive, supported by both quantitative and qualitative results. Quantitative results concerning the third dependent variable examined the supervisor's feedback and the participants' response to it by examining videotape of the thirty-minute lessons to measure frequency count of timing and type of feedback. The feedback was broken down into three areas, encouragement, question, and instruction. Results showed that "immediate feedback had a positive effect on teacher behavior." (Rock, et al., 2009, p.77). One comment worth noting describes the positive effect of BIE. "When an evaluator or peer watches you teach in person, there is no immediate feedback, which a teacher really needs. Throughout all of my lessons Dr. X was telling me how I was doing and what I needed to do, which gave me confidence in my ability to get the job done" (Rock, et al., 2009, p.76). This comment demonstrates the effect that coaching, in the form of immediate, corrective feedback, can have on teachers' instructional practice.

As previously discussed, BIE coaching has been used in supervising both physical education and special education teachers. Peer coaching using BIE technology further examines the use of this technology. In the study, conducted by Fry and Hin (2006), information and communication technology (ITC) is used to support peer coaching between physical education student teachers in an authentic school setting. Because many teacher educators think there is not enough time in pre-service teacher education programs to fully develop teaching skills and subject knowledge, (Katene & Faulkner, 2003), Fry and Hin explored using peer coaches and BIE technology to supplement elementary physical

education pedagogy courses with ITC. The mixed research design conducted over four weeks with twenty-one student teachers contains two aspects: 1) the response of the student teachers to the use of technology, and 2) coaching focus for (a) use of time, (b) presentation, (c) teacher “withitness” and (d) feedback. The response to the use of technology will be discussed in a later section of this review. The peer coaching aspect of this study is discussed here.

The study lasted four weeks and each participant was paired with a coach, or “feedback friend” except for the group of three that was formed because of the odd number of participants. Each week a student teacher taught one lesson and coached one lesson by providing feedback via BIE. The participants also provided a written feedback sheet to the student teacher as part of their coaching assignment. A 4-point Likert scale survey questioning the students on the extent of influence that communication had on their role as a teacher was used to collect data on the coaching aspect of this study. The “results suggest that there were positive effects coming from in-the-moment wireless assisted coaching. From the increased satisfaction (from 3.7 to 4.0, Table 2) with their role as a teacher in the half-class clinical setting, it appeared that quite possibly this teacher satisfaction was linked to the positive reinforcement received from their coaches” (Fry & Hin, 2006, p. 201). Results also indicate that student teachers became less dependent on the coach as their confidence improved, and that the quality of communication improved as the coaches’ observational skills improved.

Peer coaching between co-teachers using BIE also produced positive results. In a study conducted by Sheeler et al. (2010), three dyads of special education and general education teachers coached each other in the delivery of three-term contingency (TTC)

during instruction in inclusive classroom settings. This study extends previous studies in two ways: First, the coaching involved in-service teachers in their own classrooms; second, teachers not supervisors or researchers delivered the feedback through BIE. Two dependent measures were examined: (a) the percentage of TTC trials completed by the co-teacher, and (b) how easy and useful it was to deliver and receive feedback through BIE. Results indicate that immediate feedback delivered by BIE technology increased the mean percentage of completed TTC trials by an average of 76.9. During the intervention phase, the percentage of completed trials ranged from 90 to 100, and during maintenance phase, every teacher maintained a higher percentage than baseline, ranging from 82.7 to 100. The results from this study further support the use of BIE to deliver immediate feedback targeting a specific teaching behavior.

### **Changes in Teacher Behavior**

In each of the studies using BIE to coach for specific teacher behaviors, the intervention produced a change in teacher behavior. The percentage of change in targeted behavior ranged from 88 to 100 percent across all the studies. These results agree with the results from studies related to the delivery of feedback to teachers.

### **Social Validity**

Most of the BIE studies included some form of social validity measure. Wolf (1978) establishes the need for social validity by determining that society should validate the work of behavioral research based on the social significance of the goals, the appropriateness of the procedures and the importance of the effects. Consequently, examining the reaction of the participants in the BIE studies meets the criteria of social validity. A variety of means were used across these studies to determine the participants' reaction to the bug-in-ear

technology. In some cases, interviews were conducted (Fry & Hin, 2006; Kahan, 2002; Scheeler et al., 2004). In a few cases, anecdotal records included participants reactions (Dal Bello et al., 2007; Farrell & Chandler, 2008; Goodman et al., 2008). In many studies questionnaires were delivered (Kahan, 2002; M. C. Scheeler et al., 2010, 2008, 2006; Mary Catherine Scheeler et al., 2009), and in one study, written reflections were obtained (Rock, Gregg, Gable, & Zigmond, 2009). Generally, the social validity of the studies were concerned with the preference of receiving and giving feedback using BIE technology as well as the comfort of wearing the device. In general, reactions were positive thus confirming the social validity of using BIE technology to deliver immediate feedback.

### **Augmented Reality Training Environments**

Simulation may be new in the field of education, however it has existed in other disciplines for many years. Flight simulators make it possible for trainee pilots to learn how a plane will respond to their actions (Richards & Szilas, 2012; Salas, Bowers, & Lori, 1998). Police may use physical training simulators to improve hand-eye-coordination in high-risk situations and to practice high speed pursuits (Richards & Szilas, 2012). Simulation technology increases in popularity for training healthcare professionals across all disciplines (Aggarwal, Black, Hance, Darzi, & Cheshire, 2006; Gordon, 2000; Kneebone et al., 2006). National Defense and military training conduct many of the routine aspects of training in simulation or virtual environments (Dunleavy, Dede, & Mitchell, 2008; Fox, Arena, & Bailenson, 2009; Stedmon & Stone, 2001). What started as rudimentary simulation with simple graphic design has grown into a continuum of simulation training complexity from simple physical simulation to complex virtual reality simulation (Hughes, Stapleton, Hughes, & Smith, 2005). The review of literature in this study is limited to specific simulation technology known as augmented

reality simulation (ARS) as it used in the area of teacher preparation.

A search of PsychINFO, Google scholar and Omni databases for the years 1990 to present using key words “augmented reality simulation” and “teacher preparation” returned no results. An ancestral search of articles written specifically about TeachLivE produced related literature. Due to the limited literature on the use of augmented-reality simulation in teacher preparation, it is worthwhile to examine literature related to how ARS is described and how it is used for learning.

### **Defining Augmented Reality**

Augmented Reality Simulation is one type of simulation along a continuum of simulation environments. Even those who are experts in the creation and implementation of simulation have varying definitions for the terms. Based on the definition previously stated, i.e. “where a real-world physical space is supplemented by computer technology to add contextual data, such as graphics, sound, and/or video to create an experience for the person emerged in the environment” four articles were selected that enliven the definition.

Two of the articles, one written for the Human Interface Technology (HIT) Lab in New Zealand, and one published by IEEE Computer society, provide a technical description of ARS. The article from New Zealand explains that AR “allows the user to interact with virtual images using real objects in a seamless way” (Zhou, Duh, & Billingham, 2008, p. 193). There are three things that define ARS: (1) combines real and virtual imagery; (2) is interactive in real time; and (3) registers virtual imagery with the real world. While the article out of New Zealand focuses more on the technical description, the IEEE article includes the technology, but it also emphasizes the importance of the story that the ARS is trying to create. Stapleton and Hughes (2006) posit that for this type of technology to have human

impact, it must affect the imagination. These authors articulate how the technology of ARS blends the real world and the virtual objects to create a participatory experience for the user. The imaginary reality created by ARS sparks the cognitive perception and creation of the user while the “free play draws on the intuitive physical interaction’s participatory aspect and generates cause and effect consequences” (p.90).

In the third descriptive article, the same authors extend the description of ARS by placing it on a mixed reality continuum. This continuum extends from the physical reality to the virtual reality, with augmented reality near the center. The authors explain that the characteristics of augmented reality are distinguishable from mixed reality by a very specific characteristic. Augmented reality does not melt the boundaries between real and virtual, instead it is a projection-based system that allows the virtual and the real to be “interspersed (such as oil and vinegar)” (Hughes & Stapleton, 2004, p. 2). Furthermore, they describe ARS as “the condition where users are situated in a real setting with synthetic objects added to the real landscape” (p. 1). The authors articulate the importance of people (users) maintaining their identity in ARS, because it is “personal identity that leads to social interaction” (Hughes & Stapleton, 2004, p. 1).

The fourth descriptive article explores using ARS in social simulations. Richards and Szilas’ (2012) interest lies in “categories of simulations that assist training, that is the acquisition of knowledge, skills and competencies by the learner” (p.1). The authors describe the different simulations that are used in pilot, police, military, EMT and HazMat training where the user is immersed in a virtual world. This description better fits Hughes and Stapleton’s (2006) definition of virtual reality than augmented reality. However, as Richard and Szilas (2007) further articulate their interest in social application, the applications for

ARS in education begin to emerge. Richards and Szilas (2007) discuss the way that multi-user dungeon (MUD), multi-user virtual environments (MUVES) and virtual worlds (VW) “allow difficult situation to be safely explored” (p. 2). ARS fit into the same use category, although the article’s focus is primarily on created characters or agents that behave according to the user’s direction. In a rich description about the components and necessity of believability, Richards and Szilas bridge the space between VR and ARS. They suggest that interactive narrative is the key to providing “engaging interactions that are interesting and leave a lasting impression” (Richards et al., 2007, p. 4). The authors suggest that it is interactive narrative that creates a “dramatic experience for the learner, in order to make learning more efficient” (p. 4). Interactive narrative is possible at any place along Milgram and Kishino’s (1994) continuum of Mixed Reality Simulation. Richards and Szilas (2007) suggest that interactive play combined with mixed/augmented reality will present opportunities for rich learning experiences.

### **Uses of ARS for Learning**

The relevant literature describing the various uses of ARS to support and facilitate learning reveals three common applications: (a) cognitive retraining, (b) transfer learning, (c) situated learning.

Cognitive retraining in a virtual environment, which includes ARS, allows ARS to become a rehabilitation tool (Fidopiastis et al., 2006). This article reports a single subject design case study of a 48 year old man who suffered a traumatic brain injury. In this study, a mixed reality ARS of the patient’s kitchen was created and he was able to practice the same protocol for making breakfast in the simulated environment. Using tracking hardware and software, the patient was monitored for location errors and memory errors as well as the time

it took him to complete the task. Additional data was collected on the same scenario in the patient's actual home. Results revealed that after five sessions in the mixed reality ARS, the time it took the patient to make breakfast in his own home was reduced by three and a half minutes. In this study, transfer of learning from the mixed reality ARS to the home environment was evidenced by decreased time spent on the task of making breakfast.

In their article on human transfer learning, Cook and her colleagues, study how knowledge is transferred by humans playing various scenarios in ARS that are specifically designed to test various levels of transfer. Transfer of learning is, simply stated, "the ability to extend what has been learned in one context to new contexts" (Cook, Holder, & Youngblood, 2007, p. 1465). In this study, a complex urban combat test-bed was created and data were collected on two players, one trained and the other untrained, who performed multiple scenarios. A series of complex algorithms measured the players' ability to move forward to the next level of complexity based on what he had learned on the current level. Results suggest "humans are able to perform transfer of learned knowledge at multiple levels of complexity" (Cook et al., 2007, p. 1491). A goal the authors have for future study is to inform realistic simulation so the simulations will be consistent with how humans are observed performing tasks in the real world. The key to reaching their goal may lie in the results of a situated learning study.

With funding from a National Science Foundation Grant, Ketelhut and her colleague studied situated learning in multi-user virtual environments (MUVES) in a place they created called "*River City*". In this MUVE, students (n=330), from four public urban high schools learned about water-borne, air-borne, and insect-borne illnesses in a virtual town set in the late 1800s (Ketelhut, Dede, Clarke, Nelson, & Bowman, 2006). The students interacted with

expert avatars (played by college science majors) as well as imbedded computer-based agents. In this constructivist approach, students gained knowledge about illnesses in 1800s by playing in the MUVE. Data were collected on how the students interacted within the MUVE by looking for patterns of movement, interactions, chats, and questioning the virtual residents of *River City*. The results of this study include multilevel multiple regression analysis and qualitative data from case study interviews. Researchers report that “the MUVE-based curriculum has a statistically significant, positive impact on student learning for girls and boys ( $p < .05$ )” (Ketelhut et al., 2006, p.18) . Qualitative data showed that students gained critical thinking skills, developed self-confidence, and improved thoughtfulness of inquiry.

The implications of studies on cognitive retraining, transfer learning and situated learning in MUVES help inform research being explored around using ARS in teacher preparation. The final article reviewed, written by Dieker and her colleagues, explores the use of technology in teacher education. This article describes the development of an ARS whose purpose is “to positively impact teacher recruitment, preparation, and retention in education by allowing teachers to hone their skills with virtual children, providing a more ethical approach to learning the art of teaching” (Dieker et al., 2008, p. 4). The article thoroughly explains the development of the technology, the creation of the avatars, and the role of the inter-actors who make live simulation possible. Although no research results were available on the ARS teaching environment at the time of this article, the authors do report success for simulations in a kitchen and in a restaurant. In both the MR kitchen and the MR restaurant, participants were able to practice behaviors in a safe environment and results showed that learning occurred and behavior improved. ARS in teacher education is an emerging field. For the purpose of this review, the numerous articles written about ARS in

the medical profession will not be examined, instead it is noted that ARS has been used successfully in all dimensions of health care professional preparation for decades (Van Dongen et al., 2011; Westwood, Westwood, Fellander-tsai, Haluck, & Senger, 2013). It is reasonable to conclude that what can be learned from ARS use in health care, as well as in situated and transfer learning will continue to inform how ARS can be used in teacher education.

## **CHAPTER III**

### **METHODOLOGY**

#### **Purpose and Research Questions**

The purpose of this study is to extend the research on bug-in-ear coaching as a means to increase behavior-specific praise statements delivered by secondary teachers. This study explored Tele-Coaching using bug-in-ear technology in an augmented reality simulation environment called TeachLivE KU to determine if Tele-Coaching affected the rate of behavior-specific praise of secondary teachers in this environment. Additionally, this study examined the social validity of using TeachLivE KU as a setting for developing and practicing evidence-based strategies for classroom management.

#### **Research Questions**

1. Does real-time coaching delivered through Bug-in-Ear technology change teacher behavior in the frequency and specificity of behavior-specific praise statements (BSPS) delivered to middle school students in an augmented reality environment known as TeachLivE KU?
2. Does the frequency and specificity of BSPS delivered by secondary teachers change the rate of student disruptions occurring in the TeachLivE KU Lab?
3. Does the TeachLivE KU Lab provide an appropriate environment for developing and practicing evidence-based strategies for classroom management?

The dependent variables for this investigation included one teacher variable: the rate of behavior-specific praise statements, and one student variable: the occurrences of disruptive

behavior. The independent variable was Tele-Coaching using bug-in-ear technology to deliver immediate feedback. Social validity measures include responses from survey data, open-ended questions, and written responses from study participants.

### **Participants**

Participants for this study were two males and two females with secondary teaching experience that ranged from three to twenty-six years. After obtaining human subjects approval (see Appendix A) from the university, teachers recruited to participate in this study were secondary teachers, either general or special educators from local area middle and high schools. Seven teachers responded to the email request for participants, but two respondents had scheduling conflicts that preventing their participation. Five teachers with secondary teaching experience were accepted for the study. Teachers had a minimum of three years teaching experience. Teachers were willing to interact with the student-avatars at the University of Kansas in the TeachLivE KU Lab for three to fives sessions a day over five consecutive days and three sessions at a later date. Because more than four teachers volunteered, participants were screened based on the frequency of behavior-specific praise statements delivered during the baseline phase. No teachers were eliminated from the study, but one teacher chose to withdraw for personal reasons. Participants were willing to wear a Bluetooth hearing device, BIE, to receive coaching while they interacted with the student-avatars. Participants gave written consent to participate in the research study based on the guidelines of the university.

In relation to question three regarding the appropriateness (social validity) of the TeachLivE environment, participants included both general and special education advance practicum students from the University of Kansas, in so much as those data collected from

the survey participants are triangulated with the four participants from this research study. Survey participants were enrolled in initial and advanced practica that are designed for novice teachers to master and apply strategies and skills that facilitate inclusion of middle and secondary students with disabilities within general education classrooms. In this class, novice teachers are exposed to specific research-based strategies in behavior management that they are expected to apply in their practicum teaching experience.

### **Setting**

Teachers participated in the University of Kansas TeachLivE Lab, an augmented reality simulated environment, (Dieker, Hynes, Hughes, & Smith, 2008). The TeachLivE KU Lab is located in the Learning Resource Center in the School of Education building on the main campus in Lawrence, Kansas. In this lab, the participants faced a large projection screen, where they interacted in a spontaneous manner with a group of ethnically diverse student-avatars who are sitting at their desks in a middle school classroom. All that is required to create the simulation is a computer, Internet connection, web camera, projector and screen. The software developed by the University of Central Florida known as TLE TeachLivE™ and a SKYPE connection make the live interaction possible. Motion sensing cameras, located on the ceiling, react to the participant-teacher's movements around the classroom, thus making it possible to simulate proximity to the student-avatars who are appearing on the screen by altering the participant-teacher's visual perspective on the student-avatars. Throughout the ten-minute interactive role-play session, participant-teachers are given an opportunity to practice classroom management strategies, specifically, behavior specific praise, in the TeachLivE KU Lab. The teachers participate in interactive role-play

with five student-avatars who demonstrate characteristics that have been observed in middle school classrooms located in densely populated cities. The student-avatars respond to the teacher-participant's behaviors similar to responses that could be expected from middle school students. The interaction is live, not computer-generated, thus allowing the interaction to feel real while providing the opportunity for the teacher-participant to practice new classroom management skills or skills that were underdeveloped (Hynes, Stapleton, Dieker, & Hughes, 2007). In this augmented reality setting, teacher-participants can practice many different classroom management or instructional strategies and increase their proficiency before using that strategy in the physical classroom setting with actual students.

Augmented reality simulation in the TeachLivE KU Lab offers live interactive role-play through professional inter-actors who represent and deliver the responses of the five student-avatars. Inter-actors are part of an emerging discipline known as Interactive Performance (IP), where inter-actors improvise a story with non-trained participants called spect-actors (Wirth, Norris, Mapes, Ingraham, & Moshell, 2011). Inter-actors are skilled in story structure, psychology, improvisation, dramatic performance and technology. In IP, there is no traditional script, and the spect-actor, or participant, says and does things that directly and immediately add to the story. The inter-actor responds to the spect-actor to create a believable, immersive experience (Braun, 2003). Both Braun and Wirth agree that extensive theatrical experience with an emphasis in audience participatory theater, interactive theater or improvisational theater permits the inter-actor to integrate the participant into the story. In this way, the participant accepts his role in the co-constructed story. Braun states, "they [the participants] have to be back leaded to play without their notice to be forced to play" (2003, p. 3). Furthermore, the interactive technique of back-leading "places the spect-

actor, rather than the inter-actor, at the center of the experience. A well-trained inter-actor can make spect-actors become the driver of the stories without their even realizing it” (Kenny & Wirth, 2009, p. 36). Augmented reality simulation in the TeachLivE KU Lab achieves this immersive experience of a middle school classroom as the inter-actor back leads the teacher-participant to create a story that becomes believable.

The inter-actor who portrays the five student-avatars in the TeachLivE KU Lab for this study has more than twenty years experience in improvisational theater, audience participatory theater, and theatrical performance (M. Russell, personal communication, March 20, 2013). Ms. Russell participated in the pilot project to test a “novel control mechanism designed by Dan Mapes” (Wirth et al., 2011, p. 5) that enabled one inter-actor to control five avatars. Wirth explains how this motion-capture system allows the inter-actor to deliver realistic movements of the other avatars while being in full control and full character of a specific avatar. Much like a trained actor’s job is to research a character in depth, Ms. Russell and the other members of the IP team participated in field work at middle schools. “They observed and interacted with girls and boys in the after school program, observing interpersonal non-verbal and verbal behaviors” (Wirth et al., 2011, p. 112). During the pilot project, the teenage consultants informed the body language, gestures, and emotions that the inter-actors used to gather images for the avatar prototypes. Ms. Russell explained that the creation of the most recent student-avatars occurred differently than those in the pilot study, but her research for the characters was very much the same as for the original generation (M. Russell, personal conversation, March 20, 2013). Her research included: (a) observation of children that age in a variety of settings, both inside and outside the classroom, (b) watching YouTube videos, and (c) episodes of a television talk show where controversial situations

created conflict between individuals and family members. Ms. Russell's years of experience in improvisational performance directly contributes to her ability to play the distinct characters of the five student-avatars. "The more highly trained the actors are in improvisational acting techniques, the more realistic and powerful the scenes will be" (Boggs, Mickel, & Holtom, 2007, p. 839).

The student-avatars are based on Long's adolescent profile: Aggressive-independent, aggressive-dependent, passive-independent, and passive-dependent, illustrated in Figure 3 (Dieker et al., 2008). Long describes the characteristics within this continuum as normal growth and development for an adolescent. Dreikur's research in social psychiatry defines the four goals for misbehavior that frame undesirable behaviors of the student-avatars. These four goals are: (a) attention getting, (b) power and control, (c) revenge, and (d) helplessness and inadequacy. "The work of Long and Dreikurs provides the most critical information for developing middle school students" (Dieker et al., 2008, p. 9).

According to Dieker et al., "Using the attributes of adolescents in this review, developers of virtual students can create classrooms of virtual students that can act according to their indicated attributes. By choosing students with specific attributes, a classroom from an urban setting can be created, or a classroom from a rural community can be developed. Using the attributes of adolescents together with the research on facial expressions, body language, motion capture, and artificial intelligence, developers will be able to create virtual classrooms that are realistic tools in teacher education" (2008, p. 10). A recent interview with two inter-actors who helped develop the original avatars and who participated in the second stage of development of the student-avatars used in this study---shed light on how this theoretical framework informs their depiction of the student-avatars. "We took these

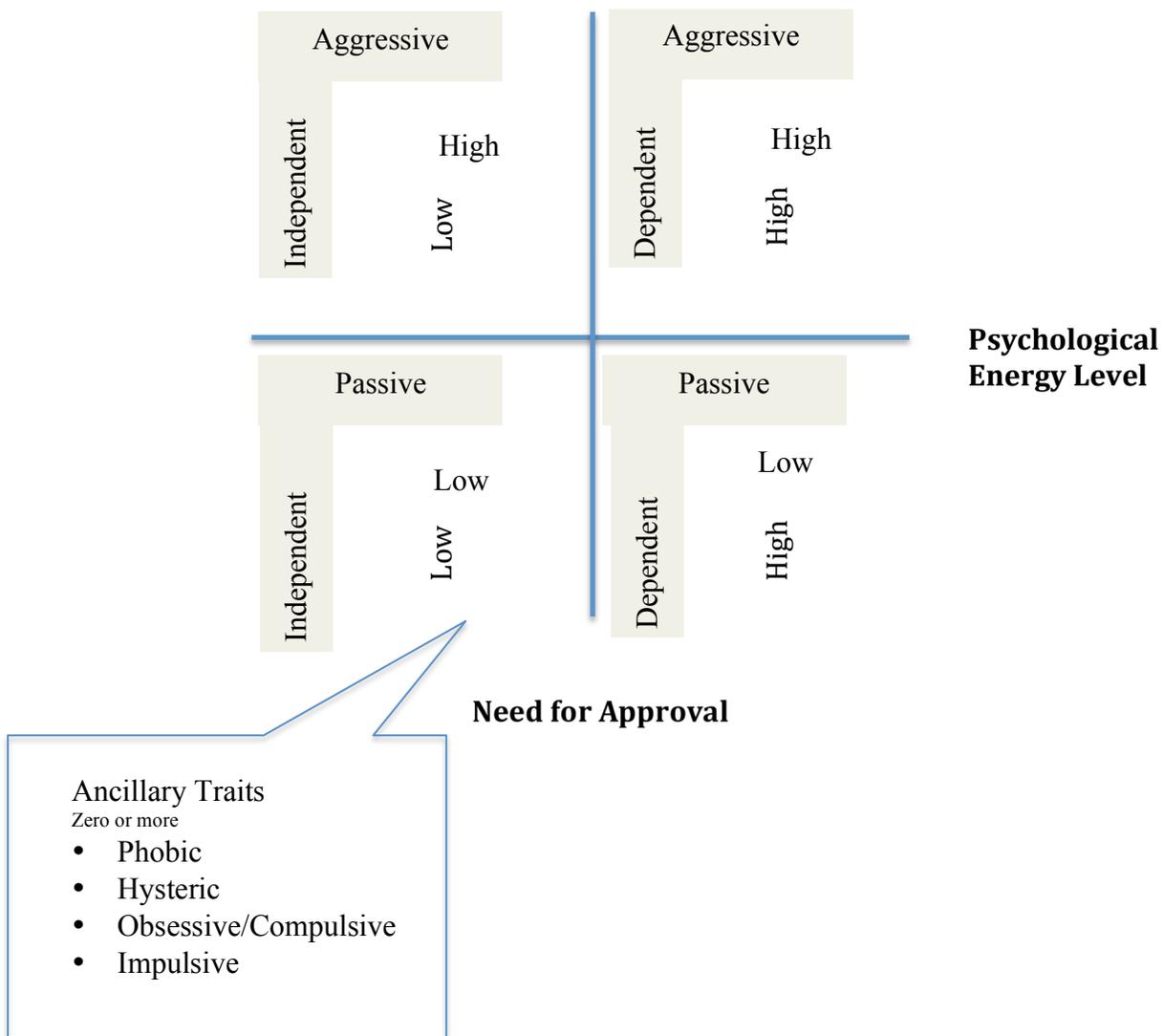


Figure 3. Behavior types: Aggressive-independent, aggressive-dependent, passive-independent, and passive-dependent

Source: Virtual Character Theoretical Framework, by B. DaCosta, unpublished paper, University of Central Florida, Media Convergence Laboratory, 2007 (Dieker et al., 2008, p. 8)

motivations and said, okay, how did this manifest in the middle-schooler like C.J. or like Sean?” (K. Ingraham, personal conversation, March 20, 2013). “Interrupting – that’s Sean, wanting to get attention and wanting approval” (M. Russell, personal conversation, March 20, 2013). Ms. Ingraham explained that during the development of the first generation of

student-avatars, teachers gave feedback that influenced character development. For instance, the teachers in the focus group asked about friendships, and “we realized early on that having friendships in the classroom was very important for teachers and it influences how they can manage a classroom” (K. Ingraham, personal conversation, March 20, 2013). Influence from the focus group, research about adolescent personality types, hours of observation, and personal connection to living people who are very much like the characters of the student-avatars bring realism to the classroom. “To produce scenes with a high level of realism, actors need to know their characters--- the relationship among them, what they want, their circumstances” (Boggs et al., 2007, p. 840). Ms. Russell and Ms. Ingraham know these student-avatars because they helped create them.

### **Research Design**

The first two research questions were examined using a multi-element single-subject research design, known as alternating treatment design (Barlow & Hayes, 1979). The third research question, the appropriateness of the TeachLivE KU Lab for developing and practicing evidence-based strategies, was examined and triangulated using survey data collected from 63 participants enrolled in undergraduate and graduate special education courses offered at the University of Kansas. A full description of the research design for the appropriateness of the setting, i.e. TeachLivE KU, occurs later in this methodology section.

An alternating treatment design allowed for the fast alteration of two different treatments. “In the typical design, after a baseline period, two treatments (A and B) are administered, alternating with each other, and the effects on one behavior are observed” (Barlow & Hayes, 1979, p. 200). With this design, the conditions that might affect the data, such as time of day, or location, are counterbalanced as the experiment continues. In this

study, the location remains constant, so the only condition that may require counterbalance will be the time of day or order of sessions in the TeachLivE KU Lab. In alternating treatment design, the behavior change can be attributed to the treatment itself because there is a direct comparison between the two (or more) treatments (Kennedy, 2005). Data were plotted separately for each intervention so that the effects of the treatment can be easily and visibly distinguished (Barlow & Hayes, 1979; Kennedy, 2005). The research question in this study investigates the intervention of Tele-Coaching using BIE technology. The intervention was easily alternated between sessions thus making alternating treatment SSR design a suitable multi-element design for this study.

### **Intervention Procedures**

Alternating treatment SSR design suited this research because the intervention, Tele-Coaching, can be alternately administered or withdrawn. Single case alternating treatment design was used to collect data on the behavior of four teachers over a period of 19 sessions. In this A-B-A design, A = baseline, B = Tele-Coaching, A= return to baseline, the researcher measured the effects of Tele-Coaching for the frequency and specificity of behavior-specific praise statements (BSPS) delivered to middle school students in an augmented reality environment known as TeachLivE KU. This alternating treatment design had four phases: Phase 1 baseline (A), Phase 2 intervention (B), Phase 3 withdrawal (A), and Phase 4 follow-up (A). The intervention consisted of a coach providing the teacher with verbal feedback for delivering behavior-specific praise during a mini-lesson in the TeachLivE KU Lab. The coach delivered immediate feedback, both reinforcing and correcting, from a remote location using a BIE device. The coach observed the teacher using FaceTime connection between a MacBook Pro computer and an iPad. Figure 4 illustrates this relationship and technology.

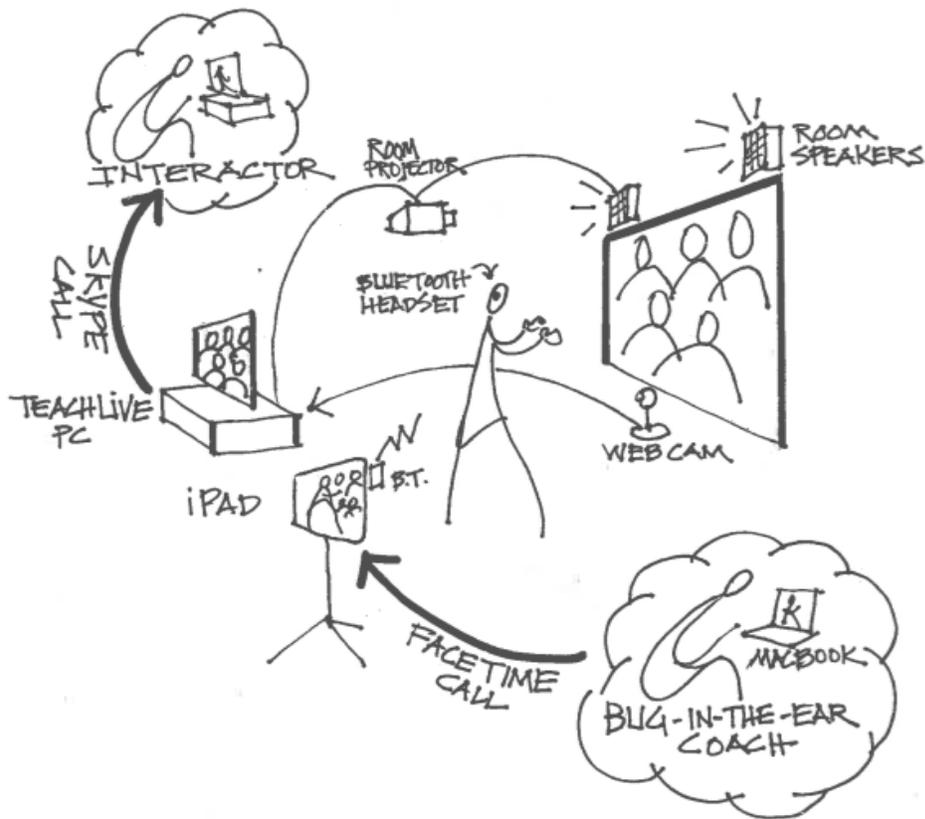


Figure 4. Schematic of the relationship and technology for Tele-Coaching in TeachLive KU (Source: Frank Carey, University of Kansas, 2012)

Each teacher completed a series of sessions in the TeachLive KU Lab. The sessions each consist of three parts: (a) Advance Organizer; (b) Time in Simulator; (c) After-Action Review.

**Advance organizer.** The advance organizer outlined each session’s objectives, addressed any concerns participants had, and allowed the investigator to assess the comfort

level of the participant.

**Time in simulator.** Participants spent ten minutes interacting with the student-avatars in the simulator. During these ten minutes, each participant taught a mini-lesson while using the BSPS strategy outlined in the advanced organizer. Ten minutes was designated because the preliminary research states that five minutes in the augmented-reality classroom is equal to thirty minutes in an actual classroom (Dieker et al., 2008).

**After-action review.** An after-action review served as an exit interview after each session, and it was designed to open a dialogue about the participants' interaction with the student-avatars and about their comfort level with the technology.

Teachers were scheduled to participate in the simulation sessions over consecutive days as their schedules allow. Each session was approximately twenty minutes long to accommodate the advance organizer (AO), ten minutes for time in simulator (TIS) and a short after-action review (AAR). Participants completed three to five session each day, rotating through the simulator in sequential order, alternating participation as often as possible. On occasion, the same participant had to complete two or more sessions in a row, but only after at least a twenty-minute break between sessions. The schedule for the sessions is attached in Appendix B.

Prior to baseline, teachers were given a written information sheet that thoroughly described behavior-specific praise. The information sheet is provided as Appendix C. Teachers also participated in an introductory session that explained the information sheet and described the routine for each session. During this introduction, the rotation schedule for participating in each session was explained and adjusted to accommodate the varied weekly schedule of each participant. Finally, each of the teachers participated in an unstructured

session with the student-avatars in order to familiarize himself with the augmented simulation environment.

During baseline, participants wore a wireless earpiece (BIE) for receiving real-time coaching (Tele-Coaching) during their sessions in the TeachLivE KU Lab. The teacher-participants wore the earpiece every session, but teachers were not being coached during baseline. Data were collected on the frequency of behavior-specific praise statements that each participant delivered to the student-avatars.

**Data Collection Procedures**

Every session was videotaped using IMCapture from a remote location on a MacBook Pro computer for collecting data on the one teacher variable: the rate of behavior-specific praise statements, and one student variable: the occurrences of disruptive behavior. Teacher-participants wore the earpiece every session but were only to be coached during alternating sessions. The alternating treatment process is illustrated by the chart shown in Figure 5.

	Session 1	Session 2	Session 3
Participant A	BIE Coaching		BIE Coaching
Participant B		BIE Coaching	
Participant D	BIE Coaching		BIE Coaching
Participant E		BIE Coaching	

*Figure 5.* Alternating treatment coaching schedule for individual participants.

A complete schedule of the alternating treatment across all participants, all phases, and each day of the study is illustrated in Figure 6.

<b>A</b>	<b>B</b>			<b>A</b>			<b>B</b>			<b>A</b>	<b>A</b>
Baseline	Alternating Treatment			Alternating Treatment			Alternating Treatment			Return to Baseline (no coaching)	Follow-Up (no coaching)
P. A 3 sessions	C	NC	C	NC	C	NC	C	NC	C	P. A 3 sessions	P. A 3 sessions
P. B 3 sessions	NC	C	NC	C	NC	C	NC	C	NC	P. B 3 sessions	P. B 3 sessions
P. D 3 sessions	C	NC	C	NC	C	NC	C	NC	C	P. D 3 sessions	P. D 3 sessions
P. E 3 sessions	NC	C	NC	C	NC	C	NC	C	NC	P. E 3 sessions	P. E 3 sessions
DAY 1	DAY 2			DAY 3			DAY 4			DAY 5	Day 6 – after 1 month
Phase 1	Phase 2									Phase 3	Phase 4

Figure 6. Alternating treatment schedule across all participants, days of treatment and phases.

Additionally, sessions were video-recorded using a Sony Handycam HDR-CX210 (NTSC). Colored and labeled index cards were used to identify the participant and session numbers. Video was captured on three SanDisk Extreme (45MB/s) 16GB memory cards and backed up on Lacie Porsche 500GB external hard drives.

This study examined the frequency of behavior-specific-praise statements delivered by teachers to students during a series of mini-lessons delivered in the TeachLivE KU Lab, and the occurrence of disruptive behavior by students during the lesson. Video recording of each session was examined to determine the frequency and specificity of BSPS. The researcher used a data collection form (Appendix D) to document the frequency of BSPS delivered to the students with and without prompting through BIE technology. On the same data collection form, the researcher will record the occurrence of student disruptions during the Time-in-Simulator.

As previously mentioned, the simulation is a live interaction. The student-avatars are puppeteered by a professional inter-actor who is skilled at acting, improvisation and human psychology. The inter-actor facilitates the teacher-participants “natural capacity to play in a virtual context” (Dieker et al., 2008, p. 11). The interactive story experience began with

session objectives and lesson plans that the inter-actor received from the researcher as a means of contextualizing the session. In order to eliminate any inter-actor bias, the session description included the data collection for opportunities to respond and ratio of interaction (see Appendix F). The inter-actor was not aware that rate of disruptions were measured, nor was the inter-actor aware of the teacher who received coaching during any session.

The independent variable was Tele-Coaching using BIE given to participants in the TeachLive KU Lab during a series of ten-minute mini-lessons. The number of reinforcing and/or correcting feedback terms given with BIE by the researcher was recorded with a tally mark in the appropriate column on the data collection instrument.

### **Reliability**

In order to establish inter-rater reliability, a second trained observer viewed 39% of the video recordings and coded each session for teacher BSPS, and student disruptions. After viewing and coding the videos, a direct comparison of both observations was made to determine a point-by-point agreement ratio. The number of agreements for the observation was divided by the total number of agreements plus disagreements and multiplied by 100 to form a percentage (Kadzin, 1982). Reliability was achieved when a point-by-point analysis of at least 90% existed between the researcher and co-observer. Data from all sessions was coded and analyzed, and the results were graphed. Discussion of the results concludes this study.

### **Social Validity**

Baer, Wolf, and Risley (1968) provide an ethical context for applied behavioral analysis by suggesting that researchers have a responsibility to examine behaviors that are socially important, not just behaviors that are convenient for study. In many cases, this

implies studying behaviors in their usual social setting rather than in a “laboratory setting” (p. 92). Furthermore, the authors suggest that applied research should be directly related to the interest society has in a problem being studied. Finally, applied research asks: “how it is possible to get an individual to do something effectively?” (p. 93). In further examination of applied research, Wolf (1978) develops three levels of societal validation for the social importance of applied research. He states those levels as: (a) the social significance of the goals, (b) the social appropriateness of the procedures; and (c) the social importance of the effects. This framework for social validity is well established in single-subject design studies, particularly in education (Horner et al., 2005). In single-subject design research, the intervention (independent variable) is meant to change behavior (dependent variable). Therefore, the emphasis on the intervention as it relates to the behavior change necessitates the implications of the social importance of the intervention.

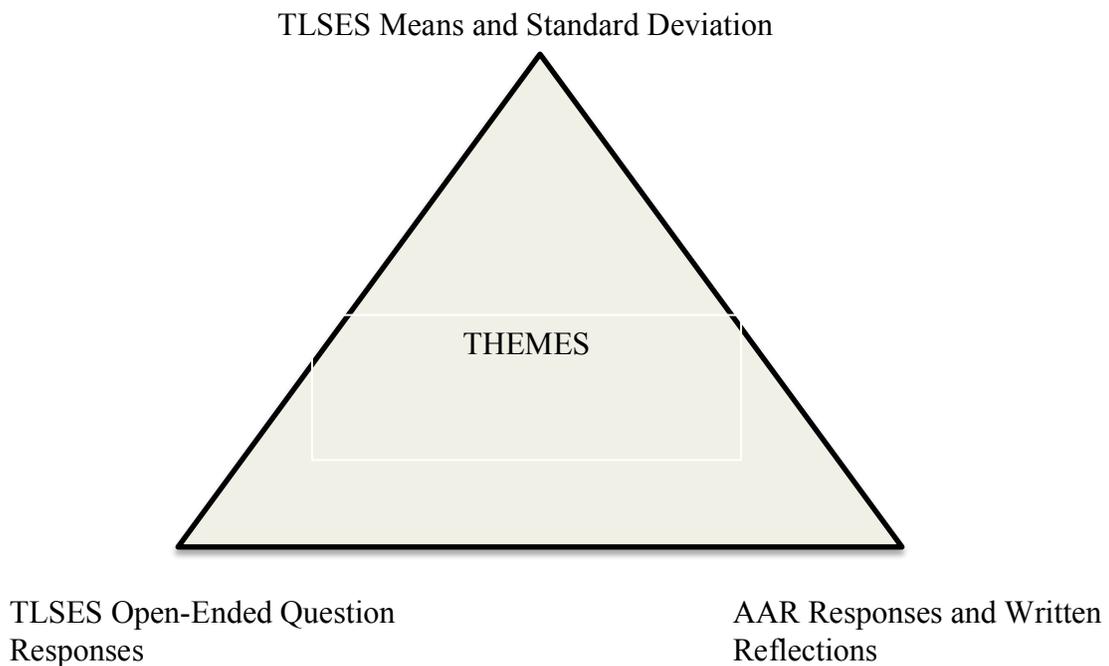
Horner (2005) extends Wolf’s levels of societal validation for applied research by suggesting four criteria that enhance the social validity of single-subject research goals, procedures and findings. First, the dependent variable has high social importance. This criterion aligns with Wolf’s level of social significance of the goal. Second, the independent variables are applied with fidelity by those normally delivering the intervention, such as teachers or parents, over a meaningful period of time. Third, the people applying the intervention deem the procedures to be acceptable, feasible, effective, and worth continuing. These two criteria match what Wolf calls the social appropriateness of the procedures. Finally, Horner’s fourth criterion---evidence that the intervention produced the desired effect, or the effect that met the stated, clinical need---adheres to Wolf’s societal validation for the social importance of the effects.

In special education, the focus of single-subject research is often concentrated on strategies that increase student achievement or improve social behavior or enhance the skills of teachers (Horner et al., 2005). This research study focuses on the effects of an intervention (tele-coaching) on changing teacher behavior (the frequency of behavior-specific praise statements). The social validity of this intervention is previously established in the literature. However, the setting for this study, the TeachLivE KU Lab, has not been examined for social validity. For the purpose of this study, the research question concerning the appropriateness of the TeachLivE KU Lab environment for developing and practicing evidence-based strategies for classroom management was examined. Using the theoretical framework of Wolf (1978) and Horner (2005), the third research question was investigated in relation to previously collected Likert-scale survey and open-ended survey data.

### **Research Design for Social Validity Question**

By considering the work of Wolf (1978) and Horner et al. (2005), a strategy for determining TeachLivE's social validity can be designed for this research study. Two important components of the study should be considered: (a) the use of BIE technology for receiving real-time feedback, and (b) the augmented reality simulation. Most of the BIE studies examined in the review of the literature contain some means of assessing the social validity for using this BIE technology for receiving immediate feedback. To assess the social validity of BIE technology in this study, specific questions included in the after-action-review provided opportunity for the participants to comment on their satisfaction and comfort level with using the Bluetooth device for receiving real-time feedback. Those questions are found in a document labeled Appendix D. Some of those questions also addressed the participants experience in the augmented reality simulation environment.

In order to examine the appropriateness (Wolf, 1978) of the TeachLivE KU Lab as a setting for developing evidence-based teaching behaviors, three measures were used. First, a recent unpublished survey, TeachLivE Simulation Experience Survey (TLSES) (Elford, 2011), previously distributed to fifty general education and thirteen special education practicum students examined the effectiveness of using the TeachLivE KU Lab as a practice environment for classroom management strategies. Statistical analysis from the TLSES will be reported. Second, responses to the open-ended questions in the TLSES were coded and analyzed. Third, responses from the research study participants' AAR were video recorded and transcribed and written reflections from the participants were collected daily and at the end of the fourth phase.



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*Figure 7.* Model for triangulation of data pertaining to social validity.

A survey was created and distributed to sixty-three participants, fifty general education practicum students and thirteen special education practicum students. The survey contained 10-Likert response items and five open-ended response items. The results from TLSES provide sufficient preliminary data for using the TeachLivE KU Lab as the setting for this study. The Likert scale questions in this survey seek to measure the follow procedures and outcomes of using the TeachLivE KU Lab: (a) authenticity of the environment, (b) authenticity of the characteristics of the avatars, (c) perceived benefit for practicing teaching skills, (d) perceived self-efficacy, and (e) perceived proficiency. The open-ended questions included on the survey provided an opportunity for survey respondents to further comment on their experience in the TeachLivE KU Lab.

As a second measure for social validity in this study, the teacher-participants engaged in an after-action review after each session and in a written reflection. Questions in the AAR focused primarily on the technology of the intervention, the BIE itself, and the setting of the TeachLivE KU Lab. To measure social validity of the TeachLivE KU Lab, participants were asked to write a daily reflection about their experience. The participants were told to write about their experience in the same way that they write reflections in their professional practice. Neither the length nor the content of the reflection was designated; participants were instructed to be as open, honest, and specific as possible. The AAR was a guided interview with questions from the researcher, whereas the written reflection was unstructured and completely dependent on the participants' professional practice of reflecting on his or her teaching.

Finally, as an additional measure for social validity at the conclusion of the study, participants responded to eight open-ended response questions about their experience in the

TeachLive KU Lab. Their responses were delivered in writing shortly after the conclusion of the study, and the participants were encouraged to contact the researcher at any time to offer more comments related to the experience. The responses from this study's participants were examined in relation to the themes that appear in the survey data to discover the social validity for the TeachLive KU Lab as the setting for this study.

The results of the survey data are reported statistically and thematically. Statistical analysis includes calculating the mean and standard deviation of the Likert scale items and generating the correlation coefficient of each variable using SPSS: Version 20.0. The results are presented in table and narrative form. The open-ended responses were coded for similarities and percentages calculated to illustrate generalized opinions of the participants. Additionally, specific comments from the open-ended responses that articulate the generalized opinions are reported. These survey data are compared to the daily reflections and the final response document of the four research study participants. In this way, survey data creates a framework for comparing the responses from this study's participants in order to examine the social validity of this study.

## **CHAPTER IV**

### **RESULTS**

The purpose of this study was to determine if Tele-Coaching using BIE technology increased behavior-specific praise statements delivered by secondary teachers. The researcher used an alternating treatment single subject design across four participants and plotted data on a line graph for visual analysis. The researcher also collected data through written reflections and informal interviews with all the participants. This study also examined the social validity of using TeachLivE KU as a setting for developing and practicing evidence-based strategies for classroom management. Likert-scale survey data and open-ended response data collected from previous TeachLivE participants was triangulated with after-action reviews and open-ended responses from these four participants to explore the appropriateness of the TeachLivE KU Lab for developing and practicing evidence-based strategies for classroom management. The results of all these data are presented in this chapter. Additionally, this chapter reports session schedules, requirements for technology, and protocols for intervention and data collection.

#### **Sessions**

Eighty-one sessions were completed in the TeachLivE KU Lab by five participants. Four of the participants completed twenty sessions, and the fifth participant completed two sessions before leaving the study. Participants were assigned an alphabetic character (A through E), and each session was numbered sequentially. All the sessions were video recorded for data collection. The film technician held a card with the alphabetic character and session number in front of the camera as each session began in order to define the

participant and the session being recorded. Participants completed an introductory session in order to acquaint themselves with the augmented reality simulation environment and introduce themselves to the student-avatars. Creating a safe environment with a warm-up activity, such as an introduction, aids in helping participants overcome any reluctance they might feel to the interactive experience (Boggs et al., 2007). The introductory session was not coded for behavior-specific praise statements or student disruptions. Three components comprised each session: (a) advance organizer, (b) time-in-simulator, and (c) after-action review. Five sessions were not included in this study. One participant, Participant C, removed herself from the study for personal reasons after completing the introduction and the first session. Four sessions were not included due to failed technology making data collection impossible.

### **Inter-Rater Reliability**

A second trained observer viewed and coded 50% of Phase 2, the treatment phase, and 30% of Phase 1, Phase 3, and Phase 4. The co-observer was trained on coding procedures after all the session video were collected. The researcher and the co-observer used a point-by-point analysis with 88.67% agreement. Additional training was done and 96.33% agreement was reached. Of the 76 sessions across four participants, 72 were successfully recorded and included in the study. Thirty-nine percent of the 72 video recorded sessions were coded for treatment integrity. This included four sessions from Phase 2 (alternating treatment), and one session each from Phase 1 (baseline), Phase 3 (withdrawal), and Phase 4 (follow-up).

Table 1 reports data on Inter-rater reliability for all participants, each phase, and both variables. Videos from each phase were randomly selected for inter-rater reliability. After

the initial and additional training, each observer watched the same video at separate times in different locations. Observers recorded the frequency of specific feedback statements and occurrence of student disruptions on the TL BIE Coding Form. When the observations were concluded, the researcher calculated the mean between the co-observers for the frequency of BSPS and for the frequency of student disruptions. These two mean scores were each multiplied by 100 to form a percentage. As the table illustrates, a stronger inter-rater reliability exists for the teacher variable of BSPS (94.2%) than for the student variable of frequency of disruptions (90.4%). Although a wide range of mean scores for Phase 2 exists across participants, the mean agreement for both the teacher variable and the student variable is above 90%, and this is acceptable reliability for inter-observer agreement.

Table 1

*Inter-Rater Reliability*

	Teacher Variable Mean	Student Variable Mean	Mean Range Across Participants
Phase 1	92.25	87.6	85 - 100
Phase 2	94.63	88.61	78 - 100
Phase 3	98.25	91	80 - 99
Phase 4	91.5	94.25	85-100
Total Mean for all Phases	94.2	90.4	78 -100

**Data Analysis**

This study examined the results of three research questions. The first two research questions sought to discover the effects of an intervention for increasing the rate of behavior-

specific praise statements delivered by secondary teachers. Research question one inspected the change in the rate of BSPS when teachers were being coached to deliver BSPS compared to the rate of BSPS when teachers were not being coached. The second research question considered the effects on the rate of student disruptions compared to the rate of BSPS delivered by secondary teachers. The results of the single-subject, alternating treatment design (Kennedy, 2005) across participants were analyzed. The third research question considers the appropriateness of the setting of an augmented reality simulation environment, TeachLivE KU, as a socially valid (Horner et al., 2005; Wolf, 1978) setting for developing evidence-based teaching behaviors.

### **Problems with Technology**

A few technical incidents presented problems for the researcher and the participant. The technical problems included software issues with IMCapture, platform issues with TeachLivE, and connection issues with FaceTime. IMCapture failed to convert the captured videos on fifteen occasions. The video data was embedded within the IMCapture software and was not converted to a format that could be viewed on common software such as QuickTime. This problem was only resolved after significant time and effort by the researcher. IMCapture software support proved to be unreliable during this process. Fortunately, video data was also recorded with a Sony Handycam HDR-CX210 during each session. There were four occasions during which video data was lost. The video data from four files failed to upload to the external drive and could not be retrieved from the SanDisk Extreme (45MB/s) 16GB memory cards. Additional technical problems occurred when the TeachLivE server experienced challenges. The inter-actor located at the University of Central Florida was forced to reboot the server on a few occasions and the system was

launched again to begin the session. This platform issue happened only a few times and did not create any hardship for the participants or the researcher. Several times, the FaceTime dropped the connection between the coach and the teacher. Fortunately, this occurred most often between sessions or at the very beginning when the coach was giving the advance organizer to the teacher. No coaching or data collection was hindered due to a loss in FaceTime connection. The use of technology creates the potential for problems, but no problems occurred during this study that could not be resolved except the loss of four video sessions.

### **Challenges with Scheduling**

When creating the session schedule with the inter-actor, the researcher and the inter-actor calculated that twelve sessions per day for six days, equaling four hours a day, would provide all the sessions necessary for the participants to complete all four phases of the design (see Appendix C). The researcher organized the schedule to create a rotation for the participants so that each participant would complete a 3 twenty-minute sessions each day with an hour between each session. The study was designed for four participants, and when five volunteered, extra time was immediately scheduled with the inter-actor and the schedule was reconstructed. During the orientation with the participants, the researcher learned that two participants lived in the same town and would benefit from traveling together. Another participant had time constraints due to a part-time job, and one participant hoped to leave at the end of the week on a holiday. The schedule was reconstructed again to accommodate the participants. A final schedule was established and maintained when one participant removed herself from the study for personal reasons. The scheduling challenges changed the planned rotation of the participants, and on a few occasions the same participant completed sessions

in sequence with only a twenty-minute break in between. This did not appear to create stress for the participants or for the inter-actor. One participant reported in her reflection that she found back-to-back sessions to be beneficial.

Regardless of the technology challenges and the schedule challenges, successful data collection resulted in visual analysis of the data points to determine the effectiveness of Tele-Coaching using BIE technology for providing immediate feedback to secondary teachers in an augmented reality simulation environment. The results of 72 successfully recorded and observed sessions were included in the data analysis and the results for each participant are discussed below.

### **Research Question 1**

The first research question concentrated on whether Tele-Coaching would increase teacher's rate of behavior-specific praise statements delivered to student-avatars in the TeachLivE Lab. Specifically stated, "Does real-time coaching delivered through Bug-in-Ear technology change teacher behavior in the frequency and specificity of behavior-specific praise statements (BSPS) delivered to middle school students in an augmented reality environment known as TeachLivE KU?"

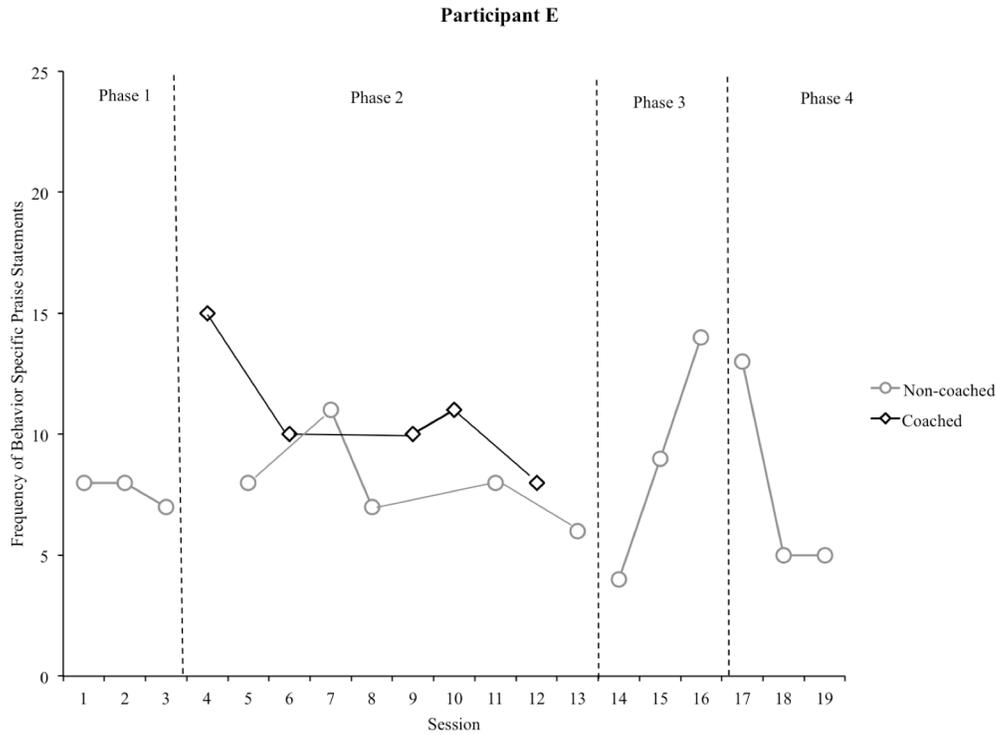
### **Results**

The results of Tele-Coaching for each participant are presented using graphed analysis. These results illustrate the rate of BSPS delivered by each participant during all four phases of the study. Phase 2 presents the results of the alternating treatment when the participants were either coached or not coached during a session. These graphs permit the visual analysis for each phase of the study and provide a direct response to the first research question. By examining the rate of BSPS teachers delivered when being coached compared

to the rate of BSPS teachers delivered when not being coached, the researcher can determine what effects Tele-Coaching had on changing teacher behavior.

### **Participant A**

Figure 8 represents the first teacher who received Tele-Coaching using BIE technology. During baseline, this person's average rate of behavior-specific praise statements delivered to the student-avatars was above the average range presented in the literature. During the three baseline sessions, the frequency of BSPS did not exceed nine occurrences in ten minutes. The intervention began on session four when prompts were delivered by the Tele-Coach. An increase in BSPS occurred when the teacher received immediate feedback through Tele-Coaching. The average BSPS delivered during baseline was 7.7 occurrences. Tele-Coaching during Phase 2 produced an average of 12.5 BPS. This difference in frequency constituted a 62.3% increase in the frequency of behavior specific praise statements delivered by Participant A during Tele-Coaching. Furthermore, the difference in frequency of BPS between coached and non-coached sessions in Phase 2 was an average of 4.9 occurrences or 63.6% increase during the coached sessions. Although there is a wide range of variability during the Tele-Coaching intervention phase ranging from 8 to 15, the variability could be accounted for by examining the lesson content and the opportunities for the teacher to deliver BPS. During Phase 3, the follow-up phase, where no coaching occurred, Participant A averaged 9 BPS --- a 17% increase from the baseline average. The mean score for Phase 4, 7.7 BPS, equaled the mean score for Phase 1. By examining the average rate of behavior-specific praise statements delivered by participant A to the student-avatars, the evidence for the effectiveness of Tele-Coaching using BIE for increasing BPS can be established for this participant.



*Figure 8.* Participant A: Frequency of Behavior-Specific Feedback

**Participant B**

Participant B completed nineteen sessions in the TeachLive KU Lab; however data were only collected on seventeen sessions. Recordings were damaged during two sessions of Phase 4, making data collection impossible for those sessions. As demonstrated by the visual evidence in Figure 9, the effects of Tele-Coaching on participant B produced a nine point variation (11 to 3) between behavior-specific praise statements delivered during Tele-Coached sessions and those delivered during non-coached sessions. During the intervention phase, an increase of 31% of BSPTS occurred during the Tele-Coached sessions. The average rate of BSPTS during Tele-Coaching was 8.4, and the rate of BSPTS was 5.8 during non-coached sessions of Phase 2. Comparing the averages between the Tele-Coached sessions

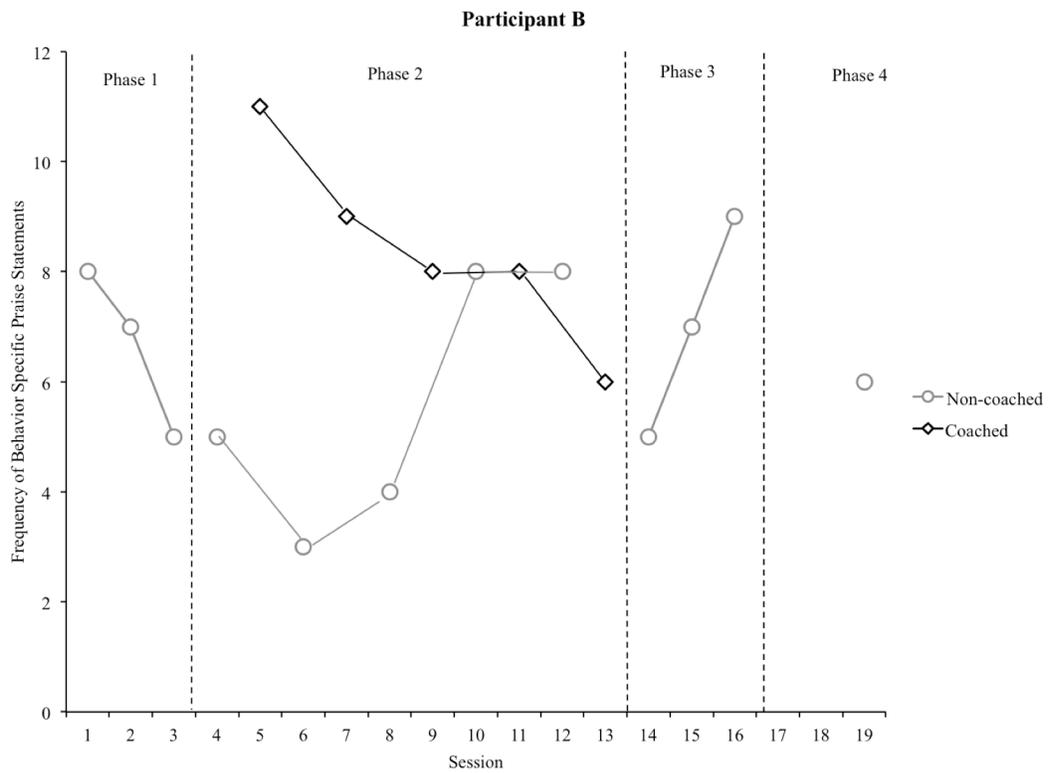


Figure 9. Participant B: Frequency of Behavior-Specific Feedback

(8.4 BSPS) and the average of all the non-coached sessions (6.4 BSPS) across all four phases reveals an overall 24% increase in behavior-specific praise statements delivered during Tele-Coached sessions. As Figure 9 depicts, participant B delivered as many as 9 and as few as 3 BSPS during non-coached sessions, but the highest rate of BSPS occurred during the first Tele-Coached session.

### Participant C

Results for Participant C are not reported because this participant withdrew from the study after completing the introduction and one session.

## Participant D

The results for participant D demonstrate a lesser variation in the rate of BSPS between Tele-Coached and non-coached sessions during the intervention phase. The variation of BSPS during Tele-Coaching was seven points (13 to 6), and the variation of BSPS during non-coached sessions of Phase 2 was six points (11 to 5). There are two sessions during the intervention phase that the rate of BSPS is higher during non-coached sessions than the lowest rate of BSPS delivered during Tele-Coached sessions. The average rate of BSPS during Tele-Coached sessions (9.0) was 13% higher than the rate of BSPS during non-coached sessions of the intervention. By only examining the intervention phase, Tele-Coaching would be considered effective for increasing the rate of BSPS delivered by this participant. However, as Figure 10 presents, the rate of BSPS in the baseline (Phase 1) and in the follow-up (Phase 4) phases is disproportionately high in two of the sessions. The irregularity in Phase 1 can be accounted for by explaining the classroom management plan posed by participant D during session one. The teacher offered a medal system like the Olympics---gold, silver and bronze---as a method of delivering participation rewards for each student. At the end of session one, when the teacher awarded the medals, she delivered behavior-specific praise statements describing to each student why s/he had been awarded a medal. Phase 4, the follow-up, occurred one month after Phase 3 (the withdrawal). One explanation for the significantly higher rate of BSPS during Phase 4 than in the other three phases, is that this teacher participated in additional behavior-specific feedback training between Phase 3 and Phase 4.

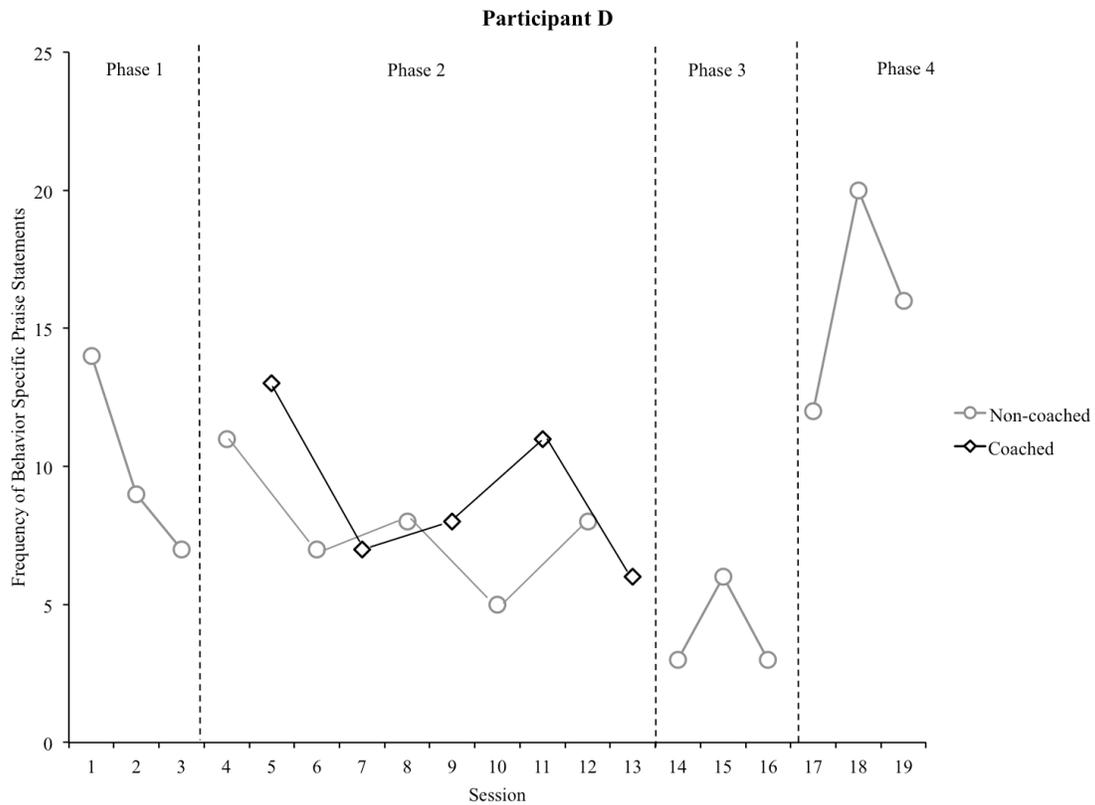


Figure 10. Participant D: Frequency of Behavior-Specific Feedback

### Participant E

The results for participant E, illustrated in Figure 11, portray the most erratic delivery of behavior-specific praise statements across all the sessions. Although participant E completed nineteen TeachLive simulation sessions, data were not collected on session five or session seventeen. Recordings of these two sessions were unable to be retrieved due to technological errors. Based on the visual depiction of the results, it is unlikely that the absence of these two sessions would significantly affect the overall results, particularly because neither of these missing sessions were Tele-Coached sessions. Examining the results across all sessions reveals an average rate of 5.6 BSPS for all non-coached sessions,

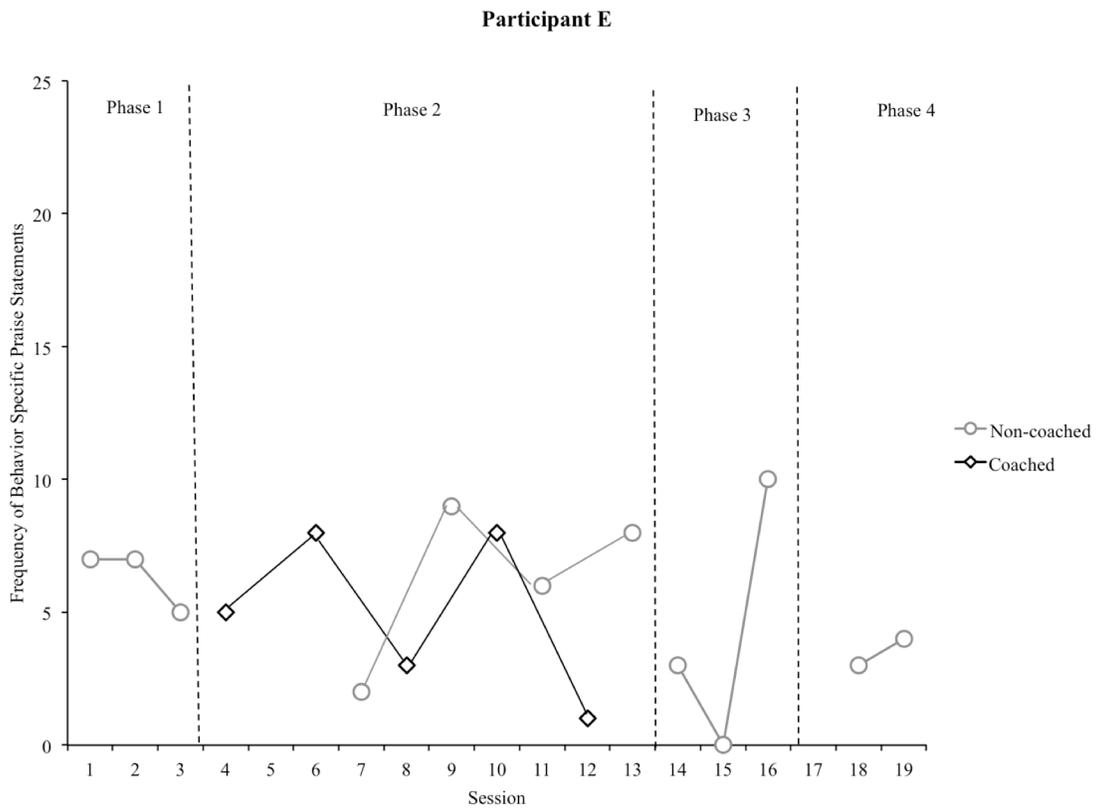


Figure 11. Participant E: Frequency of Behavior-Specific Feedback

and an average rate of 5.0 BSPS for the five Tele-Coached sessions. By comparing these averages, it could be concluded that Tele-Coaching had no effect on the rate of behavior-specific praise statements delivered by this teacher to the student-avatars. Furthermore, the highest rate of behavior-specific praise statements occurred during a non-coached session in Phase 3, the withdrawal phase. The occurrence of 10 BSPS delivered by participant E followed a session where zero BSPS were delivered. This extreme variance makes evident the irregularity demonstrated by these results.

### Summary of Tele-Coaching Results

To fully explore the results of Tele-Coaching across all four participants, the average

rate of BSPS for each participant was calculated for each phase of the study. Table 2 illustrates the difference in averages between Tele-Coached and non-coached sessions during Phase 2, the intervention phase, and the percentage of variance between the alternating treatments. The average rate of behavior-specific feedback increased during Tele-Coaching for three of the four participants. The range of increase was between 13% and 64% for those three participants. One participant demonstrated a negative result of 26% fewer BSPS during Tele-Coaching than during non-coached sessions.

Table 2

*Differences in Averages between Tele-Coached and non-Coached Sessions*

Participant	Tele-Coached	Non-Coached	Percentage of Variance
A	12.5	7.6	64% increase
B	8.4	5.8	31% increase
D	9.0	7.8	13% increase
E	5.0	6.3	26% decrease

**Research Question 2**

The second research question sought to explore the relationship between BSPS and student disruptions. This research questions asks, “Does the frequency and specificity of BSPS delivered by secondary teachers change the rate of student disruptions occurring in the TeachLivE KU Lab?” The results of the data analysis are represented by the graphs in Figure 12. In order for the findings to correlate with previous studies that state that when behavior-specific praise increases, student disruptions decrease (Beaman & Wheldall, 2000; Duchaine et al., 2011; Sutherland et al., 2000), one would expect to see a decrease in the

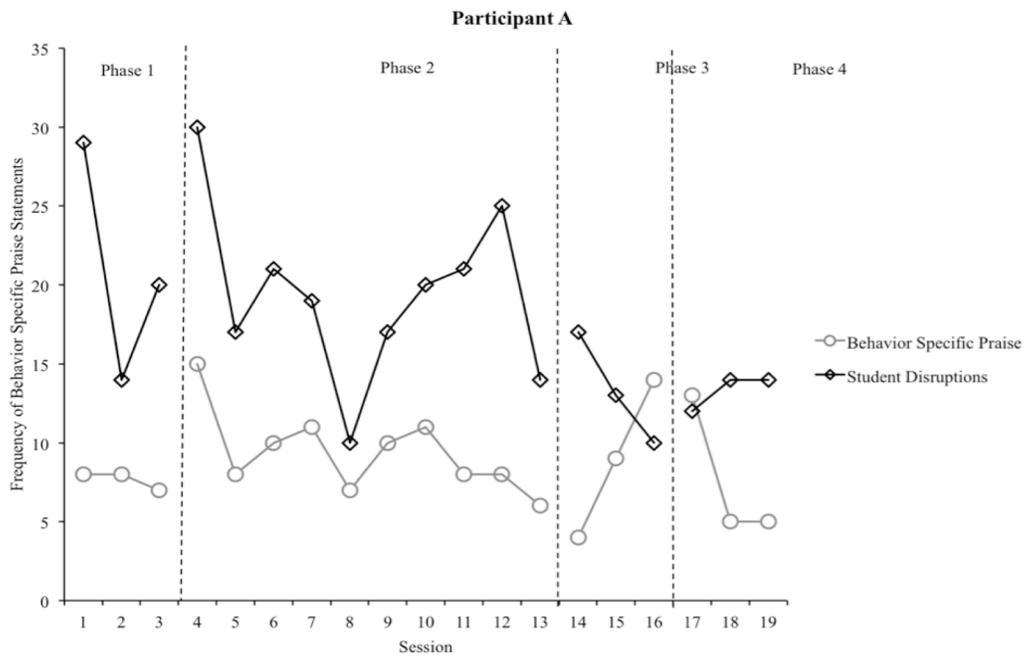


Figure 12a. Participant A: Data analysis of student disruptions graphs

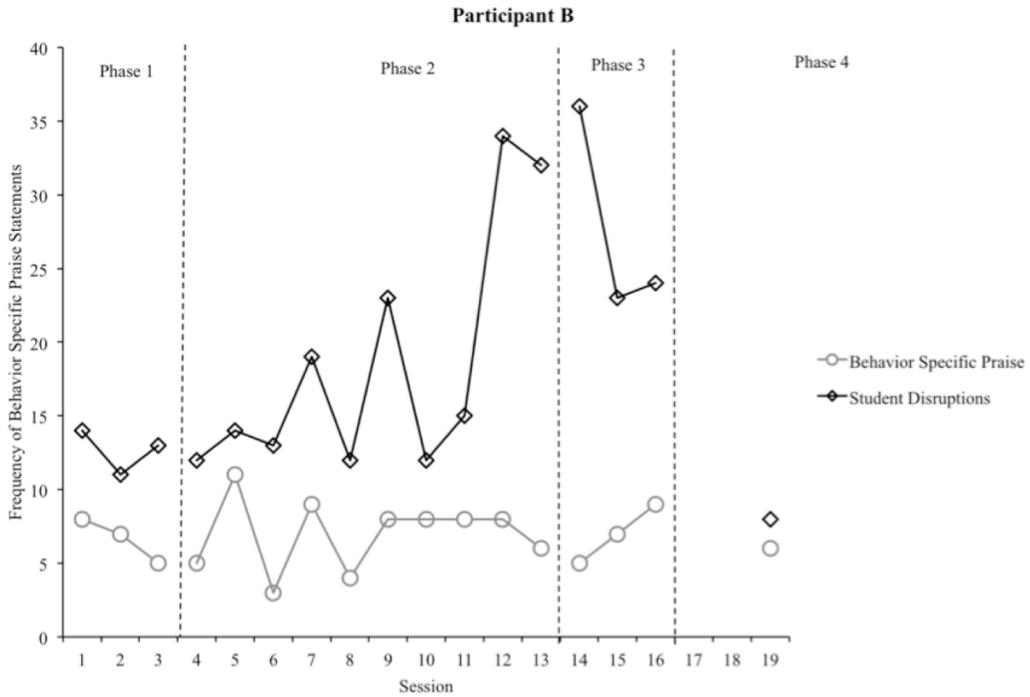


Figure 12b. Participant B: Data analysis of student disruptions graphs

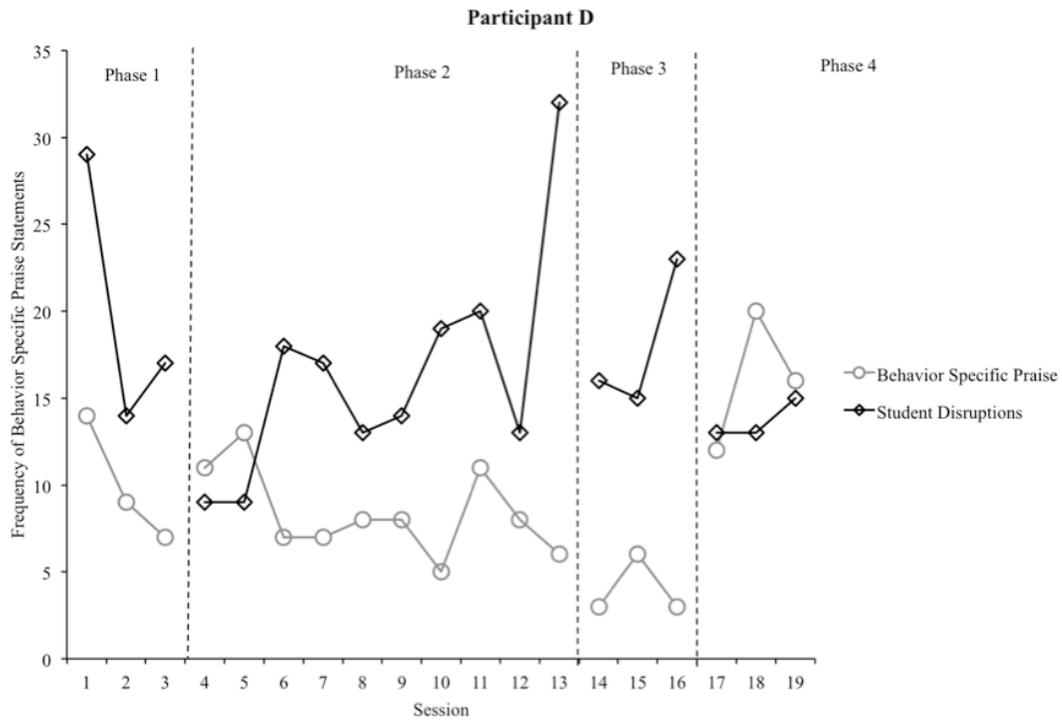


Figure 12c. Participant D: Data analysis of student disruptions graphs

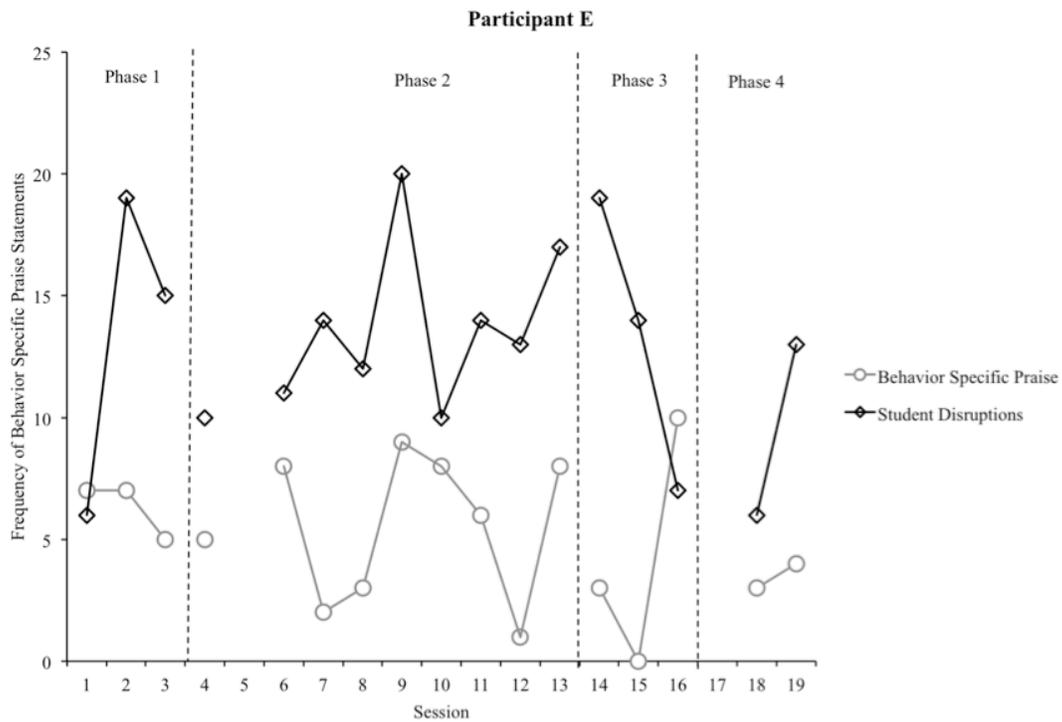


Figure 12d. Participant E: Data analysis of student disruptions graphs

occurrence of student disruptions each time the rate of BSPS increased. The results of this study do not indicate a correlation between the increase of BSPS and a decrease in student disruptions. As illustrated in Figure 12, an increase in BSPS and a decrease in student disruptions occurs only eight times: (a) sessions 7, 16 and 17 for participant A, (b) no sessions for participant B, (c) session 3, 15, and 18 for participant D, and (d) sessions 6 and 16 for participant E.

One possible explanation for this result is that student disruptions measured in this study were those specifically created for the TeachLivE environment. The disruptive behaviors are computer generated and controlled by the inter-actor. These disruptive behaviors are limited to these specific behaviors: (a) answering or texting on a cell phone; (b) engaging in sidebar conversations; (c) interrupting; (d) excessive talking; (e) beat-boxing or inappropriate noises; or (f) yawning. The inter-actor, responding as one of the student-avatars, demonstrates these behaviors.

### **Research Question 3**

The answer to the third research question lies in the context of social validity. Wolf's (1978) second criteria for social validity is the appropriateness of the procedure. To answer this research question: "does the TeachLivE KU Lab provide an appropriate environment for developing and practicing evidence-based strategies for classroom management?" the social appropriateness of the setting of the augmented reality environment will be examined. Although qualitative data was collected from the participants in this study during an after-action and in daily written reflections, the low number of participants limited the amount of data that the researcher can collect. However, when these interview and reflection data are combined with TLSES (Elford, 2011) Likert-scale survey data and open-ended survey

question data from the other sixty-three participants who experienced TeachLivE, the data can be triangulated and examined for emerging themes. In order to answer the research question about the appropriateness of the setting, first, the survey data will be illustrated in a table that illustrates the mean and standard deviation of each survey item. Second, the survey results will be represented by a line graph so the means from two different participant groups can be visually examined. Further quantitative analysis will be demonstrated by examining the Pearson correlation coefficient of related survey items. Third, open-ended responses that were coded for similarities are represented by a circle graph of percentages were generated to illustrate the generalized opinions of the participants. Fourth, the comments from the four participants from this study are grouped for similarities and reported. By triangulating these data, conclusions related to social appropriateness of the setting of an augmented reality environment for Tele-Coaching secondary teachers will be reported.

### **Examination of the Survey Data**

What the teacher-participants experienced in the TeachLivE KU Lab is new to education, and it is important and reasonable to explore the opinions of those who have participated in its use. A survey was developed and examined as part of an exploratory study to determine the effectiveness of using TeachLivE KU as a practice tool for classroom management strategies for advance practicum students. The survey data was analyzed to test the hypothesis: Pre-service practicum teachers who perceive their TeachLivE KU experience to be positive also have personal efficacy in classroom management strategies and find TeachLivE KU to be beneficial for practicing those strategies.

The survey was initially patterned after a teacher efficacy scale, created by Tschannen-Moran and Woolfolk Hoy (2001), and published in the May 2009 issue of *The*

*Learning Principal*, a journal published by the National Staff Development Council (NSDC). The teacher efficacy scale had three subsets: 1) efficacy in student engagement; 2) efficacy in instructional strategies; and 3) efficacy in classroom management. This scale served as a model for constructing the instrument to measure teachers' perceptions, efficacy and attitudes toward TeachLivE KU as an environment for practicing classroom management and instructional strategies. Another resource that informed the survey instrument was the recent study from the University of Central Florida that compared the simulation environment to an urban classroom (Hynes et al., 2007). A University of Kansas faculty member who holds recognized expertise in Psychology and Research in Education was consulted during the questionnaire and scale development. Additionally, an associate professor and a doctoral candidate read the items and offered feedback on item construction. A Likert-scale suited the response options, because it is "widely used in measuring opinions, beliefs, and attitudes" (DeVellis, 2003, p.79). A ten-point scale from one to ten, with one being low or none and ten being high, permitted a larger number of response alternatives allowing respondents to be more precise in their points of view (Muñiz, García-Cueto, & Lozano, 2005). The research states, "the results show that the number of response alternatives increases, both reliability and validity improve" (Lozano, García-Cueto, & Muñiz, 2008, p.73). This same research suggests that the optimum number of response options is between four and seven, but there is some increase, however small, in psychometric properties with greater than seven response options. A ten-point scale was used to maximize validity and reliability, because a standardized instrument does not currently exist for measuring the perceptions, efficacy and attitudes of pre- and in-service teachers in the TeachLivE KU environment.

Survey items 1, 5, 6 and 9 measures participants' perception of their overall experience, while survey items 2, 3 and 4 focus on perceived authenticity of the simulation environment. Perceptions related to classroom management are measured with survey items 7, 8 and 10. Items 5, and 7 through 10 also require participants to respond to personal efficacy related to classroom management. The participants' efficacy and attitude related to the overall experience is addressed in items 1, 5, 6 and 9. Table 3 illustrates the explanation of the survey items.

Table 3

*Item Explanation*

	Overall Experience	Authenticity	Classroom Management
Perception	1,5,6,9	2,3,4,	7,8,10
Efficacy	6,9		5,7,8,9,10
Attitude	1,5,6		

Survey respondents included both general and special education advance practicum students from the University of Kansas during the Fall 2011 semester. Fifty participants were enrolled in an advanced practicum class that was designed for novice teachers to master and apply strategies and skills that facilitate inclusion of middle and secondary students with disabilities within general education classrooms. In this class, novice teachers were exposed to specific research-based strategies in behavior management that they were expected to apply in their practicum teaching experience. Thirteen participants were special education students enrolled in an advanced practicum experience for a 5<sup>th</sup> year and graduate students who are seeking teaching licensure/endorsement or classroom experience in the adaptive

area. This practicum is designed to provide intense, diverse, and direct teaching experiences with children and youth who have learning and behavioral needs in the mild through moderate range. No additional demographic data were collected.

Each practicum student participated in a five-minute session in the TeachLivE KU Lab. The Special Education practicum students were given the task of engaging in a “read-aloud” activity with the student-avatars. Each participant read the same book, and each participant was instructed to manage behaviors and classroom disruptions using evidence-based practices that were comfortable. After a brief interview where qualitative data were collected, these teacher-participants were asked to complete the 10- question Likert-scale survey using a web-based computer program called Survey Monkey.

General Education practicum students had a more complex assignment. They were shown a video of an unsuccessful teacher in the TeachLivE KU Lab who was trying to calm a very disruptive class. These practicum students generated a list of ideas that the unsuccessful teacher could have used to create success in that situation. The general education practicum students were each given five minutes in the TeachLivE KU Lab where they encountered the same scenario they had witnessed on the video. The advance organizer for each participant was to diminish disruptive behaviors and begin teaching a lesson of their choice.

Immediately after each participant had completed his/her five minutes in the TeachLivE KU, s/he walked a short distance to the computer lab and completed the entire survey, including the 10-question Likert-scale items and the five open-ended response items, using Survey Monkey. Because these students had the specific goal during their simulation of getting the students on task, an additional question was added to their survey. The question was the last item on the Likert scale questions.

In order to test the hypothesis, the 63 participants were asked to rate their overall experience in the TeachLivE KU Lab and report their beliefs about its authenticity and benefit for practicing classroom management strategies. The survey results were examined in four ways.

### **Means and Standard Deviation**

The survey delivered to both special educator and general educator practicum students were identical except for the additional question added to the general educators' survey. To examine the reliability of both surveys, the coefficient alpha was calculated for each survey. The TLSES Likert-scale survey was delivered to the all respondents (n=63) and initial data analysis revealed a Cronbach's Alpha of  $\alpha = 0.917$ , which demonstrates satisfactory internal consistency of the instrument. Chronbach's alpha is a measure of internal consistency, or how closely related a set of items is. An alpha coefficient of 0.7 or higher is considered to be reliable. The higher the score, the more reliable the scale is considered to be ( DeVellis, 2003). Using a model efficacy survey and item examination by those with expertise in survey development contribute to both the face validity and the content validity of this survey instrument.

Each item's mean score and standard deviation is represented in Table 4. A Standard deviation of 2 or higher is represented on all of the items except items related to knowledge of classroom management techniques. Such a large spread between the means and the standard deviation indicates that participants' answers varied significantly.

Table 4

*Item Mean Scores (n=63)*

Item	Mean	SD
How would you rate your overall experience in the TeachLivE lab during this introductory experience?	5.76	3.11
How would you rate the authenticity of the student avatars?	5.0	2.96
How typically would you say these students' behavior represents the behavior of students in low-income, densely populated schools?	5.54	2.60
How well would you say these students represent the diversity of students in an urban population?	6.51	2.54
How would you rate the level of comfort you felt as you interacted with the student avatars?	5.90	3.07
How beneficial do you think the TeachLivE lab could be for practicing strategies for instructing and managing students?	5.97	3.34
How would you rate your knowledge of classroom management techniques?	7.40	1.34
How effectively do you believe you incorporated classroom management during your TeachLivE experience?	6.75	2.11
How effectively do you believe you made connections with the student avatars?	5.37	2.67
How well do you feel you were able to get the students on task?	5.76	3.09

The high standard deviation scores led to further investigation and analysis. The data were separated between the two groups, general educators (n=50) and special educators (n=13). The results are illustrated in Figure 13. The spread between the mean scores further illustrates and explains the large standard deviation on nine of the items.

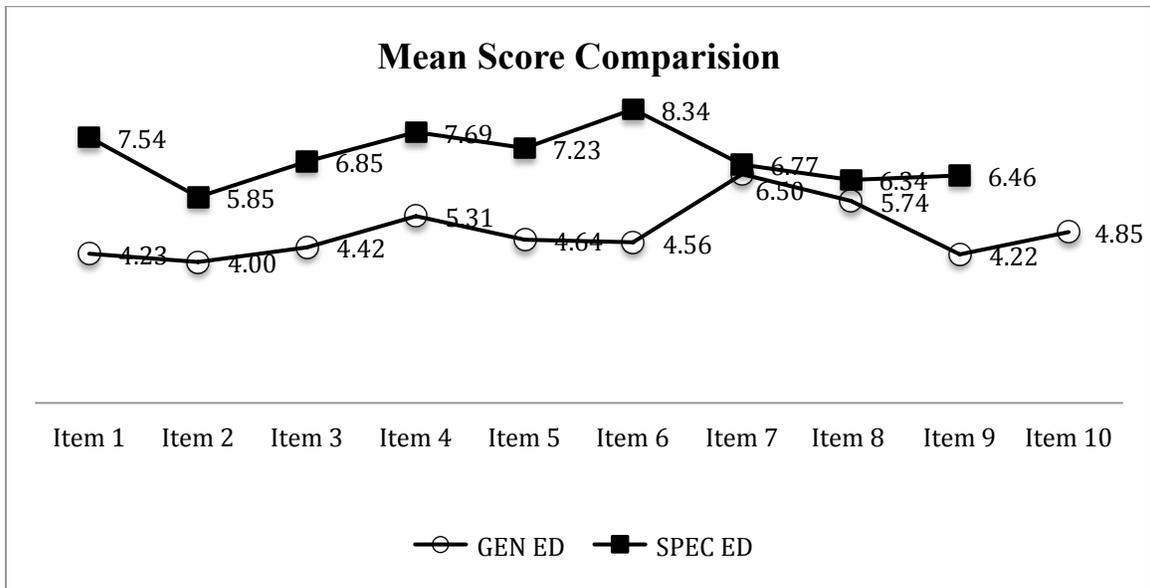


Figure 13. Comparing mean scores of general and special educators

The largest spread between the means is on the item that asks about the benefit of TeachLivE KU for practicing instructional and classroom management strategies. General educators did not find it beneficial ( $M=4.56$ ), whereas special educators found TeachLivE KU very beneficial ( $M=8.34$ ). A similar difference was found in the participants' overall experience in the TeachLivE KU Lab; general educators had a less positive experience ( $M=4.23$ ), while special educators' experience was more positive ( $M=7.54$ ). Both general and special educators agreed on their level of knowledge of classroom management strategies. The similar means are  $M=6.50$  and  $M=6.77$  respectively. It is noted that this line graph illustrates the absence of response on item 10 by the respondents who were special educators. As previously mentioned, item 10 was added for the general education group because the question was directly related to the goal of getting the students on task as their session objective. Although examination of these data between the two groups helps explain

the varied responses across the mean, the research questions look at all practicum teachers. Therefore, these data were not separated when examining the correlation between variables.

### **Correlation of Items**

The correlation between perception, efficacy and attitude variables was analyzed using SPSS to generate the Pearson correlation coefficient for the Likert-scale items (Howell, 2008). The correlation coefficient revealed the highest correlation between overall experience and perceived authenticity of the student-avatars ( $r=.815$ ). Additionally, a high correlation existed between overall experience and level of comfort interacting with the student avatars ( $r=.781$ ), and overall experience and benefit of TeachLivE KU for practicing instructional and classroom management strategies ( $r=.821$ ). Based on these results, it is reasonable to conclude that pre-service practicum teachers perceived TeachLivE KU environment to be authentic and that they consider TeachLivE KU beneficial for practicing classroom management strategies.

Further examination reveals a high correlation ( $r=.751$  to  $r=.792$ ), between the perceived authenticity, typical behaviors, and level of comfort interacting with the avatars, and the benefit for practicing strategies. Interestingly, there was very little significance ( $r=-.060$  to  $r=.373$ ) in the way the participants rated their knowledge of classroom management techniques and all the other items. These results indicate that no significant relationship exists between knowledge and overall experience or any other variable. Yet, participants' personal efficacy in classroom management is represented by the high correlation between teacher participants level of comfort interacting with student avatars they perceive to be authentic, representative of urban populations, and with typical behaviors of diverse urban students.

A Pearson correlation between the mean overall experience and the mean perceived benefit produced a correlation of  $r = .831$ , and this correlation is significant at  $\alpha = .0001$  ( $r(62) = .831, p < .01$ ). Based on this statistical significance, the null hypothesis can be rejected, and it can be concluded that pre-service practicum teachers who perceive their TeachLivE KU experience to be positive also have personal efficacy in classroom management strategies and find TeachLivE KU to be beneficial for practicing those strategies.

### **Analysis of Open-Ended Responses**

In addition to Likert-scale questions, the survey contained five open-ended questions to give the participants the opportunity to further express their thoughts and opinions. 50 of the 63 participants who completed the survey answered the open-ended questions. These 50 were general education practicum students. The 13 special education practicum students answered similar questions in a recorded after-action review, but their responses were not factored into these results. Responses from these open-ended questions were coded with a numeric value of 3 = positive, 2 = neutral or both positive and negative, 1 = negative based on the language used in the response. The coded responses were calculated into a percentage score for each open-ended question. The total percentage score results of all the open-ended responses are illustrated in the Figure 14.

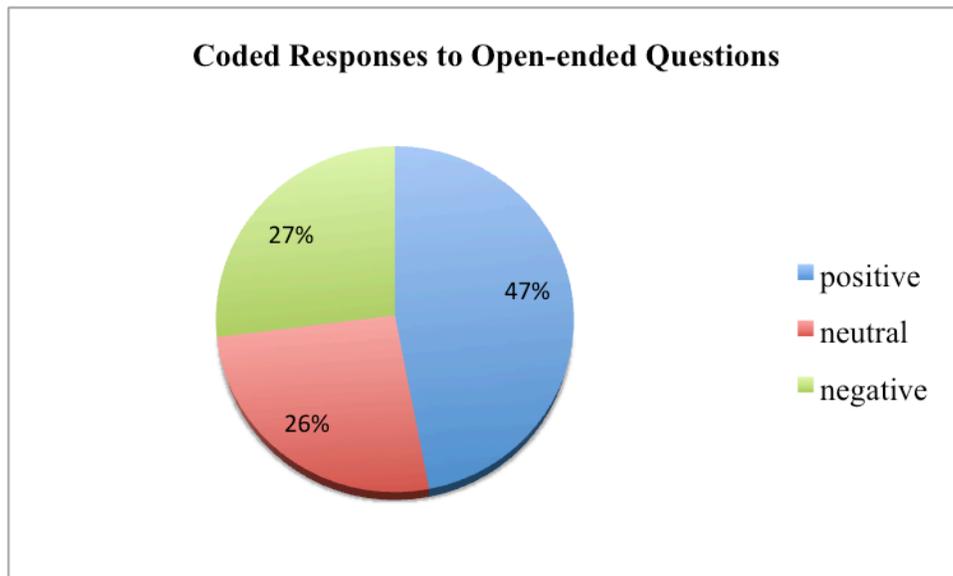


Figure 14. Coded responses to open-ended questions.

*Describe the positive and negative aspects of the TeachLivE experience.* 20% (n=10) of the answers were positive, 58% (n=29) were neutral, and 22% (n=11) were negative. Positive statements confirmed the authenticity of behaviors and diversity in urban environments. Neutral comments mentioned the difficulty in identifying which student was making noise, talking or acting out. Negative comments centered around the lack of opportunity to establish classroom rules and set expectations.

*Please describe or list the classroom management strategies you used during this session.* 74% (n=37) of the answers were positive, 12% (n=6) were neutral, and 14% (n=7) were negative. This aligns with the teacher-participants' efficacy of their knowledge classroom management strategies (M=7.40, SD=1.34) and the high correlation ( $r=.821$ ) between the overall experience and the benefit of TeachLivE™ KU© for practicing strategies for instructing and managing students.

*What do you think you did well?* 40% (n=20) of the answers were positive, 40% (n=20) were neutral, and 20% (n=10) were negative. In this case, responses were coded as neutral if there were any hints of negative response, such as “I think that I was able to get the students on task a little bit but it was hard to get them to engage and ask questions and answer my questions”. There may be some relationship between the positive responses and the high correlation ( $r=.801$ ) between overall experience and level of comfort.

*What would you do differently if you had another opportunity to participate in this TeachLivE experience?* 74% (n=37) of the answers were positive, none were neutral, and 26% were negative. Positive comments focused on teacher behaviors, such as, “I would try to address Marcus in another way” and “I would focus on Marcus more” and “I would also try to address all the students more”. Negative comments focused more on the environment: “I wish I could have written the assignment on the board as well as the classroom rules, but these were not things that I was able to do.”

*What additional comments do you have about this experience?* 26% (n=13) of the answers were positive, 28% (n=14) were neutral, and 46% (n=23) were negative. Positive responses were very positive:

- Overall I think it's really cool and helpful, it could be improved upon by creating the ability for more than one student to speak at a time.
- Similar to real classroom just need to be able to see clicking pen and them writing in a notebook.
- I think it's great! Keep it evolving. It'll someday be a trademark of the pedagogical classroom!

Examples of neutral responses:

- Anytime in the school of education, there's a lot of tasks that are contrived. This is

one of them. However, it is probably more valid compared to peer (graduate student-graduate student) practice in classroom management.

- Difficult to hear the avatars, and make them a bit more responsive.

Negative responses were very negative:

- I think that the teach live needs a little work to make the class more real to really help educators in a meaningful way.
- I still don't think this really prepares one for teaching real students.
- The students in an actual classroom are not as defiant. When asked to give something to a teacher they usually give up after being asked twice, especially in middle school.
- Technology is still a bit clunky and hard to work with. Feels weird.

Examining these data related to participants' experience reports perceptions of the 63 practicum students who participated in augmented reality simulation during the end of their teacher preparation program. The perceptions of general educators and special educators vary substantially, yet the participants' overall experience suggests a benefit to using TeachLivE KU for practicing classroom management and instructional strategies.

### **Study Participants' Reflection and After-Action Review**

The participants in the Tele-Coaching study answered questions in an after-action review at the end of each session. Each participant also completed a daily reflection after finishing all of the sessions. The recorded comments from the after-action review were transcribed and coded for key topics, such as experience, classroom management, technology and Tele-Coaching. The results of the data collected from the after-action review and the reflections are summarized here. The responses that mention Tele-Coaching are of interest because studies previously mentioned in the literature review also include responses to open-ended questions about BIE coaching as a social validity measure. However, in this section,

an emphasis is placed on the participants' experience, on classroom management and technology because these three items relate specifically to the research question examining the social validity of the augmented reality environment.

All four participants described the positive benefits of Tele-Coaching, such as ease of use, reminders, and immediate feedback in practice. None of the teachers reported that the BIE device was uncomfortable or annoying, and one participant wrote that the device and being coached was "very comfortable". One participant said that it [coaching] took some getting used to, but "it was extremely helpful". A different participant mentioned that she could hear the sound of movement sometimes, but it wasn't distracting. On the second day, one of the teachers wrote, "I've decided that I like being coached; it is going to help me in the long run." When asked to describe being Tele-Coached, one participant said, "I personally loved the bug-in-ear coaching. It was very comfortable, never felt invasive or caused me anxiety at any time. I knew what to expect at all times." All participants stated that Tele-coaching helped them remember to deliver behavior-specific feedback to the students. Participants reported that receiving immediate feedback through Tele-Coaching did not throw off the lesson, felt natural, and was seamless. The same person who liked being coached wrote this comment, "It really gives me confidence in my teaching when I am able to give good feedback to the students." One teacher described the Tele-coaching as someone reminding you of what you know you should be doing, but you just haven't practiced it enough to do it naturally. "Like changing a habit". All of the participants explained that Tele-coaching caused them to slow down and really listen to what the students were saying so they could give a specific response. The results from the after-action reviews and daily

reflections supports data collected in previous studies for the social validity of using a BIE device to deliver immediate feedback to teachers.

The after-action review contained three questions designed to extract comments about the participants' experience in the augmented reality setting. The questions sought to discover the participants' reaction to the experience of that session, to encourage the participants to describe something that went well, and to provide a frame for reflection on what the participant wanted to do differently in future sessions. Responses to the first question: "Tell me about your experience" produced reaction statements such as: "that was hard," "that went better," and "it was good." Additionally, participants often commented on content delivery or relationship building experiences. When asked what went well, the participant's response frequently described a relationship experience with one of the students, e.g. "I got Maria to answer a question," and "it really helped me make a connection with CJ when I learned that her mom is diabetic; because there is diabetes in my family, I think she realized I could relate," and "changing it up a bit, so CJ wasn't bored." One participant commented that, "Kevin is really into music, and I think he liked it that I knew some of the things he was talking about." Another participant stated, "I think I made a personal connection with some of them like Sean and his grandpa." As the participants reflected on what they would do differently, most of the comments centered on ways to make the lesson more engaging, structuring the timing of the lesson better, and finding ways to deal with classroom management issues. Teachers reflected on the positive use of cooperative learning strategies to keep the students engaged. All of the participants described how quickly the ten-minute time-in-simulator passed, and either talked about how they would adjust their lesson or commented that it is no different than running out of time in their regular

classroom. The issue of how to deal with C.J.'s cell phone was mentioned by every participant, and each person used his or her personal style to manage the disruption that C.J.'s cell phone caused. One teacher set boundaries for C.J. and allowed use of the cell phone for lesson related purposes. One teacher used external reinforcement, such as a reward if C.J. did not text on her phone more than three times during the session. One teacher reminded C.J. of school policy and explained that he would be calling her mother. One teacher described his frustration with the situation: "That cell phone would be mine by now, but it is kind of hard . . . I'm not trying to butt heads with her. I'm trying to give her some self-esteem. In my experience, at first I just want to scream . . . but obviously that doesn't get them, I can't do that. Secondly, I want to move her but I can't. So using verbal instructions and cues to get her back on track --- so that is something I need to work on. I felt like I was going to lose my cool and that's what they want --- to have control, but that is not an option." Based on these comments, it can be inferred that the participants took the sessions seriously and spoke genuinely about their experiences in the TeachLive KU Lab.

As previously noted, pre-service and in-service teachers find classroom management to be challenging. (Beeth & Adadan, 2006; Brouwers & Tomic, 2000; Emmer & Stough, 2010). The comments of the four participants in this study align with the research. The participants conveyed the challenges they faced in each session. These challenges can be summarized by the behaviors of the student-avatars, i.e. Sean's talkativeness, C.J.'s cell phone use, Maria's silence, Kevin's sidebar conversations with C.J., and Ed's lack of engagement. The participants' written reflections and after-action reviews focused primarily on what to do about C.J.'s cell phone, how to redirect Sean when he talks too much, and how to get the other three students to be appropriately invested in the class. Because student-avatars cannot be sent out of the classroom,

or moved to a different desk, or students' cell phones confiscated, teachers have to think of different ways to manage this classroom. Three of the four teacher-participants consistently mentioned what he or she would change about his or her behavior rather than describing what the student needed to do differently. An example comes from the teacher who chose rewards to manage C.J.'s cell phone usage. This participant said, "I'm back to having trouble with C.J. talking back, so I'm going to have to come up with a new fresh reinforcement to keep her interested." The fourth participant had the greatest amount of experience (26 years) and he chose to tell C.J. that he would have to phone her mother; he was the least flexible in exploring changes in his own behavior that might produce successful classroom management. He mentioned wanting to be able to write a discipline referral for C.J. because she would not comply with school policy. The challenges the participants noted are consistent with the personality types listed as the basis for each of the avatar's character. For instance, because C.J.'s avatar persona is based on an aggressive-independent profile, it makes sense that the teachers would experience the most management issues related to her behaviors. Not all of the sessions were challenging. One teacher reported a particularly successful session in this way: "They all really seemed to enjoy it [the activity]. If they were all really doing it, I have no doubt that it would have had the same results with the kids. . . . Evaluate and interpret. I'm pretty sure 8<sup>th</sup> graders can understand that. As soon as I explained what that was, they picked up on it right there and were engaged and I think it went awesome." Interestingly, this is the same teacher who previously expressed his frustration in an after-action review from an earlier session.

The comments about technology can be sorted into three areas: 1) limitations, 2) authenticity and 3) benefits. Table 5 shows the participants' responses according to each of these areas.

Table 5

*Participants' Technology Comments*

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**Limitations**

One downfall is that students are limited in their hands-on interactive capabilities with TL, so technology may need more development in this area, but overall, the two environments are very comparable with minor differences, one being the number of students in the class.

I didn't know the parameters of the technology, so I haven't done much independent work with the students.

One downfall of the technology is that I can't see the student's work, I just have to listen to their explanations.

**Authenticity**

The TL environment is very comparable to an actual classroom.

The simulator is so lifelike, it is easy to become comfortable in front of the students quickly. It is very much like a regular class! I enjoyed getting to know the students today and have began thinking a bit about how to address each one of their needs/personalities in my next session.

Before beginning the study, I was pretty nervous/anxious/scared about the technology, being filmed, having people watch me teach, etc. I felt like I was going to be going back to student teaching. After the meet and greet with the students, I was amazed with how real the technology is. Going on my 7th year teaching, I wish I would have had this when I was in college to experience!

**Benefits**

Advantages to teach live are numerous, but one that sticks out to me is the advantage it gives pre-service teachers. Using this technology, pre-service teachers are able to get real-time experience with implementation of classroom management and behavior management strategies. This would be beneficial for them to experience BEFORE entering a live classroom to reduce their anxiety, learn how to handle student behaviors, and provide feedback to student responses during lessons.

TeachLivE has the potential to be a leader in teacher education. Pre-service teachers will have the opportunity to decide if they in fact want to be teachers if they can experience this technology early- it gives them the experience of being in a classroom, without really being in a classroom, making it a safe place for mistakes, and feedback on their lessons, management styles, etc. In-service teachers can also benefit by using TL to practice implementing NEW techniques and strategies in their already established classrooms. This gives them a safe place to practice, receive coaching, and make decisions about implementation in their own classrooms before getting in front of their students.

TL technology can help teachers become better classroom managers. Knowing how to interact with students using words instead of physical or negative talk to handle situations is a skill that this technology helps with.

TL provides a very real and interactive setting for teachers to practice new strategies. It is a safe environment, meaning if mistakes are made by the teacher, there is no embarrassment or anxiety as the sessions progress.

Studying new strategies and their effectiveness, using them on different age levels of students, training pre-service teachers to use classroom and behavior management strategies before putting them in a real classroom, allowing inservice or "seasoned" teachers to brush up on new techniques.

Using TL technology, I can really work on improving my teaching in a more private, safer environment so I become more comfortable and confident with myself

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## Summary of Social Validity

The model for social validity constructed by Wolf (1978) and expanded by Horner (2005) creates the framework for summarizing the findings for the data collected to answer research question: “does the TeachLivE KU Lab provide an appropriate environment for developing and practicing evidence-based strategies for classroom management?” Data were analyzed from three sources: 1) TLSES Likert-scale survey responses, 2) TLSES open-ended responses, and 3) research study participants’ oral after-action reviews and written reflections. All the respondents, whether TLSES survey respondents (n=63), TLSES open-ended respondents (n=50), or research study participants (n=4), completed sessions in the TeachLivE KU Lab and responded to questions about that experience. The results of these measures have been reported above and can now be examined within the framework of social validity.

Wolf’s (1978) first standard for measuring social validity is the significance of the goal. Horner extends that measure by examining the dependent variable for social importance (Horner, 2005). In this study the dependent variable for teachers is the increased rate of behavior-specific praise statements delivered by secondary teachers. Prior research has determined the significance and importance of this dependent variable by establishing that an increase in behavior-specific praise. As the survey data and open-ended responses revealed, it is important to both pre-service and inservice teachers to be able to minimize disruptions and manage student behaviors. Increasing behavior-specific praise as the dependent variable in this study is socially important, therefore it meets both Wolf’s and Horner’s criteria for social validity.

The focus of the third research question explored the social appropriateness of the setting of the augmented reality environment for developing and practicing evidence-based strategies such as BSPS. Wolf (1978) articulates this social validity measure as the appropriateness of the procedure. Horner (2005) expands the measure with these two criteria: 1) the independent variable is applied with fidelity, and 2) people deem the intervention acceptable, feasible, effective and worth continuing. When these measures are applied to the TeachLivE KU augmented reality learning environment, the responses from the participants determine if the criteria for social appropriateness is met. As previously reported, the Likert-scale survey data revealed the strongest correlation between the teachers' experience in the TeachLivE KU Lab and their perceived authenticity of the students, the benefit for practicing strategies and their level of comfort in interacting with the student-avatars. Additionally, 47% of the comments from the practicum students were positive about their experiences in this augmented reality learning environment. Finally, as the four participants in this study reflected on their experiences, their comments emphasized the benefits of the environment as a safe, risk-free way to develop, practice and improve classroom management skills by teachers at every stage of their careers. These quantitative and qualitative results support the social validity of TeachLivE KU as an appropriate learning environment for teachers.

The final measure for social validity is the importance of the effects (Wolf 1978), or if the intervention produced the desired effects (Horner, 2005). Visual representation of the data from the alternating treatment application of the intervention, Tele-Coaching, had the desired effects of increasing BSPS in the four secondary teachers in the TeachLivE KU setting. The setting of TeachLivE KU, although not the intervention, may be considered

socially valid because of the importance of the effects revealed by triangulating the data from different measures and the responses from participants who experienced the augmented reality learning environment. First, Likert-scale survey data reported statistical significance for the benefits of practicing skills in the TeachLivE. Second, open-ended questions revealed almost twice as many positive comments as negative comments (47% to 27%) about the practicum teachers' experience in the TeachLivE KU lab. Third, the four participants in this study wrote enthusiastically about their experiences in the augmented reality learning environment, and their responses further support the previous data. These data satisfy the social validity measure of the importance of the effects of TeachLivE KU as an appropriate, effective setting for teachers to prepare, develop and practice classroom management strategies, such as the delivery of behavior-specific praise statements.

## **CHAPTER V**

### **DISCUSSION**

The purpose of this study was to extend the research on Tele-Coaching using BIE technology to increase behavior-specific praise statements delivered by secondary teachers in an augmented reality learning environment. This chapter presents a brief summary of the study as well as discussion of the main findings noting the consistency and contrasting the findings within the literature. The chapter concludes with a discussion of the (a) limitations of the study, (b) implications for future research, and (c) implications for practice.

#### **Overview of Study**

This single case design study sought to discover if using Tele-Coaching to deliver immediate feedback to secondary teachers changed the rate of behavior-specific praise statements teachers gave to student-avatars in the TeachLivE KU augmented reality learning environment. One teacher dependent variable and one student dependent variable were measured. The teacher's rate of behavior-specific praise statements was the dependent variable for teacher behavior. Additionally, the researcher examined the rate of student disruptions in relationship to the rate of teacher praise. The student dependent variable was the rate of disruptions. Finally, the appropriateness of the augmented reality environment was explored by triangulating data collected from previously collected Likert-scale and open-ended survey questions with the oral and written responses of this study's participants.

#### **Discussion of Results**

Previous studies tested the effects of bug-in-ear coaching to increase teachers' implementation of evidence based practices (i.e. Giebelhaus, 1994; Rock. et al., 2009; M. C.

Scheeler et al., 2006). These studies demonstrated that immediate, corrective feedback effects teacher behavior and the targeted behavior increased during the intervention. Although the research designs in these studies differ from the alternating treatment single subject design in the current study, the results of changed teacher behavior are consistent across all the studies. The study conducted by Rock et al. (2009) included a dependent measure for student engagement and the level of disruption and benefit associated with the BIE intervention. Rock et al.'s study showed an increase in students who were on task during the BIE intervention. Teacher's in Rock et al.'s study were coached for instructional practices such as praise, redirects, reprimands, as well as other low and high-access practices. Increased student engagement during the intervention in Rock et al. cannot be directly attributed to the increase in teacher praise. However, studies conducted by Sutherland et al. (2000), Broden et al. (1970) and Hall, et al. (1968), show that an increase in teacher praise correlates with a decrease student disruptions and an increase in students' on-task behavior. These findings do not agree with the result of the current study. A visual analysis of the result from this research study shows that an increase in behavior-specific praise correlated with a decrease in student disruptions only eight times across four participants and seventy-two sessions --- an average of 11%. Social validity results were consistent between the current study and the research examined in the review of the literature. Data were collected by Likert-scale surveys, interviews, and open-ended questions with written responses. Participants in every study found coaching through the BIE technology to be appropriate and effective.

When comparing the results from previous BIE studies, it should be noted that fifteen of the sixteen studies were conducted with elementary education teachers, both pre- and in-

service. Researchers in previous BIE studies examined whether immediate feedback increased the desired component of the instruction being defined in the study, i.e. direct instruction or the delivery three-term contingency instruction. This study involved secondary teachers in an augmented reality learning environment. The teachers were being coached for one teaching behavior – the delivery of behavior-specific praise. As review of the literature revealed, secondary teachers deliver praise infrequently (Alber et al., 1999; Sutherland et al., 2003, 2000), so the results of this study which show an increase in the mean rate of BSPS are promising given the limited amount of time for Tele-Coaching and the small sample size.

The setting for this study was an augmented reality learning environment --- TeachLivE KU. Other studies conducted in similar settings with teachers as participants are limited, but the social validity results from one similar study conducted by Garland, Vasquez and Pearl (2012) are consistent with those in this study. In the Garland et al. study, four teachers with two to 15 years experience participated in a study for improving discrete trials teaching, conducted within the TLE TeachLivE™ virtual classroom (Garland et al., 2012). These teachers agreed that they benefited from the training, and that they would use what they learned in their actual classrooms. These four participants reported, “coaching was enhanced because they were able to practice in the TLE TeachLivE™ lab” (p.511). Participants commented that they thought about the avatar-student, Austin, with whom they worked, even when they were not in the TLE TeachLivE™ lab. This reaction parallels a comment from the 26-year veteran teacher who, after his first experience in the TeachLivE KU lab, said that he “had been thinking about different ways to engage Maria.” (Elford, Carter, & Aronin, 2013, p. 42). When the social validity measures from Likert-scale and open-ended survey responses were triangulated with responses from the four participants of

the current study, the data revealed the setting of the TeachLivE KU lab to meet the criteria for social validity established by Wolf (1978) and extended by Horner (2005).

### **Limitations**

Limitations with the research design, sampling and setting require that results of this study should be interpreted with caution. The alternating treatment design permits Tele-Coaching to occur during alternate sessions for each participant. Administering and removing the intervention allows the researcher to attribute any change in behavior to the intervention – Tele-Coaching. Although three of the four participants showed positive effects with a mean increase of behavior-specific praise statements of 36% ranging from 13% - 64% during Tele-Coached sessions, a fourth participant showed a negative effect, with a mean decrease in behavior-specific praise statements of 26% during the intervention sessions. There is no evidence that the results from the treatment, whether positive or negative, are “generalizable from the contrived experimental situation to the natural situation” (Barlow & Hayes, 1979, p. 203).

Another limitation in this study is the sampling. Secondary teachers were purposefully selected for this study to extend the research done with BIE technology for real time coaching beyond elementary teachers. The participants were solicited through association requests, in other words the research contacted a larger pool of secondary teachers through professional association. By limiting the sample to secondary teachers, and by limiting the sample to those teachers who had some level of association with the researcher, whether direct or indirect, the probability exists that the participants are different than the actual population. This probability introduces a potential of source bias (Gall, Gall, & Borg, 2002).

Finally, the setting limits the study to a specific augmented reality learning environment with the same five student-avatars who have distinct and predetermined personality types and behaviors. The TeachLivE KU lab simulates a real classroom by placing the teacher in front of a projection screen where the student-avatars are projected. A webcam with an embedded microphone mounted near the projection screen allowed the inter-actor to view and hear the participant during the sessions. Real-time communication between the participant and the inter-actor created the simulation and perceived authenticity of the classroom. Even though the participants' comments suggested they felt immersed in a classroom, and they thought of the avatars as "real" students does not indicate that this setting can be considered comparable to a physical classroom. Difficulties with the technology caused sessions to be interrupted or briefly delayed. This may have affected the participants' level of engagement or investment in the session. Cost of the TeachLivE KU lab may also be a limiting factor for researchers. The university where this research was conducted generously donated technical support and session time for this study.

### **Implication for Future Research**

The findings of this study indicate that further research can provide additional information on the impact of Tele-Coaching using BIE technology with secondary teachers as a means to increase the use of evidence-based practices in augmented reality learning environments. The evolution, integration and increasing uses of technology in the field of education suggests that Tele-Coaching to provide immediate feedback is an accessible tool for supporting teachers as they improve their delivery of behavior-specific praise. Further research should include larger sample size and treatment over a longer period of time. A comparative study between augmented reality and physical reality would help to inform the

meaningfulness of Tele-Coaching in either setting. The limited number of empirical studies for the rate of behavior-specific feedback delivered by secondary teachers indicates that further study for interventions that improve this evidence-based practice is required. The delivery of behavior-specific feedback is not the only teaching behavior that can be coached. It would be worthwhile to examine effects of immediate feedback through Tele-Coaching for other evidence-based practices such as ratio of interactions and opportunities to respond.

### **Implication for Practice**

Numerous studies exist that indicate the value of immediate feedback. A distinct set of studies have determined that using BIE technology to deliver immediate feedback improves targeted teaching practices such as three-term contingencies in literacy instruction and rate of teacher praise. Tele-Coaching using BIE technology provides an avenue for delivering immediate feedback in a variety of settings, by different populations, e.g. supervisors to student teachers, peer-mentors, instructional coaches to classroom teachers, special educators to paraprofessional.

The TeachLivE KU lab provides a setting where theory meets practice in participatory learning. This augmented reality creates a space for transactional and transformative learning where learners correctly process and internalize information (Kenny & Wirth, 2009). “The basis for a successful, interactive learning experience is one in which the concept of ‘knowledge’ becomes an inherent property of the learner who emotionally invests in the process and who is willing to make mistakes in order to learn” (Kenny & Wirth, 2009, p. 39). In order for behavior to change a disruption to the norm must occur. TeachLivE KU offers that disruption through live interaction where a trained inter-actor creates situations that lead the teacher or spect-actor toward a learning goal through small,

incremental changes. The inter-actor's sensitivity to body language, facial expressions and other clues from the spect-actor helps establish a receptive learning environment. The situated role-play of TeachLivE KU produces participatory learning for pre- and in-service educators that extends far beyond peer role-play because of the authenticity that interactive performance provides.

### **Conclusion**

The findings in this study illustrate the effects of immediate feedback on a small sample of secondary teachers. Results indicate that Tele-coaching increased the targeted behavior in three of the four participants. The rate of student disruptions did not decrease with the increase in the rate of teacher praise as expected. Social validity measures indicate that the participants in this study found the intervention, Tele-Coaching, and the setting, TeachLivE KU, to be appropriate and beneficial. These findings suggest that further research is required to determine if Tele-Coaching in TeachLivE KU is an effective intervention and setting for changing teacher behavior.

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Appendix A  
Informed Consent

**KU TeachLivE™ Simulator Participant's/Interactor's  
Informed Consent for Research & Digitized Video Recording**

**Study title:** *Developing group behavior management skills in the classroom.*

**Intent of study:** To observe changes in spontaneous and sustained teacher-student interactions in novice teachers as a function of deliberate, guided practice within a semi-immersive augmented-reality learning environment.

**Research procedures:** Time-in-Simulator (TIS) and in After-Action Review (AAR) will be video-recorded and measured, the total TIS/AAR cycle duration not to exceed 10 minutes per participant. Recordings may be used in AARs, but for the most part recordings will be used to observe, record, and graph spontaneous and sustained teacher-student interactions in order to determine the effectiveness of the simulation training experience.

**How recordings/images will be used:** Digitized video recordings (DVRs) are used in settings with teacher candidates, instructors, university student teaching supervisors, and researchers for research purposes only. Video recordings may be shown in part in research presentations with prior approval of the participant(s)/ interactor(s), and still images derived from DVRs may be used in research articles and reports. The researchers and participants/interactors in this study will not post images/recordings to public Internet sites without prior permission of KU HSCL and the participant/interactor. The recordings will be stored in a secure location by the Principal Investigator and will be destroyed after the completion of study. No public display or distribution of these tapes will occur as part of this study and any use beyond the initial study for further research purposes will be approved prior to future use by the participant/interactor and the TeachMe KU team. Participants/interactors are free to withdraw from this agreement at any time.

**Risks/Benefits of Participation:** There is no risk to student participant. Although it is possible that, for a small percentage of participants, some psychological discomfort may result from some of the misbehavior of the avatar students during the simulation, there are no other risks associated with the simulation experience. All participants who are educators or are in training to become educators, by virtue of their participation in the simulations, have the opportunity to benefit directly from the ways semi-immersive environmental characteristics enable the participant to experience real conditions under which K-12 educators teach.

**Dates of participant's/interactor's simulator use:**

If additional or amended dates become necessary, we will duly inform participant/interactors as per KU HSCL policy UCF beta testing policy, and the KU-UCF Memorandum of Understanding. Again, participants/interactors are free to withdraw from this agreement at any time. The PI/primary contact for this research at KU is Earle Knowlton, 785.864.0544; [eknow@ku.edu](mailto:eknow@ku.edu).

I understand that if I have any additional questions about my rights as a research participant, I may call (785) 864-7429, write the Human Subjects Committee Lawrence Campus (HSCL), University of Kansas, 2385 Irving Hill Road, Lawrence, Kansas 66045-7568, or email [irb@ku.edu](mailto:irb@ku.edu)).

**By my signature I affirm that I am at least 18 years old and that I have received a copy of this Consent and Authorization form. I give my informed consent for participation and/or to be video-recorded for purposes of this specific research study only. I understand that future use of this work will require my further approval and that these images are being gathered for research purposes and will not be publicly displayed or distributed by students or faculty involved in this research. I also understand that I am free to withdraw my participation and/or any resultant DVRs at any time.**

Name of Participant/Interactor:

Date \_\_\_\_\_

\_\_\_\_\_  
Print

\_\_\_\_\_  
Sign

## Appendix B

### Tele-Coaching Time Table

Tele-Coaching Time Table

<b>Day 1</b>	Baseline – session 1	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
<b>Baseline</b> 4 hrs	Baseline – session 2	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	Baseline – session 3	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	<b>Day 2</b>	Alternating Treatment – session 4	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min
<b>Phase 2</b> 4 hrs	Alternating Treatment – session 5	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	Alternating Treatment – session 6	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	<b>Day 3</b>	Alternating Treatment – session 7	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min
<b>Phase 2</b> 4 hrs	Alternating Treatment – session 8	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	Alternating Treatment – session 9	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	<b>Day 4</b>	Alternating Treatment – session 10	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min
<b>Phase 2</b> 4 hrs	Alternating Treatment – session 11	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	Alternating Treatment – session 12	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	<b>Day 5</b>	Return to Baseline session 13	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min
<b>Phase 3</b> 4 hrs	Return to Baseline session 14	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
	Return to Baseline session 15	Participant 1 – 20 min	Participant 2 – 20 min	Participant 3 – 20 min	Participant 4 – 20 min
<b>Day 6</b>	Follow Up session 16	Participant 1 – 20 min x 3	Participant 2 – 20 min x 3	Participant 3 – 20 min x 3	Participant 4 – 20 min x 3
<b>Phase 4</b>					

## Appendix C

### Research Study Information Sheet

## Research Study Information Sheet

Thank you for participating in this research study.

This document contains these four important pieces of information: 1) the expectations of you as the participant; 2) the description of what each day will look like 3) some scholarly information about the research questions; and 4) the letter of informed consent.

First – the expectations:

1. A time commitment
  - a. Please arrive by 8:45 each day; it is important that we begin promptly at 9:00. Our schedule time in the simulator is inflexible.
  - b. Participation on July 30 is mandatory.
  - c. July 30<sup>th</sup> plus three additional days (approximately 18 sessions per participant)
2. Lesson preparation
  - a. Please prepare either a series of mini-lessons (each 10 minutes long) or one long lesson you can break into 10-minute segments.
  - b. Please email an overview of your lesson with any materials you want the students to have on the first day no later than 3 p.m. on Friday.
  - c. Any subsequent materials should be available for the students 48 hours in advance.
3. Technology involvement
  - a. You will be interacting with computer-generated images of middle school student.
  - b. The setting is an augmented-reality environment. This means that even though the students look like avatars, the interpersonal exchange between you, the participant, and them, the students, happens in real time with actual human interaction.
  - c. You will be wearing a Bluetooth hearing device like people use to listen to their cell phone when they are driving.
4. Reflection
  - a. Please keep a daily journal of your thoughts about your experience. It may only be one sentence or it could be several pages. Whatever you have time to write.
  - b. This will be collected at the end of the study.
5. Flexibility
  - a. We will do our best to make this as smooth and comfortable for you as possible.
  - b. We are dealing with technology, and that means anything can go wrong.
  - c. Flexibility goes both ways. If something happens and you can't come; we will do all we can to make adjustments.

Second – What each day will look like:

- Arrival time 8:45
- Come to the designated area in the Learning Resource Center (LRC) at Joseph R. Pearson (JRP) Hall 1122 West Campus Road, Lawrence, KS
- Obtain session schedule for that day
  
- Fitting and testing the Bluetooth device will occur prior to each session.

Each session consisted of three parts:

- *Advanced Organizer:* The advanced organizer outlines each session's objectives, addresses any concerns participants may have.
  - *Time in Simulation:* Participants will spend ten minutes interacting with student-avatars in the simulator. The participants, in these ten minutes, will teach mini lesson while using the strategies given to them in the advanced organizer to address behaviors exhibited by the simulated students. Ten minutes was selected because the preliminary research states that five minutes in the augmented-reality classroom is equal to thirty minutes in an actual classroom (Dieker et al., 2008).
  - *After Action Review:* An after action review serves as an exit interview after each session and is designed to open a dialogue about the participants' interaction with the student-avatars and about their comfort level with the technology.
- During each session, the participants will interact with the virtual students in TeachLivE™ KU© simulator while they were being observed and coached remotely through a Bluetooth device.

Day 1 –

- There will be a brief orientation and Q&A from 8:45-9:00. At 9:00, I will introduce everyone to the students, and each of you will get 5 minutes to interact with them in a meet and greet format.
- The first regular sessions will occur after the introductions.

Third:

### **Behavior-specific praise/feedback**

Building self-esteem in children is not about telling them how wonderful they are. Rather, it's about helping them feel good about their actions and accomplishments.

There are two kinds of feedback that adults typically give in response to children's behaviors. **The first is encouragement, which fosters a child's sense of mastery and allows them to**

**evaluate their own behavior.** The second form of feedback is praise, which may have the counter effect to what adults intend. It can actually make children feel helpless and more dependent on others' feedback and approval. Praise tends to be judgmental, is based in competition, and is vague. It's often delivered publicly, and is associated with a finished product, rather than occurring during the preparation phase (Hitz & Driscoll, 1988).

Encouragement allows the child to evaluate his or her own efforts rather than compare himself to another child. It's specific, and occurs through the process of a child's step-by-step accomplishments toward a given goal (Hitz & Driscoll, 1988).

“A relationship between academic difficulty and problem behavior, although complex, does appear to exist” (Talbot & Coe, 1997). If rates of effective instruction are increased, the expectation would be that **academic achievement would improve and the rates of problem behavior decrease**. Two critical components of effective instruction are the rate at which students are given the opportunity to actively respond to academic requests (OTR) and the **number of praise statements students receive for appropriate academic and social behavior**” (Sutherland, Wehby, & Yoder, 2002). According to Sutherland, et al., (2002) studies examining teacher praise statements showed positive effects for students' on task engagement and decreased disruptive behavior. Although studies provide evidence that both increased rates of OTR and teacher praise have positive effects on academic outcomes and classroom behavior, teacher practice of praise and OTR remains limited.

For the purpose of this study, we will define behavior-specific feedback as:

Feedback given by the teacher that names or labels the student behavior that the teacher wants to continue or occur.

Examples include:

“Steve, you found a new way to solve that problem.” “Joan, I see you focusing on your assignment.” “J’Juan, I noticed you working with Raymond during team reading.”

*Behavior-specific praise*, which is also referred to as *descriptive* or *labeled praise*, names the specific behavior being praised. For example, a behavior-specific praise statement such as, “You did a great job completing your assignment on time,” is more effective for changing behavior than a *non-behavior-specific praise statement*, or *general praise*, which provides a positive statement but does not specify the desired behavior for which the student is being praised (Bernhardt & Forehand, 1975; Sutherland et al., 2000).

Appendix D  
TL BIE Coding Form

## TL BIE Coding Form

Participant Letter (circle)

A ---- B ---- C ---- D ---- E

Session Number 1 – 2 – 3 – 4 – 5 -- 6 – 7 – 8 – 9 – 10 – 11 – 12 – 13 – 14 – 15 – 16 – 17 – 18 – 19

Teacher Behaviors

General Praise	Behavior Specific Praise Statements	Opportunities to Respond
Total number	Total number	Total number

Student Behaviors:

Cell phone	
Sidebar conversations / laughing	
Interrupting	
Excessive talking	
Beat-boxing / inappropriate noises	
Yawning	

Total number \_\_\_\_\_

Tele-Coaching (circle one)

Coached

Not Coached

Positive Feedback	Corrective Feedback
Total	Total

## Appendix E

### Bug-in-Ear Coaching in TeachLivE

#### After-Action-Review Questions

## Bug-in-Ear Coaching in TeachLivE

### After-Action-Review Questions:

- 1) Tell me about your experience.
- 2) Describe something that you thought went very well.
- 3) Tell me about something you would like to do differently next time.
- 4) How comfortable is the Bug-in-Ear?
- 5) What did you like or not like about being coached?

## Appendix F

### **TLE TeachLivE™ Session Objectives**

# TLE TeachLive™ Session Objectives

## SESSION PLANNING TEMPLATE

### REQUESTER INFORMATION

Name:	Martha D. Elford	University:	KU
Department:	Special Education	Class:	JRP Lawrence Campus 9:30a.m.-1:30p.m. EST
Date:	30-31 July - 3 Aug and 5-9 Aug 2012	Duration Period:	8:30 a.m. - 12:30 p.m. CDT

### DESCRIPTION OF THE SESSION

During this session, we want to record teacher behaviors such as 1) opportunities to respond (OTR), i.e. ways teachers elicit responses from students through questions; and 2) ratio of interactions (ROI) behavior-specific feedback. The content lessons will be on the topic of Adolescent Health and Wellness. Each teacher-participant will approach the topic from his/her area of expertise, e.g. P.E., Art, English, Special Education. Each session for each participant will last approximately 20 minutes and will include an Advance Organizer, 10 minutes Time in Simulator, and an After Action Review. The participants will be assigned alternating session times during each day and each participant will have a break of at least 20 minutes between sessions. Each teacher-participant may choose for him/herself whether the lessons they present on the topic are new each time, or whether the lessons are part of a series. Teacher-Participants will be instructed to be explicit with the students as they introduce the content about how it will be delivered.

The purpose of the recording is to collect data for a research study. The sessions will be repeated by each of the participants over a period of 9 days from July 30 through August 9.

### BEHAVIOR LEVEL

Choose the Preferred Behavior Level from the Dropdown **1-3**

Behavior Level: 0-----1-----2-----3-----4-----5

0 = no classroom misbehavior

1 = mild misbehavior -> distraction, fidgeting, inattention at low frequency

2 = mild/moderate misbehavior -> distraction, fidgeting, inattention, mild resistance at low frequency

3 = moderate misbehavior -> distraction, fidgeting, inattention, resistance at medium frequency

4 = moderate / intense misbehavior -> distraction, fidgeting, inattention, resistance, bullying behavior at medium frequency

5 = intense misbehavior -> distraction, fidgeting, inattention, resistance, bullying behavior at high frequency

## 1<sup>ST</sup> GOAL/OBJECTIVE FOR STUDENTS

**Description:**

video capture of teaching practices for data collection

**Measurement:**

partial interval recording of teaching behaviors including opportunities to respond (OTR) and ratio of interactions (ROI), specifically, behavior-specific feedback

Completed videos for data collection

**Importance:**            **Essential**

**TLE TeachLivE™ Research Study:  
Interactor Informed Consent**

Research plan: (Provide details regarding procedures - how/what data will be analyzed)

Intent of research: This research will investigate (Provide details regarding research objectives).

Use of tapes/images: Videotapes will be used in instructional settings with teacher candidates, instructors, university student teaching supervisors, and researchers in this study for research purposes only. Videotapes may be shown in part in research presentations with prior approval of UCF and the interactor. Still images may be used in research articles. The researchers and participants in the study will not post images/tapes to public Internet sites without prior permission of the interactor. The tapes will be stored in a secure location by the Principal Investigator and will be destroyed after the completion of study. No public display or distribution of these tapes will occur as part of this study and any use beyond the initial study for further research purposes will be approved prior to future use by the interactor and the UCF team.

Dates of taping:

If additional dates become necessary, we will duly inform the interactors.

Section Below to be completed by INTERACTOR

I give my informed consent to be videotaped for purposes of this research study only.

I understand that future use of this work will require my further approval and that these images are being gathered for research purposes and will not be publicly displayed or distributed by students or faculty involved in this research:

Interactor:

Date:

X

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TLE TeachLivE™ INTERACTOR