Pushing the Horizons of Student Teacher Supervision: Can a Bug-in-Ear System be an Effective Plug-and-Play Tool for a Novice Electronic-Coach to Use in Student Teacher Supervision?

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Submitted to the Graduate Faculty of

the School of Education in partial fulfillment

of the requirements for the degree of

Doctor of Education

University of Pittsburgh

2012

UNIVERSITY OF PITTSBURGH

SCHOOL OF EDUCATION

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The National Council for Accreditation of Teacher Education has called for strengthening teacher preparation by incorporating more fieldwork. Supervision with effective instructional feedback is an essential component of meaningful fieldwork, and immediate feedback has proven more efficacious than delayed feedback. Rock and her colleagues have developed the wireless Bug-in-Ear (BIE) system to provide immediate, online feedback from a remote location (electronic coaching or e-coaching), and they have pioneered the use of BIE e-coaching (BIE^2 coaching) in coaching teachers in graduate education. Other research has also documented successful use of the BIE system with teachers. This case study explored the use of the BIE tool for undergraduate student teacher supervision in the hands of a novice BIE^2 coach, including the ease with which BIE equipment can be set up and operated by a novice coach and naïve users in the classroom. The findings provide support for the use of BIE^2 coaching as tool for undergraduate student teacher supervision, based on the changed behaviors during reading instruction exhibited by two out of three student teacher participants. Consistently increased use of targeted instructional behaviors was seen after just five coached lessons, and also seen in follow-up observations during which no coaching was provided. Student teachers reported that benefits far outweighed drawbacks in BIE^2 coaching, but they found it challenging to simultaneously monitor elementary pupils and BIE feedback. The experience of the researcher showed that BIE^2 coaching could be accomplished by a novice electronic-coach with significant

previous coaching experience, but that additional training on the use of concise feedback language and affirming vs. corrective prompting may be needed for less experienced coaches. While this case study documents the experience of only one coach, and only three student teachers all working in homogenous, suburban classroom sites, BIE^2 coaching showed great promise as a student teacher supervision tool. Future research on training for e-coaches, determining which undergraduates will respond to BIE^2 coaching, and discerning patterns of responsiveness to coaching are called for.

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1.0 INTRODUCTION

Today, pre-service elementary teachers face the daunting prospect of providing effective, research-based reading instruction (National Institute of Child Health and Human Development, 2000) for an increasingly diverse range of students in general education classes, during a time of rising accountability and stringent reading benchmarks (U.S. Department of Education, 2001). Teacher preparation programs must address the acknowledged gap between reading research and teacher practice (National Institute of Child Health and Human Development, 2000; National Research Council, 1998)).

1.1 STATEMENT OF THE PROBLEM

During the past thirty years a growing number of studies has focused on pre-service reading preparation (Anders, Hoffman, & Duffy, 2000), and this research has shown that coursework plus integrated field experiences is more effective than either learning experience alone (Cox et al., 1998; Linek et al., 1999; Massey, 2003). While the majority of teacher preparation programs follow this model, they are not equally successful in producing effective teachers (Billingsley & McLeskey, 2004; Gunter & Reed, 1996; Gable, 2004; Polsgrove, 2003), and they are not necessarily preparing pre-service teachers to use research-based instruction. One well-documented issue in teacher preparation is student teachers' difficulty transferring learning from

their pre-service programs to their classroom instruction (Boudah, Logan, & Greenwood, 2001; Bowles & Nelson, 1976; Engelmann, 1988; Gersten, Morvant, & Brengelman, 1995; Greenwood & Abbott, 2001; Horton, 1975; Leach & Conto, 1999; Noell, Witt, Gilbertson, Ranier, & Freeland, 1997; Robinson & Swanton, 1980; Rose & Church, 1998; Scheeler, Bruno, Grubb, & Seavey, 2008; Vaughn, Klingner, & Hughes, 2000).

Field placements are designed to provide opportunities for student teachers to practice and improve instructional skills, including those they have learned in coursework. However, like all apprentices, pre-service teachers need performance feedback to reinforce and correct their instruction. Performance feedback is most effective when provided immediately as instruction is being delivered (Scheeler, Ruhl, & McAfee, 2004), but with traditional on-site supervision, such feedback runs the risk of disrupting the student teacher's instruction and her young students' learning. Pioneering work on providing immediate feedback through bug-in-ear (BIE) technology (Bowles & Nelson, 1976; Gallant & Thyer, 1989; Giebelhaus & Cruz, 1992, 1994; Herold, Ramirez & Newkirk, 1971; Korner & Brown, 1952) has demonstrated that electronic systems can be used successfully to provide immediate feedback; however, the early technology was somewhat problematic. More recently, with the advent of wireless Bluetooth technology, web cameras, and Internet communication programs like Skype, BIE technology has improved so much that a new wave of researchers has begun using BIE to provide immediate, specific feedback with little to no disruption of instruction (Goodman, Brady, Duffy, Scott, & Pollard, 2008; Rock, et al., 2009-b; Wade, 2010).

One of the most important aspects of instruction that a student teacher must practice in her field placements is engaging students so that they participate in instruction. If students are not engaged in the lesson, even well designed instruction will be ineffective. This is especially

critical in reading and language arts instruction, because print is an abstract concept based on spelling/decoding rules divorced from conversational meaning. This means that struggling readers must rely on high quality instruction and repeated practice in order to learn and master reading skills. As an example of the abstract nature of reading and writing, consider a one syllable word ending with /k/ (sound of the letter "k"). The spelling of the final sound, /k/, depends on the pattern of sounds heard before it, that is, the smallest units of sound in a word (phonemes) must be distinguished, sequenced, and then used to determine correct spelling.

- If the /k/ follows a short vowel you use a "ck" spelling, as in *back*. If any sounds come between the short vowel and the /k/, you use a "k" spelling, as in *bark* or *bank.*
- But in a one syllable word with a long vowel followed by /k/, you use a "k," for example with vowel pair, like *break,* or a silent-e, like *brake*.

As these examples demonstrate, there is no meaningful reason for spelling the final /k/ differently. However, to become effective readers and writers, students must understand this abstract construct.

There are many interactive ways to introduce these types of rules, and a plethora of interactive possibilities that are useful for both guided and independent practice. But this instruction will be lost on the less-able reader who is not participating in the interactions, unless teachers use specific instructional moves to engage these students and include many practice opportunities for them in lessons.

It is well established that the neural pathways needed to achieve automaticity in reading, or automaticity in any activity—like driving a car—can only be developed through systematic, consistent practice (Shaywitz, 2003). Unfortunately, while most individuals recognize that it

takes many, many hours of practice to learn to drive well, it is not well understood by all educators that struggling readers require many, many hours of systematic, consistent practice to master reading skills. These students need active participation in reading instruction to begin the practice they will need as they work toward mastery.

High-access instruction (Feldman & Denti, 2004) is an effective way to ensure that *all* students are engaged in a lesson by using instructional methods that require a response from every student. During reading instruction, high-access instruction can take many forms, ranging from simple whole group prompts like agree/disagree signaling with thumbs up/thumbs down, to participation in partner reading. Every use of high-access instruction provides additional practice of the target skill, and another hook for student participation and engagement. In contrast, traditional instruction relies on questions designed to engage only one student in answering, while the rest of the students are passive observers of, or even disengaged from, the lesson.

At this time, there is mounting evidence that feedback from Bug-in-Ear electronic coaching (BIE^2 coaching) can be successfully employed to enhance the instruction of new teachers (Rock, et al., 2009-b; Wade, 2010) and pre-service teachers (Scheeler, & Lee, 2002; Scheeler, McAfee, Ruhl, & Lee, 2006). For this research, Rock has used only online BIE technology that can be used long distance, via Skype and the Internet. She has focused on practicing teachers, or teachers returning for special education certification. In contrast, Scheeler has used only radio-frequency based BIE systems for her work with pre-service teachers. The radio-frequency technology has a range of less than 300 feet, so student teacher supervisors must be on-site to provide BIE electronic feedback. While Scheeler has found this feedback effective, it does not provide the long-distance coaching opportunity of the BIE online system used by Rock. This study will document the use of electronic coaching using Internet-based BIE

feedback with pre-service teachers during their student teaching placement. The study will also examine the experience of a novice e-coach in setting up and operating the BIE system in schools for the first time.

1.2 RESEARCH QUESTIONS

1.2.1 Question one

What roadblocks were encountered in setting up and using the BIE system in the schools and in the "home base"?

1.2.2 Question two

How reliable was the technology as it was used for student teaching supervision?

1.2.3 Question three

What was it like to provide electronic coaching, as prescribed by Rock, et al.?

1.2.4 Question four

What were the reactions of the student teachers, cooperating teachers, and elementary pupils to the e-coaching experience?

1.2.5 Question five

Did Bug-in-Ear e-coaching have an effect on the instructional behavior of student teachers?

1.3 PURPOSE OF THE STUDY

The primary purpose of this case study was to document the use of BIE^2 coaching as a tool for remote supervision of undergraduate student teachers. The study investigated the effectiveness of BIE^2 coaching in changing pre-service teachers' instructional behavior during reading lessons. It also examined the experience of a novice e-coach providing feedback, and the experiences of the naïve undergraduate student teachers receiving coaching. Finally the study considered the ease with which a novice BIE^2 coach and naïve users were able to set up and operate the BIE equipment.

BIE online technology (Bluetooth headsets and USB adapters, webcams, and the Skype Internet program) has been used by Dr. Marcia Rock in groundbreaking work with teachers in training (Rock, et al., 2009-b). Her work shows that the inexpensive BIE system allows a supervisor to communicate with teachers from a remote location, and coach them synchronously with immediate, real-time feedback during their instruction. This study extended the application of Rock's work to undergraduate education students, a new population for the BIE^2 coaching experience. This remote, synchronous, electronic coaching could extend the horizons for teacher preparation programs, particularly if BIE installation and use is simple enough for novices to accomplish with minimal support and little training.

Prior e-coaching has differed in one of two ways. First, many e-coaching studies dealt with populations of practicing teachers (Rock, Gregg, Gable, & Zigmond, 2009-a; 2009-b; 2009-c; Scheeler, Congdon, & Stansbery, 2010; Wade, 2010). Second, those studies that address student teachers used an older generation BIE system that relied on radio-frequency transmission (Giebelhaus, 1994; Giebelhaus & Cruz, 1992, 1994; Scheeler et al., 2008; Scheeler et al., 2006; Scheeler et al., 2004), which limited e-coaching to on-site supervision rather than allowing coaching and supervision BIE^2 coaching from a distance would differ from on-site e-coaching because remote BIE^2 coaching does not allow the supervisor to intervene personally to solve problems. Thus remote e-coaching effectively removes a potential crutch from the student teaching experience.

Undergraduate student teachers were the target of this study because the field of education faces strong pressure to improve student teacher preparation in radical ways, including more fieldwork (National Council for the Accreditation of Teacher Education, 2010), and a critical need to improve teachers' use of research-based, highly effective instruction (Imig & Imig, 2006; U.S. Department of Education, 2001). These two demands come together in the supervision of student teaching.

Effective teachers play a critical role in students' academic outcomes (Sanders & Horn, 1998; Wright, Horn and Sanders, 1997). Unfortunately, new teachers have trouble generalizing what they have learned (Scheeler et al., 2008) and teaching habits form quickly. Most practicing teachers do not easily change core instructional practices (Berends, 2004; Boudah et al., 2001; Elmore, 1996; Glennan, Bodilly, Galegher, Kerr, 2004; Schneider & McDonald, 2007). In fact, any activity that is repeatedly implemented in response to similar stimuli, like teaching reading using a publisher's series in elementary general education classes, is likely to be habituated.

Once any behavior has become habituated and routine it is more difficult to change. This is true even when the change would lead to more desirable outcomes (Eisner, 1992). This problem was recognized in education decades ago when Sarason (1982) described teaching culture as an element that stands in the way of change; Cuban (1983) identified a set of standard teaching practices that have prevailed for over a century; and Shubert (1986) recognized how difficult it was to change teachers' practices.

1.3.1 Focus on using BIE^2 coaching with pre-service teachers

Therefore, rather than working to change the instruction of practicing teachers, this study was designed to work in student teaching placements. Pre-service programs have been called upon to improve the content and the delivery of their teacher preparation (Darling-Hammond, 2005). The impetus for this call for improvement rests on several factors. Perhaps the most telling factor is that an unrealistic majority of candidates who student teach get a passing grade. In 80% of the teacher preparation programs nation-wide, an improbable 99% of candidates pass student teaching, and in 15% of these programs every student teacher passes (Sudzina & Knowles, 1993). It is difficult to believe that so many programs turn out effective teachers when Lavely, Berger, and Fulmar (1992) report 10% of candidates transitioning into teaching positions—in other words, those who have passed student teaching—are viewed as incompetent.

There is a strong body of research that has defined effective practices in teacher preparation (Brophy & Good, 1986; Christenson, Ysseldyke, & Thurlow, 1989; Ellis, Worthington, & Larkin, 1994; Rosenshine & Stevens, 1986; Stein, Smith, & Silver, 1999; Wittrock, 1986). Most pre-service programs follow a format that combines college course work with field experiences, but as described above, not all programs produce effective teachers

(Billingsley & McLeskey, 2004; Gable, 2004; Gunter & Reed, 1996; Polsgrove, 2003). A major difficulty in teacher preparation is that teacher candidates do not generalize instructional knowledge from their training settings to their real-world classrooms (Boudah et al., 2001; Bowles & Nelson, 1976; Engelmann, 1988; Gersten et al., 1995; Greenwood & Abbot, 2001; Han & Weiss, 2005; Horton, 1975; Leach & Conto, 1999; Noell et al., 1997; Robinson & Swanton, 1980; Rose & Church, 1998; Scruggs & Mastropieri, 1994; Vaughn et al., 2000). However, since repeated teaching practices quickly become teaching habits, student teachers may need more opportunities to practice effective instruction to the point of habituation. Thus, teacher preparation programs need to provide the guided practice necessary to establish evidence-based practices as teaching habits.

For these reasons, this study focused on student teacher participants during their first semester of student teaching, when instructional habits are just beginning. Because the BIE electronic coaching had to occur within a limited time frame, the research-based, effective instruction chosen for reinforcement was the use of high-access instruction during reading lessons, (i.e. teaching behaviors that are easily measureable and widely applicable). Student teachers who learn to rely on high-access instruction will have a system that provides much-needed practice for all students during reading lessons. High-access instruction is a technique that can be easily transferred from one content area to another, and it crosses all grade levels, so it will prove useful as student teachers move forward. High-access instruction is also easy to observe and measure and therefore will lend itself to an intervention designed to increase usage. (See Section 1.3.3 and Appendix A for specific examples of high-access instruction suitable for reading instruction.)

1.3.2 Focus on using BIE^2 coaching to change instructional behavior

In order to document the use of BIE^2 coaching as a student teacher supervision tool, this study focused on coaching pre-service teachers to increase their use of high access instruction (HAI) (Feldman & Denti, 2001, 2004), a research-based set of strategies designed to increase student engagement. HAI was chosen as a focus because its strategies can be employed in reading instruction at any grade level, for a wide range of instructional topics, and it works for diverse student reading levels in one class. So increasing HAI would enhance reading instruction in any student teaching placement. Student teachers' baseline use of high-access instruction was observed at the beginning of the seven-week student teaching placement and compared to HAI levels during maintenance observations at the end of the placement. In the interim, each student teacher was to receive ten BIE^2 coaching sessions focused on HAI. This allowed a determination to be made about the effectiveness of BIE^2 coaching on use of high-access instruction.

High-access instruction is a useful technique for requiring participation from all students. It encompasses a number of measureable instructional moves that can be deployed during reading lessons. The list below shows a selection of these high-access instructional moves.

- Choral responses
  - Verbal
    - Choral reading of text
    - Cloze reading
    - Vocabulary practice: saying the vocabulary word that matches a given scenario (Beck, McKeown, & Kucan, 2002).

    - Non-verbal
        - Yes/no or agree/disagree signals: thumbs up/down, stand up/sit down, etc.
        - Hold up a choice of response cards (for example: sound cards to indicate the short-vowel heard in a word)
        - example: sound cards to indicate the short-vowel heard in a word)
- Every student takes time to think of an answer individually, and is ready to respond:
    - Classroom whip-around
    - Random answering (student names pulled to randomly determine who answers)
- Practice "games" with whole-group participation
    - Decoding/word reading:
        - Word Building (Beck, 2005)
        - Syllasearch (Beck, 2005)
    - Encoding/spelling:
        - Making Words (Cunningham, Hall, & Defee, 1991)
- Partner strategies
    - Peer Assisted Learning Strategies (Fuchs, Fuchs, Kasdan & Allen, 1999)
    - Think—Pair—Share
    - Do—Check—Teach
    - Classwide Peer Tutoring (Greenwood & Delquadri, 1995)

These instructional techniques require teachers to provide specific types of prompts to elicit the desired response, or to follow a particular protocol, such as leading students through a letter-by-letter change for Word Building. Each of these instructional moves can be easily

observed, counted, and directly linked to countable student responses, so that high-access instruction is easily measured.

1.4 FRAMEWORK OF THE STUDY

1.4.1 Case study design

Case study design was selected for this study in order to document the use of an intervention on individual participants. Case studies methodology provided the researcher opportunities to develop a rich description of the e-coaching experience from a variety of perspectives.

1.4.2 Electronic coaching with Bug-in-Ear

The earliest reported work using BIE took place about 60 years ago, and even that first study found that immediate, electronic feedback was preferable to traditional, delayed feedback in clinical supervision (Korner & Brown, 1952). Later, when BIE studies were reviewed (Gallant & Thyer, 1989), this finding was confirmed, along with the fact that electronic feedback was non-disruptive and welcomed by participants. These studies used earpieces linked through FM radio frequencies so that a clinical supervisor could provide immediate feedback to a participant. Overall, studies found that using the BIE equipment and technology was not problematic.

However, Rock et al. (2009-b) identified drawbacks that may have prevented wider use of first-generation BIE. The primary drawback of the technology was the maximum transmission

power of 150-300 feet for an FM radio frequency (Herold et al., 1971; Scheeler et al., 2006). This meant that supervisors had to remain on-site. So although the technology itself was not disruptive, the presence of the supervisor in the classroom could disrupt instruction. Other fields, such as clinical psychology, observe through two-way mirrors, but this is not an option available in schools. In addition, during this early BIE work the supervisors could take observational notes while providing feedback, but did not have an additional data source built into the BIE system. Such inconveniences were apparently enough to keep teacher preparation programs and school districts from wider use of BIE technology to provide immediate feedback.

Some researchers continue to use first-generation BIE systems (Scheeler, et al., 2010) that require the coach/supervisor to be on site, less than 300 feet from the student teacher. However, BIE^2 coaching has taken on new life in the era of mobile, wireless technology. Synchronous, electronic coaching from a remote location is possible through a system that uses the Internet to link a teacher's classroom to a supervisor's computer (Rock et al., 2009-b.). The classroom components consist of a wireless Bluetooth headset worn by the student teacher, and a webcam and Bluetooth adapter connected to a classroom computer. These are linked through Skype (Internet software) to a supervisor's computer and headset to provide wireless, synchronous feedback from any distance. Video recording and storage of the observed lesson provide an additional source of rich data that can be analyzed as needed. This second generation, Internet-based system has been chosen for the current study in order to add to a body of research on a new tool that provides effective instructional feedback more efficiently.

1.4.3 Extending the work of Marcia Rock, Ph.D.

Rock has successfully used the Internet-based, wireless BIE system in her research (Rock, et al., 2009-a; Rock et al, 2009-c). Her studies have shown that for novice teachers (Rock et al., 2009-a) and practicing teachers pursuing additional certification (Rock, et al., 2009-c), instructional practices can be improved through use of BIE^2 coaching. This research also shows that the coach/supervisor need not be physically near the feedback recipient, and therefore expands the horizons in teacher preparation and training. However, to date her work has not focused on the ease with which the wireless BIE system can be set up and operated by a novice e-coach and naïve classroom users who have little technological support. Simplicity of use would add to the allure of BIE^2 coaching and promote its spread. Additionally, this study took Rock's research to a new population by working with undergraduate student teachers.

1.4.4 Undergraduate student teacher participants in first semester placements

The current study was designed to add to Rock's research by providing BIE e-coaching to a different population of teacher-participants: undergraduate student teachers in their first semester of student teaching. Researchers have called upon teacher preparation programs to improve the quality of the content and pedagogy they offer (Zeichner, 2005; Darling-Hammond & Youngs, 2002; Shanker, 1996), particularly regarding the integration of coursework and field experiences (Buck, Morsink, Griffin, Hines, & Lenk, 1992; Cox et al., 1998; Darling-Hammond, 2006; Frazier, Mencer, & Duchein, 1997; Harlin, 1999; Hendrick, McGee, & Mittag, 2000; Linek et al., 1999; Sturtevant & Spor, 1990; Wham, 1993). BIE^2 electronic coaching presents an excellent tool for linking course content to instructional practice by offering scaffolding for the use of

research-based instruction during regular instruction in the field placement. This scaffolding feedback can prevent a problem, reported by Gersten and colleagues (1995): the tendency for teachers to maintain their existing teaching skills rather than incorporate new, research-based practices into their instructional life.

1.4.5 General education setting

This study also added to Rock's work by applying BIE^2 coaching for high-access instruction to reading instruction in the general education classroom. Classrooms in the 21st century include more and more students with diverse learning needs (Zigmond & Matta, 2004), and student teachers need to provide instruction that reaches all students. This instructional need is critical, because the poor academic achievement of some students reflects not a student-based problem but a failure of instruction due to poor teacher preparation (Greenwood & Maheady, 1997). Therefore, it is important to extend effective instructional feedback practices to student teachers in general education classrooms.

1.4.6 Use of high-access instruction during reading instruction

High-access instruction (HAI) is a method of teaching that provides opportunities for all students to participate in lessons, thereby increasing student engagement and student interaction with content (Feldman & Denti, 2004). HAI is also a way to reframe the traditional notion of education, so that undifferentiated instruction is no longer the norm and schools are prepared to meet the needs of diverse learners. See Table 1 for the contrast between low- and high-access

instruction on a number of key factors relating to classroom instructionI. This table makes it clear that HAI is a very different approach to instruction, unlike what has been traditionally seen in elementary classrooms.

Table 1. Contrast between low- and high-access instruction

Educational factors	low access	high access
Student participation	call on one student to answer	entire class simultaneously engaged
Response time	fast response: little or no thinking time	thinking time as a priority for all students
Teacher assumptions	assume students are equipped with prior knowledge	assume students present a broad varied range of knowledge
Focus	"cover" the topic	focus: on learning opportunities
Lessons	discipline, forced engagement, based on threats	non-threatening, designed for student success
Student interaction	not planned for	carefully structured for all
Teacher role (Feldman & Denti, 2004)	"disseminator of information"	"choreographer of learning"
Overall instruction	undifferentiated	differentiated

Feldman and Denti (2004) state that HAI is a new concept "challeng[ing] the notion that schools are for those students who 'do school well'" (2004, p. 267). It is especially critical to look beyond the successful students in reading instruction, because research has documented that struggling readers are likely to resist reading instruction, balk at actively reading themselves, and respond shallowly or passively if at all (Ganske, Monroe, & Strickland, 2003; Margolis & McCabe, 2004). These are the students for whom active, engaging classroom instruction and

practice are most critical and for whom HAI is extremely important, and many of them are found in general education classes. Low-access (traditional) and high-access reading instruction are contrasted in Table 2 below. So, this study extended Rock's use of BIE^2 coaching to increase high-access instruction to typical elementary reading instruction.

Table 2. Examples of low- and high-access instruction during reading lessons

low access	high access
Teacher asks a closed comprehension question and immediately calls on one student to answer	Teacher poses a comprehension question and asks class to think, wait for signal, and then do thumbs up/agree or thumbs down/disagree
Round Robin reading, or listen to CD/ teacher/other students read aloud	Partner reading with split-half partners* trained in the roles and requirements of this method
Seat work assignment: write a sentence for each vocabulary word	Vocabulary choral response: teacher gives a prompt, students say applicable word
Students split into unstructured small groups to find text-based answers to a list of questions	Split-half partners* use Do-Check-Teach to find answers to one question at a time, check answers against a key, and if both are correct, next questions. Or, partner with correct answer teaches the other how to find that answer, and then go on.

2.0 TEACHER PREPARATION PROGRAMS

2.0.1 Importance of fieldwork in effective teacher preparation for reading instruction

One essential factor shared by effective teacher preparation programs is a set of fieldwork opportunities that link classroom experiences with academic knowledge from coursework. Research demonstrates that to develop effective literacy instruction skills, it is important to link coursework and classroom instruction, rather than providing either component alone (Hendrick et al., 2000; Linek et al., 1999, Massey, 2003). A majority of programs provide this linkage, and include fieldwork as some combination of observations, one-on-one tutoring, short-duration practica, student teaching placements totaling one or more semesters, and school year internships. Linek et al. (1999) reported on three case studies of teacher candidates in reading methods courses at three different universities, and found that while all teacher candidates agreed that their courses had taught them more about literacy instruction, only the courses with a supervised, integrated field placement allowed them to apply their learning. However, integrating coursework and field placements does not guarantee success in producing effective teachers (Billingsley & McLeskey, 2004; Gable, 2004; Gunter & Read, 1996; Polsgrove, 2003), and not all programs are necessarily preparing pre-service teachers to use research-based reading instruction.

One well-documented issue for student teachers and newly minted teachers is difficulty transferring knowledge from courses to classroom instruction (Boudah et al., 2001; Bowles & Nelson, 1976; Engelmann, 1988; Gersten et al., 1995; Greenwood & Abbott, 2001; Horton, 1975; Leach & Conto, 1999; Noell et al., 1997; Robinson & Swanton, 1980; Rose & Church, 1998; Scheeler, et al., 2008; Vaughn, et al., 2000). Researchers have reported that programs that positively influence student teacher's convictions and practices regarding instruction, especially literacy instruction, share a common trait. These programs support strong connections between fieldwork and the higher-education components of teacher preparation, (i.e., instructors and coursework) (Frazier, et al., 1997).

Overall, the literature on teacher preparation programs presents a strong picture of the importance of integrating field experiences into coursework, since the fieldwork allows pre-service teachers to take the crucial steps of transferring their knowledge and practicing their academic understanding in real world settings. Research has also shown that the supervision of fieldwork experiences is vitally important. Effective student teacher supervision provides a strong link between the instructors and coursework in higher education and the practical classroom application of knowledge and development of instructional skills required during student teaching. One of the essential components of effective supervision is performance feedback, which is discussed in the following section.

2.1 EFFECTIVE PERFORMANCE FEEDBACK

Performance feedback has been defined as communicating knowledge of processes and results to promote transfer or maintenance of desired skills and behaviors (Mortenson & Witt 1998; Scheeler & Lee, 2002). Immediate performance feedback and supportive supervision are essential components of teacher preparation programs and new teacher induction programs (Buck et al., 1992; Colvin, Flannery, Sugai, & Monegan, 2009; Darling-Hammond, 2005; Darling-Hammond, Chung, & Frelow, 2002), because novice teachers improve their instructional practices when they receive performance feedback that is consistent, specific and corrective (Coulter & Grossen, 1997; Scheeler & Lee, 2002; Scheeler et al., 2004). Effective performance feedback is the basis of both effective student teacher supervision and BIE^2 coaching. However the literature reports two difficulties with the traditional model of performance feedback for pre-service teacher: student teachers do not get enough effective feedback, and the feedback they do get is delayed rather than immediate.

Most new teachers report a lack of consistent, immediate instructional feedback in their pre-service supervision (Scheeler et al., 2004). When novice teachers begin working in their own classrooms, an increasing number of them report feeling unprepared to provide instruction for general education students, and even less prepared to teach the students with disabilities who are included in many general education classrooms (Brownell, Hirsch & Seo, 2004; McLeskey, Tyler, & Flippin, 2004). Since researchers have shown that fieldwork is essential for effective teacher preparation programs (Massey, 2003; Hedrick et al., 2000; Linek et al., 1999), this reported lack of feedback and preparation could be linked to the off-campus man-hours required to implement and sustain high quality field experiences for pre-service teachers.

Traditionally, field placement supervisors have provided feedback at school sites within a reasonable commute from their campus locations. Supervisors have had three, well-established stages for providing this feedback (Allsopp, DeMarie, Alvarez-McHatton & Doone, 2006; Buck, et al., 1992; Hattie & Timperly, 2007; Rock, et al., 2009-c; Rock et al., 2009-b; Scheeler & Lee, 2002; Scheeler, et al., 2004). These stages are listed below.

1. During a pre-conference before an instructional observation. At this stage feedback references either the plan for the lesson or the student teacher's previous instructional needs.
2. Immediately after an observation. This feedback is typically short because the student teacher is not free of on-going instructional duties. The feedback is focused on the most critical elements, and outlines what will be covered in more detailed feedback during the third stage, and in a written observation report.
3. During a post-conference. This stage offers more time for longer, in-depth feedback and coaching because it takes place when the student teacher and supervisor meet later in the day or later in the week. This delayed feedback may include a review of the written report, or else the observer uses examples from field notes to provide specific feedback on the student teacher's performance and growth steps.

This three-stage model assumes that the supervisor is a passive observer of classroom events. The observer quietly records data in detailed field notes while remaining unobtrusive so that s/he provides no instructional interference (Sheeler et al., 2006; Scheeler & Lee, 2002).

The difficulty with this model is that student teachers may present inaccurate information or practice less effective methods of instruction, and these go uncorrected because feedback is

delayed until instruction is complete (Colvin et al., 2009; Sheeler et al., 2006; Scheeler et al., 2004, Scheeler & Lee, 2002).

If time for stage two feedback immediately after an observation is very limited, student teachers run the risk of practicing poor instruction or providing inaccurate content for days, until feedback can be delivered later, at a stage three, post-conference feedback session. This is particularly unfortunate since teachers do make positive changes in instruction and increase target behaviors in response to regular, constructive feedback (Colvin et al., 2009; Greenwod & Meheady, 1997; Moor & Sampson, 2008). So if feedback were given immediately, student teachers could alter instructional behavior, not only improving their instruction, but also practicing the improvements immediately to reinforce the instructional moves. Researchers have found that novice teachers who received immediate, corrective feedback via a radio-frequency, short-range BIE system were able to increase desired behaviors, and that this immediate feedback was more effective than traditional delayed feedback (Colvin et al., 2009; Scheeler et al., 2006).

In short, student teachers want more feedback, and researchers have demonstrated that immediate, specific, corrective feedback is an effective tool for enhancing teacher practices.

2.2 BIE TECHNOLOGY AND ELECTRONIC COACHING

Radio wave based, first generation, Bug in Ear (BIE) technology has a history that precedes its appearance in education, and it has proven an effective tool for delivering immediate feedback in many settings. Some of the earliest BIE work took place in the middle of the last century (Korner & Brown, 1952), and in those early years was reported in studies from clinical psychology and a

variety of fields. Twenty years later BIE was first used in by educational researchers (Herold, et al., 1971), who found that immediate, electronic coaching was more effective than traditional, delayed-conferencing feedback. Almost 20 more years passed, during which additional BIE research was done. In 1989, Gallant and Thyer reviewed 13 BIE studies and concluded that immediate, electronic feedback was efficacious across many disciplines. Whiffen and Byung-Hall (1982) concluded that the most effective use of BIE feedback seemed to be with new professionals who needed specific, immediate feedback to resolve some of their first challenges. The BIE technology used in all these studies depended on radio frequency transmission to send signals from coach to listener. This meant that transmission was only one-way, from coach to subject. The radio waves also limited the distance the signal could travel to a few hundred feet, so that truly remote coaching was not possible with this first-generation BIE technology.

In education, research has demonstrated that BIE technology can offer support for pre-service and new teachers, particularly in helping them to generalize and maintain effective teaching practices for more diverse student populations (Scheeler et al., 2008; Wade, 2010).

Technology has become commonplace in school life in recent decades. The National Center for Educational Statistics (NCES) reported that 15 years ago, approximately two-thirds of American schools had Internet access. But seven short years later, the NCES (2007) reported that virtually every school in the country had Internet access, even those in economically disadvantaged neighborhoods. In the intervening years, technology use has become ubiquitous in schools and homes across America. Parents report three year olds playing computer games online, and preteens routinely using their own cell phones to talk, text, and link to the Internet. This is an enviable context for introducing BIE technology into classrooms. The use of Bluetooth-type headsets and webcams has become common, and virtually all classrooms have

computers with Internet access. School districts contacted for this study assured the researcher that the technology required was a standard part of the classroom operating environment (J. Giancola, personal communication, July 28, 2011; D. Tartaglione, personal communication, August 2, 2011).

2.3 STUDENT PARTICIPATION AND ENGAGEMENT

Student engagement is critical for effective instruction, and high-access instruction is one method for increasing behavioral engagement (e.g., participation). No matter how good the lesson, students can only benefit from instruction when they are engaged. The engagement literature has not yet specified one over-arching definition of academic engagement, because engagement draws together three previously distinct areas of research. Educational research offers the first two components of engagement, both related to student behavior: attention and cognitive strategy use. The third component is from psychological research: motivation and affect. Therefore, although there are various definitions of engagement, all components of the definitions fall into three categories, representing research in the fields of education and psychology. (See Appendix B for a table delineating the components of researchers' definitions, categorized as described here). These categories are behavioral engagement, emotional engagement and cognitive engagement (Fredericks, Blumfeld, & Paris, 2004). This section begins with an overview of the engagement literature, including why it is important for successful reading instruction, and a detailed description of behavioral engagement. This focus on behavioral engagement is prompted by three considerations. First, behavior is often used as proxy for engagement. Second, behavior is overt and as such it is easily measured, unlike

emotions or cognitive functions. Finally, behavioral engagement can be synonymous with participation, and increasing participation is the goal of this study's BIE^2 coaching for high-access instruction.

2.3.1 Overview of engagement

Academic engagement leads to higher student achievement both on school grades and standardized measures; is linked to better personal adjustment while in school; and furthers students' social and cognitive development (Finn, 1993; Newmann, 1992; Newmann, Wehlage, & Lamborn, 1992; Skinner, Wellborn, & Connell, 1990). Academic engagement, which pertains to the intellectual work of the classroom, should not be confused with school engagement, which includes non-academic and extra-curricular activities, not just academics. This discussion will deal with academic engagement, and will define it as a constantly evolving set of student actions designed to enhance knowledge by allocating mental resources toward learning activities. As described above, the components of academic engagement are emotional engagement, behavioral engagement, and cognitive engagement (Fredericks, et al. 2004).

Marks (2000), Newmann, et al. (1992) and Csikszentmihalyi (1990) define engagement as a psychological process of making mental investments and apportioning effort in order to learn. In addition, Marks states that engagement embraces both emotional and behavioral participation in learning. Newmann and his colleagues add that in engaged learning, the students' efforts are directed toward mastery, in which mastery represents the value of the activity or the outcome for the student. This view of engagement is dependent upon the learner's personal inclinations, reinforcement given for paying attention in other situations, and the value of the activity for the individual. Csikszentmihalyi calls the state of engagement "flow" and ties it to

development. Other researchers describe it as a combination of emotional engagement factors: interest, emotional commitment, and motivation (Steinberg, 1996).

Guthrie and Wigfield (2000) define *reading* engagement as a fusion of "motivation and thoughtfulness." Their descriptions of engaged readers are easily interpreted as engagement components. Engaged readers are cognitively engaged: mastery-oriented and seeking to comprehend what they read. Engaged readers are emotionally engaged: believing in their own reading abilities, displaying self-efficacy, feeling intrinsic motivation, and enjoying learning from their reading. Guthrie and Wigfeld do not specify anything that could be interpreted as behavioral engagement; however, students could not exhibit cognitive and emotional engagement as described unless they assumed students would be attending to, and participating in, reading instruction, thus demonstrating behavioral engagement as well.

Engagement is a predictor of student achievement and eventual graduation (Connell, Spencer, & Aber, 1994; Skinner, Zimmer-Gembeck, & Connell,1998). Higher academic engagement correlates with higher academic achievement in the classroom, and higher scores on standardized achievement tests (Skinner et al., 1990).

It also provides one route for correcting the sharp decline seen in student motivation at all grade levels (Eccles, Midgely, & Alder, 1984; Fredricks & Eccles, 2002), which is particularly worrisome because of the negative influence it exerts on student learning overall, and reading achievement in particular. Researchers have found significant decreases in motivation from the earliest to latest elementary grades (Wigfield, et al., 1997), which are critical years for reading instruction if students are to become successful readers. Juel (1988) reported that students' reading ability in first grade is highly correlated to their reading ability in fourth grade. This means that struggling readers in first grade, after three years of instruction, are still struggling

with reading in fourth grade. A student's positive perception of her ability and her motivation to rise to a challenge are directly correlated to emotional engagement. Therefore, if a student struggles with reading and perceives that she is not up to the challenge, motivation and academic engagement drop. This is especially disheartening because it means the struggling readers who have a critical need for systematic and explicit instruction (National Research Council, 1998; National Institute of Child Health and Human Development, 2000) would be the very students who are increasingly *dis*engaged. Low-achieving young readers can significantly improve their reading growth when their struggles are identified early and they are given intensive interventions (Chard & Kame'enui, 2000; National Research Council, 1998; National Institute of Child Health and Human Development, 2000; Torgeson, 2000; Torgeson, et al., 2001). However, instruction is only effective to the extent that students are academically engaged.

2.3.2 Description of behavioral engagement

The research on engagement that is of greatest concern for this study is that which studies student behavior, including studies of attention (Finn, Pannozzo, & Voelkl, 1995), participation (Finn, Folger, & Cox, 1991), and on-task behavior (Easton & Engelhard, 1982; Rosenshine & Berliner, 1978). This is the easiest engagement component to identify because it is made up of directly observable behaviors. As part of academic engagement, behavioral engagement can be seen in the actions that indicate a student is positively involved in learning tasks (i.e., paying attention, putting forth effort, participating in classroom lessons, persisting in the face of difficulties, and working on classroom assignments). For the purpose of this study, behavioral engagement will be considered synonymous with student participation. Finn (1989) has developed a scale to rate the quality of participation from the most basic level, responding to

teacher's direction, up through the fourth and highest level in which students take initiative, exerting their autonomy to choose to participate in school activities. With this interpretation, Finn (1993) and others (Finn et al., 1995; Finn & Rock, 1997) have made an important distinction between the minimal engagement of responding when prompted by the teacher, and the rich, self-initiated engagement that is only possible when students also have a strong sense of emotional engagement.

Stipek (2002) identified an important consideration in the interplay between emotional engagement and behavioral engagement. She pointed out that although researchers sometimes determine emotional engagement by interviewing or surveying students, or asking teachers for their perceptions of students, the other often-used tool for determining emotional engagement has been observing student behavior. This may make behavioral engagement even more relevant, since it can serve as an indicator of emotional engagement, especially for very young students who may be somewhat inconsistent in recalling emotional reactions after the conclusion of a lesson. It is therefore not surprising that teachers rely on behavioral engagement as an observable indicator of student's emotional engagement during instruction (Furrer & Skinner, 2003; Patrick, Skinner, & Connell, 1993; Skinner & Belmont, 1993).

Stipek (2002) reported on three studies, only two of which concern this discussion: first, an observational investigation of student engagement during fourth through sixth grade mathematics instruction; second, another observational study of classroom instruction and engagement during both reading and mathematics instruction with second and third grade students.

In the both of these studies, Stipek's findings indicated that the instruction recommended by mathematics and reading experts correlated with student behavioral engagement as shown by

observation of whole class behavior, with significant correlations between many specific instructional recommendations and classroom level student engagement. The particular teacher practices that were significant included ensuring active participation, fostering high-level discussion and asking higher order questions that called for students to make sense of concepts. In both these studies, academic engagement, or student participation, correlated with student achievement.

2.4 READING NEEDS

In addition to academic engagement and participation in reading lessons, the literature offers studies on students' motivation to read. Since students who are motivated to read are more likely to participate in reading instruction, motivation was another factor to consider for this study. An examination of motivation in reading research shows researchers have teased apart attributes that are separate from—but sometimes confused with—motivation, such as attitude and interest. Attitude refers to liking the task. Students who report that they like to read are typically motivated to read more, but liking the task of reading is not equivalent to motivation (McKenna, Kear, & Ellsworth, 1995). Similarly, motivation is not interest. Interest in a particular topic can drive students to discover more about it through reading. So although students may be "motivated" to read about football, dinosaurs, or celebrities, they are actually motivated to discover more about their interest, and they are motivated to read only to the extent that this feeds their interest (Schraw, 1997; Shiefele, 1996).

Researchers (Nolen & Nichols, 1994; Thorkildsen, Nolen, & Fournier, 1994) have found that student reports of practices that are academically motivating often do not match teacher

reports of the same concept. This is another reminder that teacher and student perceptions of classroom effectiveness can differ widely.

As described above in section 2.4.1, researchers have documented decreases in motivation from first through fourth grades (Wigfield, et al., 1997). These are the critical years for establishing strong reading skills and important reading habits if students are to become successful readers. Struggling readers in first grade, after three years of instruction, still tend to be struggling with reading in fourth grade (Juel, 1988). The National Research Panel (1998) and the National Institute of Child Health and Human Development (2000) both concluded that struggling readers have a critical need for systematic and explicit instruction because early identification and intensive instruction can change the trajectory of young, struggling readers (Chard & Kame'enui, 2000; National Research Council, 1998; National Institute of Child Health and Human Development, 2000; Torgeson, 2000; Torgeson, et al., 2001).

Allington (1983) has stated "good and poor readers differ in their reading ability as much because of differences in instruction as variations in individual learning styles or aptitudes" (p. 548). Wenglinksy (2002) offers support for this notion in finding that classroom practices, plus teacher characteristics, have the same effect size as student background on student's academic performance. So if credit for student academic performance (or lack thereof) can be attributed to student's background, as some teachers believe, their classroom practices must split the credit equally.

Gambrell, Wilson and Gantt (1981) found that good readers are generally reading texts at their independent level during instruction, (i.e., texts where they encounter fewer than one unknown word in every 100 words of connected text). In contrast, the researchers found that poor readers were working through texts in which they encountered 10 unknown words out of

every 100 words of text, which is *frustration* level for reading materials. However, when low-achieving readers were given instructional texts that they could read with at least 95% accuracy, the students' time on task rose from 22 percent of the instructional time to 42 percent of the instructional time. Gambrell, et al. (1981) reported more findings that supported this contention. They determined that when students exhibited oral reading error rates of five percent or more, they also exhibited a significant increase in off-task behaviors. This supports Clay's (1971) observation that good readers used "easy" texts for reading instruction but poor readers used "difficult" texts for instruction

Berliner (1981) found consistent evidence that *high* success on tasks was linked to both stronger learning and improved attitude for the content. In contrast, *moderate* success meant less learning, and *low* success meant not only poor learning, but also increased off-task behavior. In other words, not only were these students struggling with academic skills, they were also struggling with academic engagement and were not participating in instruction. In some schools a fair number of students are given texts that do not correspond to their *instructional* level, let alone their *independent* reading level. Chall and Conrad (1991) found that reading anthologies were at an appropriate level of difficulty for 40 to 60 percent of the average readers in the grade, as indicated by their achievement on standardized tests of reading. However, that meant approximately half the average students had reading materials that were too difficult, and all struggling readers faced texts at frustration level. This means that reading lessons must be differentiated to meet learner needs. But it also means that when teachers are providing instruction to a group, high-access instruction becomes critical. Teachers must learn to design lessons based on student interaction and opportunities to respond. Therefore, this study is testing

a method to increase the use of high-access instruction that would establish participation routes for all students during reading lessons.

2.5 HIGH-ACCESS INSTRUCTION

High-access instruction is a phrase coined several years ago by Feldman and Denti (2004) to describe an educational philosophy that accepts all children as capable learners when given appropriate instruction, and describes appropriate instruction as not only highly interactive, but also that which provides opportunities for all students as to participate in instruction, all the time.

> *High-access instruction sees all students as potential assets rather than problems. It also asks teachers to analyze their teaching and look for areas where instruction may be "breaking down," rather than blame their students for not understanding the content. By shifting the paradigm of instruction to variables the teacher controls, high-access instruction lays the groundwork for more interaction between teachers, students, ancillary staff, and parent volunteers.* (Feldman & Denti, 2004, p. 3)

The researchers collected examples of high-access instruction that might be familiar to many educators and discussed how these offer mechanisms for every student to interact with lesson content. They proposed that educators begin using this high-access instruction as a grassroots method of initiating differentiated instruction in their classrooms. They cited methods as widely used as choral responding, the classroom whip around, think-pair-share (Kagan, 1992), and thumbs-up when you know the answer. The researchers also highlighted well-known student partnering strategies, including: Class-wide Peer Tutoring (Greenwood & Delquadri, 1995),

Peer-Assisted Learning Strategies (Fuchs, Fuchs, Mathes, & Simmons, 1997), and Reciprocal Teaching (Palincsar & Brown, 1984). In addition, Feldman and Denti described other instructional strategies that teachers could easily adopt.

As indicated in the section above on student engagement, discovering how to motivate students to participate in instruction is a growing challenge in today's classrooms—full of increasingly diverse learners who have grown accustomed to an electronic world at their fingertips. A number of researchers have reported that teachers can help readers by learning more about motivation (Carmine, Silbert, Kame'enui, Tarver, & Jungjohann, 1997; Guthrie & Davis, 2003; Guthrie & Humenick, 2004; Guthrie & Wigfield, 2004), which could then add excellent insights and techniques to the repertoire of practicing and student teachers. However, for short-term improvement, Feldman and Denti (2004) have outlined high-access instructional techniques, designed to increase student participation in instruction, in essence creating instruction with engagement hooks built in. See Appendix A for a full list of the instruction included in their discussion.

In proposing high-access instruction, Feldman and Denti want to change the way instruction is delivered in American classrooms. Traditional instruction provides many opportunities for the most able students to respond; however, the less able student cannot take advantage of these opportunities for several reasons. The lower-achieving classmate is unlikely to share the background knowledge of a high achiever, or may need more time to think about the answer than the teacher allocated. A lower achiever may lack the confidence to respond in front of classmates and fear embarrassment from a wrong answer. Even more disheartening, a low achieving student may have suffered from poor instruction, so that "holes" in content knowledge prevent him/her from grasping new instruction.

Feldman and Denti (2004) take issue with the undifferentiated instruction provided in many classrooms and propose that high-access instruction can differentiate the lesson so that more students participate in the learning process. High-access instruction would then be especially useful for teachers or schools not yet ready to take other steps to intensify instruction for students who need it, such as adding small-group instruction, spending more time on the lesson, or offering more hands-on, interactive practice with the concept. This reluctance is especially unfortunate because the lower achiever requires more practice to master a skill, and yet has fewer opportunities to participate in the instruction. Essential characteristics of high- and low-access instruction were contrasted in Table 2.

For this study, specific high-access instructional methods made up the focus of instruction. The methods were chosen because they could easily fit into the instructional routines and curricula of most elementary reading programs with minimal training of student teachers and elementary students. These strategies can be easily incorporated into a variety of language arts lesson plans, and will offer a varied repertoire of easily implemented whole-class response options. The methods used are: choral response, both oral and physical—such as "thumbs up if you agree;" classroom whip around; think-(write)-pair-share; CLOZE reading, and random questioning with name cards. (For more detail on these instructional methods, see Appendix A.)

3.0 METHODOLOGY

The purpose of this case study was to document the use of BIE^2 coaching for supervision of undergraduate student teachers by an experienced teacher-coach who was a novice e-coach, in order to build on the research of Rock et al. and push the horizons of supervision. The subjects of the study were three undergraduate student teachers providing reading instruction during their regular placements. Placements were comprised of two separate seven-week student teaching experiences, each placement experience in a different grade level. The current study took place during the subjects' second student teaching placements. Using video recordings of student teachers' reading lessons, field notes and interviews, the study examined four aspects of e-coaching as a supervision tool. These aspects included installation of BIE e-coaching technology in the classrooms and at the "home base" in the college's Education Department; reactions of the student teachers, cooperating teachers, building administrators, and elementary pupils to the e-coaching experience; the e-coach's experience of providing immediate, online, performance feedback to undergraduate student teachers using e-coaching; and the effect of e-coaching on the instructional behaviors of the student teachers. This chapter begins with a statement of the research problem and research questions, then describes the data collection methods and data collection instruments.

3.0.1 Statement of the Problem

During the past thirty years many studies have focused on pre-service reading preparation (Anders, et al., 2000), and in particular there is growing concern about the disconnect between research-validated instruction and the knowledge of reading instruction exhibited by elementary teachers (National Research Council, 1998). Many researchers have recognized that teachers have difficulty transferring learning from pre-service programs to their classroom instruction (Boudah et al., 2001; Bowles & Nelson, 1976; Engelmann, 1988; Gersten et al., 1995; Greenwood & Abbott, 2001; Horton, 1975; Leach & Conto, 1999; Noell et al., 1997; Robinson & Swanton, 1980; Rose & Church, 1998; Scheeler et al., 2008; Vaughn et al., 2000) and have called for strengthening teacher preparation programs by providing greater focus on fieldwork (National Institute of Child Health and Human Development, 2000). This emphasis on fieldwork is one way to help student teachers transfer research-based knowledge from coursework to classrooms.

BIE^2 coaching has been shown to be effective for helping practicing teachers and graduate education students use research-based instruction (Rock et al., 2009-c, 2012). In order to promote wider use of BIE^2 coaching, studies need to demonstrate the ease of operating the BIE system and the efficacy of BIE^2coaching with more and different subjects. To date, however, there have been no reports of installation of BIE technology by naïve users, provision of BIE coaching by a novice e-coach, and reactions of undergraduate student teachers to the BIE coaching experience. The purpose of this case study was to document such an implementation of BIE-coaching. The following research questions framed the study:

1. What roadblocks were encountered in setting up and using the BIE system in the schools and in the "home base"?

2. How reliable was the technology as it was used for student teaching supervision?
3. What were the reactions of the student teachers, cooperating teachers, building administrators and coach to the e-coaching experience?
4. What was it like to provide electronic coaching as prescribed by Rock, et al.?
5. Did BIE e-Coaching appear to have an effect on the instructional behavior of the student teachers?

3.1 PARTICIPANTS AND SETTING

3.1.1 Participants

This research was designed as a case study of three student teacher participants. The five undergraduates planning K-6 elementary student teaching during the Fall 2011 semester at the college were invited to participate. Four student teachers indicated interest. When placements for these student teachers were being set up, school principals were invited to offer their schools as settings for the research. Two principals quickly agreed. Teachers were recruited in the principals' elementary schools to both act as cooperating teachers and open their classrooms for the study. Three teachers quickly volunteered. Student teachers were matched to available placements based on their preferred school locations, which was the usual practice in the college's Education Department. Although the participants and settings were not selected randomly, the researcher did not influence the selection in any material way.

The three elementary student teachers were all over the age of 18, and completed their student teaching in three, different, upper-elementary, classroom sites. All of the participating

student teachers were older than typical undergraduate students, two in their mid-twenties and one in his early-thirties at the time of the study. The study took place during the final two years of kindergarten through sixth grade (K-6) certification in Pennsylvania, when education classes at the college were small and populated by many non-traditional students, so these participants represented the available pool of student teachers. Although the three participants were all seeking K-6 teacher certification, their instructional interests varied: middle school math, K-3 education, and K-6 language arts. All three had already completed a reading practicum and a math practicum, each of which required them to observe one and teach nine subject-area lessons in an elementary classroom.

The three participating elementary schools represented two suburban school districts, one large, with four updated elementary schools, and the other small, with one, older, elementary school. Both school districts consistently made adequate yearly progress on the Pennsylvania System of School Assessment. These districts described themselves as technologically savvy: all classrooms had several computers with current software that was used daily; many teachers had used Skype; both schools were eager to extend their use of technology; and principals in both settings were confident that their technology and technology support staff would be able to easily accommodate the BIE system.

3.1.2 Context

This study was conducted during the latter half of the Fall 2011 semester, when the student teacher participants were engaged in their second seven-week placement. At that time, the college's K-6 Education Program required two, consecutive, seven-week student teaching placements at different elementary grade levels to give student teachers a broad base of

experience. This meant that although the participants were halfway through their student teaching at the time of the study, they were in a new grade, in a new classroom—often in a new school, with unfamiliar elementary pupils and an unknown cooperating teacher. This timing provided a good test of BIE^2 coaching for undergraduate student teachers, because it presented all the potential pitfalls of teaching in a new environment, but the participants had already completed enough student teaching to have developed some level of comfort with the daily routines of instruction.

Three weeks before the start of the BIE experience, the three student teachers participated in an intense, interactive, 30-minute introduction to high access instructional strategies. The PowerPoint used in the training is shown in Appendix C. Training on the BIE system was on-the-job during the baseline phase, since this not only accustomed the student teachers to the technology, but also accustomed their elementary pupils to the equipment. Each cooperating teacher, working with the e-coach, introduced pupils to the BIE system as it was being installed, debugged and tested, and pupils had one opportunity to "act goofy" for the webcam during debugging, to blunt the distraction factor when the observations began. Student teachers required minimal training in the use of the BIE system components, since they were already familiar with Bluetooth headsets, web cameras, and Skype.

Permission was obtained from the parent or guardian of pupils in whose classrooms the student teachers were using BIE coaching. The larger of the two school districts routinely collected permissions for pupils to participate in research, and in still and video photography. This district had distributed a permission form to all parents at the beginning of the school year. Two of the study classrooms were in this district and neither had any pupils whose parent or guardian opted out, or did not sign, the permission form. In the second school, in another district,

the researcher explained the study and asked for parental permission in a letter that was distributed at Parent-Teacher conferences as well as sent home in students' backpacks. (See Appendix D for a copy of the letter). All parents agreed to allow their children to participate in the study.

3.2 THE EQUIPMENT

The BIE system was made up of audio and visual components for both the coach and the participants. Figure 1 shows the equipment the student teachers used. On the left are the USB computer adapter for the headset, the headset, and the power cord/charger for the headset. On the right of Figure 1 is the web camera with its USB cord. Figure 2 shows the equipment the supervisor/researcher will use. This consists of a headset with microphone and audio input jack to plug into a computer, plus an external drive with a power cord and a USB cord. The external drive will store the digital videos of each electronic coaching session

Audio-communication headsets were worn by the participant (Bluetooth headset) and the BIE^2 coach (headset with earphones and a microphone). In addition, the participants used USB adapters to send their audio signals through a computer instead of through a telephone. The coach plugged her headset into a MacBook Pro, sending and receiving audio signals through Skype. Computers were needed on both ends to run the BIE system using Internet access and Skype software for live communication. The e-coach used a MacBook rather than a PC at the suggestion of Dr. Rock (personal communication, May 19, 2011), and she used an external hard drive to store the digital video recordings of observations. BIE coaching sessions were digitally recorded through Skype, using Call Recorder for Mac (a product of Ecamm Network, LLC).

Figure 1. Student teacher Bug-in-ear equipment. Displayed on 8.5x11" paper to show scale.

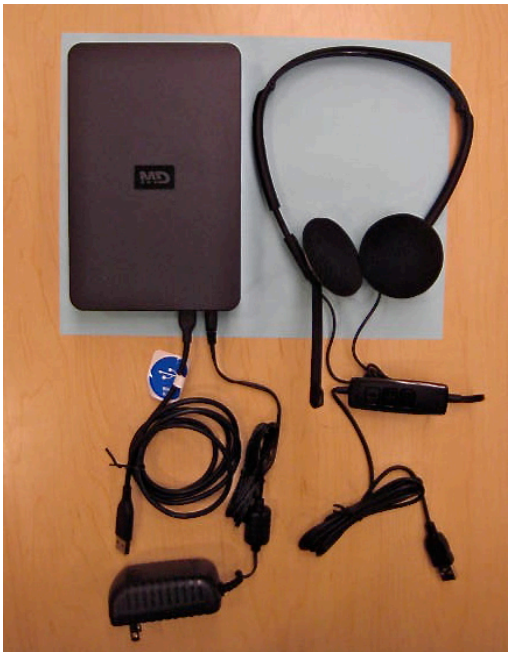


Figure 2. E-coach Bug-in-ear equipment. Displayed on 8.5x11" paper to show scale.

3.3 THE E-COACH

The BIE^2 coach/researcher had had over two decades of experience as a traditional coach of practicing teachers, working for several programs of the Pennsylvania Department of Education, in higher education settings, and as an independent learning and development coach. She prepared for BIE coaching by practicing during testing and baseline observations, when she provided inaudible feedback. She tallied positive and corrective feedback with an Excel spreadsheet on which she time-stamped cells to indicate every instance of each type of feedback. Following the example of Dr. Rock (Personal communication 7/19/11) the researcher-coach set a goal of four to five affirming comments for every corrective comment and used the Excel spreadsheet to track the nature of e-coaching comments. The researcher had used strength-based coaching for many years to help teachers incorporate research based instructional practices and meet a diverse range of reading abilities in a classroom, so this preparation was sufficient to demonstrate to the researcher that she could provide acceptable BIE^2 feedback.

3.4 BIE^2 COACHING

BIE^2 coaching, and therefore observations, were scheduled at specific times by student teachers, based on instructional routines in their classrooms. Coaching sessions ranged from approximately 10 minutes to 60 minutes in length, depending on the lesson's length and the reliability of the technology. The coach and the student teachers agreed to BIE^2 coaching during ten lessons. However, observations and coaching actually took place on a schedule that was

dictated by the school's schedule and by technical problems with the equipment, which were unpredictable. The actual schedule of coaching sessions is provided in Appendix E.

Each student teacher experienced three phases of BIE^2 coaching: *baseline, coaching*, and *maintenance*. During *baseline* the coach silently observed lessons. The equipment was turned on; the Bluetooth receiver was active; the coach and student teacher wore headsets; and the lesson was video-recorded, but the coach provided no feedback to the student teacher. During *coaching,* the second phase, the BIE^2 coach actively provided feedback while the sessions were recorded. The coach observed the student teachers' instruction, and provided live, affirming feedback when she saw interactive behaviors to encourage. She also gave live, corrective feedback when high access prompts were not used but could be effectively inserted. During the final phase, *maintenance,* the coach observed without providing any feedback while equipment recorded teacher instructional behavior.

The BIE^2 coaching feedback consisted of short, context-specific phrases delivered at times that would be minimally distracting to the student teacher so that instruction stayed on-track. The e-coach used affirming remarks such as *good strategy, great question* or *excellent response!* Corrective suggestions prompted the student teacher to use one of the specific high-access strategies that were the focus of the study, such as: *thumbs up, whip around for everyone's response, try a quick partner chat,* or *maybe work in small groups.* Behavioral interventions were sometimes necessary to maintain order, and in these cases the feedback pointed out the problem but did not offer instructional suggestions, for example: *oops--back row, noise level, two girls on the floor,* or *MORE pencil sharpening?* See Appendix F for a transcript of a sample lesson with coaching comments.

Feedback was timed to coincide with pauses in teacher-talk as much as possible. Initially the researcher planned to initiate feedback during the pauses between sentences in order to prevent student teachers from losing their instructional focus. All three student teachers reported that this coaching method was not very distracting. Later, when the researcher tested interrupting instruction to give feedback, all the student teachers exhibited signs of distraction. There was an observable pause for regrouping before instruction began again, and the student teacher sometimes appeared flustered, or asked her/his pupils, "where were we?" This confirmed for the researcher that feedback should be initiated only during pauses in teacher-talk. The coach had to weigh the importance of the specific feedback against the likelihood of interrupting the lesson flow when giving feedback at any other time during the lesson.

3.5 INSTRUMENTATION

3.5.1 Researcher journal

The BIE^2 coach/researcher kept a journal throughout the study, logging hours spent on study-related activities and the excitement and frustrations encountered. The coach's journal entries helped to explain the length of some lessons, or the positives and negatives of a particular e-coaching session, for example:

- *Tried Skyping at 9:05, 9:10, 9:15. Got thru @ 9:20. Coaching only 20 min. long. Never discovered why connection didn't work earlier. Bertie said Internet was working but she got no contact through Skype. Frustrating!*

- *Kept coaching until lesson was over to make up for so many missed opportunities—lesson was 55 min. long! Very hard to maintain concentration over this time. Dry eyes & eyebrows tired of trying to remain neutral.*
- *Spent the half-hour affirming HAI uses! Almost every time I would have prompted, she tossed in HAI. I think it's working!!☺☺!!!*

3.5.2 Recording and coding lessons

Each lesson in the three phases of the study was recorded, for a total of close to 40 digital videos, although the quality of some videos prevented their use in the study. The video recordings were stored on a password-protected dedicated external hard drive. Confidentiality was ensured because no identifying information was placed on the digital videotapes, such as elementary pupil or cooperating teacher names, or school information. Coders received their set of videos on a DVD. Videos were played and coded directly from the DVD without downloading any files. The DVDs were later collected and destroyed so that the only copy of the recordings remained on the password-protected hard-drive.

Two faculty members from the college's education department, who were former elementary teachers and current student teacher supervisors, coded the videos after they were trained. The coding scheme was based on that developed by Rock, et al (Personal communication, May 19, 2011), and was adapted by using a subset of her codes related to high-access and traditional teacher behaviors targeted in this study. For a description of each of the codes see Appendix G. The instrument used to code the data (Appendix H) was an Excel spreadsheet with an automatic time-stamp macro for coders to use each time they wanted to apply a code. This allowed coders to view a video and hit a "Start" cell as soon as they saw a

strategy, and then select the cell with the appropriate content code for strategy, which they hit at the end of the strategy. The Excel spreadsheet was designed to be used quickly and easily in a small space at the bottom of a computer screen, while the coder was watching a video on the same screen. The instrument was extremely flexible in allowing for codes-within-codes, and it contained definitions for each code that could be retrieved by hovering over the column label.

3.5.3 Interviews with key staff

At the end of the seven-week placement, student teachers, cooperating teachers, and principals were each interviewed separately about their experiences with BIE (copies of the interview protocols are provided in Appendix I). The interviews were audio recorded, using an Echo Smart Pen. The Smart Pen allowed the interviewer to simply write key words in each answer, and then by tapping the pen to the key word, play back the interview comments related to that word. Each interview answer, or entire interview, could also be played back. Instead of transcribing the entire interview, the researcher was able to listen to answers or to key word comments across all interviews and make organizational notes while recording new comments. The audio recordings, key words, and notes were organized into coded patterns and analyzed to obtain feedback on how easily the BIE system fit into participant expectations and contexts. These insights were added to case studies to triangulate and support observations and insights.

3.6 PROCEDURES

3.6.1 Training of coders and inter-coder reliability

Coders were trained on both the coding instrument and the codes. The easy to use design of the coding instrument inspired confidence in the coders, who were quick to acclimate to the spreadsheet. The Excel spreadsheet required them to type the file name, and then use two keystrokes to time-stamp a cell in the coded column. Both coders reported almost no difficulties with the data recording spreadsheet, despite very different previous experiences with Excel.

The codes used in the study evolved during coaching, coder training, and reliability work. The researcher began with the assumption that she would prompt student teachers to use one of six HAI methods. However the "think-write-pair-share" method evolved. That strategy required students to prepare a written response to an open-ended question and then take turns sharing these responses with their partners, which can be a time-consuming process in elementary classrooms. If student teachers had not planned for this time expenditure, it could be problematic. So the simpler, and broader, "partner chat" was substituted. In a "partner chat" students are given a brief thinking-time, and then respond orally to the teacher's prompt. Partner chats encompass quick discussions, sharing of answers, reaching a consensus, brainstorming, and more, yet they can be executed very quickly.

At the first training, coders were given an excel spreadsheet with columns prepared for coding the following high-access instructional moves: choral response, signaling physically, whip-around, partner chat, cloze reading, and random questioning with name cards. The spreadsheet also had columns to code these traditional instructional moves: hand raising, blurt outs, and round robin, when one after the other—in order—students gave an answer or

performed a task. During the training, coders had trouble remembering that instruction was only coded if it provided student response opportunities. They wanted to code as much as possible. By the end of the practice sessions during training, coders understood that HAI was designed to have chances for all students to respond, and the focus of all coding was not instruction in general but student response opportunities.

At the researchers request, the two coders, who were experienced teachers and student teacher supervisors, were asked to report any instruction calling for student responses that was not covered in the set of available codes. The coders found one type of student response opportunity that did not fit any code, and "small group work" was added to the codes as described in the first wave of coding below.

The two coders were trained in a half-day, and most of that time was spent in coding-practice on videos of non-participating student teachers and You Tube videos. During each practice session, the two coders and the researcher discussed the use of codes and refined the operational definitions for each code. At the end of the training, the coders received an email with these operational definitions, and a CD with the videos to be coded.

Twenty percent of the 37 videos were to be double-coded, and these eight were selected by drawing video titles from a basket. Five videos were removed from the selection pool, two that were 10 minutes or less, and three that were an hour each (58, 59, 63 minutes), because neither group was typical of the lessons which otherwise ranged from 20 to 50 minutes. Videos were assigned to either Coder A or Coder B based on two factors. The first factor was accommodation for Coder B's slightly impaired hearing, which meant that the selected videos with poor audio quality were assigned to Coder A. After that, the second factor was assignment of a relatively equal number of video minutes to each coder. Once videos were assigned, each

coder got a list of the videos to code and the order of coding, so that the first to be coded were the 20% of videos for double-coding.

Reliability was established in three waves. In the first wave each coder worked on videos that would be assigned to the other coder late in the sequence of videos. The researcher reviewed each coder's completed Excel sheet as she watched the coded videos. During this wave the researcher identified errors in the use of codes by Coder A and Coder B compared to the operational definitions, errors in not applying codes when teacher behavior called for it, and inconsistencies in interpretation of the same code by the two coders. This provided a rough estimate of 58% reliability (the number of codes the researcher deemed errors or inconsistent interpretations, divided by the total number of codes used). The coders and the researcher met to discuss the errors and inconsistent interpretations. During this discussion they refined the coding rules and definitions. One major change was the addition of a HAI code for "small group work" which covered the student response opportunities presented when students worked together on an assigned task. "Small group work" either had specific roles assigned to each student, or the students jointly completed a single task, so that they had to discuss and problem solve as they worked.

For the second wave, the coders worked on a study video from the bottom of the list for Coder B. They coded the same video independently, agreeing on 72% of the codes, which was not acceptable reliability. The researcher and the coders then met and went through each coded instance for this video, applauding matching codes and clarifying differences. This was accomplished by jointly viewing the video with its two code sheets. The three agreed on a range of examples for each of the codes based on what was seen in student teacher videos, and their prior knowledge of student teachers' instruction in general, after which the coders reported much

more confidence in their coding ability. Another video from the end of Coder A's list was viewed together but coded independently in this second wave meeting. The coders agreed on 83% of codes.

In the third wave of reliability checking, the two coders sat in a meeting room, independently reviewing and coding a study video, pausing the video when they wanted to apply a code, and saying their code choice aloud. They appeared to be contestants on a quiz show to the researcher, who was observing. The coders were stopping almost simultaneously and saying the same codes aloud. In this exciting fashion the third wave reached reliability on 12 matching code choices out of 13, or 92%. There were no differences between code choices but one instance of coder error, missing a quick "blurt out" while another student was answering.

After this, Coder A and Coder B independently viewed and coded the 20% of videos that were slated for double coding. Throughout the double coding, inter-coder reliability ranged from 89 to 92 percent, with an average of 90.5% reliability for double coding.

3.6.2 Protocol of a BIE^2 coaching session

BIE^2 coaching appointments were scheduled for the week in a pre-observation conference between the student teacher and the coach. Five to 20 minutes before the scheduled session, the student teacher called in on Skype and turned on the headset/USB adapter. During this same time, the coach logged on to Skype and made certain her equipment was working. The participant used Skype to "call" the e-coach. In the minute before the lesson began the student teacher gave a one or two sentence description of the lesson, and if needed the e-coach helped the student teacher to choose HAI strategies on which to focus. The coach began the digital recording on Skype and student teacher participant started the reading or language arts lesson.

The BIE^2 coach observed each lesson, looking specifically at the opportunities provided for elementary pupils to repond. In addition the coach noted other praiseworthy instructional or management moves that could be highlighted, as well as ineffective classroom management that allowed pupil behaviors to interfere with potential HAI.. The goal of coaching was to provide feedback that increased the use of HAI strategies. As described previously, the BIE^2 coach used a strengths-based approach in providing feedback, giving five affirming comments for every corrective comment. This meant that in order to provide enough affirming feedback the coach applauded both HAI and other good moves, both for instruction and managment. Occasionally it also meant that corrective feedback was held in check. At the start of the study, the coach kept an informal running tally of reinforcing or corrective prompts, however once it became clear that the researcher's habitual coaching style provided feedback with a ratio of four to six affirmation for every corrective comment, the tallying was discontinued because it distracted the coach.

4.0 CASE STUDIES

4.1 INTRODUCTION

Three student teachers were selected as participants in this study, as described in the methods chapter. Each participant was the subject of a case study. The three student teachers, two young women and a young man, were slightly older than traditional students. Each had come to the college as a transfer student to complete a Bachelor's degree and K-6 certification (before the window for K-6 certification in Pennsylvania was closed). In recent years the college had prepared many similar transfer students to become teachers, so these three participants represented a significant subgroup of education students. In addition, these individuals had proven themselves to be very adept education students, and each expressed the desire to participate in the study in order to further enhance their teaching skills. Studying their experiences with BIE electronic coaching provided significant insights into using e-coaching as a student teacher supervision tool.

4.2 STUDENT TEACHER #1: YVETTE

4.2.1 Participants

4.2.1.1 Student Teacher #1 Yvette was a very conscientious, 26-year old, undergraduate, elementary education student. By the time of the study, she had completed all her coursework, usually earning "A" grades. However, she did not indulge in creatively designed lessons or in thinking "outside the box." Yvette did exactly what was expected of her in most courses, and she managed her time to ensure she was able to meet basic expectations. She was content to do just what was expected because it took less time. Yvette juggled coursework, employment, and a committed boyfriend. Yvette kept her campus commitments to a minimum. She joined Kappa Delta Epsilon (KDE), a national professional society for education students; however, her work and class schedule prevented her from participating in KDE's service project, providing after-school tutoring. During the course of this study, Yvette got engaged, but she did not let that divert her from focusing on her student teaching. This meant that at times she felt frustrated by her busy life, but she persevered.

Yvette was highly motivated to get her elementary and special education certifications. She had known for years that she wanted to teach young children, and had been employed as an early childhood teacher in a day care center while taking her college courses. In that role she learned to depend on schedules, structure, rules and routine to maintain a good learning environment, and she carried these convictions with her into student teaching. She did not focus on developing a deep knowledge of any content area, because she hoped to teach in primary grades where she felt she could focus on breadth of exposure and pedagogical skill rather than depth of content knowledge.

During reading practicum and math practicum, Yvette had successfully planned and taught nine lessons in each content area. For elementary student teaching she had two seven-week placements, like all the college's elementary student teachers. Her first placement was in kindergarten, where she excelled. Yvette and the kindergarten cooperating teacher shared the same convictions about creating an appropriate learning environment through structure, routine, and rules. Yvette's experience as an early childhood teacher helped her to work well with the kindergarten students. Her broad understanding of all that was encompassed in the kindergarten curriculum, combined with her preference for step-by-step, teacher-centered instruction worked well in this first placement.

That same approach made her second placement a bit more of a struggle. Yvette's second placement was in a fifth grade language arts classroom. She acknowledged that the language arts were not her strength, and she was concerned because she had never worked with older children before. She quickly learned that her new cooperating teacher and fifth grade students all expected a much looser structure, more give-and-take interactions, and deeper content knowledge during instruction. However, Yvettte's willingness to do what was expected pushed her to broaden her content knowledge somewhat, and to slightly loosen her tight control of the classroom. As the weeks went on, she became more comfortable with these changes, and her cooperating teacher became more comfortable with Yvette's ability to teach fifth grade students—though they both acknowledged that the language arts were not Yvette's strength.

4.2.1.2 Cooperating teacher for student teacher #1 Yvette's cooperating teacher, Bertie, was a Caucasian female approximately 39 years old, who taught language arts for most of her 15 year career, and had been in a fifth grade classroom in the Horace Mann School District for eight

years. Throughout her career, she pursued professional development in language arts and in methods of teaching. Bertie regularly used the Smart Board for instruction, and included student computer assignments during some instruction. Her computers and software were upgraded during the weeks of Yvette's placement. Bertie already had a Skype account before the study began, and had used Skype in the recent past for an instructional project. She also used Skype when needed for meetings with a parent stationed overseas. She was familiar with using a web camera, though not familiar with Bluetooth. Generally, Bertie felt very comfortable with the BIE equipment. Of all three cooperating teachers in the study, she was the most intrigued by the potential of BIE technology as a tool for student teacher supervision, and she did the troubleshooting during Yvette's BIE^2 coaching.

4.2.2 Setting

4.2.2.1 The school and school district The Horace Mann School District is a small suburban district that has always made adequate yearly progress on the Pennsylvania System of School Assessment, but it had stayed below the radar for parents seeking districts with prestigious reputations. The district had one elementary school building, Horace Mann Elementary, with three classes of each grade level, kindergarten through fifth, and an inclusive model of education. The teachers all knew each other, and knew all the children who had passed through their grade. The school was situated on a quiet hill, surrounded by open lawn and woods. The building was not new, but many walls had been embellished with rich, primitive-style, floor to ceiling murals; student work was displayed all over the school; and teachers imbued classrooms with their own individual sense of style. Total enrollment in the district was 1,395, with 671 of these students in the elementary school. The elementary student body was 96 percent Caucasian, with 12 percent

of students eligible for free or reduced lunch. The principal expressed concern because for the three most recent school years scores on the Pennsylvania System of School Assessment dropped as her elementary students got older. In 2011 the percentage of students at or above proficient in reading slid from a third grade high of 93%, down to 85% in fourth grade, and just 76% by fifth grade. While percentages were slightly different each year, the overall drop in scores was stubbornly consistent.

The Horace Mann school district had been a wonderful setting for student teachers because pre-service teachers had been able to network with teachers in many grade levels and across many disciplines. Yvette liked Horace Mann so much that she and her first cooperating teacher arranged for Yvette's second elementary placement and her special education placement to be in the same school.

4.2.2.2 Elementary classroom Yvette was placed in a fifth grade language arts classroom for her second, seven-week student teaching assignment (i.e., during the time of this study). The fifth grade classroom consisted of 28 students, six of whom had Individualized Education Plans, four that addressed academic needs, and two that addressed behavioral needs. While a few students in the class needed to be asked a direct question before they would participate, the majority of the students responded to teacher prompts and queries without hesitation. It was clear that Yvette's cooperating teacher preferred an interactive classroom and had taught her students that participation was expected, and responses, whether right or wrong, constituted an acceptable form of interaction. Instructional language was positive, and strength based, so students did not regard participation as risky. The students were relatively responsive, and even supportive of

each other's attempts to participate. The overall tone of the classroom was encouraging and lively.

4.2.3 Implementation

4.2.3.1 Equipment set up and debugging The two weeks before Yvette's second placement were allocated to setting up and debugging equipment. Installation of home base (college) equipment did not take long. Although the college used PCs almost exclusively, the education department provided the researcher with a MacBook Pro. The initial installation of the BIE system took two visits, each lasting about two hours. Unfortunately, college technical staff had little familiarity with Mac computers and software, so once installation was complete they had little to offer in further support or trouble-shooting.

In Horace Mann Elementary School, equipment set up and debugging proved more complicated. The principal asked district's technical support person, Hal, to complete this work but he had very limited availability. As a result, the researcher tried to set up the equipment herself, but had to stop because the district's computers required administrator passwords for any new installation. A few days passed until Hal visited the classroom, but then he spent more than two hours installing equipment and software. When tested, both the video and audio feeds were problematic, but Hal was out of time. The next day he came back for an hour but was still unable to finish debugging. It took a third, and then a fourth visit to get the equipment running reliably. When Yvette's placement began, she experienced equipment glitches until debugging was finally successful on the third day of her placement. She immediately reported that the headset was relatively comfortable, and that she was ready to begin.

4.2.3.2 Student teacher and classroom pupil preparation At the outset of the study, the researcher met with Yvette to explain how BIE^2 coaching and the related data collection would work. During a student teaching seminar class, all student teachers, including Yvette, had participated in a workshop on high-access instructional strategies that included both discussion and interactive examples. The PowerPoint from the training can be seen in Appendix C. Yvette was given the option to do a trial run of BIE^2 coaching before data collection began but she felt that it was unnecessary.

Yvette's fifth grade class was given a very short explanation of the study and their role. The researcher introduced herself, and explained how and why student teachers were supervised. She said the college wanted to pilot a new way to coach student teachers, using Skype, a web camera and a Bluetooth headset, and then she displayed and discussed the equipment. Many of the students were familiar with Skype and the equipment. The researcher ended by telling students that the web cam would be focused on the student teacher, and that students should act normally. This introduction to the study ended with a short question and answer session.

One consequence of encouraging students in this lively class to "act normally" was that they all wanted to "play" for the camera at the beginning of the study. During the first video session, a handful of students made the most of the minutes when the camera equipment was on but the lesson was not yet underway by waving their hands wildly, making faces, or ostentatiously changing their seating positions. Yvette easily stopped this behavior. Students who continued to fuss learned that distracting behavior got no reaction from "that lady on the computer," but earned a redirection from the student teacher. After the first couple sessions the novelty, and misbehavior, faded.

4.2.4 Bug-in-Ear E-coaching (BIE^2) sessions

Yvette had 13 Bug-in-Ear sessions during her seven-week student teaching placement, and nine of those were BIE^2 coaching. In addition she had four observations without coaching, two at the start of the placement (baseline) and two at the end (maintenance). Yvette had no more than two consecutive BIE days in seven weeks. Her 14 session days required 29 school days to complete—during a placement that included only 33 school days.

4.2.5 Baseline observations

Both baseline observations were 30 minutes long. Data for these lessons appear in the first two rows in Table 3, which summarizes all of Yvette's observed lessons. Each row in this table represents one lesson, which is identified in the first column. The data for each lesson include the number of student response opportunities that were HAI and the number that were traditional, the proportion of all response opportunities that were HAI, the length of the lesson and the group size. The first baseline was a whole group text discussion, with some small group work embedded. This lesson structure was coded as "split" signifying a split between large and small group work. The second baseline was a whole class lesson during which students followed directions to complete a series of independent seatwork assignments. The "whole group" code assigned to this lesson reflected the type of instruction and delivery used throughout the lesson. As a result the baselines showed two very different patterns of instruction (see Table 3). The first session was highly interactive, with Yvette asking 23 questions, 16 of which required students to raise hands and be called on to answer. The other 7 questions asked for a choral response, but none of these were substantive exchanges. Yvette used very basic HAI when she asked simple

yes/no questions such as: *do you agree,* or *do you think that would be easy.* When most students responded, she did not require the rest of the students to participate. This relatively weak instruction was in fact Yvette's early use of HAI and was therefore coded as such. During the second baseline observation, Yvette asked only one question and students raised hands to answer. Overall, her instructional pace was brisk and she attempted to minimize instructional down time with efficient routines, but questions and directions were not always clear, and she spent significant instructional time addressing individual confusion over the text or the instructional tasks. In short, during baseline, Yvette appeared to rely on traditional recitation practices for most of her instruction.

4.2.6 BIE^2 coaching sessions

BIE^2 coaching was new to the coach as well as the student teacher. The coach relied heavily on her previous experience coaching practicing teachers to include more research based instruction in their language arts lessons, as well as her knowledge of student teacher supervision in general and the participating student teachers in particular. Guided by this knowledge, she created a list of possible BIE^2 coaching comments that she kept by her side as she coached Yvette's first three lessons. However, in those lessons, she found no need to refer to the list, because she used the coaching comments that matched the lesson and the student teacher. Feedback for Yvette's first lesson was representative of coaching feedback used throughout the study: *Lots of participation!; The think-aloud helped; Excellent question; Good wait-time; Try choral response; Nice behavior control; Let them partner-chat; Good connection; Now whip around the room; Good choral response; Excellent partner chat; Noise level??; Choral response rocks for rules!; Nice control; Great way to 'whip around the room—I see lots of smiles;' Loving choral response.* After

evaluating the first three lessons, the coach saw that she had no difficulty with affirming or correcting, and automatically gave four or five affirmations for every correction without using the list of comments or tallying affirming and correcting feedback.

The coach maintained fidelity to the affirming and corrective feedback ratio, and ensured that her comments were short and specific by evaluating her coaching in a similar way when she began work with second and then the third student teacher.

BIE^2 coaching began with a 45-minute lesson in which Yvette was modeling how to ask questions of the text during reading. Yvette's modeling style was very self-involved and she supported each question with a lot of think-aloud comments. After modeling, Yvette asked students to give feedback on her questions—initially by raising hands and waiting to be called on. However, the e-coach gave three corrective prompts during the first 15 minutes of the lesson. After these three prompts, Yvette realized how to insert HAI prompts into her modeling pattern, and continued to do so without further prompting. The first e-coaching session generated four choral responses, two partner chats and two whips around the room, for a total of ten uses of HAI. Eleven times she used traditional prompts to get student feedback, and six of these resulted in students blurting out answers rather than waiting to be called on.

The second and third coaching sessions were much shorter, 25 and 20 minutes respectively, and they offered very different coaching opportunities. In the second, very lively, session students were reading and acting out a text. Yvette asked students to raise hands to respond six times—twice children blurted out answers before she could call on anyone. In this engaging lesson, the coach easily gave nine affirming prompts. Yvette used HAI twice. The third e-coaching session took place when Yvette was organizing one of three literature groups, which she did with a lot of oral directions. This was a lesson in which the coach worked hard to give

nine affirmations, but only four corrections. Yvette used HAI three times, twice in response to prompts and one more time on her own. The fourth session was only ten minutes long due to technical problems, and Yvette talked the entire time. The lesson was about visualizing as you read, and Yvette did not pause long enough for any prompts; she only broke to ask one question.

BIE^2 coaching session five was a 20-minute lesson introducing and then practicing a concept. In that lesson the coach easily gave five affirmations and one or two corrective prompts. Yvette offered 11 opportunities for students to respond in the fifth session, and five of those were HAI. HAI began to increase after that. She offered 12 opportunities in the sixth session, and amazingly nine of those were HAI—with only one corrective prompt from the coach.

Yvette admitted that she was finding it easier to use HAI all the time. E-coaching sessions seven and eight were slightly longer, 35 minutes, and each included independent work and direct instruction. In these lessons the e-coach again offered 1-2 corrective prompts. Due to the nature of the lessons, Yvette offered only seven response opportunities in each. But all of the opportunities in session seven were HAI, as were six out of seven opportunities in the eighth session. The final e-coaching session lasted only nine minutes, and was filled with instructions on how students would be functioning in their literature circles. The coach managed to give three affirmations and two suggestions, but Yvette only had time for two questions, both of which used HAI. So overall, Yvette showed a higher proportion of HAI in the last four of her e-coached lessons than in first five lessons. She did not seem to add the HAI on to her existing instruction, but rather replaced the existing, traditional, student response opportunities with high access opportunities.

Table 3. Summary of data for Yvette's coded lesson

Session	Total HAI	Total Traditional	HAI Percentage of all response opportunities	Minutes	Group Size
Baseline 1	7	16	0.30	30	split
Baseline 2	0	1	0.00	30	whole
Coaching 1	10	11	0.48	45	split
Coaching 2	2	6	0.25	25	whole
Coaching 3	3	2	0.60	20	whole
Coaching 4	0	1	0.00	10	whole
Coaching 5	5	6	0.45	20	whole
Coaching 6	9	3	0.75	25	whole
Coaching 7	7	0	1.00	34	split
Coaching 8	6	1	0.86	35	whole
Coaching 9	2	0	1.00	9	whole
Maintenance 1	8	8	0.50	30	whole
Maintenance 2	20	11	0.65	30	split

*split: whole group of 12 or more with some small group work included

4.2.7 Maintenance sessions

One week after the last e-coaching session, two of Yvette's lessons were observed to check for maintenance of HAI. Both observation sessions were 30 minutes, and each focused on practice, and included some instruction. During the first maintenance observation Yvette offered 16 response opportunities, alternating between asking students to raise hands and asking them to use a choral response. The second lesson was much more interactive, with 31 response opportunities. In this lesson Yvette's instruction pattern was to use HAI first, and then if needed, to follow up with a clarifying question directed to specific students. During the second maintenance observation she had 20 instances of HAI and 11 of traditional instruction. These instructional patterns seemed to indicate that Yvette had made HAI part of her regular instruction. In her two baseline lessons, HAI made up 0-30% of her instruction. In the maintenance lessons, HAI made up 50-65% of Yvette's instruction. However, when using HAI in maintenance lessons, Yvette tended to ask more substantive questions, asking students to write answers on individual whiteboards and hold them up, or asking them to choose a response category, rather than asking just the yes/no questions that predominated in her baseline lessons. However maintenance lessons did not maintain the very high proportion of HAI seen in her final four coached lessons, perhaps indicating that Yvette had found a level of HAI that she could maintain without support.

4.2.8 Interviews

4.2.8.1 Yvette Yvette provided some valuable insights during her interview, but more importantly for the study, she confirmed much of what the study seemed to be revealing. She started her interview with a statement that characterized her total experience with BIE coaching,

saying that it "had its ups and downs. Technology was not always my friend, but overall it was good." The interview consisted of 15 questions (Appendix I) that concerned the experience of BIE coaching, what was learned from the coaching, and implications for student teaching and supervision.

Yvette reported that her experience with BIE^2 coaching generally was positive, and it helped her instruction. She did not feel that the immediate feedback was intrusive, and she appreciated both the affirmations and the suggestions. Yvette reported that the students in her class were not distracted by the e-coaching or by the equipment. Despite these positive statements, Yvette reported that there were times when she felt that e-coaching delayed the "process of getting through a lesson." She also commented on the frequency of technical problems. Yvette attributed a great deal of the success of her BIE experience to her cooperating teacher, Bertie, who was always willing to troubleshoot when technical glitches occurred (and they occurred in almost every session). That meant that those glitches did not interrupt the flow of Yvette's teaching. Although Bertie usually dealt with those problems, Yvette was distracted by the realization that something was wrong.

Yvette confirmed that she had learned many things from her BIE^2 coaching but two things stood out. Foremost was that trying to implement high access instruction (HAI) helped her to learn more about her students and their learning. She was familiar with many of her students' learning needs, but using HAI allowed her to actually *see* who was "getting it." HAI offered "extra data" by providing quick formative assessments throughout a lesson. Yvette's second insight came at the end of the study when she reflected on how much her increased use of HAI had changed her teaching style. She reported being particularly drawn to the ease and efficiency

of choral response. Yvette recognized that she now used HAI during large group instruction, and she began to consider ways to increase engagement in small group instruction as well.

Yvette's analysis of the use of BIE^2 coaching as a student teaching supervision tool was succinct. First, she was convinced that having a cooperating teacher who could help with technical trouble shooting was essential for successful BIE^2 coaching. Second, she felt strongly that BIE coaching would work well for student teachers who had the ability to shift their attention from what students were saying to what the coach was saying, and back again. Yvette thought of this ability as an inherent "personality" trait, while the coach viewed it as instructional flexibility, a teachable trait.

4.2.8.2 Bertie and building administrator The cooperating teacher, Bertie, like Yvette, was positive about the BIE experience in general, and stated repeatedly that e-coaching "became routine," and "worked, and just sort of became part of what we did." She confessed that before the BIE^2 coaching began she thought it was not going to work because it would be too intrusive for the student teacher and disruptive for the fifth grade students. However Bertie admitted that her initial worries were laid to rest once the study was implemented. The initial distraction presented by the equipment dissipated after the first two e-coaching sessions at which time, Bertie stated:

> *I thought it was such an interesting way for pre-service teachers to get feedback, more than just from me on a regular basis. Because I am the only source of regular feedback that pre-teachers get in my classroom and so much of that [feedback] is funneled by my own teaching style and my agenda. Having regular feedback from somebody coming from a different perspective is a wonderful thing [for the student teacher].*

Bertie was not as concerned about technology glitches as was her student teacher. She felt that the technology was innovative and its use was "fairly smooth." However she also reported that had they not had their computer support person, Hal, she didn't know what they would have done. Hal described his work as follows, "It wasn't difficult—once you figured it out. But it [took] time."

A larger issue for Bertie was the difficulty in scheduling BIE^2 coaching sessions. "Especially when you teach blocks like we do. Scheduling is fluid, and that didn't always mesh up with the scheduled times and we found ourselves having to accommodate the scheduled time for the Skyping."

However, most of Bertie's concerns related to the use of BIE coaching as a student teacher supervision tool. Bertie felt that a major factor in the effectiveness of the e-coaching was Yvette's confidence and ability to accept feedback, saying that:

> *because just the idea of feedback, whether it's positive or negative, just the idea of somebody watching you all the time, can be daunting for somebody who doesn't feel a level of confidence in the classroom. ...It could be transformative for a student teacher who was on board to really, really look at their own practice in classroom, or it could blow them out of the water. Whoever might be using this, they would have to really know who that student teacher is in order to make [the coaching] effective. But if you were in a larger university where you had some random supervisor, that's not always how it is. That would be my biggest worry.*

Despite these cautions, Bertie reported that the e-coaching could be helpful for student teachers, especially because feedback was immediate and provided a different perspective from that of the cooperating teacher. To sum up one of her insights she declared that:

The feedback I might be giving after coming from a meeting where a parent yelled at me, and I'm worried about this kid. I'm giving feedback really, in the heat of the moment. My feedback may not always be as pure as the feedback in your protocol format.

On the other hand, Bertie also shared her advice for other cooperating teachers considering BIE^2 coaching:

Teachers tend to be very protective of their classrooms and tend to want as much privacy as they can get. It does sound, when you explain it, like it could be very intrusive. It's nowhere near as much of a consideration as I thought it was going to be!

The principal interview, following the protocol (Appendix I), said other than offering support through the district technology staff, she was not aware of any complications related to BIE^2 coaching—and she would have been because she is very close to her staff. Furthermore, she felt positive about the entire experience of supporting better student teacher preparation and would certainly recommend it to others. Overall her interview did not offer much additional data. Rather supported what was reported in other interviews, and added the insight that building administration may not have a big role to play in BIE^2 coaching.

4.3 STUDENT TEACHER #2: ANTHONY

4.3.1 Participants

4.3.1.1 Student teacher #2 Anthony was an extremely articulate, committed, non-traditional undergraduate student in the elementary education program. He was 34 years old at the time of

the study, and he had been married for several years. Anthony had an impressive vocabulary and a deep-seated love of literature and the language arts. He was very adept with technology, making excellent use of Smart Board, PowerPoint and Internet resources in his course assignments and student teaching. His coursework was accurate, creative and never late. He quickly earned the respect of his instructors, and a high grade point average. He was well liked by his peers, and helpful to his classmates.

Anthony juggled married life, courses, and employment with apparent ease. He kept his end goal in mind through the day-to-day ups and down, and did not exhibit the same level of angst and frustration as most students in the program. His reason for choosing a career in elementary education differed from many other students who wanted to work with children, or loved school as a child and always wanted to be a teacher. Instead, Anthony chose a career in education because he wanted to share his appreciation of literature and language, and he laughingly said he "wanted to use his powers for good." He tended to be somewhat cautious with children, having had little experience working with children before entering the education program. In his first one or two weeks in a new classroom this came across as a rather silted presentation approach and an overly hearty, "we're-sure-having-fun" tone of voice. In this, his second student teaching placement, he overcame his stiltedness more quickly, establishing his normal instructional style within the first week.

One of Anthony's best traits as a future educator was his desire to take extra steps in his instruction. He wanted a thorough understanding of the topics he taught. He was often not satisfied with what he found in a textbook, so he checked additional print or online resources for more information. He enjoyed writing the stories and making up the word problems that he used

in lessons—and his students appreciated that work. Naturally his students were featured in his creative work, which engaged them even more in the lesson.

Like Yvette, Anthony successfully taught nine lessons in a language arts practicum and another nine in a math practicum in the semesters before student teaching, and he did well in both settings. Anthony also had two, seven-week student teaching placements for elementary education. His first placement was in kindergarten, and his second in third grade. Both cooperating teachers spoke very highly of him by the time each placement ended.

4.3.1.2 Cooperating teacher for student #2 Anthony's cooperating teacher, Mary, was a Caucasian female, approximately 48 years old, who had taught different elementary grades during her career, but had spent the last ten years teaching third grade at Jefferson School. She kept up with instructional trends through district in-service training, but did not seek out other training. She was soft spoken, with excellent classroom management and well-structured routines. However she freely admitted that technology was something she tended to avoid. Luckily, Anthony was prepared to step into the breach with the BIE equipment. During planning and the early weeks of BIE^2 coaching, Mary was not sure if the BIE technology would be a helpful tool for student teacher supervision, because she feared it would eliminate the face-to-face interaction that she believed was necessary for the professional development of pre-service teachers. Her opinion changed as BIE^2 coaching continued.

4.3.2 Setting

4.3.2.1 The school and school district The John Dewey School District was a large, highly regarded suburban district. The Jefferson School housed an elementary and middle schools, in a

modern, well-maintained building. Student work was beautifully showcased in display cabinets near the office or hung in designated areas in hallways. Grade level teams worked closely together and had an abundance of supplies and materials as well as support from building administration. Parents were often in the building and the entrance screening system was sophisticated and well-enforced.

The elementary school spanned kindergarten through grade four, and during the study had fewer than 10 students designated as either economically challenged, English language learners, African American, or Hispanic. The families who send children to this school tended to be predominately middle- to upper-income, and many parents held professional positions. Results on the Pennsylvania System of School Assessment (PSSA) and PSSA-Modified tests for the 2010-2011 school year showed that 89 percent of all students and 54 percent of students with IEPs were proficient or above in reading, and 97 percent of all students and 83 percent of students with IEPs were proficient or above in mathematics. The principal expressed concern over the students who struggled with reading, and welcomed the opportunity presented by this study to help student teachers improve language arts instruction. The principal was justifiably proud of the state of technology in the building. All classrooms had up-to-date computers, reliable Internet access, and Smart Boards. The school used the computer teacher for technical support, although there was also a technology aide for the school. Jefferson School was a good placement for Anthony's second student teaching assignment because his cooperating teacher gave Anthony free rein with all equipment, both for the BIE system and for instruction.

4.3.2.2 Elementary classroom Anthony was a student teacher in a third grade classroom of 23 literate, well-spoken students. There were very few behavior problems, due to the students

themselves and because Mary, the cooperating teacher, had an excellent, low-key management style. The physical space of the classroom was well organized, with enough room for students to work as a whole class or in small groups. The classroom had several computers with Internet access. Mary preferred a relatively quiet classroom, so student chatter was usually subdued, although participation did not seem constrained. There was less clowning-around by Anthony's third graders than was seen in either of the other two case study classrooms. The tone of the room was supportive. Within two weeks Anthony developed a strong rapport with the children.

4.3.3 Implementation

4.3.3.1 Equipment set up and debugging Equipment installation took only two days because the principal suggested that Chris, the computer teacher and the building's technology support, make time to complete the installation. However, debugging took two more days because the audio feed was not reliable. In the end, Anthony coaxed the system along, rebooting the equipment, turning the Bluetooth on and off several times, repositioning the webcam, restarting Skype and so forth, so that the system became functional and he became the trouble-shooter in his classroom. Fortunately, the base unit did not experience any special problems with Anthony's equipment.

4.3.3.2 Student teacher and classroom pupil preparation Student teacher preparation and elementary pupil presentation/orientation were similar to that presented in Yvette's case study.

4.3.4 Bug-in-Ear E-coaching (BIE^2) Sessions

Once BIE^2 coaching began for Anthony, he had seven e-coaching sessions during which usable data were collected. Before and after coaching, Anthony had two baseline observations and two maintenance observations without coaching. These 11 BIE sessions spanned 25 school days. Eight originally scheduled BIE^2 coaching sessions were cancelled due to conflicts with the school schedule, and three because the e-coach was waiting for Helena (the third student teacher participant in this study) to get her coaching sessions underway. Technological glitches prevented sessions on three additional days, and shortened one e-coaching session. The glitches caused cancellations when the problem was either inability to Skype or lack of audio signal, because there was no way to provide feedback under those conditions. Sometimes audio or Skype glitches flared up but did not last, so it was possible to provide a shortened coaching session by using the remaining minutes of the lesson. This happened during Anthony's sixth coaching session, which was shortened by 10 minutes. Unlike the other student teachers, he did not experience difficulties with the video. Despite these problems Anthony always had two or more consecutive e-coaching days. Clearly calendar issues were more troublesome than technology glitches in Anthony's case.

4.3.5 Baseline observations

Anthony's two baseline observations were of whole group lessons, 30 and 35 minutes long. He clearly had a good rapport with his students, and they did not hesitate to speak up when they had the opportunity; however, there were only 19 such opportunities over the two lessons. Anthony provided six instances of HAI (choral response) in his baseline lesson. This meant that HAI

made up one third of his response opportunities. (See Table 4.) During these baseline observations Anthony used a lot of teacher-talk and direct instruction, rather than HAI.

4.3.6 BIE^2 coaching sessions

Anthony's maturity and desire to succeed as an educator provided a strong foundation for e-coaching because he was able to accept affirming and corrective feedback equally well. He was willing to engage in problem solving, whether the problem was a schedule conflict or a suggested change in instruction. Anthony remained flexible throughout the BIE^2 coaching, and he seemed to be actively trying to incorporate the corrective feedback and lesson suggestions the e-coach provided. He occasionally asked the e-coach to repeat a comment that he had not heard, or to wait while he listened to a student. The e-coach followed the same protocol described in Yvette's case: trying to reach a ratio of five affirming prompts for every corrective prompt and inserting prompts in instructional lulls. Providing the five to one ratio of positive feedback to corrective feedback was not difficult, since Anthony's overall instruction demonstrated clear, specific, positive language and good content knowledge. The e-coach averaged a ratio of 4.9 affirmations to each corrective comment.

Anthony had a total of seven coaching sessions in his seven-week placement, and his average use of HAI increased dramatically during e-coaching, as revealed in Table 4. Anthony used both whole group and small group instruction, and when teaching small groups he was more likely to carry on conversational discussions. These conversations were coded as hand raising, even though they were more participatory than that form of instruction usually is. Coaching was challenging during this small group instruction because of Anthony's conversational tone and his tendency to maintain a connection with each student while he

checked on students' work and encouraged their participation. This meant that the e-coach found fewer opportunities for inserting HAI suggestions during small group work.

Anthony's first BIE^2 coaching took place during a lesson that included 20 minutes of whole class instruction with 23 students and 15 minutes of small group work with six students. During this lesson there was a lot of teacher-talk that focused on traditional instruction rather than HAI. The second and third sessions were whole-class, and the e-coach found it relatively easy to give feedback, although Anthony did not hear or use all the prompts. HAI averaged 39 percent of all student response opportunities in these first three e-coaching sessions. Anthony's fourth session contained both whole and small group instruction, and he jumped to 53 percent HAI. His fifth session was all whole group instruction with 88 percent HAI. Anthony's last two BIE^2 coaching sessions, both whole group, offered about the same number of HAI response opportunities at 73 and 70 percent.

The e-coach found that her feedback levels remained relatively constant throughout Anthony's lessons because they were based not only on his instruction but also on the pacing of his lessons. His pacing, with instructional pauses, was relatively consistent and this set the parameters for delivering feedback. As he used more HAI the coach tended to give him more affirming feedback although her rate of comments didn't change. Thus his increased use of HAI was a result of his growing skills with the strategies rather than increases in corrective prompts from the e-coach. This was similar to the feedback pattern the BIE^2 coach used with Yvette who also increased her use of HAI without an increase in corrective prompts.

In short, BIE^2 coaching of Anthony was not difficult, and his use of HAI increased over the course of his coaching sessions to an encouraging extent.

Table 4. Summary of Anthony's coded lessons

Session	Total HAI	Total Traditional	HAI Percentage of all response opportunities	Minutes	Group Size
Baseline 1	4	8	0.33	35	whole
Baseline 2	2	5	0.29	30	whole
Coaching 1	0	4	0	35	split
Coaching 2	12	11	0.52	40	whole
Coaching 3	8	17	0.32	45	whole
Coaching 4	8	7	0.53	40	split
Coaching 5	14	2	0.88	45	whole
Coaching 6	8	3	0.73	35	whole
Coaching 7	14	6	0.7	45	split
Maintenance 1	5	10	0.33	35	small
Maintenance 2	10	11	0.48	45	whole

*split: whole group with entire class with some small group work included

4.3.7 Maintenance sessions

Anthony had two maintenance observations, the first during a 35-minute, small-group lesson, and the second during a 45-minute, whole-group lesson. The first maintenance session had a low proportion of HAI because the lesson was small group. As explained earlier HAI was designed to be used in whole group work, so the 33 percent HAI was not unexpected. The second, whole group, maintenance observation showed a more robust use of HAI, seen in 48 percent of his student response opportunities, which seemed a more realistic measure of his maintenance use of HAI.

Overall Anthony's average use of HAI increased from baseline to maintenance observations, rising from 32 to 42 percent. However as noted above, it would be more accurate to compare the two whole group baseline lessons to the one maintenance lesson that was also whole group. In that comparison, Anthony's level of HAI rose from 32 to 48 percent.

4.3.8 Interviews

4.3.8.1 Anthony Anthony answered the same interview questions as those discussed earlier with Yvette. His interview was especially valuable because his was the most relaxed and accepting response to e-coaching of the three student teachers, perhaps because of his comfort with technology, his maturity, and his ability to accept feedback. His overall response to the e-coaching experience was that it was very helpful and made him much more aware of how he engaged students with his instruction.

Anthony felt that the BIE^2 coaching had not distracted his students and did not interfere with his getting feedback from his cooperating teacher, Mary. He felt that the technical problems

were unfortunate but not troublesome, as long as the student teacher did not allow her/himself to react negatively. Anthony agreed that he had learned a number of things from e-coaching. He focused on the ease with which HAI could be incorporated in a lesson, and its applicability in a wide range of subject areas. He stated that he found it easy to transfer his new found knowledge of HAI to any lesson, and found himself using high access strategies without even having to think about it.

Anthony echoed the need to have someone who is technologically adept on hand to troubleshoot equipment glitches, and he said "there was no problem" when Helena called on him repeatedly to trouble shoot for her. However, his conviction was even stronger than Yvette's that the effectiveness of e-coaching, and its usefulness as a student teacher supervision tool, depended on the "personality" of the student teacher and her/his "flexibility." Like Yvette, Anthony identified the need to switch attention between his pupils and the e-coach as the biggest hurdle with BIE. Anthony admitted that he was able to make the switch most of the time, but not every time. He suggested that student teachers might need a visual signal to show their pupils that they are listening to a prompt. He laughed over his occasional misstep in asking the speaker to repeat what was said, only to have both his pupils and the e-coach repeat their words—and the problem—all over again. He also mentioned that the school schedule did not always mesh well with the e-coaching sessions, and suggested that flexibility in timing of e-coaching would be important for future success.

4.3.8.2 Mary and building administrator Mary reported that she really did not have much to say about the BIE system or e-coaching because she felt it had little impact on the functioning of her room, and Anthony would be able to give more details. She attributed this to Anthony's skills

with technology, scheduling, and growing instructional ability. Like Bertie, she said she had feared it would be intrusive and was very surprised to find that her pupils and Anthony adapted well to the system and to e-coaching. She felt that the only important suggestion she could add to what Anthony had already said was the need to be certain that the e-coach/cooperating teacher communication is established early.

The building principal enthusiastically responded to all the questions in the protocol (Appendix I), although he had to admit that like Yvette's principal, he did not have much knowledge of the functioning of the BIE^2 coaching. He was pleased that the school had participated in the cutting edge of student teacher supervision, and wondered about the usefulness of the BIE^2 system for other building functions like his need to observe teachers or the need to observe and possibly tape student behavior as part of a documentation process. He was unaware of the difference in equipment functionality in Anthony's and Helena's settings, but described his building's level of technology as excellent, with occasional pockets that seemed to function poorly for unknown reasons. However, he understood that this poor technological functioning was transient. Overall this principal gave unreserved support for e-coaching and would definitely recommend it to others, as long as they had the technological savvy to support it as well as his building did.

4.4 STUDENT TEACHER #3: HELENA

4.4.1 Participants

4.4.1.1 Student Teacher #3 Helena returned to college after taking several years off, and at the time of the study was 27 years old. She was an extremely conscientious education student, and a self-proclaimed perfectionist. She was already engaged, but not planning a wedding until after she finished her education program. Helena wanted to teach upper-elementary math, and so she was determined to complete her degree quickly under Pennsylvania's K-6 certification since the commonwealth was changing elementary certification to PreK-4.

Helena found it somewhat challenging to juggle her schoolwork, her fiancé, and her ailing grandparents. Through meticulous preparation she did well in her classes, and carefully met all course and certification deadlines. She was convinced that a teaching career would suit her well, since she had worked with children previously, and her step father had been a teacher for years, so she felt she had a good basis on which to determine her career path. In dealings with children, Helena was generally strict but reasonable, and she appreciated the students in her classrooms. However, Helena was often anxious, worrying about both current and future assignments and needing reinforcement from her instructors.

As with the other two student teachers, Helena taught nine language arts and nine mathematics lessons in the two semesters before student teaching. Unlike the others, Helena spent hours in front of a mirror practicing the delivery of her lessons before she taught them, so that when her lessons were presented they were articulate and well executed. However, this approach did not work when she added multiple classes to her daily student teaching schedule. She spent most of her non-teaching time preparing lessons, and she struggled to deliver un-

rehearsed lessons. Her first seven-week placement with an exacting, somewhat temperamental, cooperating teacher was less than successful, and Helena decided not to use the letter of reference from that teacher. Helena had traditional student teacher supervision during her first placement, however she did not respond to many of the supervisor's suggestions any more than she had responded to suggestions from her cooperating teacher. Helena attributed her difficulties in this placement to the nature of the cooperating teacher. Both Helena and the student teacher supervisors expected to see a big improvement in her instruction during her second placement.

4.4.1.2 Cooperating teacher for student teacher #3 Helena's cooperating teacher for the second placement, Emily, focused on the needs of her students and the instruction that could best meet those needs. Emily was a young, Caucasian woman, not much older than Helena. Emily and her husband had a little girl who was just over a year old at the time of the study, and Emily was still getting used to teaching with a delightfully more complicated home life. She had been with the John Dewey School District for much of her career, most of that in the third grade. Emily was comfortable with technology and used it regularly in her classroom, teaching with the Smart Board, and assigning computer work to her students. However, she was not interested in taking time to troubleshoot BIE equipment.

Emily had participated in many district trainings, and implemented what she learned in her classroom. She was especially interested in strong language arts instruction and in differentiated instruction, both of which she saw as tools to meet student needs. As a result, she expected Helena to use little whole group instruction and to differentiate most lessons instead.

4.4.2 Setting

4.4.2.1 The school and school district Helena taught in the same district and school as Anthony.

4.4.2.2 Elementary classroom Helena's second placement was with a well-behaved third grade class, comprising mostly students from literate, professional homes. By late October when Helena joined them, the students had already been trained to follow directions so that they could work not only independently, but also in small groups. The classroom was organized to facilitate differentiated instruction for two dozen students. The room was equipped with several computers with Internet access, in addition to the teacher's computer, which also ran the Smart Board. There was often chatter and movement in the classroom when Emily was providing instruction, but it was purposeful and appropriate.

4.4.3 Implementation and debugging

As was the case for Anthony, the school's computer teacher, Chris, handled the initial equipment installation. Her BIE system, like his, took a couple days to install. Anthony finished the debugging and testing of his own equipment, while Chris took care of the debugging and then testing of Helena's equipment. Debugging consisted of things like checking computer settings for the Internet and correcting computer and Skype settings for audio signals, so that there was effective communication between the classroom and home base computers. After debugging, both systems seemed to be functioning the same way. However the day after the systems were ready to use, Helena was unable to get an audio signal, and the standard tactics for troubleshooting did not work for her that day. As a result the first baseline observation was

postponed for both Helena and Anthony, while Chris was called on for help. He was able to correct that problem, but as technology glitches continued to occur, Anthony stepped into the breach and became the troubleshooter when Helena's system had a glitch. Her BIE system continued to be problematic, at a rate much higher than Anthony's system, though his system was just down the hall.

4.4.4 Bug-in-Ear E-coaching (BIE^2) sessions

Helena's BIE sessions followed the same protocol as the other two participants' sessions, beginning with two baseline observations, and ending with two maintenance observations. Between these observations Helena had nine e-coaching sessions during which data could be collected. Helena's participation in the study spanned 26 school days, only slightly more days than Anthony's and Yvette's 25-day spans. However, Helena's experience differed from the others' in significant ways. She accepted the coach's offer for an e-coaching trial, which delayed the start of e-coaching by a day. After that she not only had the expected technology glitches and school schedule issues, but also lost BIE^2 coaching days to medical problems (suspected broken hand, actual broken leg, and a respiratory illness), personal problems (a grandparent's hospitalization and recovery), and even a misplaced Blue Tooth. Helena's nine BIE^2 coaching sessions were spread over 20 school days. (In contrast, Yvette's nine coaching sessions took 17 days, and Anthony's seven coaching sessions spanned 14 school days.) Helena had one coaching session, then six days of problems, then a second coaching day. She had non-coaching days in between sessions three, four and five, then she finished strong with five coaching days over six school days. Without more data, it was unclear whether the early, six-day delay, or the greater

number of school days over which coaching days were spread, or a combination of these factors contributed to Helena's eventual lack of response to coaching.

4.4.5 Baseline observations

Helena's observations began well with the first baseline, but this initial positive experience slumped into a difficult second baseline observation. Both baseline lessons were whole group lessons. The first lesson was a teacher lead discussion on how to make writing more interesting, followed by seatwork identifying interesting features of sample paragraphs, and more discussion reporting on those features. All equipment worked flawlessly for this session, and the lesson was taught as scheduled. The second lesson was instruction on similes. Unfortunately this observation had technical problems that caused the system to crash twice and that made the audio quality poor so the recorded lesson was very difficult to hear. The cause of the crashes remains a mystery, but the system crashed as soon as recording began. Skyping began again after Helena was already teaching. Mid-lesson another crash occurred and by the time Skyping capability was restored, only ten minutes remained in the lesson. As a result there were only 19 recorded minutes for the second baseline observation. Throughout these 19 minutes, the audio appeared to come from the computer microphone, so the e-coach suspected that the Bluetooth headset was not turned on. Although the coach telephoned the classroom, the message to turn on the headset did not prompt Helena to do so. Virtually all of Helena's instruction during baseline lessons was based on traditional questions she posed, and she called on individual students for answers, often returning to the same students again and again because they gave correct answers. Only 19 percent of all student response opportunities were HAI during baseline observations (see Table 5).

4.4.6 BIE^2 coaching sessions

Helena was concerned about receiving BIE^2 coaching and took advantage of the e-coach's offer to conduct a BIE^2 "trial run." This trial run was a regular e-coaching session, but the session was not taped and no data were collected. After the trial run, Helena found the prompts easy to hear and reported that prompts did not interfere with her instruction. Nevertheless, when the coach asked if she was ready to begin regular e-coaching the following day, Helena hesitated. They agreed to tape the next e-coaching, but to treat the first lessons as "practice" if need be. That option was dropped when Helena realized that her experiences with BIE^2 coaching were all similarly positive, and did not negatively affect her grade for student teaching.

Helena's instructional style proved somewhat challenging for the e-coach. She talked a lot in her lessons--even more than Yvette, but with less clarity. She spent a great deal of time describing what students were to do, which included lengthy oral instructions rather than succinct written directions—despite the efforts of her two placement supervisors and her cooperating teacher to alter this behavior. Helena's lengthy monologues offered few opportunities for students to respond, so in general each of her taped lessons had relatively few student responses, either traditional or HAI. Compared to Yvette and Anthony, most of Helena's lessons were relatively long, 40-60 minutes. Even so, she averaged only 8 student response opportunities per lesson. Although Helena might have profited from more corrective feedback, the e-coach was held in check by the protocol requiring five or more positive comments for every corrective suggestion. The coach often resorted to complimenting Helena's word choices, her movement around the classroom on crutches, her paper handling despite a bad hand, and so on, rather than affirming her instructional moves. The e-coach also had to postpone, or even

eliminate, some suggestions until after she had provided the positive feedback, because she learned that opportunities for positive feedback would not necessarily appear later in the lesson.

Helena rarely responded to any feedback, whether affirming or corrective, but when the coach specifically asked if the suggestion was heard, Helena always replied, "yes." This prompted to coach to switch her question to ask, "Why no thumbs up (or whatever strategy had been suggested)?" Helena invariably replied that there was not enough time, although in reality the entire exchange could take less than 30 seconds for prompts like, "try: thumbs up if you agree," or "maybe choral response for directions?"

For all of the reasons described above, Helena did not demonstrate a clear pattern of growth during BIE^2 coaching sessions (Table 5). Her use of, and percentage or ratio of, HAI response opportunities bounced up and down as the weeks of BIE^2 coaching went on. Her highest numbers of HAI prompts occurred during her first, sixth and ninth BIE^2 coaching sessions. Her highest percentages of, or ratio of, HAI response opportunities occurred in coaching sessions one, two, and seven and maintenance session one. So highest numbers of HAI prompts and highest ratios of HAI usage coincided only in Helena's very first coaching session. In contrast, Yvette's and Anthony's greatest numbers of HAI response opportunities and greatest ratios of HAI out of total response opportunities coincided. For both of these student teachers, these coinciding "highs" were in the later coaching sessions. For Yvette, this occurred in coaching sessions six, seven and eight, and for Anthony in sessions five, six and seven. In short, there appeared to be no relationship between BIE^2 coaching and HAI for Helena. She also showed no relationship between lesson length, lesson type, or technical glitches and HAI.

Table 5. Summary of Helena's coded lesson

Session	Total HAI	Total Traditional	HAI Percentage of all response opportunities	Minutes	Group Size
Baseline 1	2	13	0.18	29	whole
Baseline 2	2	11	0.15	19	whole
Coaching 1	11	2	0.85	59	whole
Coaching 2	1	0	1.00	63	split
Coaching 3	3	3	0.50	40	small
Coaching 4	4	3	0.59	58	whole
Coaching 5	3	6	0.33	37	whole
Coaching 6	6	6	0.50	45	whole
Coaching 7	3	1	0.75	25	whole
Coaching 8	2	1	0.66	38	whole
Coaching 9	6	4	0.60	20	split
Maintenance 1	4	0	1.00	51	split
Maintenance 2	6	1	0.86	21	split

*split: whole group with some small group work included

4.4.7 Maintenance sessions

Helena, like the others, had two maintenance observations during which instruction was recorded but there was no coaching. Both these occasions were whole group lessons that included small group work for less than one quarter of the observed time. The maintenance lessons were 51 and 21 minutes long. As in other lessons, Helena allowed relatively few opportunities for students to respond, averaging one opportunity every six and half minutes. In reality, there were no student interactions during much of the instructional time because student responses were clustered in a few minutes of instruction, and during short periods of small group work. The HAI in Helena's maintenance lessons compared very favorably with her baseline lessons that showed only 19 percent of her response opportunities were HAI. However, the fact that Helena achieved a 91 percent proportion of HAI is less a *eureka!* moment than it is more evidence that Helena's instruction followed no clear pattern.

4.4.8 Interviews

4.4.8.1 Helena Helena's interview answers did not provide many insights not already mentioned by the other two student teachers, but did reinforce what they had reported. Despite the personal difficulties of her second placement, the continuing technology glitches, and her lack of growth in HAI, Helena felt that BIE^2 coaching had been a positive experience for her, and she was better able to incorporate HAI as a result. She also stated that the students had only been slightly distracted by the equipment problems but not at all by the actual e-coaching. Unlike Anthony across the hall, Helena's technical problems did tend to interfere with instruction because they called for frequent rethinking of the schedule. Helena believed that it was extremely important to

have someone always available to trouble shoot during BIE^2 coaching. She said she was very grateful that Anthony had been able to play that role for her, because she did not believe trouble-shooting should be expected of either the student teacher or the cooperating teacher. However she also said that she had handled these problems better than others might in the future.

The surprising aspect of Helena's interview was her unequivocal statement that BIE^2 coaching would only work with student teachers who had the "personality" to deal with it. The only variable that seemed to explain Helena's results was Helena herself. Helena's statement that she could not follow the e-coach's suggestions because she did not have time to ask students to show agreement with thumbs up/thumbs down, was indicative of a bigger issue. Helena was not comfortable "thinking on her feet," and she struggled to make changes in a planned lesson. All the participants identified this as a "personality" issue, but the e-coach saw it as a lack of flexibility in her instruction, as well as a certain amount of personal rigidity.

In discussing BIE^2 coaching as a student teacher supervision tool, Helena said that it could work—depending on the technological support and the personality of the student teacher participant, echoing the words of Yvette and Anthony. However Helena did not immediately identify switching her attention between coaching feedback and her students as a challenge. Instead her first concern was for the support needed to keep the BIE system working, and her second concern was the need to have a supportive cooperating teacher. While Helena did not feel that Emily found the BIE^2 coaching an interference, she stated that Emily made a lot of demands and that *other* student teachers might have had a difficult time handling those demands if they also had to deal with e-coaching.

4.4.8.2 Emily and building administrator Emily's interview responses were generally positive, and similar to others'. She stated that she found BIE^2 coaching easy to support because neither she nor her students were interrupted, although she did recognize the important trouble-shooting role Anthony had played. She had just returned from maternity leave at the start of the school year, and said that she might have been able to offer more technological support other years, but under the circumstances she could not take on any additional tasks. Emily stressed the importance of the principal's support in ensuring a good e-coaching experience. She was cautious about the usefulness of the BIE system and e-coaching as a supervision tool, particularly because she felt some student teachers would be well equipped to benefit from the BIE^2 coaching while others would not. Her particular concern was for student teachers who were not flexible enough to incorporate suggestions immediately into lesson delivery. Emily recognized that her perceptions of the usefulness of BIE^2 coaching were strongly influenced by her own experience with Helena, who was not a responsive or flexible student teacher. (Although she did not state this in the interview, Emily refused to write a reference letter for Helena at the completion of her placement.)

Helena's principal was the same building administer interviewed for Anthony (pp. 92). In addition to the comments reported there, he shared some thoughts on Helena. He expressed concerns about Helena, who had not worked out well in either the first or second placement in his building, but he also reported that he considered this to be expected when hosting student teachers, "because they can't all be where you want them to be." He also stated his opinion that this would make the study more "real." He expressed additional concern about Helena's difficulty in working with the technology. Although he recognized that different teachers had different levels of comfort with technology, he was concerned because Helena had pulled in

another student teacher to do her trouble shooting, "You know, she won't always have a teacher available to help her when she needs it." Other than these concerns about Helena, he remained positive overall and would recommend BIE^2 coaching and student teacher supervision to others, as reported earlier.

4.5 SUMMARY OF CASE STUDY RESULTS

The study was conducted during the second of two, seven-week student teaching placements. Originally the researcher planned the study to provide BIE^2 coaching for ten, consecutive teaching-days for each of the three participating student teachers. These e-coaching sessions were to be preceded by two baseline observations and followed by two maintenance observations (four sessions without coaching) for a total of 14 BIE session days out of 35 potential days of instruction during the placement. However, the research was not implemented as planned due to technological glitches and the vagaries of elementary school schedules. In reality, student teachers received seven to nine e-coaching sessions, plus the two baseline and two maintenance observations. These BIE sessions required 28 to 31 of the 35 days in the seven-week placement. The longest stretch of BIE^2 coaching lasted four consecutive days, but most sessions were delivered singly or on two consecutive days. (See Appendix E for the distribution of coaching sessions.)

For two of the student teachers, instructional behavior changed to include much more HAI after four or five BIE^2 coaching sessions. The changes were still evident, though not as robust, in maintenance observations for these two participants. The third student teacher proved to be e-coaching resistant, and did not respond to the BIE^2 coaching with any consistent

behavioral changes. That student teacher's highest proportion of HAI occurred during her first two coaching sessions, then dropped from there for six sessions, rose slightly for two sessions, and dropped again in her final BIE^2 coaching session. Her HAI during baseline looked low and maintenance looked high, but this seemed part of her up and down pattern, rather than an indicator of changed instructional behavior. This third student teacher's instructional approach proved to be inflexible, remaining unchanged despite prompts from both traditional student teacher supervisors and her cooperating teacher as well as the BIE^2 coach's prompts. The behavioral changes seen in two of the three student teacher participants demonstrated that BIE^2 coaching could be a useful tool for student teacher supervision. However the third student teacher's experience demonstrated that some pre-service teachers might be e-coaching resistant.

4.5.1 Student teacher experiences

The first student teacher increased her use of HAI after five BIE^2 coaching sessions and her two maintenance observations continued to show increased use of HAI compared to her baselines. Her *"eureka!"* moment occurred shortly after the fifth coaching session. In a student teaching seminar she reported to her peers that she no longer had to guess if her students were "getting it" because she used high access instruction! Her use of HAI raised on average from 37 percent of her response opportunities during her first five BIE^2 coaching sessions to an average of 90 percent her remaining four coaching sessions. Overall, she rose from 15 percent HAI opportunities in baselines to 58 percent HAI opportunities in maintenance.

In her interview, student teacher number one said that she "learned to love thumbs up/thumbs down," and reported that she had become "a big thumbs person." She found that her students were more engaged when she used HAI. Equally important for her, she found she could

incorporate high access prompts with no loss of instructional time, and minimal planning. She began to incorporate more and more HAI without prompting, and she reported that she used it equally often in reading instruction with both of her fifth grade classes, even though she only received e-coaching in one class. Her one concern was that she would use thumbs up/thumbs down so much her students would grow bored with it, so the coach suggested alternative HAI strategies that could be substituted (response cards, hands raised/not raised, partner chat with report out, pinky-link, whip around, and so on). She loved the feedback she got from the students, and loved their motivation to respond, so she saw HAI as a win-win for herself and her students.

The second student teacher also increased his use of HAI, during BIE^2 coaching and comparing baseline to maintenance values. He responded to corrective feedback by incorporating HAI into his lessons more often, and then as time went on he not only began using HAI without prompting but also reported using HAI in other content areas. In his interview he said that knowing the e-coach would be Skyping reminded him to incorporate HAI into his lesson planning and instructional routines. He showed a slightly different pattern of progress from the first student teacher, because his average use of HAI continued to rise steadily. His first four lessons averaged 39 percent HAI and 61 percent traditional student response opportunities. His fourth and fifth e-coaching sessions showed 53 and 51 percent HAI, and he rose to 70 percent after seven sessions. Overall he climbed from 32 percent HAI in baselines to 42 percent HAI in his maintenance observations. However these averages did not tell the full tale, because for one of the maintenance lessons he provided small group instruction in the form of a text discussion. During this type of instruction, he worked at a small table with six less able readers and used a conversational approach to discuss the text. This approach did not offer as many opportunities

for HAI because all students in the group were participating throughout the lesson, but responding individually. The "small group work" code was only applied once—to the entire lesson, which didn't reflect the relative amount of time students spent engaged in responding to prompts. So the coding of 42 percent HAI during his maintenance phase was not terribly accurate.

BIE^2 coaching was not as effective for the third student teacher as it had been for her peers. She resisted responding to corrective prompts, even a simple, "Maybe thumbs up or down?" When asked later, she invariable stated that there was no time to use the suggested strategy (even though it would have required only seconds). She did not respond to e-coaching with any consistent behavioral changes. She began with a 19 percent proportion of HAI in baseline observations, then jumped to 86 percent for her first two e-coaching sessions. After that she dropped to averages of 54 percent for two lessons, then 43 percent for another two lessons. Her HAI did rise to 71 percent for lessons seven and eight, but dipped again to 60 percent in lesson nine. Her maintenance average shot up to 91 percent, but this reflected only a handful of response opportunities over a total of 72 minutes of instruction, hardly lessons full of HAI. Therefore her increase in HAI from baseline to maintenance, 19 to 91 percent, reflected more of her erratic response pattern rather than a behavioral trend. Unfortunately, the third student teacher did not alter her instruction in response to e-coaching prompts. Nor did her instruction change in response to prompts by her two traditional student teacher supervisors or her cooperating teacher. However she experienced a number of personal difficulties during her placement that interfered with her teaching ability. These included medical issues (suspected broken hand, actual broken leg, and the flu) and the hospitalization of her beloved grandfather.

So it is possible that her lack of instructional change may not have been strictly in response to the e-coaching.

5.0 DISCUSSION

The purpose of this study was to document the use of BIE^2 coaching as a supervision tool for undergraduate student teachers in their first semester of teaching. The researcher used a second generation, virtual Bug-In-Ear system (BIE^2) system to provide immediate instructional feedback to three student teachers as they provided reading instruction in their general education classrooms. The focus of this feedback was the student teachers' use of high-access instruction (Feldman & Denti, 2001, 2004), which comprises those instructional prompts that allow all students in a class to respond at once, such as choral response, partner chat, or thumbs up/down. Documentation of BIE^2 coaching was used to answer five research questions.0.

5.0.1 What roadblocks were encountered in setting up and using the BIE system in the schools and in the "home base?"

Setting up the "home base" was relatively straightforward with the help of the college's technical staff, and the "home base" was relatively problem-free compared to the school settings. Six areas were identified as potential roadblocks to the set up and use of the BIE system.

First, district and building administration were very cooperative, which would be required for any use of the BIE system in schools. The building principals in this study made it clear that staff should do whatever was necessary to see that the study's needs were met. Since

needs ran the gamut from technology fixes to schedule changes, it was important to have the principal's approval in advance for any problem solving that had to be done.

Second, school or district personnel were asked by their administration to help with initial set up, and later trouble shooting. In both schools, and all three classrooms, it took school or district staff time to complete the installation and debugging of BIE equipment. The equipment was designed to be "plug and play." The Bluetooth headsets, Bluetooth USB adapters, and web cameras all came with installation CDs and simple instructions. However, district/classroom firewalls prevented the researcher or classroom teacher from completing any installation since administrator passwords were required. Installation was quicker and easier where the principal asked a district technology person to get everything working, compared to installation in the school where the principal asked the school computer teacher to do the work. Throughout the study unexpected, technological glitches occurred that resulted in cancelling and rescheduling about a quarter of the coaching sessions.

Third, it was critically important to have identified a classroom trouble-shooter because over one quarter of the BIE sessions had technical problems, and almost one quarter were rescheduled due to those problems. Two classrooms demonstrated that the trouble-shooter could be either the student teacher or the cooperating teacher, and that neither needed a tremendous amount of prior technical knowledge. The trouble-shooter needed to have some familiarity with Skype, and enough experience with computers and Bluetooth headsets to feel comfortable playing around with the equipment. In other words, they only needed to be willing, calm, and slightly knowledgeable. In the third classroom, where neither the student teacher nor the cooperating teacher felt that comfort level, there were more difficulties with the BIE equipment, resulting in much more frustration for the third student teacher. That classroom was in the same

school and just down the hall from the classroom with the fewest technological problems (where student teacher two was the troubleshooter). It seemed unlikely that equipment or issues led to the different technology experiences between the two rooms. Far more likely, the hands-off attitude of the participant and her cooperating teacher toward the BIE equipment meant that problems were only discovered during the BIE^2 coaching sessions, while in the other two rooms the researcher often got some warning that the system was "glitch" before coaching began. In practice, having a designated troubleshooter in the classroom proved to be essential for smooth operation of BIE^2 coaching.

The fourth roadblock was scheduling. Scheduling conflicts caused the cancellation and rescheduling of almost one quarter of scheduled BIE^2 coaching sessions. Scheduling was especially frustrating because of the short, seven-week, student teacher placement. Every delay raised the risk that time would run out before the data were all collected, which would be less of a worry in a longer placement. School districts' calendars for the 2011-2012 school year, available on websites, made it easy to work around known events. It was much more difficult to work around the calendars of the two schools and the three classrooms, all of which altered with very little notice. During the seven weeks of this study, many school-wide conflicts arose the day before or the day of a scheduled session. These schedule-changers included: school-pictures, PTO fundraiser kickoff, fire drill, special assemblies, "school store" events, and parent-teacher meetings. Additional classroom issues arose for events such as: field trips, invited-readers, class parties, or when cooperating teachers were attending IEP meetings or committee meetings. Cooperating teachers rearranged their lesson timing to accommodate BIE sessions whenever possible, but schedule conflicts led to an average of seven cancelled BIE session days for each student teacher.

An additional scheduling roadblock was the overlapping language arts lessons for the three student teacher participants. Initially the coach tried to schedule back-to-back, 30-minute, e-coaching sessions. However this strategy did not allow for delays due to technological glitches or scheduling conflicts. Fortunately the first student teacher taught a language arts lesson in the morning and repeated it in the afternoon, which bracketed the others' simultaneous language arts lessons. This aspect of the scheduling roadblock had the greatest consequences for the BIE^2 coach. The back-to-back-to-back language arts lessons resulted in "e-coaching fatigue" because the coach was "on" for two to three consecutive, intense hours.

The final two roadblocks were minor but persistent technical issues. The e-coach's inability to hear elementary pupil responses in the classroom was most likely an equipment issue. It seemed that the Bluetooth headset could only pick up children if their voices were as loud as the teacher's. Initially the e-coach wore a headset while coaching, which may have picked up more pupils' voices, but more auditory problems occurred for the student teachers when the e-coach was wearing the headphone so it was dropped. It was not possible for the e-coach to consistently capture the children's responses, so feedback was based on the student teachers' instruction and the overall responses of the class. The sixth roadblock, a minor technological one, occurred when the home-base headset interfered with the e-coaching audio so that student teachers were unable to hear the coach. The e-coach had to abandon the headset in order to continue coaching. Neither she, nor the college's technology staff, was able to determine the cause of the headset problem.

The bottom line was that none of the roadblocks were insurmountable, and some could be lessened or eliminated in future BIE^2 coaching implementations with little additional effort

5.0.2 How reliable the BIE technology proved to be for use as a student teacher supervision tool?

To quote an old nursery rhyme: when it was good it was very, very good, and when it was bad it was horrid. The BIE e-coaching technology was reliable enough, enough of the time, to effect a change in two student teachers' instruction, so in that respect is was a good supervision tool. The greatest problem was that the system was not predictably reliable, and that made it frustrating to use, as seen from a brief examination of cancellations and delays seen in the coaching schedule (Appendix E). Originally 42, thirty-minute BIE sessions were planned (two baseline, ten e-coaching and two maintenance for each of the three student teachers). Of these planned sessions, almost one quarter were either drastically shortened, or cancelled and rescheduled, due to technological glitches.

This lack of reliability occurred for various reasons. Bluetooth headsets did not receive the audio feed from the base unit, or the Bluetooth did not transmit audio to the base unit during seven BIE sessions. In one classroom the Bluetooth did not work at all one day. The non-working-day occurred after the Bluetooth unit was unplugged in order to Skype a parent deployed overseas. When it was plugged in again the Bluetooth didn't work, despite rebooting, until it was reinstalled—with administrator's passwords. Skype spontaneously quit for unknown reasons twice in one classroom. The web cameras randomly froze and unfroze in a fifth of the lessons, but the audio feed remained active during many of those lessons. When possible, the e-coach did not reschedule the lessons, and instead provided feedback based solely on the audio feed.

An additional aspect of poor reliability was that the student teachers sometimes had trouble distinguishing exactly what was said in feedback, particularly if their classroom was noisy. The e-coach could not tell when this was a problem because the student teachers were responding to prompts as expected. However in interviews they reported that this was frustrating for them since it required more of their concentration to decipher the feedback. (See *5.5.1 signaling that feedback has been received* below.)

The BIE^2 coaching experience would be improved for both the e-coach and the student teacher participants if the reliability of the BIE equipment was improved. However even with the somewhat compromised reliability seen in this study, it was clear that the BIE system was at least reliable enough to deliver behavior-changing e-coaching.

5.0.3 What it was like to provide e-coaching, as prescribed by Rock, et al.?

The short answer is that BIE^2 coaching proved to be interesting and exciting, but challenging to implement. The e-coach found that working with three such different student teachers, who varied greatly in instructional flexibility, responsiveness, stress levels, and lesson delivery style, provided an excellent range of e-coaching experiences from which to examine the practice.

BIE^2 coaching was extremely interesting because it was a way to change how student teachers not only delivered instruction, but also how they thought about that delivery. Student teacher participants had heard in education courses about the importance of actively engaging their learners, and using formative assessment to determine if instruction was meeting student needs. But like many of their predecessors and peers, the three participants in this study sometimes engaged students, and they sometimes used paper and pencil tasks for formative assessment, but they were not dynamically changing their instruction based on what they learned

from formative assessment of their pupils. For two of the three participants, e-coaching began to change that instructional thinking because the student teachers used HAI to engage their pupils, assess what their pupils "got," and then adapt the lesson as needed. Thus, BIE^2 coaching became exciting, and very motivating for the e-coach who, saw evidence of changing instructional behaviors by the time the first five coaching sessions were completed. BIE^2 coaching proved equally exciting for the two student teachers who recognized that their thinking about instruction was changing.

However the excitement of e-coaching was tempered by the complicating factors involved. One complication was the cognitive work required to convert traditional coaching and supervision feedback into the very concise comments needed for e-coaching. The e-coach's previous experience coaching teachers did not help her to provide feedback in succinct phrases. Converting corrective suggestions into BIE-worthy feedback was a new skill to be developed. In traditional student teacher supervision and teacher coaching, delayed feedback would typically be given as suggestions for consideration and thoughtful implementation. BIE^2 corrective feedback had to be immediate, direct, and succinct. Traditional feedback looked like this: "Think about using a HAI prompt at least every five minutes. For example when you asked students to read topic sentences from each paragraph, you could ask the class to signal whether or not they agree." This feedback had to be converted into, an e-coaching prompt like: "Thumbs up or down for agreement?" With practice, this new skill became easier, but it retained some of its challenge to the end of the study.

Fortunately, the e-coach had a small window during which corrective feedback comments could be considered and reworked, as she waited for the pause in speech during which she could provide her feedback. Finding this pause was another complicating factor, because two of her

three student teacher participants talked relatively rapidly. Rock and her colleague did not try to deliver feedback during instructional lulls (Personal communication, 7/19/11), but instead kept up a running commentary during observations. The subjects in most of the studies by Rock and her colleagues (Rock, et al., 2012; Rock, et al., 2009-c) reported no problem attending to BIE^2 feedback and to their own students simultaneously. However these subjects were practicing teachers, participating in e-coaching in their own classrooms as part of their quest for certification in special education. In contrast, the undergraduate, general education student teachers in this study reported difficulty in switching attention between e-coaching feedback and their elementary pupils. For that reason the BIE^2 coach in this study felt it was critical to find speech pauses in which to deliver feedback so that attention-switching was easier and instructional momentum was maintained.

The e-coach had had many years of experience with traditional coaching of teachers using a strength-based model that acknowledged and built on instructional successes. This meant that when she was working with her student teachers it was easy to approximate Rock's ratio of four to five affirming comments for every corrective comment. However, to be certain, the e-coach originally developed a "cheat sheet" of useful affirming statements to use if needed. Examples of affirming phrases included: *good use of [HAI strategy], terrific vocabulary word, very clear directions, excellent question, good behavior management, great high-access instruction*, and so forth. This "cheat sheet" quickly became more cumbersome than useful and was abandoned after the first several e-coaching sessions, by which time the e-coach had established through her own feedback tallies that she was providing an approximate 5:1 feedback ratio. With the two more responsive student teachers, in e-coaching sessions lasting 25 minutes or more, the e-coach averaged 5.2 affirming comments for each corrective comment. However

the third, and less responsive, student teacher only got a ratio of 4.3 positive comments for every correction. This third student teacher presented two unique challenges. First, there were fewer instructional actions to commend, and second, even when the e-coach had a positive comment to make, it was difficult to find a pause in the flow of words into which feedback could be inserted. As described below in research question five, all three student teachers struggled to some extent with listening to both feedback and their pupils, and the third student teacher demonstrated an overt need to think about prompts before acting on them. Except for these instances with the third student teacher, the e-coach found that providing a high ratio of affirming to corrective feedback was a natural result of her years of providing strength-based coaching for teachers and required no additional prompting or tracking.

The greatest challenge in e-coaching was the need to be engaged in both coaching duties and troubleshooting duties, when she could be Skyping for three or four consecutive hours. Often the daily coaching schedule began before 10 a.m. and lasted until 1 p.m. or 2 p.m. On nine of the BIE session days, the e-coach spent four consecutive hours online with her student teachers. Even during BIE sessions that ended up being cancelled because of technical glitches, the coach engaged in troubleshooting for up to 30 minutes, knowing that she could still fit in a 30 minute coaching session. When problems could not be solved she tried to reschedule before Skyping her next student teacher and starting the process over. Initially the e-coach was surprised that BIE^2 coaching was cognitively tiring, because she had had a great deal of experience in coaching multiple teachers over a school day. However, although the cognitive demands of traditional coaching could be high, they were less intense because the observation and feedback functions were separated over time, and both were very familiar.

Traditional coaching and student teacher supervision have depended on a process of observing instruction, identifying successes and areas for growth, then providing this information through delayed feedback. Delayed feedback allowed the traditional coach extra time to consider the content of the coaching message. In contrast, juggling multiple, new, simultaneous demands was exponentially more difficult. The e-coach was not yet an expert in using/trouble shooting the BIE system, nor yet an expert e-coach, and she had no support for either task other than documents from Rock, et al. This study suggested that additional training may be required to prepare BIE e-coaches in several ways. The speed of the instructional feedback is unlike anything required in traditional coaching. For new e-coaches, this speed might have to be developed through repeated practice in training situations, using lesson vignettes with a variety of instructional behaviors. Similarly, the need to maintain the target ratio of five positive comments to every corrective comment may require training and practice for anyone unfamiliar with strength-based or positive coaching. Finally, even if feedback speed is reached and the 5:1 target ratio met, the experience of the e-coach in this study indicated that training in concise, easily understood feedback comments would most likely be very beneficial. . In this study, the e-coaching did grow noticeably easier as she gained some experience, and she expected that additional experience plus collaborating with other department faculty members would make e-coaching even more gratifying.

5.0.4 The fourth research question asked what the BIE e-coaching experience was like for the student teachers, elementary pupils, and cooperating teachers?

In this study, all three groups had positive experiences overall. The student teachers found e-coaching to be both challenging and rewarding. The BIE work did not distract or interfere with the elementary pupils overall, and they responded well to HAI prompts. The cooperating teachers all expressed reservations about e-coaching at the start of the study, but became more positive as they observed its effect on their student teachers and elementary pupils. Reactions from each of the constituents are expanded on, below.

The BIE experience added an extra challenge for the student teachers, who were still developing their instructional abilities. The student teachers were eager to add HAI to their lesson delivery, and experienced a great deal of satisfaction in lessons in which that was accomplished. However, student teachers reported feeling frustrated over technology glitches and scheduling issues. This satisfaction and frustration see-sawed throughout the BIE experience, depending on the number of problems and the engagement of pupils. Although technological challenges presented a problem, the amount of interference generated by the problem and the problem solving depended on who was trouble shooting. When the cooperating teacher or the student teacher worked on the issue, they both reported that the BIE system did not interfere with instruction. In contrast, when neither was the troubleshooter, the student teacher felt that these issues distracted the class. Student teachers revealed that BIE e-coaching had been a valuable experience which helped them to integrate HAI, assess students, and think differently about their instruction.

The elementary pupils reacted to BIE e-coaching with nonchalance, quickly learning to ignore the potential distraction. Initially, each classroom was told about the study, and all three rooms experienced a little disruption as the equipment was sent up, although this was minimal. As debugging was completed, each room had the chance to say hi and wave to the researcher,

who was on the computer screen. After that, a few pupils (generally the same ones in each room) needed occasional reminders to ignore the BIE system, but even this need faded after several e-coaching sessions. The student teachers and the cooperative teachers reported that the pupils did not react differently in classes with BIE e-coaching sessions, and the observed lessons did not reveal much effect from the experience except for greater participation with HAI. At the conclusion of the study when the e-coach was in the fifth grade classroom, one of the girls said, "look it's the lady from the computer," and everyone waved—just another commonplace experience for them.

The cooperating teachers reached nearly the same level of acceptance of BIE^2 coaching as their pupils, but that was an evolution in thinking. All three began with misgivings about e-coaching, fearing that it would be intrusive, interfere with instruction, and distract the elementary pupils. But within a few weeks it became routine and the cooperating teachers' confidence in BIE e-coaching grew. Unlike their student teachers, they accepted the technology glitches and scheduling conflicts with equanimity. They did not feel that the BIE system or e-coaching required a lot of preparation, or siphoned much time from instruction. In interviews at the end of the study, all three cooperating teachers reported that their student teacher benefitted from e-coaching. Two the cooperating teachers, whose student teachers were more responsive overall, felt that for a struggling student teacher, e-coaching could be a help or a hindrance depending on how it was handled. However, the coop with the least responsive student teacher said the e-coaching was especially helpful because the student teacher got immediate feedback from yet another source. Finally the cooperating teachers concluded that e-coaching could be transformative for a student teacher who was prepared to examine his/her own instruction and management.

5.0.5 Did BIE^2 coaching have an effect on the instructional behavior of student teachers?

Neither the design of the study (case study documentation) nor the amount of quantitative data collected permit any statemetns regarding the impact of BIE^2 coaching on student teachers' behavior. No causal inferences can be made on the basis of these findings. Never-the-less, for two of the three student teachers, while their rate of pupil prompts did not change, their proportion of response opportunities shifted from a majority of traditional to a majority of HAI prompts. A higher proportion of HAI prompts was seen in later coached lessons compared to earlier coached lessons for two participants, and in maintenance lessons compared to baseline lessons for all. Both student teachers one and two demonstrated an interesting pattern in the proportion of HAI in their lessons. After four or five e-coaching sessions, these participants increased their proportion of HAI prompts, and decreased traditional response opportunities. In their early BIE^2 coaching sessions, student teacher one averaged 34 percent HAI and student teacher two averaged 37 percent. In their later coaching sessions, these same student teachers averaged 77 and 90 percent HAI respectively. In contrast, the third student teacher did not consistently respond to BIE^2 coaching. She averaged 67 percent HAI in her first five e-coaching sessions, and 68 percent in her remaining sessions. There was no change in her responsiveness to corrective feedback suggestions (i.e., prompts the BIE^2 coach provided to each of the student teachers throughout her coaching experience) across the entire student teaching experience..

5.1 DISCUSSION OF FINDINGS

Findings from this study are generally consistent with what has been reported in the literature overall. Measures of participants overall satisfaction with the BIE coaching in all studies, including this one, were generally positive (Gallant, & Thyer, 1989; Giebelhaus, 1994; Rock, et al., 2012; Rock, et al., 2009-a; Rock, et al., 2009-c; Scheeler et al., 2010; Scheeler & Lee, 2002; Scheeler, et al., 2006; Scheeler, et al., 2004; Wade, 2010). Researchers demonstrated that improvements in instruction outweigh frustrations with the technology, and therefore participants regard BIE favorably (Rock, et al., 2009-b). Teacher participants feel that e-coaching is generally not intrusive for them, or distracting for their pupils (Bowles & Nelson, 1976; Giebelhaus & Cruz, 1992, 1994; Rock, et al., 2012; Rock, et al., 2009-a; Rock, et al., 2009-c; Scheeler & Lee, 2002; Scheeler, et al., 2006).

This study encountered relatively minor problems with the technology needed for BIE, similar to earlier reports that found occasional interference with e-coaching (Giebelhaus & Cruz, 1995; Herold, et al., 1971). Scheeler's research primarily used the older radio-frequency BIE system and did not report finding any technology problems that interfered with coaching (Scheeler, et al., 2010; Scheeler, et al., 2006), although the older, ratio-frequency BIE system she used had a very short transmitting distance of 150 - 300 feet, and e-coaches typically were present in the coaching classroom. Rock (Rock, et al., 2009-c) has used the newer virtual BIE^2 system, and she reported the same range of problems encountered in this study, including installation problems, Internet service going down or Skype malfunctions, audio difficulties with the Blue Tooth headset. The most troublesome of these issues were those related to sound, because e-coaching could be completed without video if necessary, but not without audio communication. This study differed from some others in that the pre-service teachers were not

responsible for making all arrangements for installation of their systems, as were Rock's participants (Rock, et al., 2012; Rock, et al., 2009-c).

One divergent finding in this study was the timing of feedback delivery. The literature reports that teachers-in-training and preservice special education teachers could attend equally to electronic feedback and their own instructional needs (Gallant, & Thyer, 1989; Giebelhaus, 1994; Rock, et al., 2009-a; Rock, et al., 2012; Rock, et al., 2009-c; Scheeler et al., 2010; Scheeler & Lee, 2002; Scheeler, et al., 2006; Scheeler, et al., 2004; Wade, 2010). Apparently, these individuals had no trouble switching between feedback and instruction as needed so that timing of feedback was not an issue. The three participants in this study appeared less able to make that switch. Data were not collected to substantiate this finding, but the e-coach regularly observed participants hesitate or look away from their pupils when feedback was given, sometimes losing their instructional momentum and needing a moment to regroup. This may be related to the population difference, more- versus less-experienced teachers, instructional differences with whole-class general education settings versus small-group special education settings, the nature or delivery of feedback, or a combination of these factors. Based on the effectiveness of feedback in changing instructional behaviors, this study seems to suggest that factors other than feedback may determine how well student teachers can switch attention from feedback to instruction.

The potential for loss of concentration is the basis for another divergent finding. In this study student teachers responded better to feedback delivered during speech pauses, than to feedback that interrupted instruction. Preventing a loss of instructional momentum was the researcher's rationale for providing feedback during speech pauses, because she saw that happening when she interrupted instruction with feedback. The actual feedback given was not

scripted because each time it was specific to the instructional move observed and the context for the instruction. (See Appendix F for a transcript of a lesson including feedback provided.) This delivery and timing of feedback has not been reported elsewhere in the literature. Rock stated that in her e-coaching for HAI with teachers-in-training she kept up a running commentary (Personal communication, 8/30/12). Rock (Rock, et al., 2009-b) also describes the feedback delivery of coaches in Alabama and Pennsylvania, who work with teachers in distant schools. Those BIE^2 coaches provide feedback while teachers are instructing, but without interfering with instruction. The description included as an example giving feedback when pupils are engaged in independent work, without specifically describing how this feedback is delivered. In contrast, Scheeler and colleagues (Scheeler, et al., 2010) explicitly described using an immediate feedback rule. Feedback must follow within three seconds of a student response or teacher comment. However, this feedback rule was designed specifically for use with a three term contingency strategy, in which a teacher's prompt was followed by a student response and then by the teacher's comment on the response. Scheeler's e-coaches gave feedback to the teacher from a short list of specific feedback sentences related to the type of exchange. This very predictable strategy made the three-second rule easy to gauge, and the list of feedback comments made it easier to provide feedback at the appropriate time. Further research may determine the relationship between delivery of feedback, coached population, and targeted behavior.

This study extends previous BIE coaching research through use with a different teacher preparation population, and by demonstrating that BIE^2 coaching can be accomplished by a novice with minimal support. Scheeler and her colleagues (Scheeler & Lee, 2002; Scheeler, et al., 2006) worked successfully with student teachers in special education settings, using BIE systems to provide feedback during subjects' instruction with one to six students. Rock and her

associates (Rock, et al., 2009-a; Rock, et al., 2012; Rock, et al., 2009-c) found BIE^2 coaching was an effective long-distance supervision tool for novice teachers, and for more experienced teachers in their general education classrooms who were returning for special education certification. This study suggests that BIE^2 coaching works equally well for pre-service teachers during their first semester of teaching in general education classes of more than 20 elementary pupils.

Finally, there have been no reports in the literature of novice e-coaches using BIE systems to provide feedback with minimal support. This study showed that an experienced, traditional, education coach or student teacher supervisor (with low risk-aversion and a can-do attitude) could provide BIE^2 coaching using only brief written instructions for installation and trouble shooting (provided by Rock, Personal communication, July 19, 2011). See the "Implications" sections below for further discussion on this topic.

5.2 LIMITATIONS

There were several limitations to this study. Some stemmed from the short, seven-week, time frame and the many schedule interferences. Other limitations were based in the small number of student teacher participants and correspondingly few placement sites. Finally, there were limitations related to the data collection process.

The short student teaching placement and the loss of half the e-coaching sessions to schedule conflicts and technology glitches severely limited the selection of lessons for e-coaching. The limitation posed by scheduling difficulties meant that e-coaching did not occur at the most opportune times. With greater latitude in scheduling, e-coaching could be provided only

for the appropriate lessons—in this study that would have meant the type of large-group instruction for which HAI was designed. In another instance, if e-coaching was targeting a student teacher's behavior management, e-coaching sessions could be scheduled to capture those times when behavior problems manifest themselves. In addition, the scheduling difficulties encountered here undoubtedly contributed to "e-coaching fatigue," and the taxing nature of e-coaching even for an experienced traditional coach. Improvements in scheduling and selection of coaching lessons would undoubtedly make the e-coaching experience more enjoyable for all.

The small student teaching class during the semester of the study did not allow for much variety among study participants, and the few placement classrooms were relatively homogeneous as well. Although one e-coaching-resistant teacher participated in the study, a larger pool of student teachers would have offered more potential to discover for whom e-coaching works best, and might have demonstrated whether it can work with diverse student teachers in a variety of settings.

This study's data collection was somewhat limited by the BIE system equipment and the fact that the researcher was a novice user of that equipment. The researcher was unable to get useable audio input from the elementary pupils, and sometimes struggled to see all the students in the classroom, so there was no way to track elementary pupil responsiveness to instruction. This also made inserting feedback into instructional lulls more challenging, which may have lead to hesitation and missed opportunities for e-coaching. The difficulties with the e-coach's headset, which caused the headset to be abandoned in favor of the computer microphone, may have diminished the quality of the e-coach feedback comments, and therefore contributed to student teachers inability to hear some comments. Finally, there was no reliable way for coders to document the duration of HAI in lessons because the researcher was unable to insert markers

into the digital recordings, or set up a coding scenario in which accurate time stamping of instruction (using an Excel spreadsheet) was possible. Duration of instructional behaviors could add an important dimension to the data on effectiveness of e-coaching in changing the instructional behavior of student teachers.

5.3 IMPLICATIONS FOR PRACTICE

This study has demonstrated the potential of BIE^2 coaching as a student teacher supervision tool, and has provided valuable insights into using BIE^2 coaching in practice with student teachers during elementary school placements. Based on this case study experience, some minor adaptations of the e-coaching protocol are suggested that might make the tool more effective with undergraduate student teachers. Coaches and student teachers could ensure clearer communication with a visual signal, but even so some the target ratio of five affirmations to one correction may need slight alteration due to the potential for missed feedback. More effective scheduling guidelines need to be established so that working with a changeable school schedule is not so problematic. Included with the schedule could be an additional benefit to schedule digital recordings of non-coached lessons for use in electronic portfolios. A trouble-shooter needs to be established for each classroom to limit the impact of inevitable technological glitches, and trouble-shooters need to have some preparation for the role, and some other steps might be taken to lessen the impact of technology issues. The need for effective scheduling and troubleshooting may require some type of host-site agreement with schools to make recruitment of sites easier and keep commitments uniform from site to site.

5.3.1 Successful communication: signaling and affirming

The e-coach and undergraduate student teacher need to ensure that communication is received and is clear. Since all three participants in this study indicated that they had difficulty switching between BIE^2 coaching feedback and classroom stimuli, it seems prudent to help undergraduate, pre-service teachers to switch their attention, rather than requiring them to do so on their own. All stakeholders indicated that BIE^2 coaching itself was not distracting to elementary students. So adding a simple visual signal that requires a brief pause would be no more distracting than using a "quiet signal," a common practice with young students in which the teacher gives a signal that requires all students to be quiet and look at the teacher. Student teachers could discretely signal their e-coach and pupils to indicate when they are listening to feedback. For example the student teacher might hold a hand cupped over the Bluetooth ear, or hold up one finger, to let everyone know when her/his attention is directed to electronic feedback. Such a signal would ensure that the student teacher listened while either pupils or e-coach spoke, but would eliminate the problem seen in this study where everyone spoke at once. Similarly, a visual signal would allow pupils to see when they needed to hold their questions and comments (briefly) without the student teacher asking them to do so. Since e-coaching feedback is extremely short, this "pause" would last only seconds, and would be as easily accepted by elementary pupils as the e-coaching itself.

It is important for e-coaching feedback to maintain the ratio of four or five affirming comments to one corrective comment in feedback. This ratio correlates to reaching desired outcomes in many contexts. These contexts range from coaching for the development and practice of specific skills (Thompson, 2003; Buzas & Ayllon, 1981), to maintaining long-term relationships (Gottman, 1994; Gottman, Coan, Carrere, & Swanson, 1998), to the development

and academic success of children (Hart & Risley, 1995; Yamamoto, K.,1972). A lower ratio of positive comments for each corrective comment does not correlate with desired results, while higher proportions of positive feedback do not achieve better results (Thompson, 2003). Until a body of research demonstrates that a different ratio can be effective in helping student teachers change instructional behavior, affirming feedback should out-number corrective feedback by at least four to one.

5.3.2 Establishing effective scheduling guidelines and benefits

Second, more effective scheduling guidelines need to be established so that working with a changeable school schedule is not so problematic. Included with the schedule could be an additional benefit to schedule digital recordings of non-coached lessons for use in electronic portfolios.

Following Rock's recommendations, e-coaching sessions should be limited to 30 minutes, and not run consecutively, to avoid "BIE^2 coacher fatigue." Based on this study, consecutive days of e-coaching do not appear necessary, and they were extremely hard to achieve. A more useful concept might be to schedule a couple sessions per week with a "make-up window" for rescheduling sessions if coaching time is lost to scheduling conflicts or technical glitches. Student teachers might also schedule lesson recording with or without e-coaching for their own professional development or for use in electronic portfolios. Having this option may provide additional incentive to motivate student teachers to participate in e-coaching.

5.3.3 Troubleshooting and technology issues

A trouble-shooter needs to be established for each classroom to limit the impact of inevitable technological glitches, and trouble-shooters need to have some preparation for the role. Some other steps might also be taken to lessen the impact of technology issues. The need for effective scheduling and troubleshooting may require some type of host-site agreement with schools to make recruitment of sites easier and keep commitments uniform from site to site.

Troubleshooting in the classroom proved to be a pivotal issue. BIE^2 coaching worked better in classrooms with a designated trouble-shooter. When BIE^2 coaching is set up in a school, perhaps the only eligible classrooms are those with a cooperating teacher who is willing to be a problem solver. This would limit the number of coaching placements, but make the experience more likely to succeed with the student teacher. Also BIE classrooms should be set up in advance not only so the appropriate technology staff can install and debug equipment, but also so cooperating teachers would have the opportunity to practice with the equipment.

In addition, it could be helpful if troubleshooters had training of some kind and a venue for sharing information and tips. In this study, it was clear that the BIE^2 coach was responsible for the troubleshooting suggestions and information. However since she was not in the schools she did not have firsthand experience, and sometimes could not map her Mac-based suggestions onto the keyboard or screen of the school's PC hardware. A wiki or other shared, searchable information repository would put some responsibility for content of troubleshooting in the hands of the host schools.

Each school may need to identify the individual who would be the technology liaison between the e-coach and the school. This would allow for more efficient sharing of information on installation, debugging and troubleshooting. In this study the experience varied from school to

school based on the personnel assigned to help with technology, so establishing who the most effective staff member would be and how to communicate with that person would be helpful in dealing with all types of technology issues.

Different equipment could be explored to discover how to pick up elementary pupil voices in addition to the student teacher's voice, and to see all pupils in the classroom. Although these issues might also be dealt with through selection of appropriate lessons for e-coaching or in the host-site agreement below.

In setting up student teacher placements that include e-coaching, it would be helpful to have a standard site-agreement that documents the responsibilities of the college and BIE^2 coach and the responsibilities of the elementary school and cooperating teacher. In this way all cooperating teachers would be able to make an informed choice about whether to accept BIE^2 coaching in their classroom, and the e-coach would be able to establish parameters in which to work effectively. The suggestions outlined above could provide the basic information about what could be covered in such an agreement, and why it would benefit both the school and the e-coach.

5.4 IMPLICATIONS FOR FUTURE RESEARCH

The present study highlights several directions for future research. Four are described below. One intriguing prospect for student teacher supervision is the possibility of coaching teachers to "think on their feet" and develop flexible instruction skills through e-coaching. Other possible research relates to e-coaching as a supervision tool. First, exploring whether there are identifiable characteristics of coaching-resistant student teachers. Second, investigating effective schedules

for delivery of e-coaching and possible patterns of behavior change in response student teachers. Finally, research is needed to investigate how best to prepare and train e-coaches for the rigors of the work.

5.4.1 Training student teachers to think on their feet

One aspect of instructional change was not measured by this study, but became evident as the weeks went by. E-coaching can help student teachers learn to think on their feet and alter instruction as needs arise. The two responsive student teachers reported that they appreciated the feedback they got from their pupils with HAI because it allowed them to either feel confident about their planned instruction, or compelled them to alter the planned lesson to meet student needs. Both these responsive student teachers had made some changes to their instruction based on feedback from the traditional feedback they received from their college supervisors, and feedback from their cooperating teachers. This feedback came from weekly observations with written feedback, with the feedback reviewed in a meeting after the instruction was over. However the changes made in response to this traditional feedback would be incorporated into future lesson planning, rather than making changes as they provided the instruction. BIE^2 coaching can help them to go "live" with instructional change, something that is generally very difficult for novice teachers, let alone pre-service student teachers. As a rule, teacher preparation programs have not helped student teachers learn to "think on their feet" and actively alter instruction to match student needs. This was not possible during traditional supervision with delayed feedback. However BIE^2 coaching is a tool that provides scaffolding to support pre-service teachers as they "think on their feet." For the first time, pre-service teachers can be coached in the critical work of adapting instruction as the lesson progresses, and they can learn

to provide flexible, needs-based instruction as their everyday instruction. This concept will need to be explored and documented in future research.

5.4.2 Identifying characteristics of coaching-resistant student teachers

Perhaps not all student teachers should receive BIE^2 coaching. Those who exhibit inflexible instruction, difficulty responding to instructional feedback in methods courses or practicum instruction, current personal difficulties, or those who share some other, as yet unsuspected, characteristic, may not benefit from BIE^2 coaching as it was piloted here. Conversely, identifying the coaching resistant pre-service teachers early could allow intervention with e-coaching. It may be that e-coaching in methods or practicum courses would lessen the characteristic(s) that contribute to coaching-resistance during student teaching placements.

5.4.3 Identifying effective e-coaching schedules and patterns of behavior change

Further research may document an effective pattern of e-coaching for student teachers, or a typical pattern of behavior changes among student teachers responsive to e-coaching. In this study e-coaching was delivered whenever possible, rarely on consecutive days or even on a similar number of days per week. Despite this, after four or five e-coaching sessions, the two responsive student teachers demonstrated a new level of the target behaviors. It is possible that more frequent or consistent coaching could influence student teacher behaviors more quickly. However, as seen in this study, just a handful of BIE^2 sessions may lead to consistent instructional behavior changes for responsive student teachers, which would be highly desirable

when supervising multiple student teachers. More BIE^2 coaching of student teachers is needed to document the most effective way to provide e-coaching that leads to desired behavior changes.

5.4.4 Preparation of e-coaches

The e-coach in this study brought years of educational coaching experience to the role, and was well versed in the strength-based coaching that requires multiple affirming comments for every corrective comment. The "e-coaching fatigue" that she experienced was due in large measure to the long hours she spent in BIE^2 coaching. However the mental fatigue of e-coaching also came from the very nature of e-coaching, the need to translate feedback into very concise comments and provide these in a way that the listener could use instantly. Inserting feedback into quiet moments or speech pauses requires intense concentration on the lesson. It was also cognitively demanding to translate potential comments into the very concise feedback needed for e-coaching. If the e-coach was unfamiliar with strength-based coaching, generating and translating affirmations as well as corrections plus tracking the ratio of these comments could be extremely challenging. E-coaches may need advance preparation and practice opportunities that provide feedback on their BIE^2 coaching. Perhaps the challenge of coaching undergraduate student teachers, who are not yet experienced teachers and to whom every comment looms large, adds a delicate layer of difficulty on top of e-coaching for which coaches also need to prepare. For all these reasons, preparation of e-coaches might incorporate the following types of training, and accompanying rubrics would need to be developed to show a progression of skill acquisition.

- Speedy recognition of the behaviors being targeted in the e-coaching: Speed can be increased only by continued practice, so videos of instruction or silent, on-line observation of classrooms must be available. Training for speedy recognition would

begin with recognition of very specific instructional behaviors, such as praise statements, and move to more general such as high access instruction and then questioning behavior.

- Speedy recognition of instructional behaviors to affirm: As above, practice is required, but anyone with educational coaching or supervision experience should find this is a natural application of their existing skills and abilities. Others would need training in recognizing effective instruction and the factors that comprise it.
- Concise feedback statements: This could begin with paper and pencil practice converting statements into feedback phrases, categorizing feedback for specific purposes, and developing personal "feedback bibles" with organized lists of feedback phrases. However to become effective, practice coaching sessions using good feedback for peer instruction and for taped or silently observed lessons will be necessary
- Tracking types of comments to ensure a high ratio of affirmations to corrections: An easy to use tool should be introduced and feedback should be logged until a coach has established a consistent ratio of four or five affirming for every correcting statement. This tool could be electronic (i.e., an Excel spreadsheet with time-stamp macro, or a paper-pencil tally sheet). The advantage to the former is that a time-stamped spreadsheet could also provide a report of feedback patterns.
- Choosing when to provide feedback: As described in this study, if the e-coach is training to work with undergraduates, timing of feedback seems to be more critical than what is reported elsewhere in the literature. This may be practiced with transcripts of lessons, and then by actively providing feedback during peer, taped or silently observed instruction.
- Data collection on e-coaching: Data need to be collected to demonstrate individual progress and to provide information to the field on preparation of e-coaches.

APPENDIX A

SUMMARY OF INSTRUCTIONAL METHODS USED IN THIS STUDY*

Choral response, oral: The teacher asks a question, and gives students time to think about the answer. On the teacher's signal, all students respond aloud together. This is effective when there is one correct answer and it is very short. It is especially helpful when practicing vocabulary.

Choral response, physical signaling: The teacher asks a question, tells students to think about it, and asks them to show their answer. All students respond in the same manner, which may be thumbs up/thumbs down, a scale of one to five shown by holding up the fingers of one hand, answer written on individual white boards, card display showing different answers on each side of the card— for example: true/false, or regular word/irregular word. When most of the students have displayed their answer, the teacher may call on students randomly or cues them to respond chorally together. This engages all students in thinking about the answer, and lets the teacher avoid calling on those who are not prepared to answer.

Classroom whip-around: Teacher poses an open-ended question, and asks students to prepare a short answer. After giving students thinking time (and modeling a response if necessary), the teacher starts with one student and "whips around the room," having students share their answers quickly, with no comments or discussion in between. Students are allowed to pass. This is a good way to have students become comfortable with sharing their ideas, and is excellent formative assessment

Think-(write)-pair-share: Teacher poses an open-ended question and gives students time to think about it or write down an answer. Then the students are directed to form pairs, and the teacher designates a "one" and "two" in each pair. The "ones" then share their answers with their partners, and then the "twos" share their answers. After this, the teacher calls on several students randomly to share their answers. This strategy is very useful for open-ended questions with many feasible answers.

Cloze reading: Teacher reads aloud from the text, having students follow along in their books. Every sentence or so, the teacher leaves out a word or phrase, and the students must read it aloud chorally. This is more effective than round-robin reading because it focuses the students' attention and gives them all access to the text, regardless of reading level.

Random questioning with name cards: The teacher writes all students' names on index cards, then poses a question and gives time for students to think. After using Thumbs Up When you Know or one of the partnering strategies to ensure everyone is prepared to respond, the teacher randomly selects a name from the among the cards and calls on that student to answer. This lets students feel like they are playing a game and it enlivens discussions.

***Adapted from Feldman & Denti (2004).*

APPENDIX B

SUMMARY OF SELECTED MAJOR STUDIES OF ENGAGEMENT, REPRESENTING THE TYPES OF ENGAGEMENT AND METHODS OF STUDY SEEN IN THE LITERATURE FOR STUDENT SAMPLES IN ELEMENTARY AND MIDDLE SCHOOLS

Study	Type of Engagement	Sample	Method(s)	Teacher practices and/or Student achievement
Birch & Ladd (1997)	Emotional	K students, primarily white	Survey, cross-sectional design; regression analysis	Dependency in child relations correlated with less school engagement
Blumenfeld & Meece (1988)	Cognitive	4th-6th grade science classes; middle-SES	Surveys, interviews, observations, cross sectional design; also quantitative & qualitative analysis of rooms with wide range of engagement scores	Engagement related to teachers' instruction and expectations; complex procedural tasks led to less use of cognitive strategies; teachers' communicating high expectation and setting high bar for understand led to high cognitive engagement
Connell & Welborn (1991)	Behavioral Emotional Cognitive	3rd to 5th grade, white, middle-SES, suburban and rural	Survey, cross-sectional; path analysis & pattern analysis	Engagement related to student achievement; students' perceived competence correlated with engagement
Finn (1993)	Behavioral Emotional	8th grade students in the representative random national sample (NELS)	Survey, cross-sectional; analysis of variance	Behavioral engagement: related to student achievement, at-risk students demonstrated lower behavioral engagement; emotional engagement: no correlation with achievement, no differences between lower and higher student achievers

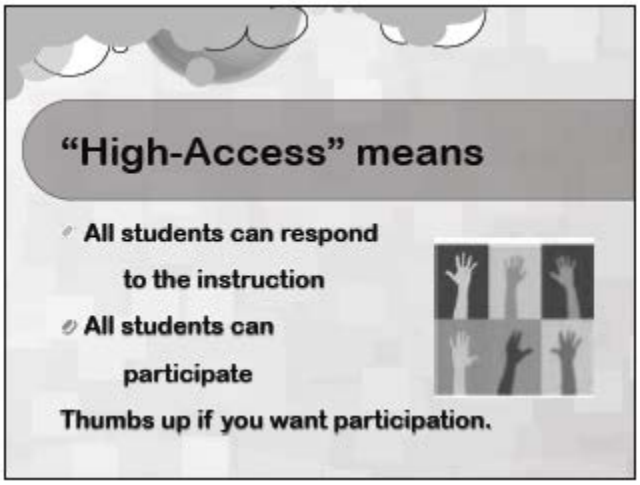
Finn, Pannozzo, & Voelkl (1995)	Behavioral	4th grade, random sample of urban, suburban and rural Tennessee schools	Survey, cross sectional; measured student participation and classified as compliant, disruptive or inattentive	Behavioral engagement related to student achievement, with disruptive students scoring lower and inattentive students scoring lowest in achievement
Fredricks, Blumenfeld, Friedel & Paris (2002)	Behavioral Emotional Cognitive	3rd to 5th grade, drawn from two Hispanic, African American, low-SES areas	Multi-method: survey and interview, longitudinal study; regression analysis and thematic analysis	Emotional and cognitive engagement related to teacher support; peers' support, norms for class work, and task challenge correlated with the three types of engagement
Furrer & Skinner (2003)	Behavioral Emotional	3rd to 6th grade, mostly White, middle-SES, suburban and rural	Survey, longitudinal from fall to spring; regression analysis, individual-centered analysis	Behavioral and emotional engagement correlated with relatedness to peers, parents and teachers; relationship with teacher was a stronger engagement predictor for boys
Kindermann (1993)	Behavioral	4th and 5th grade, mostly White, middle-SES, suburban and rural	Survey, longitudinal from fall to spring; social composite mapping	Level of behavioral engagement defined self-selected peer groups; high-engagement groups increased engagement Sept. to May
Marks (2000)	Combined Behavioral & Emotional	5th, 8th and 10th grade, math and social studies classes in restructuring schools	Survey, cross-sectional; hierarchical linear modeling	Combined measure of behavioral and emotional engagement related to previous school success; type of instruction (authentic) predicted engagement; school, class and parents working as social support for learning also predicted engagement
Meece, Blumenfeld, & Hoyle (1998)	Cognitive	5th and 6th grade science classes, middle-SES	Survey, cross-sectional; structural equation modeling	Higher cognitive engagement related to students' task-goal orientation
Patrick, Skinner & Connell (1993)	Behavioral Emotional	3rd to 5th grade, mostly White and middle-SES, suburban and rural	Survey, cross-sectional; regression analyses and pattern analyses	Both behavioral and emotional engagement related to, and predicted by, students' competence and autonomy
Ryan & Patrick (2001)	Behavioral Cognitive	7th and 8th grade in two ethnically diverse middle schools	Survey, longitudinal; regression analysis	Behavioral engagement improvements over time related to students' perceptions of teacher support; cognitive engagement related to perceptions of teacher support and encouragement of mutual respect

Skinner & Belmont (1993)	Behavioral Emotional	3rd to 5th grade, mostly White and low-middle-SES to middle-SES, rural-suburban	Survey, longitudinal across the school year; correlational and path analysis	Emotional engagement (teacher involvement) influenced all engagement aspects students experienced in the school year; reciprocal effects of engagement in the teacher-student interactions magnified across the year for an *engagement Matthew Effect*
Skinner, Zimmer-Gembeck & Connell (1998)	Combined Behavioral & Emotional	3rd to 7th grade, mostly White, middle-SES, suburban and rural	Survey, longitudinal; regression analyses and hierarchical linear analysis	(Combined) engagement predicted by perceptions of control; individual's engagement stable from 3rd through 6th grade but declined at the start of middle school; engagement over 5 years predicted by individual's development of control
Stipek (2002)	Combined Behavioral, Emotional & Cognitive	2nd to 3rd grade, low-SES, ethnically diverse	Multi-method: classroom observation, teacher ratings, survey; cross-sectional; correlational analysis	Engagement predicted by quality of instruction and academic focus; Engagement associated with achievement
Valeski & Stipek (2001)	Behavioral	K to 1st grade, low-SES ethnically diverse, suburban and rural	Multi-method: surveys of child and teacher, classroom observations; cross-sectional; correlational analyses	Students' ratings of competence related to teachers' ratings of behavioral engagement; students attitudes about their teacher were not related to engagement

Note: NELS – National Educational Longitudinal Study

APPENDIX C

HAI TRAINING POWERPOINT



Think-Write-Pair-Share: Why Participation's Important

- Write: in BIG print on whiteboards 30 sec.
- Pair: touch pinkys & raise 'em 30 sec.
- Share: If you agree, ☆ the reason 10 sec.
- Instructional time vs. Engagement? 50 sec.
- Think: your top 3 reasons

Think (review whiteboard) and we'll "Whip Around" the room…

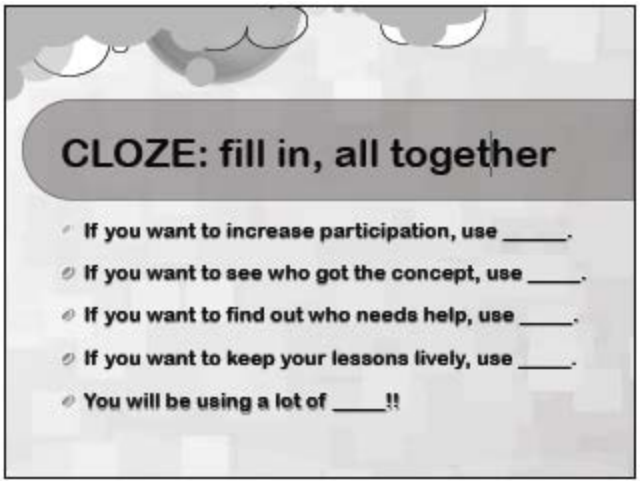
The most important reason for you

Pinky Wave if HAI…

- Would be useful in elementary grades
- Would be useful in middle grade
- Would be useful in high school
- Would be important in all content areas
- Would require extra class time

Partner chat, then write

- Brainstorm all the versions of HAI you can think of on your paper--legibly
- Star the ones you have tried
- We'll review on doc camera & ask you to share what you know/have done


CLOZE: fill in, all together
If you want to increase participation, use _____.
If you want to see who got the concept, use _____.
If you want to find out who needs help, use _____.
If you want to keep your lessons lively, use _____.
You will be using a lot of _____!!

APPENDIX D

INFORMED CONSENT PARENTAL PERMISSION LETTER

Fall 2011

Dear Parents,

This fall your child's [school district] classroom is participating in an exciting research study. The study investigates whether "electronic coaching" can enhance student teachers' instruction.

You are being asked to give permission for your child to be digitally recorded as part of this research. The study will not change the curriculum. Instead, it is designed to increase kids' participation in reading lessons, so they practice more reading skills in each lesson.

The research uses a computer, webcam and Bluetooth to connect the student teacher and her supervisor from a distance. This technology allows coaching during the lesson, without the class hearing a thing. This immediate feedback from the coaching helps a student teacher to improve instruction quickly, rather than accidently forming bad instructional habits. The coaching and recording only occur for 30 minutes, twice a week. The rest of the week instruction proceeds as usual.

Digital recordings of the observations are made so that the supervisor can later analyze the student teacher's response to coaching, and the participation of the class. Digital recordings are kept confidential: stored in a password-protected external hard-drive, in a locked office. The recordings will only be viewed by the researchers, as part of the study.

The research study is being conducted by Maria Almendarez Barron, who is an Assistant Professor in the Education Department at [college]. If you have questions, please call her at 412.536.1211.

- -

I will permit my child(ren) to participate in the research study described above. I agree that as part of this research my child(ren) may be included in digital recordings of their classroom.

____ ________________

Signature of Parent Date

____

Name(s) of participating child(ren)

APPENDIX E

CALENDAR OF E-COACHING SESSIONS IMPLEMENTED

	17-Oct	18-Oct	19-Oct	20-Oct	21-Oct	24-Oct	25-Oct	26-Oct	27-Oct	28-Oct	31-Oct	01-Nov	02-Nov	03-Nov	04-Nov	07-Nov	08-Nov	09-Nov	10-Nov	11-Nov	14-Nov
	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14	Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
Student Teacher #1	X	X	X	/B 1	B 2	NA	NA	NA	NA	C 1	/C2	X	X	C3	NA	X	/C4	X	C5	NA	C6
Teacher #3									X	X	NA	X	X	B1	/B 2	coach- trial	C1	NA	NA	NA	X
Teacher #2									X	X	NA	X	NA	B1	B2	NA	X	NA	NA	NA	X

Calendar codes

B #	Baseline observation	/M #	technical glitch interrupts maintenance
/B #	technical glitch interrupts baseline	NA	not teaching, or class event
C #	uninterrupted coaching	X	session cancelled
/C #	technical glitch interrupts coaching	Med	no coaching, student teacher medical issue
M #	maintenance observation		

	15-Nov	16-Nov	17-Nov	18-Nov	21-Nov	22-Nov	28-Nov	29-Nov	30-Nov	01-Dec	02-Dec	05-Dec	05-Dec	06-Dec	07-Dec	08-Dec	08-Dec	09-Dec	12-Dec	13-Dec
	Day 22	Day 23	Day 24	Day 25	Day 26	Day 27	Day 28	Day 29	Day 30	Day 31	Day 32	Day 33	Day 33	Day 34	Day 35	Day 36	Day 36	Day 37	Day 38	Day 39
Student Teacher#1	X	/C7	C8	NA	/C 9	NA	/M1	M2												
Student Teacher #3	Med	Med	C2	NA	Med	/C3	Med	/C4	lost Bluetooth	/C 5	C 6	/C 7	/C 8	Bad Sound	/C 9	X		X	M 1	M 2
Student Teacher #2		C1	C2	NA	X	NA	NA	X	C3	C4	NA	C5		/C 6	C7	M 1	M 2			

Calendar codes

B #	baseline observation	/M #	technical glitch interrupts maintenance
/B #	technical glitch interrupts baseline	NA	not teaching, or class event
C #	uninterrupted coaching	X	session cancelled
/C #	technical glitch interrupts coaching	Med	no coaching, student teacher medical issue
M #	maintenance observation		

PLEASE NOTE: CALENDAR SHOWS STUDENT TEACHERS #1, #3, AND #2
RATHER THAN IN #1, #2, #3 ORDER

APPENDIX F

TRANSCRIPT OF LESSON WITH BIE^2 COACHING FEEDBACK

Context This transcript is the first twenty minutes of an hour-long lesson. In this lesson, the student teacher will attempt differentiated instruction for the first time. Students were pretested on the content the day before. Two tested above level and will work independently. All others will begin with the same group instruction.

Student Teacher	*Five… Four… Three… Two…* Students are scurrying to their desks and settling in. All are in place by the count of "two."
BIE^2 coach	*Nice!*
Student Teacher	*OK , what I need to do, we are going to do something a little different today. Thank you for filling out the notecards* [yesterday*]. That way I really understood what personification really means. But today I need everybody to come up here and sit on the carpet in this area.*
Student	*Can we sit over there?* Student points to one side.
Student Teacher	*Yes that's fine*. [Calls two students by name.] *Could you please come with me back there*. Student teacher points to back table. *OK everyone take a seat. Please do me a favor, and pass these around to everyone sitting over there in the front. Hmmm….*

Boys do me a favor and move to sit over there. Student teacher separates potentially disruptive students.

BIE² coach — *Very calm affect. Great behavior management!*

Student Teacher — Returns to back table with two students. *OK, back here. What I'd like you to do, since you already understand what personification is, can you remind me real quick what that means.*

Student — *Yeah, that's like, um, when maybe you said a pretzel rolls around, like, happily, like it's alive and real.*

Student Teacher — *Very good. What I want you to do, see there are the directions here. I want you read an example of a poem that has personification. Then I want you to write a letter to a friend, but you will write it like you were a small insect—and you will use your twist about personification in the letter. So let me get you a piece of paper and then… if you have any questions just raise your hand. And yes, you may sharpen your pencil.*

Student teacher returns to the large group at the front of the room. *OK boys and girls, what I would like you to do, I had* [student] *pass this out to you. Who did not get one? Everybody else has one? Read this silently to yourself then I'm going to read it out loud and I'm going to ask questions about it to you. Go ahead and read it now.*

Tells two students at back table, *If you have a question maybe ask each other, but otherwise I would like to see your own work.*

BIE² coach — *Excellent classroom management!*

Student Teacher — *It's different because it is a poem. Once you are done, all eyes up here so I know you are finished*.

One student has been sliding closer and closer to student teacher until she barely has room to stand up. *Um,* [student] *will you please scoot back a tiny bit.*

BIE^2 coach	(laughing) *Good one!*
Student Teacher	*OK, yes*?
Student	Student teacher calls on one girl who has raised her hand, who explains something about not understanding the poem but she is almost inaudible.
Student Teacher	*That's OK, poems are very difficult sometimes to understand because when an author writes a poem, sometimes there are words in here that rhyme to make the poem flow a little bit better. So now what I would like to do is read the poem aloud to you, to see if you can get a better feel for what the poem is talking about. So everyone just follow along*. [Reads poem about a sleepy mouse and the Milky Way.] *What about this poem is very unique? Can you think about something that relates to your own life? Maybe you have seen this before. What are your thoughts?*
Student	*Well, I'm just wondering* [something about how small a mouse is and the difficulty of moving around the big universe]
Student Teacher	*Very good*. Calls on the next student.
Student	*I think* [something inaudible…because…] *I watch a lot of TV. I mean really a lot. You see things like this.* The rest is inaudible, but he is clearly trying to be funny. Other students chuckle.
Student	Completely inaudible
Student Teacher	*Ok, so what I've heard so far is about animals talking, the way they were moving, how they were sleeping…* Calls on another student who raised her hand.

Student	*I made a connection. It's like with my little brother. He's like the mouse. You know like he's scurrying and curious and stuff*
Student Teacher	*Very good. So you connected that idea to your brother, who is a person, or he's a human at least.*
BIE^2 coach	[Laughing] *Stick to person, it matches personification!*
Student Teacher	*Very good*. She calls on the next student.
Student	*I connect with myself. But it was weird about space like maybe a monkey could go there, but seriously, a mouse? That was weird.*
Student Teacher	*OK, well right, sometimes poems are confusing or very hard to understand. But what I want to point out from your responses to the poem, you picked up exactly what I wanted you to see.* Tells kid who has been waving his hand around, *Just hold on for one minute*. *You said things such as the way the mouse sleeps*. Calls on that student who repeats his connection but inaudibly. *And how about the way the animals talked?* Calls on student to repeat that comment, but she is too quiet to hear. [Student] *you said about your brother, please repeat that.* Student is inaudible. *Yesterday I asked you what personification might mean to you. After reading this poem, and the author used a lot of personification in here, do you have an idea of what the word personification could be now? Take a minute.*
BIE^2 coach	*Try think-pair-share*

Student Teacher	*What I want you to do is take about 10 seconds. If you need to reread the poem, go through it one more time. I want you to think about it yourself.*
BIE^2 coach	*Maybe a whip-around for ideas on personification?*
Student Teacher	*OK.* *So what I'd like you to do is real quick, tell me, what do you think it means? Personification in that poem, what do you think in might mean?*
Students	Several replies in a row, indistinguishable or inaudible.
Student Teacher	*Over here? Just real quick!* Students' quiet replies are inaudible.
Student Teacher	Tells a subset of 5 students, *Come over here. I need to talk to you.* Students move and get settled. To the rest of the students she says, *While you are waiting, what I would like you to do…* Two students at the back table raise hands, *OK, just do the best you can and I will be back there is just a minute.* Turns back to the rest of the students, *I'd like you to read this poem. If you can whisper together, I'd like you to read this, and IF you can whisper you can do it together.* To the 5 students called to a small groupm, *You are going to read this poem about being a small insect then you are going to write a letter about it using personification. So get started with reading and I'll get back to you.* Waves to the two students originally working at the back table, and they come for instructions. *This is really a neat job. So if you like teddy bears better pick them. If you'd like elephants better, pick them. Please read this poem, and then create your own alternate ending to the poem. So whichever*

	you would like to try first, go ahead, Just whatever you'd like to try first, just go ahead.
BIE^2 coach	*Good differentiation of practice work!*
Student Teacher	*To one off-task student, Are you with us up here?*
Student	*Yeah, what do you need? What's happening*?
Student Teacher	*I'm moving them. I would like you to come back up because we are going to be talking immediately after that.*
Student	*Why can't I just read that other half? That half?*
Student Teacher	*It's because you weren't supposed to see the other half, so just go back up with the group and read the new poem.*
	All students are working on their assigned tasks.
BIE^2 coach	*We plan, but kids happen!*
	This was a great start on differentiated instruction.
	When you get a final definition of "differentiation" from students, how about doing a thumbs up for agreement or not? Then you can refine the definition if needed.
Student Teacher	*Sounds like that might work. I better check on them*.

APPENDIX G

CODE DIRECTIONS AND DESCRIPTIONS

To code

- Only code teacher's instructional actions designed *to elicit responses from students*
- For each new response episode, position cursor in the next row in the "start" column
- *Hit [Control] Z,* which will time stamp, at *the start* of the response episode
- Move the cursor along the row until it is under the instructional code chosen for that episode
- *Hit [Control] Z*, which will time stamp, at *the end* of the response episode
- Note: the cumulative frequency for each code will automatically appear at the top of the code column
- If a second response episode is embedded within the first, like partner chat with a choral response inserted…
    - Leave the original time-stamped row and go to the row below
    - Time stamp that lower row ASAP in the "start" cell
    - Time stamp in the appropriate cell to code the end of the instructional move
    - Return to the row above and time stamp when that instructional move ends

High access instructional codes

Choral response

- *All students* answer with any agreed upon signal
- May be *oral or physical* response (say the answer, say yes/no, thumbs up/down, temperature reading, show individual white board answers, stand up/down, response cards, etc.)
- All students are responding to the *same question*

Partner chat

- Two or more students *talk briefly* to share their answers, or brainstorm an answer
- NOT: solving a problem, or engaging in a group task (below)

Small group

- Two or more students work on an assigned task together
- If the task is only to talk about something, use Partner Chat (above)

Whip around

- *Multiple students* take a *turn* to answer in some kind of order
- Teacher collects responses from *at least 30%* of kids in the group
- Teacher may call students by name, or students may answer in order
- All students are responding to the *same question*

CLOZE

- *Oral fill-in-the-blank*
- Teacher makes a statement or poses a question and pauses for the students to insert the missing word(s)
- Each CLOZE opportunity is a different prompt
- Characterized by inserting a missing word in the teacher's statement, unlike choral response

Traditional instruction

Hand raising

- Teacher calls on individual students to respond to a prompt
- Students *hands may or may not be raised* or not when the teacher calls on them

Blurt out

- Teacher asks a question or makes a comment; student(s) shout(s) out the answer w/o waiting for a turn or for the teacher to call on him
- One or more students may blurt out the answer

Round robin

- Teacher offers different prompts or questions for each student to respond to
- Students respond one by one; at least 30% of students respond
- Covers reading aloud one after the other, including popcorn reading

Hand raising

- Teacher poses a question and expects to get a correct answer
- May ask one or more specific student to answer
- May ask for raised hands

APPENDIX H

DATA COLLECTION AND CODING INSTRUMENT: EXCEL SHEET CODES

	Frequency
START STRATEGY: time stamp - space, control, shift, semi-colon	
Choral Response: all kids respond together--verbal, hand signal, response card…	
Partner Chat: talk to your neighbor about…	
Small Group Work: kids work together on assigned task; roles may be assigned	
Whip Around: each student responds in turn	
Cloze: oral fill-in-the-blank	
Hand Raising: in response to prompt, teachers call on one or more to answer	
Blurt Outs: with/with-out hand raised, a student shouts out an answer or comment	
Round Robin: Students read-aloud in a given order, or as selected by peers (pop-corn reading)	
Comments or notes	

	Frequency

DATA COLLECTION AND CODING INSTRUMENT:
EXCEL SHEET TO USE IN CODING VIDEOS

	START STRATEGTY: time stamp - space, control, shift, semi-colon	Choral Response	Partner Chat	Sm Grp.Work	Whip Around	CLOZE	Hand Raising	Blurt Outs	Round Robin	Comments
Frequency	time stamp start time	0	0	0	0	0	0	0	0	Frequency

APPENDIX I

INTERVIEW PROTOCOL

Student teacher interview

1. Tell me about your BIE e-Coaching experience. What was the experience like for you as a teacher?

2. How did the BIE e-coaching compare to the traditional student teacher supervision you have experienced?

3. What did you *think* about the BIE technology?

4. How did you *feel* about the BIE technology?

5. In your opinion was it rude (i.e., hindering) or helpful to give feedback in the teacher's ear while he/she was teaching?

6. As a student teacher, how was the BIE helpful to you?

7. As a student teacher, how was the BIE not helpful to you?

8. What did you learn through the BIE e-Coaching experiences about yourself as an elementary student teacher?

9. What did you learn through the BIE technology about the students you teach?

10. Did the students in your classroom experience disruptions as a result of the BIE e-Coaching?

11. If someone came to you for information and/or suggestions about using BIE technology, based on your experiences, what would you say to them?

12. Do you have concerns about using the BIE technology as a student teacher supervision tool? What are your concerns?

13. What sort of planning and preparation is required for a student teacher to successfully use the BIE technology?

14. What technological "bugs" or "glitches" did you encounter when using the BIE technology?

15. Would you recommend BIE e-Coaching to other student teachers? Why or why not?

Note: This document adapted from Dr. Marica Rock's interview protocol, shared July 2011

Cooperating teacher interview

1. What was the overall BIE experience in your classroom? Positive? Difficult? Other?

2. What did you *think* about the BIE technology?

3. How did you *feel* about the BIE technology?

4. How did the BIE e-coaching compare to the traditional student teacher supervision you have experienced in your classroom?

5. In your opinion was it rude (i.e., hindering) or helpful to give feedback in the teacher's ear while he/she was teaching?

6. Did you feel the BIE e-Coaching was helpful to your student teacher? Why or why not?

7. Were the students in your classroom disrupted by the BIE e-Coaching?

8. If someone came to you for information and/or suggestions about using BIE technology, based on your experiences, what would you say to them?

9. Do you have concerns about using the BIE technology as a student teacher supervision tool? What are your concerns?

10. What sort of planning and preparation is required for a classroom to successfully host the BIE technology?

11. What technological "bugs" or "glitches" did you encounter when using the BIE system?

12. Would you recommend BIE e-Coaching to other student teachers? Why or why not?

Note: This document adapted from Dr. Marcia Rock's interview protocol, shared July 2011.

Administrator interview

1. What did you notice about my student teacher's BIE e-Coaching experience in one of your classrooms?

2. What did you *think* about the BIE technology?

3. How did you *feel* about the BIE technology?

4. How did the BIE e-coaching compare to the traditional student teacher supervision you have experienced in your school?

5. In your opinion would it be rude (i.e., hindering) or helpful to give feedback in the teacher's ear while he/she was teaching?

6. Do you think the students in the classroom experienced disruptions as a result of the BIE e-Coaching?

7. Do you have concerns about using the BIE technology as a student teacher supervision tool? What are your concerns?

8. What sort of planning and preparation is required for a school to successfully host the BIE technology?

9. Are you aware of any technological "bugs" or "glitches" encountered when using the BIE technology?

10. Would you recommend BIE e-Coaching to other administrators? Why or why not?

Note: This document adapted from Dr. Marcia Rock's interview protocol, shared July 2011.

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