How Are They Now? Longer Term Effects of eCoaching Through Online Bug-In-Ear Technology

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Abstract:

In this study, using mixed methods, we investigated the longer term effects of eCoaching through advanced online bug-in-ear (BIE) technology. Quantitative data on five dependent variables were extracted from 14 participants' electronically archived video files at three points in time—Spring 1 (i.e., baseline, which was the first semester of enrollment without eCoaching feedback), Spring 2 (i.e., 1 year later with eCoaching feedback), and Spring 3 (i.e., 2 years later after exiting the program without eCoaching feedback). Qualitative data were collected by means of interviews with participants regarding their ongoing participation in eCoaching. Quantitative analysis, using repeated-measures ANOVA, confirmed initial improvements in participants' teaching practices and P-12 student engagement generally withstood the test of time. Also, qualitative findings indicated, as time went on, participants had more positive than negative attitudes toward eCoaching through advanced online BIE.

Keywords: eCoaching | bug in ear | teacher development | evidence-based practices | research methods | long-term effects

Article:

All children deserve an effective teacher. This truism is supported by the U.S. Department of Education's (2013) *Blueprint for Recognizing Educational Success, Professional Excellence, and Collaborative Teaching* (RESPECT). Policy makers, practitioners, and researchers agree that achieving this end, in part, requires transformation of existing pre- and in-service teacher development tactics. One such approach involves coaching. Joyce and Showers (2002) found traditional techniques, such as demonstration and practice, had an effect size of 0.0 on transfer of

training. When coaching was added, however, the effect size increased to 1.42. More recently, Knight (2007) reported that teachers who received coaching were 4 times more likely to carry out newly learned skills than those who received traditional lecture-based professional development.

When combined with other critical features (e.g., well-aligned course and well-supervised field work) associated with quality preparation (Brownell, Ross, Colon, & McCallum, 2005; Leko, Brownell, Sindelar, & Murphy, 2012), *e*Coaching, formerly referred to as virtual coaching, through advanced online bug-in-ear (BIE) technology may play a vital role in developing effective teachers. Drawing on seminal definitions of clinical supervision in psychotherapy and clinical services (Gallant & Thyer, 1989; Hess, 1980), we broadly define *e*Coaching as a relationship in which one or more persons' effective teaching skills are intentionally and potentially enhanced through online interactions with another person. Unlike face-to-face supervision or elbow coaching, *e*Coaching does not require onsite delivery. In one specific form of *e*Coaching, the online supervisor or coach offers discreet in ear feedback to pre- and in-service teachers in vivo (see M. L. Rock, Gregg, Gable, & Zigmond, 2009; M. L. Rock, Zigmond, Gregg, & Gable, 2011).

Onsite and Online BIE Technologies

Although online BIE technologies are relatively new, researchers have long used onsite variations of the device to deliver immediate feedback to teachers during training. As the name implies, BIE devices allow discreet communications between supervisor and supervisee. Typically, the trainee wears an ear bud audio receiver, while the supervisor or coach provides input or feedback through a microphone. Until recently, BIE devices relied primarily on wired and wireless forms of FM radio technology with limited transmitting capabilities (Herold, Ramirez, & Newkirk, 1971; Scheeler & Lee, 2002; Scheeler, McAfee, Ruhl, & Lee, 2006). In 2009, Rock and her colleagues (see M.L. Rock, Gregg, Thead, Acker, Gable, & Zigmond, 2009) made use of mobile and web-based technologies, pioneering the research and development of *e*Coaching through advanced online BIE. Unlike its predecessor, the advanced online BIE device consists of three inexpensive "off the shelf" components— a Bluetooth earpiece, a wide-angle web cam, and a Bluetooth adaptor (see M. L. Rock, Gregg, Gable, & Zigmond, 2009 and M. L. Rock, Zigmond, Gregg, & Gable, 2011 for technology specifications), which, when added to a teacher's existing desk or laptop computer, allow an online coach or supervisor to provide a teacher-in-training with feedback via the Internet in real time from a remote location.

Short- and Longer Term Effects of BIE Technologies

To determine the short- and longer term effects of using BIE technology to provide feedback to pre- and in-service teachers as a means of improving their classroom practices, we used three methods to search the professional literature. First, we reviewed the reference lists from previously published reviews, not only of BIE (Gallant & Thyer, 1989) but also of more general

performance based teacher feedback (Scheeler, Ruhl, & McAfee, 2004), and from one recent meta-analysis of the effect of feedback on teachers' treatment integrity (Solomon, Klein, & Politylo, 2012). Second, we searched the Academic Search Complete (EBSCO), ERIC, and PsycINFO databases for articles published between 1966 (the earliest entry in the ERIC database) and April 2013, using the keyword: "bug-in-the-ear" in conjunction with one of the following keywords: "education," "teacher preparation," "professional development," "feedback," "supervision," "student teacher supervision," "teacher education," and "coaching." These keyword searches resulted in 99 citations. Third, we reviewed the reference lists of the articles obtained through the *EBSCO, ERIC,* and *PsycINFO* searches. From the pool of accumulated articles, we selected only those in which researchers conducted empirical investigations of the effects of BIE use with pre- or in-service teachers. In all, our search and filter strategies produced 15 articles specific to general or special education teacher preparation at the pre- or in-service level, published between 1971 and 2013.

Short-Term and Longer Term Effects

Short-term effects for onsite BIE. Between 1971 and 2008, we located five articles—one descriptive account (Herold et al., 1971), one experimental study (Bowles & Nelson, 1976), two single-subject investigations (Kahan, 2002; Scheeler & Lee, 2002), and one qualitative inquiry (Farrell & Chandler, 2008)—wherein the authors reported the short-term effects of BIE feedback delivered onsite. With onsite delivery, the BIE communication system used was wired or wireless; however, due to limited transmitting capabilities, the supervisor or coach was physically present in the classroom or school building when providing feedback through it. We classified an article in the "short-term effects" category when authors reported the impact of feedback delivered through BIE, but not the follow along or generalization effects. To date, short-term findings associated with onsite BIE have indicated: field-testing the BIE not only allayed trainees' fears, but also led to enthusiastic use (Herold et al., 1971). Providing well-timed suggestions often redirected the course of a problematic lesson (Herold et al., 1971). Adding 2 hours of BIE training to a traditional in-service workshop resulted in changes to teachers' behavior management practices (Bowles & Nelson, 1976). Using the BIE promoted "withitness" and autonomy during student teaching (Kahan, 2002). Offering immediate feedback through the BIE device during instruction was more effective in increasing pre-service teachers' completion of three-term contingency trials than providing delayed feedback during a post-observation conference (Scheeler & Lee, 2002). Pre-service teachers adjusted easily to wearing and using the BIE device (Scheeler & Lee, 2002). Cooperating teachers reported that, at the end of an early field experience, although teaching competencies were similar among those who had received BIE feedback and those who had not, the former demonstrated a faster progression and expressed less frustration (Farrell & Chandler, 2008).

Short-term effects for online BIE. In addition to the reports of onsite BIE usage, we found two studies published between 2009 and 2012 in which researchers used an online BIE variation. Both studies used quasi-experimental group designs and expanded understanding of BIE effects

by including student engagement as a dependent variable. Initial research findings from M. L. Rock, Gregg, Thead, et al. (2009) indicated that the advanced online BIE was a feasible and powerful tool for improving use of evidence-based practices by teachers in training *and* increasing their P-12 students' academic engagement. In a more recent investigation, M. Rock et al. (2012) replicated the results of the first study, not only by confirming the effectiveness of the advanced online BIE with a new group of participants, but also by demonstrating improved dependability of the technology.

Longer term effects for onsite BIE. Between 1978 and 2010, we located seven articles in which the authors investigated not only short-term but also longer term effects of feedback delivered through onsite BIE use. We defined "longer term" as including fading, maintenance, and/or generalization phases, or follow-up post-testing. In six of the seven studies, the investigators used single-subject research designs (see Goodman, Brady, Duffy, Scott, & Pollard, 2008; Scheeler, Bruno, Grubb, & Seavey, 2009; Scheeler, Congdon, & Stansbery, 2010; Scheeler et al., 2006; Thomson, Holmberg, Baer, Hodges, & Moore, 1978; Van der Mars, 1987). In one of the seven, the researcher utilized a group experimental design (see Giebelhaus, 1994).

Collectively, longer term findings associated with onsite BIE, confirmed initial withdraw of BIE feedback led to declines in improved teacher performance; however, reinstatement resulted in recovery that was maintained (Thomson et al., 1978). Some improvements in teacher behavior were maintained at 6-month post checks, while others were not (Van der Mars, 1987). Pre- and in-service teachers maintained gains in targeted teaching behaviors that were explicit in nature (e.g., delivering learn units during direct instruction; see Goodman et al., 2008; Scheeler et al., 2006, 2010). Beginning teachers failed to generalize initial improvements until they developed and implemented a specific plan to do so (Scheeler et al., 2009). Pre-service teachers who received BIE feedback over a relatively short period of time (i.e., 2 weeks) did not differ from those who did not at pre, post, or follow-up (Giebelhaus, 1994). After prolonged use, some disliked the BIE (Scheeler et al., 2009; Thomson et al., 1978).

Longer term effects for online BIE. Most recently, Scheeler, McKinnon, and Stout (2012) used the advanced online BIE technology developed by Rock and her colleagues in 2009, but without electronic video capture, to provide immediate feedback to five pre-service teachers during practicum. They used a single-subject across participants design that included a brief maintenance phase, consisting of between one and three probes. During that time, no immediate feedback was provided. Results indicated that four of the five teachers maintained initial improvements in their teaching behavior during the maintenance phase. The fifth teacher had not reached the maintenance phase by study's end.

Summary. In the extant literature to date, 8 of 15 (53.3%) onsite or online BIE studies included some measurement and evidence of longer term effectiveness, 7 of 12 (58.3%) onsite BIE studies and 1 of 3 (33.3%) online (or web based) BIE. Overall, the longer term effects of BIE were mixed. In 4 of the 8 (43%) studies, the findings were variable (see Giebelhaus, 1994; Scheeler et

al., 2009; Thomson et al., 1978; Van der Mars, 1987). By comparison, in the remaining 4 investigations, researchers reported consistently favorable results (see Goodman et al., 2008; Scheeler et al., 2010; Scheeler et al., 2006; Scheeler et al., 2012). Because fewer than 5 long-term effects single-subject studies (with positive results) have been reported, by fewer than three different researchers across three different geographic locations involving fewer than 20 participants, the existing body of evidence does not meet Horner et al.'s (2005) criteria for achieving confidence in the effect. Moreover, the limited number of data points included in the maintenance and/or generalization phases of these studies raises further concerns (Kratochwill et al., 2010).

On the basis of aforementioned shortcomings, our purposes for conducting this study were threefold: (a) to investigate longer term effects of *e*Coaching delivered through advanced online wireless BIE technology on practicing teacher trainees in real time, (b) to explore how trainees' practices were sustained after *e*Coaching ended, and (c) to monitor the ongoing acceptability of *e*Coaching with trainees who were practicing, Master's degree level, general and special education teachers. Below are the three related research questions we sought to answer.

> **Research Question 1:** How are initial teacher improvements influenced over time with continued use of *e*Coaching through advanced online BIE?
>
> **Research Question 2:** How are initial and ongoing improvements demonstrated by trainees affected when *e*Coaching through advanced online BIE ends?
>
> **Research Question 3:** How do teachers perceive ongoing participation in *e*Coaching

Method

Because this study was part of a longitudinal investigation of *e*Coaching delivered through advanced online BIE and the method has been published in detail (see M. Rock et al., 2012; M. L. Rock, Gregg, Thead, et al., 2009), we offer here only an abbreviated synopsis.

Participants and Settings

In this study, participants were those included in the M. L. Rock, Gregg, Thead, et al. (2009) study, with one exception. One participant withdrew from the federally funded project for personal reasons. See Table 1 for revised participant demographics. The 14 participants (2 males and 12 females) were enrolled in a federally funded personnel preparation program for six consecutive semesters, resulting in a Master's degree in special education and state approved licensure. All 14 received full tuition remission and textbook stipends. The participants had an average of 5 years of teaching experience. Eleven of the 14 taught elementary students in public school general and special education classrooms. Three taught in self-contained special education settings that included secondary students. For example, 1 taught in a rural district in a self-contained classroom that served K-12 students with emotional and behavioral disorders.

Table 1. Participant Demographics.

	Frequency	%
Gender		
Male	2	14.3
Female	12	85.7
Age		
18-24	4	28.6
25-35	3	21.4
36-45	6	42.9
46+	1	7.1
Years teaching		
0-5	8	57.2
6-10	3	21.4
11-20	3	21.4
Assigned grade		
K	1	7.1
1st	1	7.1
2nd	2	14.4
3rd	2	14.4
4th	2	14.4
5th	1	7.1
6th	1	7.1
3rd-6th	1	7.1
K-5th	2	14.4
K-12th	1	7.1
Ethnicity		
Caucasian	10	71.4
African American	4	28.6
Formal training		
Bachelor's in education	10	71.4
Master's in education	2	14.3
Bachelor's in non-education field	2	14.3
Certification		
Elementary Education	11	78.6
Elementary and Special	1	7.1
Education (Dual)		
Uncertified (Emergency)	2	14.3

As reported in M. L. Rock, Gregg, Thead, et al. (2009), participants were employed in differing school districts located in the southeastern section of the United States. At project's end, they taught in 13 different school buildings (two taught on the same one) that were located at a mean distance of 31.43 miles (one way) from the university. The school districts varied in type and size: 5 were rural, 4 were small city, 2 were midsize suburban, and 2 were large suburban. This

description differs slightly from that which was reported in M. L. Rock, Gregg, Thead, et al. because six participants transferred to new school buildings or became employed by a different school district. Also, unlike the first study in which Rock and her colleagues reported baseline and intervention findings from participants' first semester of enrollment, the eCoaching effects reported in this study are representative of their performance 1 and 2 years later.

Written permission to conduct both *e*Coaching and data collection was obtained from an administrative representative in each participant's school district. Also, through an annual Institutional Review Board (IRB) approval process, we were granted an ongoing waiver for the school-age (i.e., P-12) students. As was the case in M. L. Rock, Gregg, Thead, et al. (2009) and M. Rock et al. (2012), if any school-age student's parent declined district permission to video, the student was removed from view of the webcam.

In the first study (see M. L. Rock, Gregg, Thead, et al., 2009), the online *e*Coach operated only from her university office. In this study, during Spring 2 (i.e., 1 year after baseline), the first author conducted the *e*Coaching from various locations, including her home, university office, or a pilot *e*Coaching lab on campus. When coaching from her home, she used a MacBook Pro laptop computer with an internal webcam (iSight) and microphone, and high-speed wireless Internet access. When in the pilot *e*Coaching lab located in the university's faculty resource center, she relied on a Mac desktop computer, with webcam, and high-speed wired Internet access. This equipment differed slightly from the PC desktop we reported using in the first study (see M. L. Rock, Gregg, Thead, et al., 2009); however, the *e*Coach continued to use the Dell computer, Creative Live! webcam, and external microphone when coaching from her campus-based office. Alternating among various computing platforms and various venues helped us establish, in part, how technical dependability of the advanced online BIE technology could be improved (see M. Rock et al., 2012).

In Spring 3, the semester after participants exited the federally funded training program, the follow along sessions were conducted from the pilot *e*Coaching lab on campus. One of the co-authors, a clinical faculty member with an earned doctorate in special education who was *not* the *e*Coach, visited each participant online during a prescheduled block of time. During follow along sessions, she provided no feedback; however, the teachers continued to wear the Bluetooth earpiece while teaching.

During each semester, members of the research team captured the sessions electronically and archived them on an external hard drive stored in a secure office in compliance with Institutional Review Board (IRB) regulations. In Spring 2, the first author devoted between 8 and 16 hours a week to scheduling, carrying out, and troubleshooting the *e*Coaching sessions. By contrast, in Spring 3, one of the other authors spent less than 4 hours a week conducting the follow along online visits.

Intervention

As noted in M. L. Rock, Gregg, Thead, et al. (2009) and M. Rock et al. (2012), during the first semester (Spring 1), grant funds supported the purchase of advanced online BIE technology components for each teacher in training (see M. L. Rock, Gregg, Thead, et al. 2009; M. L. Rock et al., 2011). Participants were responsible for installing the advanced online BIE technology using the three pages of written instructions we provided. During Spring 1, participants reported on average a 3-hour installation time. That time was either eliminated entirely or reduced to about 30 to 45 minutes in Springs 2 and 3 when trainees moved to a new classroom, school building, or district. In those instances, they had to reinstall the advanced online BIE technology components on another desk or laptop computer. It is clear that trainees had become far more proficient. Across Springs 1, 2, and 3, technical support was provided, as needed, by each participant's school district, the first author's college technical support personnel, and the first author.

Following the description of cyber supervision in counselor education used by Coker, Jones, Staples, and Harbach (2002), we defined the specific type of *e*Coaching intervention used in this study as the provision of immediate feedback to teacher trainees, through advanced online BIE technology, during real-time classroom instruction. During Spring 2, the *e*Coach provided one of four types of immediate feedback—encouraging, correcting, instructing, questioning— in real time while the teacher trainee engaged in 30 minutes of classroom instruction. Using a running commentary approach, the *e*Coach intermittently interjected immediate feedback. As was the case in M. L. Rock, Gregg, Thead, et al. (2009) and M. Rock et al. (2012), we drew on Scheeler et al.'s (2004) approach to operationalize the four types of feedback provided. *Instructing feedback* was specified as "objective information related to predetermined specific teaching behaviors" (p. 399). For example, "Hmm . . . only one or two students are volunteering answers to your questions. Let's try a think, pair, and share technique here so the students can consult a peer before responding." *Correcting feedback* was characterized as "the type and extent of errors and specific ways to correct the error" (p. 399). For instance, "Oh dear, by responding to her blurt out, you have reinforced it. That means she is more likely to do so in the future. Ignore her next time, praise a student with a quiet raised hand, and call on him or her to answer." *Encouraging feedback* was defined as "praise contingent on demonstration of a specific teaching behavior" (p. 399), such as, "Wow! I love the way you are weaving response cards into this lesson. All students are responding accurately and at a high rate. Bravo!" *Questioning feedback* was construed as a sentence posed in interrogative form to get information or clarify specific teaching behaviors (Random House Unabridged Dictionary, 2006). For example, "Are the students using a graphic organizer or a worksheet to record their responses?"

In Spring 2, after connecting online through Skype at an agreed upon time, the *e*Coach, the teacher in training, and the P-12 students exchanged warm, but brief greetings. Then, the teacher in training began the lesson. Through the Bluetooth earpiece, the *e*Coach provided immediate feedback to the teacher trainee—delivering instructive, corrective, encouraging, and questioning remarks while he or she was speaking as well as when he or she was not. Generally, the feedback

centered not only on the teacher trainee's use of evidence- based practices, but also on P-12 students' responsiveness. Taking this approach allowed the *e*Coach to provide teaching- and learning-centered feedback. At the end of the lesson, the *e*Coach provided the trainee with a quick summary of observed strengths. Finally, prior to bidding farewell to the P-12 students and signing off, the trainee and the *e*Coach co-constructed one to three future goals. Participants regularly sent electronic versions of their daily classroom schedule and a detailed lesson plan to the first author. She used the former to create a weekly schedule for *e*Coaching appointments and the latter, in part, to guide the immediate feedback provided *in situ*. Curriculum content and instructional format varied across participants. Each session with feedback was limited to approximately 30 minutes.

During Spring 3, the *e*Coach became a silent observer, but followed the same procedures as described in the preceding paragraph. At the end of the 30-minute observation, the online observer (i.e., *e*Coach) thanked the teacher trainee, said a brief good bye to the P-12 students, and disconnected the Skype call.

Design

Consistent with the original investigation (see M. L. Rock, Gregg, Thead, et al., 2009) and the replication (see M. Rock et al., 2012), we used a mixed-methods explanatory strategy (Creswell, 2013; Tashakkori & Teddlie, 2010) in this study. For quantitative analyses, we examined the frequencies of codes in participants' electronically archived video files using a repeated-measures design (McMillan & Schumacher, 2009). A repeated-measures design permits a smaller sample size in statistical analyses because individuals serve as their own controls. The number of teachers (i.e., sample size) in this study was 14. In calculations of effect size (in this case, the magnitude of difference expected in the dependent measure across three time periods), a medium effect size given Power = .80 yields sample size of $n = 14$. An *a priori* determination of power for the $n = 14$ teachers proceeded for both a multivariate and univariate repeated measures design. The results are acceptable in either case.

For the qualitative analyses, we used methods proposed by Lincoln and Guba (1985). We coded data obtained through participants' recorded interviews about their ongoing participation in *e*Coaching through advanced online BIE technology. We provide more extensive information related to the interviews and approach used to analyze these data later in this section when addressing "qualitative measurement."

Quantitative measurement. During Spring 1 and Spring 3 (i.e., baseline and follow along online observation without *e*Coaching) and during Spring 2 (i.e., online observation with *e*Coaching intervention), all sessions were captured electronically and coded systematically. Audio and video were recorded for both the online coach and the participant using Pamela Call Recorder 3.5 for Skype Business for PC or the eCamm Network Call Recorder for Mac.1 When participants placed the Skype video conference call to the first author, they were directed by

screen and speech prompts to accept or decline the video recording of the online coaching session. Participants had the option of terminating an online coaching session at any time by ending the Skype call. All online coaching sessions captured as video files were transferred from the desk or laptop computer's internal hard drive to an external one (i.e., Maxtor OneTouch4) where they were stored securely. Then, to ensure meaningful analyses of the observation data, we did not transcribe them. Instead, we followed recommendations from Derry (2007) and Derry et al. (2010) and worked exclusively with the video files to collect, code, and quantify study data.

Our aim in this study was to investigate longer term effects of *e*Coaching through advanced online BIE technology, so we used baseline data obtained during Spring 1 (reported in M. L. Rock, Gregg, Thead, et al. 2009) not only as the comparison for data collected in Spring 2, 1 year later while participants were still receiving *e*Coaching, but also for data gathered in Spring 3, 2 years later after participants had exited the program and were no longer receiving *e*Coaching. Spring 1, baseline data collection procedures were described previously in M. L.Rock, Gregg, Thead, et al. (2009).2 For each of the Spring 2 and Spring 3 data sets, based on the best AV quality, we selected four video files for analysis, one from the early, two from the middle, and one from the end of the prescribed time period (between January and May). We used the mean of the four selected *e*Coaching sessions with each participant to create the data sample for Spring 2 (i.e., 1 year after baseline with *e*Coaching) and for Spring 3 (i.e., 2 years after baseline for follow along without *e*Coaching).

The three dependent measures included in this study were (a) changes in teaching behavior—defined as the participants' use of low and high access instructional practices (see Feldman & Denti, 2004), (b) changes in classroom climate—defined as the participants' use of praise and redirects or reprimands as well as the percent of classroom students' engaged during instruction, and (c) participants' perceptions regarding the benefits and liabilities of ongoing participation in *e*Coaching. All three measures were included in the initial investigation (see Rock et al., 2009) and were selected based on reviews of the professional literature (see Schmidt, Rozendal, & Greenman, 2002) and evidence of classwide efficacy (see Conroy, Sutherland, Snyder, & Marsh, 2008). Also, with only the minor variations described below, coding and measuring procedures were those used in earlier research (see M. L. Rock, Gregg, Thead, et al., 2009).

To evaluate changes in teaching behavior, we combined *variable a1* (frequency of hand raising) and *variable a2* (frequency of round robin or teacher-led reading) to create *variable 1.1* (trainees' use of low access instructional practices, abbreviated as Low). We did the same to develop *variable 1.2* (trainees' use of high access instructional practices, abbreviated as High), by combining *variables a4* (frequency of choral/nonverbal group response) and *a5* (frequency of partner strategies). To evaluate changes in classroom climate, we examined the frequency of teacher praise (abbreviated as Praise), coded into *variable 2.1*, and combined *variable b1* (frequency of teacher redirects, abbreviated as redirects) and *variable b2* (frequency of teacher reprimands) to create *variable 2.2*. Operational definitions for all variables were reported in M. L. Rock, Gregg, Thead, et al. (2009).

We further analyzed these same video files for student engagement to determine whether changes in teaching behavior and classroom climate were accompanied by changes in student behavior. As in previous studies, we used momentary time-sampling methods at 5-minute intervals to code students' engagement during the 30-minute classroom lessons (Cooper, Heron, & Heward, 2007). The operational definition for student engagement and the procedure for collecting momentary time sample data were reported in M. L. Rock, Gregg, Thead, et al. (2009).

Inter-observer agreement (IOA). Four individuals, one clinical professor, one adjunct faculty member, one doctoral student, and one graduate assistant, coded frequencies of teacher behavior, classroom student behavior, and *e*Coach behavior using the archived videos selected from Spring 2 and 3 files. All were experienced in coding project-related data (see M. L. Rock, Gregg, Thead, et al., 2009) and achieved 80% to 100% levels of agreement on practice video files prior to coding for this study. When agreement fell below recommended levels (i.e., see Cooper et al., 2007), the coders engaged in retraining activities.

We calculated IOA on four of the eight (50%) video files selected from Springs 2 and 3. Agreement percentages, based on a comparison of any two coders' records, were calculated by dividing the total number of agreements by the total number of agreements plus disagreements, multiplied by 100 (Cooper et al., 2007). As reported previously (see Rock et al., 2009) Spring 1 Baseline IOA data were adequate. The mean IOA across Spring 2 video files was 88.61% for low access instructional strategy use, 87.92% for high access instructional strategy use, 86.78% for redirects and reprimands, 86.17% for praise, and 97.08% for student engagement. The overall IOA for Spring 2 coding was 89.31%. The mean IOA for Spring 3 coding was 87.31% for low access instructional strategy use, 90.69% for high access instructional strategy use, 89.16% for redirects and reprimands, 88.63% for praise, and 99.41% for student engagement for an overall IOA of 91.04%.

Qualitative measurement. To better understand participants' ongoing experiences with *e*Coaching and the use of advanced online BIE technology, each participant was interviewed by one of the research team members (but not the first author who had served as the *e*Coach) during the fifth semester of the six semester program. The open-ended prompts were as follows:

1. Tell me about your experience of using the advanced online BIE technology.

2. Tell me about the importance of the immediate, online feedback you received from the virtual coach, Dr. X.

3. Are there some additional comments about the advanced online BIE technology technology or the immediate, online feedback (i.e., *e*Coaching) you would like to share?

We captured each interview on video that was archived for transcription and analysis. These interviews ranged from 2 minutes 38 seconds to 11 minutes 43 seconds (*m* = 3 minutes 16 seconds).

We used a systematic approach to code and thematically analyze archived interview data (Patton, 2002). We were challenged to make sense of these data by "reducing the volume of raw information, sifting trivia from significance, identifying significant patterns, and constructing a framework for communicating the essence of what the data reveal" (Patton, 2002, p. 432). To ensure our approach reflected careful, recursive analyses (see Lincoln & Guba, 1985), we followed procedures recommended by Berg (2001). First, the graduate assistant member of the team transcribed the videotaped interviews. Second, we developed a preliminary set of codes based on over 50 years of traditional BIE research and our own previous investigations and affixed the codes to the textually represented data. Third, we translated codes into categorical themes. Fourth, we sorted the text data into the categories. Fifth, we closely examined the sorted texts to isolate meaningful patterns. Finally, we compared and contrasted the patterns with previous research and existing theories, yielding a small set of generalizations. Identifying patterns and unveiling uncertainties and ambiguities in this way helped us to build rich descriptions of our participants' ongoing participation in *e*Coaching and their feedback on the use of the advanced online BIE technology.

To establish credibility (i.e., validity) of the qualitative findings, we incorporated several strategies recommended by Creswell (2013). First, we used triangulation of data obtained, not only in this study, but also in our previously published work. Second, we used rich, thick descriptions. Third, we identified potential biases in the limitations section. Fourth, we presented negative and discrepant information. Fifth, we spent prolonged periods of time trying to gain in-depth understanding of participants' experiences. Sixth, we also involved individuals who were not the lead researchers when conducting the interviews.

Inter-rater agreement. To establish reliability of qualitative data, two members of the research team used percent agreement to calculate inter-rater agreement (Silverman, 2006) on 100% of coded interview data. Mean data for each theme was as follows: Advantages X = 89.72%, Disadvantages X = 95.5%, Feedback X = 83.38%, Emotion X = 89.46%, Other X = 90.46. Across the five themes, the overall mean percent of inter-rater agreement was 89.22%.

Results

By and large, the quantitative and qualitative data obtained through this study lend support to the favorable findings regarding longer term BIE use reported previously by others (see Goodman et al., 2008; Scheeler et al., 2010; Scheeler et al., 2006; Scheeler et al., 2012). Our results confirm that initial improvements in teaching practices can withstand the test of time. Also, our findings indicate that, as time went on, participants harbored more positive than negative orientations toward *e*Coaching through advanced online BIE.

Changes in Teaching Practices and Student Engagement Over Time

The five dependent measures included participants' use of low access instruction (Low), high access instruction (High), redirection (Redirect), and praise (Praise) as well as P-12 student engagement (Engaged) across three time periods (Baseline Spring 1, Feedback Spring 2, and Maintenance Spring 3). Because the expected trend for all five dependent variables is *not* the same (i.e., not all should increase over time), a MANOVA was *not* used. Instead, we applied univariate ANOVA repeated-measures analyses for each of the five dependent variables, adjusting the alpha level to control for power. Power to detect a difference exceeded .80 for all five analyses.

Use of low access instructional strategies. The average values for use of low access instruction (Low) showed a quadratic trend from a high of 34.07 in Spring 1, to a low of 3.98 in Sprint 2, to an increase to 9.8 in Spring 3 (see Figure 1). The trend was statistically significant, $F(2, 12) = 19.08$, $p = .0001$. The effect size ($\eta p 2$) was .76 with power of .99. The specific test of quadratic trend was statistically significant, $F(1, 13) = 34.66$, with an effect size of .73 and power of 1.0.

Use of high access instructional strategies. The average values for use of high access instruction (High) indicated a linear trend from Spring 1 to Spring 3 of 11.29 to 51.01 to 63.69 (see Figure 1). Again, the differences in the means at the three points in time were statistically significant, $F(2, 12) = 33.82$, $p = .0001$, with an effect size ($\eta p 2$) of .85 and power of 1.00. The specific test of linear trend was also statistically significant, $F(1, 13) = 73.01$, with an effect size of .85 and power of 1.0.

Use of redirection. The average values for use of redirection (Redirect) indicated a decline from 9.86 in Spring 1 to 5.73 in Spring 2, followed by another slight decline in Spring 3 to 5.44 (see Figure 2). The mean differences were not statistically significant, $F(1, 12) = 1.25$, $p = .32$, with an effect size of .17 and power of .22. The specific test of quadratic trend was also not statistically significant, $F(1, 13) = 2.01$, with an effect size of .13 and power of .26.

Use of praise. The average values for use of praise (Praise) showed an increase from baseline (27.64) to follow-up (52.35) followed by a decrease 1 year later (50.7) (see Figure 2). The ANOVA indicated statistically significant mean differences, $F(2, 12) = 18.95$, $p = .0001$, with an effect size ($\eta p 2$) of .76 and power of .99. The specific quadratic trend was statistically significant, $F(1, 13) = 12.61$, $p = .004$, with an effect size of .49 and power of .90.

Student engagement. The average values for student engagement (Engaged) indicated a linear trend from 75 to 96 to 99 (see Figure 3). Mean differences were statistically significant, $F(2, 12) = 13.88$, $p = .001$, with an effect size of .70 and power of .99. The specific test of linear trend was also statistically significant, $F(1, 13) = 17.95$, $p = .001$, with an effect size of .58 and power of .97.

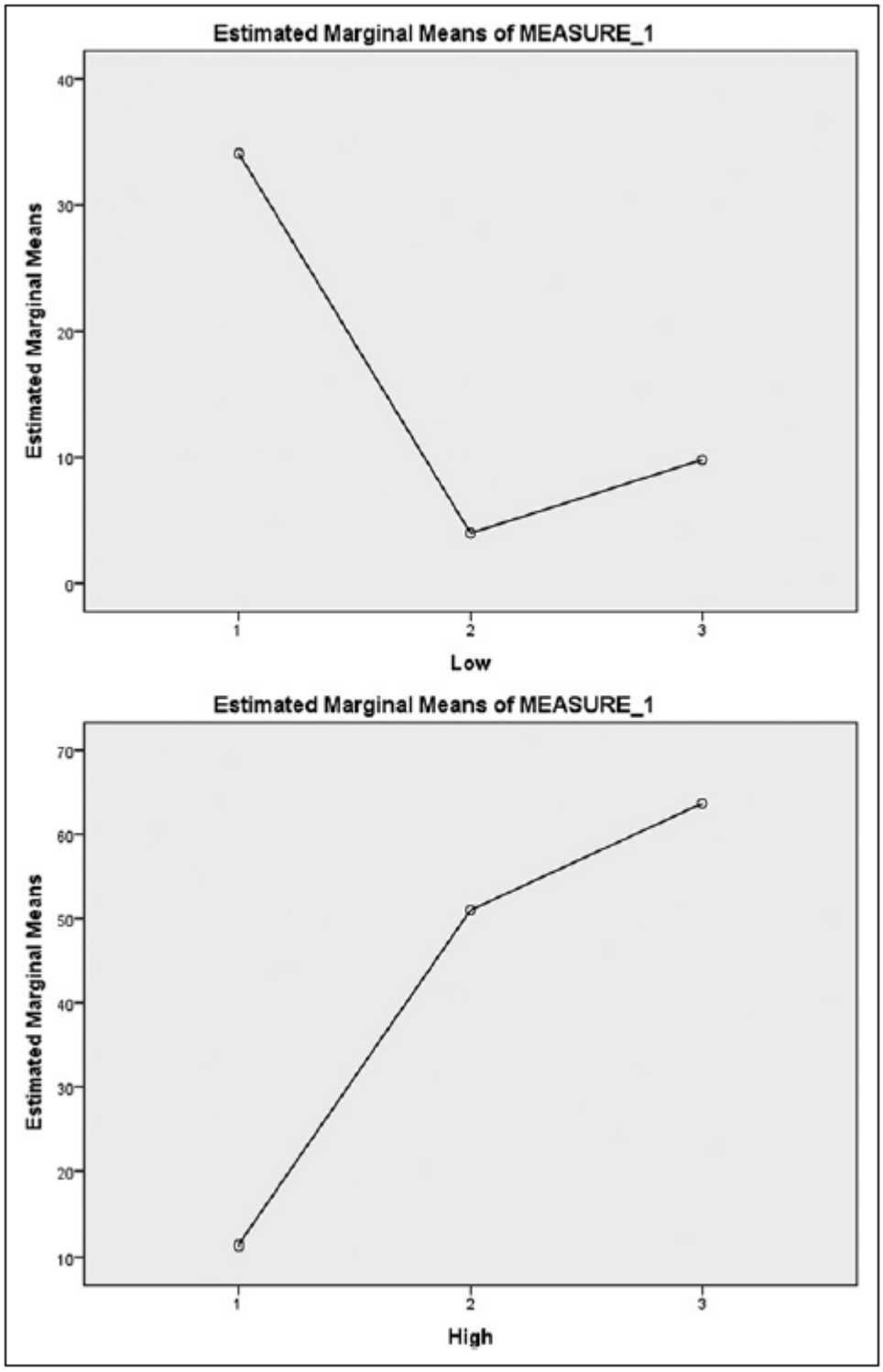

Figure 1. Trends for low and high access instructional strategy use.

Summary. Effect sizes were large for four of the five dependent variables that were statistically significant, ranging from >.25 and around .75 values. Power was > .80 for those dependent

variables that had a statistically significant trend, whether linear or quadratic. Descriptive statistics for the above-mentioned dependent variables are provided in Table 2.

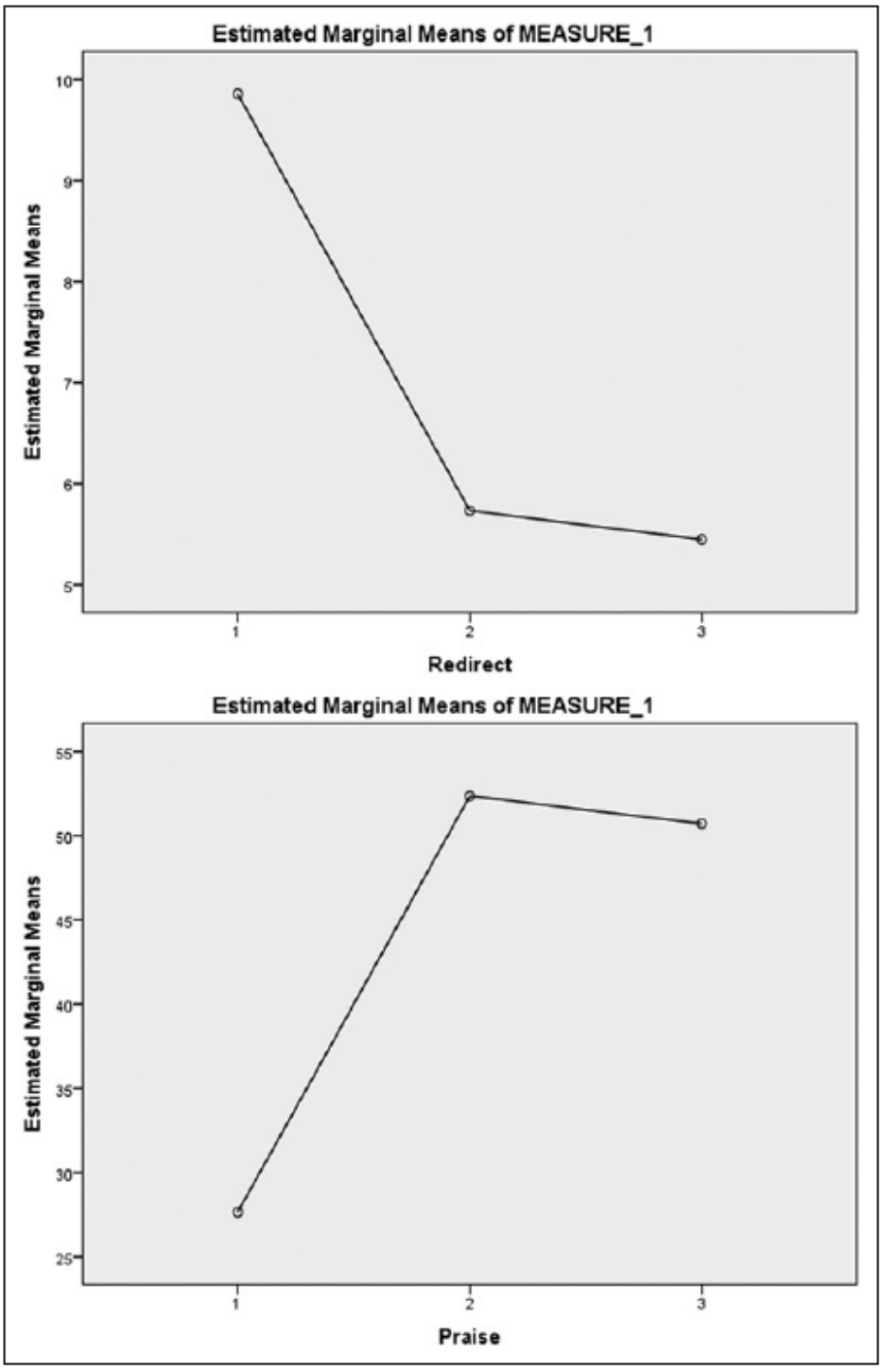

Figure 2. Trends for redirection and praise use.

Acceptability of Ongoing Use

The trainees' remarks about their ongoing participation in *e*Coaching addressed five separate themes: advantages of advanced online BIE, disadvantages of advanced online BIE, feedback issues, emotional responses to the *e*Coaching experience, and other matters. The trainees, on average, made 23.4 statements about the advantages of advanced online BIE in each interview, the theme that emerged most strongly in the data. Two additional themes yielded nearly as many responses per participant: emotional response to BIE (16.8 statements per interview) and feedback issues (15.1 statements per interview). Disadvantages of advanced online BIE were concerned nearly exclusively with problems in the initial setup of the systems and intermittent failure of the technology due to district policies and systems and were less common (approximately 7.6 statements per interview) indicating a three to one ratio of advantage over disadvantage. Finally, interviews typically contained 3.2 statements about other matters relating to *e*Coaching through advanced online BIE, predominately the trainees' opinions that it should enjoy wider use.

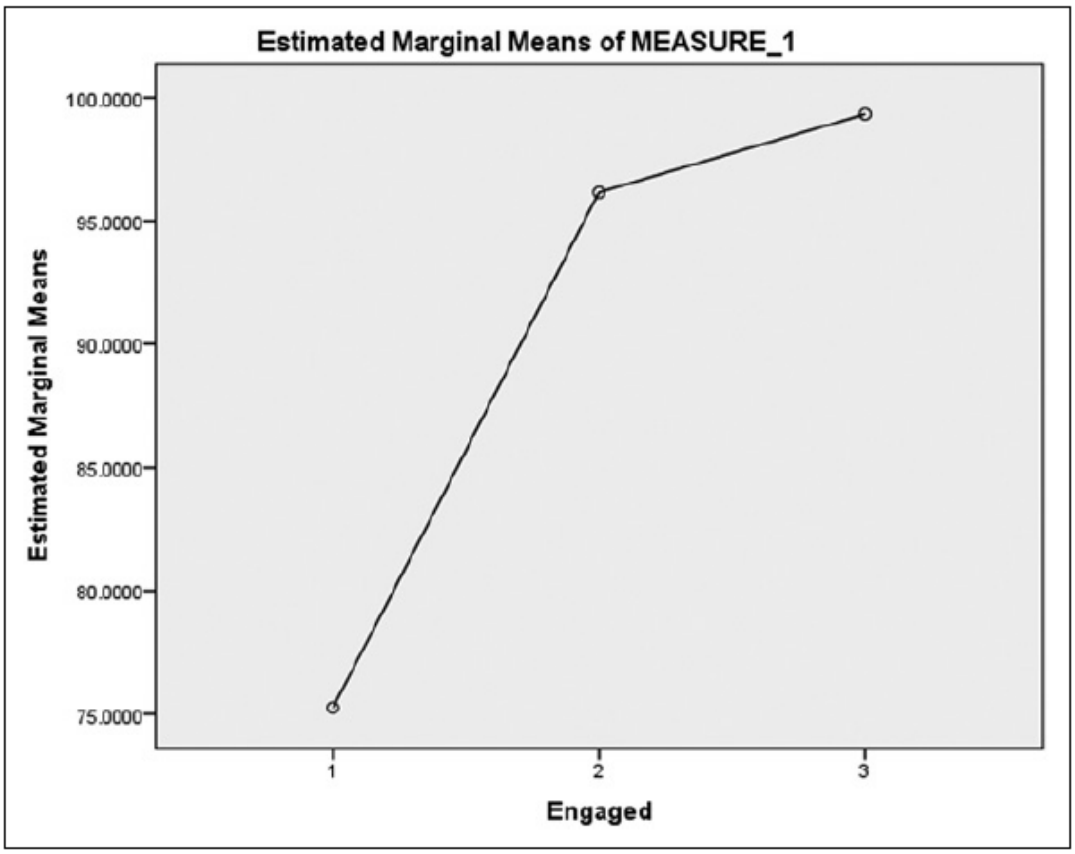

Figure 3. Trend for student engagement.

Table 2. Descriptive Statistics for Dependent Variables.

Condition	*M*	*SD*	*n*
Spring 1 Low	34.07	22.612	14
Spring 2 Low	3.9821	2.40485	14

Spring 3 Low	9.8036	5.67483	14
Spring 1 High	11.29	16.122	14
Spring 2 High	51.0179	31.13903	14
Spring 3 High	63.6964	25.67758	14
Spring 1 Redirect	9.86	10.220	14
Spring 2 Redirect	5.7321	1.87715	14
Spring 3 Redirect	5.4464	3.59511	14
Spring 1 Praise	27.64	22.294	14
Spring 2 Praise	52.3571	17.15644	14
Spring 3 Praise	50.7143	17.31075	14
Spring 1 Engaged	75.250000	21.4797131	14
Spring 2 Engaged	96.157	4.9474	14
Spring 3 Engaged	99.3336	0.89017	14

Advantages. All trainees attested to the fact that *e*Coaching was helpful to them. Twelve claimed that *e*Coaching facilitated their acquisition of evidence-based teaching strategies, leading to independent use of them in lesson planning and delivery. One trainee offered a particularly elegant description of this process:

> Having Dr. X in my ear has been an interesting evolution. In the beginning, it kind of caught me off guard because it was kind of like an interruption . . . but, as it got along it was almost like it just became part of what was going on in my head . . . and, so even when she is not in my ear I can hear her talking to me sometimes . . . her voice has now turned in to my own self talk. So it's been a great evolution from the beginning where it was a distraction to becoming part of my teaching process . . . She can say, "Okay, now use it." And, by practicing that in the actual moment, I get better at choosing those moments for myself.

Another trainee made a similar point about moving toward independence, saying, "Dr. X tells you in your ear, you do it and see that it works, and it's etched in your brain. You remember to use it each time." A third echoed the same theme.

> Whenever I heard Dr. X's feedback it kind of reinforced some of the things I was thinking already about what went well in the lesson. I can hear her feedback, and I know I've recognized those research-based strategies because I thought of it myself.

From the interviews, it became clear that there were three qualitatively different types of eCoaching. Some trainees described how the coach had companioned with them, giving them specific language and directions that enabled them to survive a difficult or chaotic lesson.

> I know a couple of times with—I have a couple of behavior issues on both sides of my classroom and a hard time trying to judge it and work with the kids. She just kind of talked me through it. I would do the 4:1 ratio and the start, target, do [redirection] and she

> helped remind me to do that. The kids got on target, right kind of in the lesson. They were completely changed and they were doing exactly what the object of the lesson was for.

Others carefully explained that the coaching attended to particular difficulties they were having with a specific teaching technique. In effect, the virtual coach partitioned the task of using the new strategy and guided them through its use.

> If I am trying a new strategy and I am not real sure of myself, she will give me feedback and help me get through it. Well, then I know how to do it the next time because I have actually done it.

At other times, coaching enabled the trainees to correct an error in using a particular technique. For example, the trainees had been taught the importance of guided practice when introducing a new skill. In one participant's lesson, the guided practice was missing:

> The feedback she gives me gets me back on track if I've gotten off track and that is especially important to me because I do not have the background in education. So I am coming in kind of as a blank slate and so she just immediately pops in and says, "You just went from direct instruction to independent work without any scaffolding [guided practice]. You need to go back and scaffold." And, I can immediately go back.

The participants appreciated the expertise of the *e*Coaching that enabled them to acquire the strategies effectively.

The third kind of coaching was evident when the *e*Coach functioned as an "outside eye." For many participants, it was comforting and reassuring to have another teacher attending to their children and their children's learning. Often, the "outside eye" saw individual student needs of which they were unaware. In the words of one trainee,

> Sometimes you know being on the outside looking in she can see, ummm, "Hey, you need to go do some teacher proximity for the little red shirt over there who is going to sleep." And, I might not have noticed that.
>
> or
>
> I learned how to do two things at one time . . . as far as continuing with the instruction. If she said something I needed to implement, I thought in my head. "Hey, I was supposed to do that anyways" or "I could have [*done*] that anyways." And, I just slid it on in without saying a word.

Another important advantage of *e*Coaching is that it appeared to foster the participants' desire to be held accountable for high quality classroom teaching. What was clear in the interview data was that the *e*Coaching scaffolding made possible to promote independence in using evidence-

based practices. Once the participants could use the strategies competently, their minds moved to issues of accountability for student learning. Six of those interviewed spoke to their developing sense of accountability. For example, one teacher reported, “I think it’s the most effective way for teacher educators to know that what they are teaching is actually being implemented in the classroom.” Three other teachers made similar comments.

> At first I wasn’t sure [it was] affecting [the way I teach], but then when you get the feedback . . . it really is changing the way my classroom is, you know, learning. The way the students are learning, the way I am teaching them, and I know it’s more effective. I know it’s more higher order thinking strategies and research-based and it’s helpful when she gives me the feedback because I know it’s specifically what I am working on.
>
> I look back now and I think it was a great asset. It helped me be a better teacher and I feel like, [with] me being a better teacher my students did a much a better job than they would have otherwise.
>
> The [advanced online] BIE technology is just, I mean, it’s just a new generation. The staff here have been just enthusiastic about wanting to find out more about the BIE technology and they are amazed at the capabilities, and I really believe it’s just the new wave for the future to be able to help educate our children in more effective ways.

Disadvantages. Participants identified few disadvantages to *e*Coaching. Nearly all of the disadvantages were bread and butter technology hassles endemic to relying on electronic equipment. None of the disadvantages were coaching-specific. In other words, the trainees did not view the *e*Coaching as intrusive, ineffective, or unwelcome. Six spoke of difficulties in installing the first generation of advanced online BIE software. District policies meant that participants didn’t have administrative rights that would allow them personally to install or reinstall the software; each had to negotiate co-installation via the technical support personnel in their districts, with all of the attendant delay and frustration that involves. As one participant described, “The set up for the BIE technology was complicated for me. I got to a point and couldn’t figure it out so our technology person had to come in and install it.”

> Eleven of the participants also spoke of ongoing occasional technology breakdowns, Bluetooth audio echoes, dropped Skype calls, and Internet outages. As one put it, “Getting the actual technology to work some days was difficult. I always had my Bluetooth charged, but sometimes the Internet just didn’t work.” Another commented,

We had some echoing in the ear when I was trying to read the story aloud but all I was hearing was my own voice coming back to me. So it kind of threw me off a little bit. That was just right at the beginning, like the first semester we did it. But since then it’s gotten a little bit better. We’re still having a few dropped calls here and there, but that’s a system problem. It doesn’t have anything to do with the specific software of the technology.

Feedback. All of the participants appreciated the way that reflecting on their lessons offered a specific focus for improving their teaching. Thirteen valued the positive nature of the feedback they received from the online coach and found it encouraging. Eleven spoke spontaneously of the importance of the immediacy of the feedback to their growth and development. In sum, the trainees found the *e*Coaching feedback via advanced online BIE to be helpful. One said, "I really enjoyed Dr. X's feedback. She guides us, you know. We teach and she will tell us, 'Well why don't you try this', or different strategies to try to help the kids have success within the lesson." Another stated, "Dr. X's feedback is very important to me. Her feedback, positive and negative, helps me grow and I welcome any of it." A third participant added,

> The feedback has been incredible; being able to collaborate with Dr. X and every professor is really, really beneficial for me; to be able to get that immediate feedback and to be able to focus on my kids at the same time in the learning environment. She has an amazing way of bringing out the best in every student, to be able to bring positive things [about] what we are doing to also show us what we need to work on.

Emotional responses. For all of the participants, reflecting on their experience with *e*Coaching generated positive emotions, which were sprinkled liberally throughout the interviews. The participants expressed amazement at the power of the technology and enthused about how valuable they found the *e*Coaching process. For 11 of the 14, negative emotions were also articulated. These negative emotions were primarily linked to the experience of installing the software at the beginning of the program, although some negative emotions were associated with ongoing technology glitches and the need to remain flexible in the face of typical elementary school scheduling issues. Perhaps the most interesting focus of the participants' emotional response was *trust*. Participants spoke about feeling safe and comfortable with the *e*Coach and the online BIE technology, and how that freed them to risk attempting to teach with strategies and methods not familiar to them. Eleven of the 14 interviewees spoke explicitly of the importance of trust to the *e*Coaching process, but trust could be inferred from the interviews of all participants.

Nine expressed pride in being part of this innovative approach with comments like "It's really just amazing to have her in my ear"; "I love using the BIE technology. It's just amazing. It is, I love it. I love it"; and "I was at first very hesitant, but now I'm very thankful for the BIEs . . . I wish I could be the one on the other end helping other teachers. It's been really beneficial."

Other. Of the various comments made by the trainees about other *e*Coaching-related matters, the one that emerged most strongly from the data was the desire that the technology enjoy wider use. Sixty-two percent of participants proposed contexts for additional uses in schools. Their own experiences with *e*Coaching through advanced online BIE had convinced them that wider use was both possible and desirable. One said, "Overall, it's been a great thing to implement and I think it would be great for principals to use for observing teachers as well." Another put it this way.

I just think it's something that once other people find out about the technology and how we use it, it's going to be so important and especially in the education of teachers and being able to collaborate with different classrooms.

Discussion

Over the past four decades, researchers have investigated the short and longer term effects of using BIE feedback to improve pre- and in-service teachers' classroom practices. The vast majority of those investigations of longer term effects have lasted for no more than a few weeks (i.e., 1-3) after BIE intervention ceased. In the present study, we attempted to advance the existing knowledge base by studying how participants who had received *e*Coaching feedback, through advanced online BIE technology, in the M. L. Rock, Gregg, Thead, et al. (2009) study fared as time went on.

Longer Term Effects on Improved Classroom Practice and Student Engagement

Although by no means definitive, overall, we found successful longer term use as evidenced by continued improvements in teacher and student behavior that were apparent not only during Spring 2 (1 year later with continued online BIE feedback), but also during Spring 3 (2 years later after the start of BIE coaching with no *e*Coaching during the second year). Specifically, during Spring 3, teachers demonstrated ongoing increases in their use of high access instructional strategies and continued decreases in their use of redirects and reprimands. However, in Spring 3, a slight increase was observed in the teachers' use of low access instruction, while small declines were also noted in their use of praise. We posit that the former illustrates an attempt to pair low and high access instruction (i.e., pose a question to the class that one student can answer and follow with a nonverbal choral response from all to indicate agreement or disagreement), while the latter likely reflects a ceiling effect (i.e., overtraining during Year 2). A speculation we find logical given that their students' classroom on-task engagement continued to improve.

Because previous studies of longer term BIE use were mixed, it is not surprising that our results converge with some and diverge from others. Unlike Thomson et al. (1978), we did not need to reinstate *e*Coaching because we did not record initial drops in improved teacher performance when *e*Coaching ceased. This may be because our participants received more *e*Coaching feedback through advanced online BIE over a longer period of time. Longer duration of initial eCoaching may explain other similarities and differences in our findings as well. For example, contrary to the Van der Mars (1987) finding, the use of praise by participants in this study remained higher than during the baseline condition; the one subject included in the Van der Mars study received *e*Coaching, during only 12 teaching sessions. Giebelhaus (1994) did not report statistically significant differences in student teachers' classroom performance after receiving BIE feedback whereas our quantitative analysis revealed statistically significant changes in four of five dependent measures. BIE intervention used in Giebelhaus' study lasted only 14 days compared with 1 year in our study. Finally, our participants were able to maintain improvements

in teaching behavior without a generalization plan, which was needed to counteract the deterioration reported by Scheeler et al. in their 2009 study. This difference may also be attributable, in part, to the extensive *e*Coaching intervention our participants received.

Also noteworthy are our longer term findings that align with those reported previously by Scheeler et al. (2006, 2010, 2012) and Goodman et al. (2008). As was the case in each of these single-subject research design studies, we found that initial improvements in teacher behavior generally maintained over time (e.g., baseline, intervention, maintenance). Perhaps more importantly, however, we found that initial and ongoing improvements were not limited to teacher behavior. In our study, students' academic engagement also continued to increase as time went on. Moreover, our results strengthen the existing literature by increasing the number of participants, expanding the number of researchers conducting relevant studies, varying the research methodology, and extending the follow along period, all of which are needed to establish BIE feedback as an evidence-based practice.

Perceptions Regarding Prolonged Use and Thoughts About Ongoing Participation

Our qualitative findings regarding ongoing participation differed from those reported by Thomson et al. (1978), which indicated participants disliked the BIE after prolonged use. Scheeler et al. (2009), too, found that at least one teacher participant grew tired of the BIE as time went on. We found the reverse. Although some of our participants initially disliked the *e*Coaching they received, through advanced online BIE coaching became overwhelmingly favorable over time. It seems reasonable to conclude that for some pre- and in-service teachers, ongoing BIE is an acquired taste. For others, the opposite may be true, making any initial appeal short-lived.

Commensurate with the reports of others (see Scheeler et al., 2009; Scheeler et al., 2010; Scheeler et al., 2006), we found that longer term BIE caused little or no problems, as evidenced by trainees' reports that feedback from the *e*Coach was helpful, not disruptive. In fact, many, in our study, echoed Giebelhaus's (1994) assertion that BIE feedback was especially valuable when lessons were difficult, or when "treading on new ground" (p. 370). Also, as was the case for participants in several other studies (Giebelhaus, 1994; Goodman et al., 2008; Scheeler et al., 2009,2010, 2012), our participants reported ease of use and described a variety of positive emotional responses. Like those in the Goodman et al. (2008) inquiry, our participants wanted *more* BIE feedback in the future. More specifically, they expressed a desire for wider use (e.g., providing student teachers with BIE feedback when they become cooperating teachers, supporting other teachers through BIE feedback, welcoming BIE feedback from administrators)—a finding also reported by Scheeler and her colleagues, not only in 2009, but also in 2010.

Our participants noted one distinct disadvantage associated with current advanced online BIE technology, the distracting nature of recurring audio issues. This disadvantage was also pointed

out by Scheeler et al. (2006), but mentioned only in passing by Scheeler and her colleagues (2012; that is, " . . . occasional Skype disruptions . . . ," p. 83). We found technology glitches to be overwhelming in the short-term, but our participants confirmed that these issues could be overcome through longer term use—a finding that underscores feasibility.

Limitations

Without question, the results of this study strengthen understanding of longer term outcomes associated with *e*Coaching. Still, limitations exist. First, one of the major drawbacks associated with repeated measures (Smith, Gratz, & Bousquet, 2008) is that improvements may have been a result of practice effects and not the intervention. Unfortunately, counterbalancing, the recommended approach for safeguarding against practice effects was not feasible in this study. Second, changes may be attributable, in part, to differential carryover effects, which we could also not control through counterbalancing (Smith et al., 2008). Third, as there was no control group and the study was not blinded for either the participants or the persons who coded the data, it is not possible to rule out a halo effect as contributing to the outcomes. Fourth, although we carried out six of the eight strategies recommended by Creswell (2013) to ensure credibility of the qualitative data, because participants' comments could not be made anonymously, they may not have been able to be completely honest. Fifth, because we relied on convenience sampling, the generalizability of our findings should be viewed with caution. Finally, lack of a true experimental design, complete with random assignment and a control group, in conjunction with the longitudinal nature of this study, means that we cannot disregard threats to internal validity (e.g., regression, maturation, and history; Gall, Gall, & Borg, 2007).

Implications for Research

In this study, although we devoted more time to longer term follow-up than has been reported previously, an obvious series of unanswered question emerges: How long do effects continue before regression sets in? One year? Two years? Five years? Answering these questions would be important to further closing the gap on what remains unknown about longer term BIE use. Also, as policy makers continue to advance educational reform efforts that champion accountability, researchers need to undertake investigations that move beyond establishing proof of concept. In other words, future investigators should explore longer term changes, not only in teacher behavior, but also in student performance. Finally, as *e*Coaching, through advanced online BIE, becomes recognized as an evidence-based practice, researchers need to investigate and develop training protocols for *e*Coaches. Knowing what to say and when to say it effectively in real time is not always intuitive. Moreover, whether teachers use suggestions from coaches may be attributed, in part, to how helpful they feel those suggestions are (or what level of expertise or authority they attribute to the coach) and very little about the manner in which those suggestions were delivered. Thus, more research is needed, especially in clarifying what aspects of *e*Coaching produce what specific outcomes and what modifications can be made to achieve improved outcomes.

Implications for Practice

While traditional knowledge or course-based training approaches to teacher development have been in place for decades, our findings add to the growing recognition of the value added by practice-based supports (e.g., online or elbow coaching; Neuman & Cunningham, 2009; M. L. Rock, M. L. Rock, Gregg, Thead, et al., 2009; M. Rock et al., 2012), especially when it comes to promoting teachers' use of evidence-based practices. Analysis of our qualitative data revealed that 12 participants talked about how *e*Coaching helped them acquire independence in using evidence-based practices. Moreover, nine participants understood that their competence in using evidence-based practices was now professionally at a level where accountability mattered. In other words, what was clear in the data was that the scaffolding made possible through *e*Coaching promoted independence, and only after teachers-in-training could use strategies competently did their minds move to issues of accountability for student learning. Six of the participants in this study spoke to their developing sense of accountability. Therefore, when used over time, eCoaching through advanced online BIE may be a powerful approach to promoting teacher accountability and improved use of evidence-based practice.

Concluding Thoughts

Our findings shed additional light on the longer term value of *e*Coaching through advanced online BIE technology. Without a fading or generalization plan, improvements in teachers' use of evidence-based practices (e.g., high access instruction) and students' engagement and classroom behavior generally withstood the test of time. Over two decades ago, Giebelhaus and Cruz (1992, p. 11) speculated, "the more often BIE is used, the more effective the feedback and learning." When considered with the existing body of evidence, we believe our results lend much needed empirical support to this assertion. We hope our longitudinal findings propel *e*Coaching toward the greater widespread use it deserves in 21st-century pre- and in-service teacher development.

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Notes

1. The cost of Pamela Business version was US$36.95 and allowed for 1 year of unlimited video recording, while Call Recorder provided unlimited video capture for US$19.95.

2. Because one participant withdrew from the program for personal reasons, we recalculated the baseline mean. Removal of that participant's data from original baseline data accounts for the slight variation in reported values.

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