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Innovations in Behavioral Intervention Preparation for Paraprofessionals Working with Children with Autism Spectrum Disorder

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Abstract

Given the empirically validated success of behavioral intervention based on applied behavior analysis for individuals with autism spectrum disorder and other developmental disabilities, the demand for knowledgeable and skilled paraprofessional teaching staff is very high. Unfortunately, there currently exists a widely recognized shortage of such practitioners. This paper describes the development of an online training program aimed at preparing paraprofessionals for face-to-face training and supervision, as part of a solution to the growing demand. The focus of the program has been on moving beyond traditional online pedagogy, which has limited interactivity. Instead, the approach to teaching fundamental knowledge and implementation skills in behavioral intervention methods incorporates first-person simulations, typical of live mentor/mentee training. Preliminary program evaluation data are also described.

Autism Spectrum Disorder (ASD) is a neurologically based disorder that is characterized by persistent impairments in social communication and the exhibition of repetitive, restricted patterns of behaviors, interests, or activities (American Psychiatric Association, 2013). A diagnosis of ASD is made on the presence of these core characteristics, usually by the age of

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three years. Regardless of variations in the core characteristics of the disorder (no two children with ASD are alike), ASD can have devastating effects on the child and family (Johnson, Frenn, Feetham, & Simpson, 2011).

Early and intensive intervention can greatly improve a child's chances of learning adaptive, communication, and academic skills. Behavioral intervention (BI) methods based on applied behavior analysis (ABA) have the strongest evidence base for teaching critical academic and life skills effectively, and for reducing the restricted and maladaptive behaviors often seen in children with ASD (Eikeseth, 2009; Odom, Boyd, Hall, & Hume, 2010). Research has shown that children who are exposed to early and intensive BI make the most clinical gains (Eldevik, Hastings, Hughes, Jahr, Eikeseth and Cross, 2010) and make significant gains in learning a variety of skills when BI is implemented in a mainstream or inclusive school setting (Grindle et al., 2012; Koegel, Matos-Freden, Lang, & Koegel, 2012).

Given the increasing prevalence of ASD (CDC, 2012; CDC, 2013) and the success of evidence-based interventions like BI for its treatment (Eldevik et al., 2010), the demand is high for certified clinicians to assess and develop appropriate treatment procedures, as well as for practitioners who can implement BI programs. The demand appears to be fueled further by the fact that paying for treatments has become less burdensome to parents; at least 31 states require insurance companies to pay for behavioral treatment for children with ASD (National Conference of State Legislatures, 2012). Unfortunately, there is currently a shortage of personnel to deliver these services (Boe, 2006). For example, Wise, Little, Holliman, Wise, and Wang (2010) surveyed 52 state and territory early intervention coordinators and found that 89% reported shortages of behavior therapists to provide ASD-related services. Moreover, there is a distinct lack of specific training in ABA-based methods available for special educators, general educators, and paraprofessionals or teaching assistants (Hendrick, 2011; Scheuermann, Webber, Boutot & Goodwin 2003). Hendrick (2011) noted that few states have a specific endorsement or specialization in ASD treatment for special educators.

Schools and agencies that serve children with ASD are increasingly turning to the use of Board Certified Behavior Analysts (BCBAs™) to provide BI interventions. As described below, BCBAs are generally tasked with conducting comprehensive behavioral assessments and developing behavioral treatment programs for children with ASD on their caseloads, but the day-to-day implementation of one-on-one treatment is usually conducted by a skilled paraprofessional under the BCBA's supervision. Importantly, the paraprofessionals themselves must undergo training sufficient to carry out the BI program developed by the BCBA competently. Such training necessarily requires a rudimentary understanding of the science ABA and familiarity with a variety of treatment procedures prior to supervised treatment with a child. Moreover, given the increasing demand for BI services, such training must be delivered efficiently. As part of the solution to increase the availability of trained practitioners, the University of Massachusetts Medical School/E.K. Shriver Center and the University of Massachusetts Lowell have begun to address this need through the development of a high-quality, asynchronous (anywhere, anytime) distance-learning training program designed for paraprofessionals (Hamad, Serna, Fleming, Morrison, 2010; Morrison, Fleming, Gray, Fleming & Hamad, 2013).

This paper describes the development of a generalizable introductory training program in BI that uses online training, including first-person interactive practice, for paraprofessionals who work directly with BCBAs. Specifically, our online training program, *LearningABA*, was designed to provide naïve paraprofessionals with fundamental knowledge *and* implementation skills in BI methods. As detailed below, *LearningABA* is part of a model for both extending the reach and increasing the efficiency of BI training by preparing the learner to receive face-to-face training and supervision at their place of employment. Though the program described in this paper was developed with the aim of preparing paraprofessionals, there is a demonstrated need for preparing parents, special educators, and general educators to interact with BI professionals and implement programming (Johnson et al., 2007; Loiacono & Allen, 2008; Loiacono & Valenti, 2010); this training approach could fill that need.

Behavioral Intervention and Practitioner Training

At its core, BI recognizes that children with ASD need structure, consistency, and repetition to learn the key skills that are targeted for intervention. To accomplish this, BI uses scientific, evidence-based behavior-change procedures that are highly individualized, structured, predictable, and specific to the learning needs and styles of the child. Common BI methods include “shaping” to gradually develop new behavior, “prompting” to evoke behavior through gestural, verbal, or physical cues, “fading” to eliminate prompts, “differential reinforcement” to increase desired behaviors and reduce undesired behaviors, and “error correction” to guide the child toward correct performance (MacDuff, Krantz & McClannahan, 2001). In addition, a key component of any BI model or program is the careful evaluation and documentation of a child’s performance, as a means of determining the effectiveness of, or course correction to, given behavioral procedures.

Though BI treatment programs often can be highly technical, one need not possess an advanced degree to implement them (e.g., Catania, Almeida, Liu-Constant, & Reed, 2009; Mueller et al., 2003). In practice, a consulting or staff BCBA is most often responsible for the assessment of behavioral excesses and deficits in a child, as well as the design of behavior-change programs. However, the day-to-day implementation of behavior-change programs, whether school and/or home based, is most often carried out at the *practitioner* level, under the supervision of the BCBA. In schools or early childhood treatment settings, a practitioner might be a teacher’s aide (or “para-educator”), a paraprofessional, support staff, or special education teacher. In home settings, paraprofessionals often implement behavior-change procedures, but just as often parents or other family members become practitioners. Ideally, BI-based treatments for a given child are consistently applied in a coordinated manner both at home and in school. In this paper, the practitioner of interest is the paraprofessional, an individual who carries out BI methods under the direct supervision of a BCBA.

For BI methods to be implemented properly, paraprofessionals must be well-trained in the fundamentals of BI, which includes both foundational knowledge and the skills to implement the methods (Hamad et al., 2010). Paraprofessionals also must be skilled at observation, data recording, and basic data graphing. Again, it is *not* required that paraprofessionals achieve the level of knowledge and skill that a BCBA must have in order to design BI programs. Instead, training in the fundamentals of BI prepares the paraprofessional to implement BI treatment plans designed by the BCBA, help analyze the outcomes, and interact effectively with BCBA as well as the child and family.

Training paraprofessionals to work with BCBAs can take many forms. For example, there are university degree and certificate programs in BI, some of which are online (e.g., the University of Massachusetts Lowell's Certificate in Behavioral Intervention in Autism). However, degree and certificate programs may take years to complete, are relatively expensive, and are generally geared toward producing senior-level BI specialists. Alternatively, the internet offers a rich source of information about BI, but exists as an overwhelming array of disparate resources and without a sound pedagogical framework. Increasingly, online training programs geared toward paraprofessionals and other non-BCBAs are becoming more commonplace. However, they do not allow for online practice of implementing BI skills. Another common training tool is live workshops or in-service trainings provided by experts in BI. However, they often focus on a single BI approach, and may not be available to geographically disparate persons.

Most typically, BCBAs and/or experienced in-service trainers train paraprofessionals directly and individually in the relevant clinical setting, in a mentor/mentee fashion. Whether in the home, school, or other therapeutic setting, successful training usually includes a combination of didactic instruction, observation, modeling, rehearsal, and feedback (Ryan & Hemms, 2005; Sarakoff & Sturmey, 2004). For example, in face-to-face paraprofessional training, a person new to ABA may begin his/her individual training with a BCBA mentor. The mentor will likely provide individual didactic instruction on ABA principles and various related methods and techniques that will be used in teaching and treatment. In some larger agencies, didactic instruction might be provided by an in-service trainer. The next step for the paraprofessional would be to observe the mentor or other well-trained paraprofessionals modeling BI methods with a child. The paraprofessional would then be given the opportunity to practice particular methods with a mentor who provides performance feedback. Finally, when the new ABA paraprofessional begins working directly with a child, he/she will do so under close supervision by the mentor. There are, of course, variations of this model depending on the rate at which the paraprofessional learns or the particular clients and setting in which the paraprofessional is employed.

Although the training model above can serve the training requirements that BCBAs and ABA-service agencies need for paraprofessionals, it may not be sufficient to keep up with the demand for trained implementers of BI methods. To address the demand, distance learning may be part of the solution. Distance learning (or distance education) is a general term used to describe the use of computer and communication technology to deliver instruction (Moore & Kearsley, 2005). At present, despite ongoing technological advances, distance learning arguably cannot fully take the place of the face-to-face training and supervision needed to develop competent paraprofessionals to implement BI methods. Nonetheless, it has the potential to greatly extend the reach of and efficiency with which paraprofessionals are prepared for more advanced face-to-face training.

Online Paraprofessional Preparation: *LearningABA*

LearningABA is an online training course that provides trainees with the fundamental knowledge and implementation skills needed to accelerate face-to-face training as an ABA paraprofessional. The course was designed to help meet the professional development needs of a range of institutions and agencies that employ paraprofessionals. The course offers flexible and wide deployment by leveraging distance education techniques and online technology. *LearningABA* is an asynchronous (instructorless) program, and is thus available anytime one chooses to access it. It is also presented at a level that reaches anyone who may have little or no prior experience with ABA. These qualities will likely benefit non-traditional students (e.g., working people) who are in locations where quality training may not be routinely accessible or available. The course is also appropriate for parents of children with ASD who will be interacting with BCBAs.

From the early stages of the development of the *LearningABA* program, it became clear that traditional online instruction would not suffice. For example, most online college courses utilize a learner-instructor/expert format (Culatta, 2013) in an attempt to simulate a classroom environment. For the purposes of training a practitioner in BI skills, however, the classroom-simulation model may not be appropriate. Instead, a format that more closely models the face-to-face training provided by the BCBA/practitioner, mentor/mentee training experience would likely better serve the learner. To simulate the mentor/mentee relationship online, *LearningABA* is almost entirely video-based, and the mentor speaks directly to the learner. The 14-unit *LearningABA* program (see Appendix) begins with the video mentor introducing the learner to important introductory background information on ASD and BI. The mentor then educates the learner on the role, responsibilities, and professional ethics that must be followed when s/he assumes a working position with individuals who have ASD. From this point onward, the mentor gradually shapes, across several course units, the fundamental BI implementation skills the learner ultimately will need to function as a practitioner. Much of the curriculum's focus with regard to behavioral teaching is on the method known as Discrete Trial Training (DTT) (Smith, 2001). Though DTT skills represent only a portion of the BI skills needed by practitioners, DTT provides the basis of many other ABA-based treatment methods, including incidental teaching and other naturalistic interventions that are well represented in *LearningABA*. Therefore, providing implementation skills training in DTT, and other fundamentals such as observation, data collection, and reinforcement (see Appendix), constitutes a critical first step in creating an educated workforce of paraprofessionals that has the skills to teach children with ASD. Importantly, like most face-to-face training in BI, *LearningABA* is designed to teach general BI skills, such that the skill can be used with a variety of teaching tasks and clinical circumstances.

Like much face-to-face paraprofessional training, each individual BI skill in *LearningABA* is introduced first via didactic instruction. For most of the skills taught, this is followed by opportunities for the learner to observe onscreen the BI skill being performed by experienced paraprofessionals in a classroom and other treatment environments. The learner is then allowed to practice the skill directly with an onscreen child (see Figure 1), while being provided automatic feedback on his/her performance. Finally, the learner works with the onscreen child without feedback to demonstrate mastery, as described below. BI skills include: recognizing behavior according to objective definitions; providing immediate reinforcement; performing the sequence of behaviors necessary to accomplish discrete-trial training trials; prompting and fading instructional cues; error correction procedures; data collection; graphing data; and understanding incidental teaching.

The *LearningABA* online program incorporates several cutting-edge elements to enrich the learning experience and to help simulate a mentor/mentee experience for the learner. The distinguishing feature of this course is the video-based and highly dynamic presentation of content. Throughout the entire course, a single mentor introduces concepts through short lectures, interviews experts in the field and practicing school-based behavior analysts, and facilitates interactive exercises. Lectures and demonstrations are supported only by limited text. Instead, graphic organizers illustrate information with interactive graphic learning activities. BI methods are first demonstrated in their component parts, so that learners have a clear visual and narrated step-by-step presentation of each skill. The methods are also demonstrated in real time, so that the learner gets a sense of the actual pace and flow of a given activity.

Perhaps the most innovative aspect of *LearningABA* is the use of Interactive Video Exercises (IVEs). Interactive Video Exercises are Flash®-based exercises that simulate a first-person point-of-view video interaction with a child/student in an educational setting or other environment. Whereas demonstration video is typically linear (i.e., video that runs from beginning to end), IVEs make use of sophisticated branching routines to show different video or text feedback, depending on the learner's responses.

Figure 1 shows a still capture of an IVE from *LearningABA.* The onscreen child appears from the perspective of the learner. In this exercise, the learner's task is to teach the onscreen child to verbally name the letter that follows the letter being held up by the learner. This example represents an exercise from a unit later in the *LearningABA* training course, and as such, represents a more advanced skill for both the learner and the onscreen child. Importantly, the focus of training in this exercise is not on the task *per se*. Rather, the focus of training is on the generalizable skills of ensuring that the stimulus materials and instructions are presented when the child is ready, reacting appropriately to the child's response, implementing a correction procedure if necessary, and providing timely reinforcement.

To properly instruct the onscreen child, the learner first must ascertain whether the child is "ready" to begin a discrete-trial training trial. That is, the child must be making eye contact with the learner, have her hands in her lap, and be sitting still. If not, the learner clicks the button in the array at the bottom of the window labeled "GET READY," and an audio instruction is delivered to the onscreen child, "Show me ready." The child then responds appropriately (a response the child has previously learned). Once the child is "ready," the learner clicks the "PRESENT LETTER" button. The onscreen result is the presentation of a letter to the learner (a hand moves toward the child with the letter, as shown in Figure 1) and the presentation of an audio instruction, "What letter comes next?" If the child names the correct letter, the learner must click the "PRESENT PRAISE" button within 1.5 seconds for the audio praise to be presented. If the child is incorrect, the learner then has an opportunity to implement a previously learned error-correction procedure, which includes simulated prompting and praise. In addition, throughout the trial, the learner is provided with opportunities to record the child's responses using an onscreen data sheet (not shown).

For each of the implementation skills that are simulated in *LearningABA*, there are two levels of IVEs: Practice and Final Test. The Practice exercise provides the learner with several trials that simulate the direction interaction with the child. Throughout the exercise, the learner is provided with immediate and automatic corrective feedback for each component skill they perform incorrectly. Figure 2 shows a screen capture of the feedback provided if the learning makes a procedural error. To move on to the Final-Test IVE, the learner must master all the component skills at a criterion of 85% accuracy; if the skill criterion is not met, the learner is required by the program to repeat the Practice IVE. The Final Test IVE is similar to the Practice IVE, with the exception that there is little or no feedback (depending on a given unit's exercise) to the learner. To move on to the next unit in the course, the learner must master the Final Test IVE of a given unit at the 85% criterion.

LearningABA was designed by a team of PhD-level behavior analysts and BCBAs with years of teaching in the field and clinical experience with children with autism. Once complete, the course was vetted by a panel of experts in the field of BI. In total, the program requires approximately 12 hours to complete. In addition, *LearningABA* was designed to be cost-effective. For example, the entire program is currently made available at $69 per individual user, but institutional volume licensing would lower this per-user cost to approximately $50. Thus, the *hourly* cost for the 12-hour course is less than $5 per user. Two similar interactive online training programs are priced in this same range, although they do not feature *LearningABA*'s first-person interactive learning experiences. Cost comparisons of online versus face-to-face training programs are difficult to make because they depend on regional and organizational factors such as trainees' travel to the training site -- a particularly significant expense in rural areas -- and group scheduling. Nevertheless, it is reasonable to speculate that the cost of face-to-face training would be significantly reduced if supplemented with *LearningABA*.

A Preliminary Evaluation

As part of an initial evaluation, the extent to which *LearningABA* could impart knowledge of fundamental BI methods was evaluated in a field test. Prior to the initiation of the field test, the project was granted an exemption by the Institutional Review Board at the University of Massachusetts Medical School.

Participants were recruited nationwide via online advertisements. Only volunteers who did not have any previous experience in the field of BI and had access to a computer with broadband Internet connectivity were considered for participation. Participants were randomly assigned to either an experimental or a wait-list control group. Table 1 shows a summary of the participant demographic characteristics. Both groups were roughly similar in demographic characteristics.

All participants completed a pre-test knowledge assessment consisting of 30 multiple-choice questions and assessed knowledge about terms and procedures from each of the 14 units in the course. The experimental group was then given two weeks to complete the entire online course. After finishing the course, participants from the experimental group completed a post-test knowledge assessment, which was identical to the pretest and a course satisfaction survey. At the same time, participants from the wait-list control group also completed the post-test knowledge assessment. This allowed for evaluation of any differential knowledge gains between the groups. Afterwards, the wait-list control group was granted access to the course as a token of appreciation for their participation in the wait-list group, though they were not required to complete it. All participants were compensated $50 for their participation.

Nineteen participants in the experimental group and 31 control group participants completed both the pre-test and post-test knowledge assessments. Table 2 summarizes findings from these assessments.

A one-way analysis of variance (ANOVA) was conducted to evaluate group differences in pre-test to post-test change scores. Significant group differences were found, favoring the experimental group ($F(1, 48) = 21.52$, $p < 0.0001$.) The experimental group demonstrated a mean improvement in correct responses of 32.98%, whereas the control group improved only 7.74%. This yielded an effect size of 1.34, which is considered very large according to Cohen's criteria and further supports the significance of this finding.

A one-way analysis of covariance (ANCOVA) with pre-test to post-test change score as the dependent variable, group as the main factor, and time between test administration as a covariate was conducted to assess whether group differences were present in change scores, adjusting for differences in the time elapsed from administration of the pretest to the administration of the posttest. Time was not a significant factor either directly or when interacting with group. A significant main effect of group was observed when controlling for time ($F(1, 46) = 7.27$, $p = 0.01$), corroborating findings from the previous analysis. A direct comparison of the time between tests for both groups was conducted through a one-way ANOVA. There was a very slight difference in time between test administrations for the experimental group (mean of 12.12 days) and the control group (mean 12.82 days), but the difference was not significant ($F(1, 48) = 0.63$, $p = 0.43$.)

A separate one-way ANCOVA with post-test score as the dependent variable, group as the main factor, and pre-test score as a covariate was conducted to further evaluate differences in posttest scores between the experimental and the control groups, adjusting for differences in pre-test scores. In conjunction with previous findings, the results indicate that the course had a positive impact on participants' knowledge in addition to improvements from pre-test to post-test scores. A significant main effect of group was found ($F(1, 47) = 20.86$, $p < 0.0001$), and pre-test scores also impacted post-test scores, ($F(1, 47) = 4.50$, $p = .04$) as would be expected. The post-test mean for the experimental group, adjusted for the pretest score, was 72.95%, whereas the adjusted mean post-test score for the intervention group was 49.48%, yielding a very large effect size of 1.34.

The course satisfaction survey completed by the experimental group queried participants' opinions on a range of issues related to course content and navigation, learning interface, media resources, supplemental materials, and general usability. The satisfaction survey included a 5-point Likert scale consisting of 35 items and seven open-ended questions. Overall, results from this survey were positive; participants approved of the course design, content presentation, video demonstrations, and interactive features. In addition, 78.9% of the participants rated the overall quality of the course highly (a rating of 4 or 5 on the 5-point scale), and 89.5% participants indicated they would recommend the course as part of BI practitioner training (again, a rating of 4 or 5). Areas for improvement identified by the participants centered on issues related to limited Internet connectivity and high server demand and further enhancing the asynchronous aspects of the course interface that will support learners making progress at their own pace and being able to very precisely resume at the point where they left off or exited for a break.

The results of the field test clearly demonstrated that the *LearningABA* course could impart knowledge about BI methods to naïve users. In addition, it appears that the features of *LearningABA* were well-received by the field-test participants. Moreover, several areas of improvement were identified that will help strengthen future iterations of the course.

Future Research Directions

The results of this initial evaluation of the *LearningABA* course were quite positive and suggest that an online learning platform to provide introductory training in BI to naïve users is a viable and effective means for imparting critical knowledge about BI. However, some important research issues remain that warrant future exploration.

Although the preliminary evaluation described herein was designed to evaluate whether the course could impart knowledge about BI methods, *LearningABA* was also designed to provide learners with *implementation skills*, which are fundamental to serving as a paraprofessional in a clinical setting. Thus, what is needed is evaluation of the extent to which skills acquired from *LearningABA* translate to live performance of various types. For example, an evaluation of whether learners who complete the course are subsequently able to implement live DTT sessions with a child who has ASD or another developmental disability would important to undertake. Likewise, assessing the extent to which those who have completed *LearningABA* are more ready than naïve applicants for live, mentored training also warrants investigation. And finally, an evaluation of whether learners who have completed *LearningABA* demonstrate more rapid acquisition of advanced BI skills during mentored training than naïve counterparts is worthy of exploration. In part, answers to these kinds of questions will ultimately demonstrate the utility of online training programs such as *LearningABA*.

Related to the research areas described above, another research area to be explored concerns the relative contributions of different features of *LearningABA*. A growing body of research suggests that video-based training can be a powerful tool for achieving skill proficiency. For example, Moore & Fischer (2007) used video to train bachelor's level nonprofessional staff to implement functional behavior assessments (Iwata, Wallace, Kanhg, Lindberg, Roscoe, &

Connors, 2000). Video instruction has also been found to be effective for teaching direct care staff to implement steps of client-specific behavioral programs (Macurik, O'Kane, Malanga, & Reid, 2008). In an intervention with parents, Crockett, Fleming, Doepke, and Stevens (2007) successfully used video modeling as a training component to teach parents of young children with ASD how to implement a DTT procedure. Parents rapidly acquired teaching skills and, importantly, after just two training examples generalized their teaching to new child behaviors targeted for teaching. Similarly, Catania et al. (2009) successfully used video modeling for direct-service staff to acquire skills in implementing DTT procedures. Clearly, video can be used successfully for staff and parent training, and it is easily delivered online. A research question that remains, however, is whether there is added value when online training programs utilize interactive simulation features, such as those used in *LearningABA*. Evidence from other training fields would suggest that this may be the case. For example, in medical, nursing, and counseling training, research has shown that a wide variety of skills can be taught using computer simulations (Ravert, 2002; Schoening, Sittner & Todd, 2006; Scalese, Obeso, & Issenberg, 2007). Moreover, efforts to train staff using computer simulation alone to teach DTT skills have shown some promise (Eldevik et al, 2010). Whether simulation further increases acquisition of fundamental BI skills above and beyond video modeling remains unknown. The answer may depend on the type and difficulty of the particular skill being taught; for example, linear video modeling may be sufficient for relatively easy, fundamental skills, while more complex skills may require interactive simulation to master.

Conclusion

In recent years a dramatic increase in the prevalence of ASD has been observed. To answer the service needs for this population, a number of initiatives at the federal and state levels have been launched along with the concerted efforts of private citizens and a multitude of organizations nationwide. There is a growing demand for BI services as an effective treatment that can benefit the development of individuals with ASD from a very young age. Online courses, such as *LearningABA*, can provide necessary knowledge and effective skill training to those preparing to become BI paraprofessionals. Online courses can help meet professional development needs of a range of institutions, agencies, and private individuals. The course described herein offers flexible and wide deployment by leveraging distance education techniques and online technology. These qualities are bound to benefit non-traditional students, working people, and locations in which quality training is not routinely accessible or available.

It is important to reemphasize the place of *LearningABA* in a larger training context: online training *alone* should not be seen as wholly sufficient to meet the professional development goals of BI paraprofessionals. Instead, such courses should strive to bring the learner as close as possible to these goals, with the understanding that other training resources to follow will be necessary. Ultimately, live observation, *in vivo* practice, and on-site supervision are critical to the training process. Nevertheless, an online skill-based course may provide distinct advantages. For example, across live BI-treatment settings, there is a wide range of conditions under which children with ASD are taught. The idiosyncratic behaviors across children with ASD are just as varied. An online course that teaches the fundamentals of BI practice cannot anticipate all the variations one might experience in a face-to-face setting. However, one could reasonably speculate that the paraprofessional first trained through a skill-based online training course would likely adapt to face-to-face training far more quickly and efficiently than a naïve trainee. In sum, a course like *LearningABA* provides a viable method for introducing the practice of BI with children with ASD and can be used to supplement and/or enhance the live training experience. Until technology for asynchronous delivery of online training improves to the point that face-to-face training and supervision can be replaced, preparatory programs like *LearningABA* could represent a good start to addressing the demands for trained paraprofessionals, once additional research is accomplished.

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References

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5. Arlington, VA: American Psychiatric Publishing; 2013.

Boe EE. Long-term trends in the national demand, supply and shortage of special education teachers. The Journal of Special Education. 2006; 40(3):138–150.

Catania CN, Almeida D, Liu–Constant B, DiGennaro Reed FD. Video modeling to train staff to implement discrete-trial instruction. Journal of Applied Behavior Analysis. 2009; 42:387–392. [PubMed: 19949529]

CDC. Prevalence of Autism Spectrum Disorders – Autism and Developmental Disabilities Monitoring Network, 14 Sites, United States, 2008. Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report Surveillance Summaries. 2012; 61:1–19.

CDC. Changes in prevalence of parent-reported autism spectrum disorder in school-aged U.S. children: 2007 to 2011–2012. Centers for Disease Control and Prevention National Health Statistics Reports. 2013; 65:1–12.

Crockett JL, Fleming RK, Doepke KJ, Stevens JS. Parent training: Acquisition and generalization of discrete trials teaching skills with parents of children with autism. Research in Developmental Disabilities. 2007; 28:23–36. [PubMed: 16338118]

Culatta, R. Designing Interactions for Online Learning: An Interview with Richard Culatta. YouTube video. Retrieved May 5, 2013www.youtube.com/watch?v=ZvGCFdLdo&feature=player_embedded

Eikeseth S. Outcomes of comprehensive psycho-educational interventions for young children with autism. Research in Developmental Disabilities. 2009; 30:158–178. [PubMed: 18385012]

Eldevik S, Hastings RP, Hughes JC, Jahr E, Eikeseth S, Cross S. Using participant data to extend the evidence base for intensive behavioral intervention for children with autism. American Journal on Intellectual and Developmental Disabilities. 2010; 115:381–405.10.1352/1944-7558-115.5.381 [PubMed: 20687823]

Grindle CF, Hastings RP, Saville M, Hughes JC, Huxley K, Kovshoff H, Remington B. Outcomes of a behavioral education model for children with autism in a mainstream school setting. Behavior Modification. 2012; 36(3):298–319. [PubMed: 22569577]

Hamad CD, Serna RW, Morrison L, Fleming R. Extending the reach of early intervention training for practitioners: A preliminary investigation of an online curriculum for teaching behavioral intervention knowledge in autism to family and service providers. Infants and Young Children. 2010; 23:195–208. [PubMed: 23504540]

Hendrick D. Characteristics of special education teachers serving students with autism: A descriptive study of the characteristics and self-reported knowledge and practices employed. Journal of Vocational Rehabilitation. 2011; 35:37–50.10.3233/JVR-2011-0552

Iwata BA, Wallace MD, Kahng SW, Lindberg JS, Roscoe EM, Conners J. Skill acquisition in the implementation of functional analysis methodology. Journal of Applied Behavior Analysis. 2000; 33:181–194. [PubMed: 10885526]

Johnson N, Frenn M, Feetham S, Simpson P. Autism spectrum disorder: Parenting stress, family functioning and health-related quality of life. Families, Systems, & Health. 2011; 29(3):232–252.

Johnson CR, Handen BL, Butter E, Wagner A, Mulick J, Sukhodolsky DG, Smith T. Development of a Parent Training Program for Children with Pervasive Developmental Disorders. Behavioral Interventions. 22:201–221.

Koegel L, Matos-Freden R, Lang R, Koegel R. Interventions for children with autism spectrum disorders in inclusive school settings. Cognitive and Behavioral Practice. 2012; 19(3):401–412.

Loiacono V, Allen B. Are special education teachers prepared to teach the increasing number of students diagnosed with autism? International Journal of Special Education. 2008; 23:120.

Loiacono V, Valenti V. General education teachers need to be prepared to co-teach the increasing number of children with autism in inclusive settings. International Journal of Special Education. 2010; 25:24–32.

MacDuff, GS.; Krantz, PJ.; McClannahan, LE. Prompts and prompt-fading strategies for people with autism. In: Green, G.; Maurice, C., editors. Making a difference: Behavioral intervention for autism. Austin, TX: PRO-ED; 2001. p. 37-50.

Macurik KM, O'Kane NP, Malanga P, Reid DH. Video training of support staff in intervention plans for challenging behavior: Comparison with live training. Behavioral Interventions. 2008; 23:143–163.

Moore JW, Fisher WW. The effects of videotape modeling on staff acquisition of functional analysis methodology. Journal of Applied Behavior Analysis. 2007; 40:197–202. [PubMed: 17471805]

Moore, MG.; Kearsley, G. Distance education: A systems view. 2. Belmont, CA: Wadsworth; 2005.

Morrison L, Fleming C, Hamad C, Gray C, Fleming R. Online learning for early intervention professionals: Transition planning from early intervention to school. Journal of Special Education and Technology. 2013; 28:43–51.

Mueller MM, Piazza CC, Moore JW, Kelley ME, Bethke SA, Pruett AE, Layer SA. Training Parents to Implement Pediatric Feeding Protocols. Journal of Applied Behavior Analysis. 2003; 36:545–562.10.1901/jaba.2003.36-545 [PubMed: 14768672]

Insurance coverage for autism; National Conference of State Legislatures; 2012, August; Retrieved from http://www.ncsl.org/issues-research/health/autism-and-insurance-coverage-state-laws.aspx

Odom SL, Boyd BA, Hall LJ, Hume KA. Evaluation of comprehensive treatment models for individuals with autism spectrum disorders. Journal of Autism and Developmental Disabilities. 2010; 40:425–437.

Ravert P. An Integrative Review of Computer-based Simulation in the Education Process. CIN: Computers, Informatics, Nursing. 2002; 20(5):203–208.

Ryan CS, Hemmes NS. Post-training discrete-trial teaching performance by instructors of young children with autism in early intensive behavioral intervention. The Behavior Analyst Today. 2005; 6:1–12.

Sarakoff RA, Sturmey P. The effects of behavioral skills training on staff implementation of discrete-trial teaching. Journal of Applied Behavior Analysis. 2004; 37:535–538. [PubMed: 15669415]

Scalese RJ, Obeso VT, Issenberg SB. Simulation technology for skills training and competency assessment in medical education. J Gen Intern Med. 2007; 23(Suppl 1):46–49.10.1007/s11606-007-0283-4 [PubMed: 18095044]

Schoening AM, Sittner BD, Todd MJ. Simulated clinical experience: Nursing students' perceptions and the educators' role. Nurse Educator. 2006; 31(6):253–258. [PubMed: 17108788]

Scheuermann B, Webber JA, Boutot EA, Goodwin M. Problems with personnel in autism spectrum disorders. Focus on Autism and Other Developmental Disabilities. 2003; 18(3):197–206.

Smith T. Discrete trial training in the treatment of autism. Focus on Autism and Other Developmental Disabilities. 2001; 16(2):86–92.

Wise MD, Little AA, Holliman JB, Wise PH, Wang CJ. Can State Early Intervention Programs Meet the Increased Demand of Children Suspected of Having Autism Spectrum Disorders? Journal of

Developmental & Behavioral Pediatrics. 2010; 31:469–476.10.1097/DBP.0b013e3181e56db2 [PubMed: 20585267]

Appendix

Titles and descriptions of the 14 content units that appear in *LearningABA*.

Unit 1: What is Autism? Learners are introduced to the different types of ASDs, their characteristics and key symptoms, as well as current information on prevalence and causes of ASDs. Characteristics of effective interventions for ASDs and how to tackle learning needs that children with ASDs may experience are discussed.

Unit 2: What is Applied Behavior Analysis? BI empirically validated practices are introduced within the context of ABA, its characteristics, and importance in the treatment of ASDs. Learners also are introduced to the field of early intervention, and how Applied Behavior Analysis relates to it and translates into effective interventions for children with ASDs.

Unit 3: What is Your Role? Learners are presented with a characterization of the role of the BI practitioner and how this practitioner works in collaborative interdisciplinary teams to benefit children with ASDs. Basic guidelines for professional and ethical conduct are reviewed in this unit.

Unit 4: Focus on Behavior. This unit focuses on the concept of target behaviors in BI. Learners are taught to identify target behaviors based on precise and accurate definitions. Learners also practice this foundational skill through a series of interactive exercises.

Unit 5: Measuring Target Behaviors. Learners are presented with common observation methods used to measure target behaviors. Emphasis is placed on frequency and duration recording, their widespread use in BIA, and the type of data yielded by these observation methods. Like in the previous unit, learners practice these methods by completing interactive exercises.

Unit 6: Understanding and Delivering Positive Reinforcement. This unit is centered on positive reinforcement and how to provide and withhold reinforcement in a systematic manner when teaching children with ASDs. Guidelines for delivery of reinforcers are presented. Learners also have the chance to practice delivering positive reinforcement through interactive exercises.

Unit 7: Teaching Children Through Discrete Trial Training. Learners are introduced to Discrete Trial Training (DTT) as a key procedure used in BI to help children with ASDs learn a broad range of skills. DTT is approached from a functional perspective in relation to the ABC model. Learners practice fundamental components of basic DTT in an interactive environment.

Unit 8: Correcting Student Errors. This unit deals with providing corrective feedback and practice when children with ASDs make errors while learning new skills. Components of effective BI error correction procedures are demonstrated. Learners complete interactive exercises aimed at practicing error correction within the context of DTT.

Unit 9: Using Prompts to Help Students Learn. This unit addresses prompts and their use to help children with ASDs learn. Different types of prompts are described and demonstrated as part of BI procedures. This unit examines the role of prompt dependence and fading in promoting independence and mastery of taught skills by children with ASDs.

Unit 10: Prompting and Fading Methods. Further information on prompting and fading is provided in this unit. Learners are taught different methods that BI practitioners employ to facilitate skill acquisition and then transfer behavioral control to the natural environment. Demonstrations and interactive exercises enhance the learning experience in this unit.

Unit 11: Collecting Data on Teaching Sessions. This unit addresses accurate and continuous data collection as a means to drive teaching efficacy and monitor learning by children with ASDs. Learners are taught and practice how to collect data while conducting DTT teaching sessions.

Unit 12: Putting It All Together. This unit provides learners with a space to integrate the foundational BI skills that have been taught so far in the course. Comprehensive interactive exercises are provided to this effect. In addition, practical advice and tips for teaching children with ASDs in classrooms and other settings are offered.

Unit 13: Tracking Behavior Change with Graphs. Learners are taught how to plot and monitor data from BI teaching sessions using behavior graphs. Data driven decision-making is discussed across a range of levels of learning progress that are often encountered in real life interventions.

Unit 14: Extending Teaching to the Natural Environment. This unit considers the natural environment and how to extend BI teaching methods beyond typical classroom activities. Learners are shown how DTT can be used effectively in naturalistic situations. This unit also examines incidental teaching and its use in furthering generalization and maintenance of taught skills in the everyday activities and routines of children with ASDs.

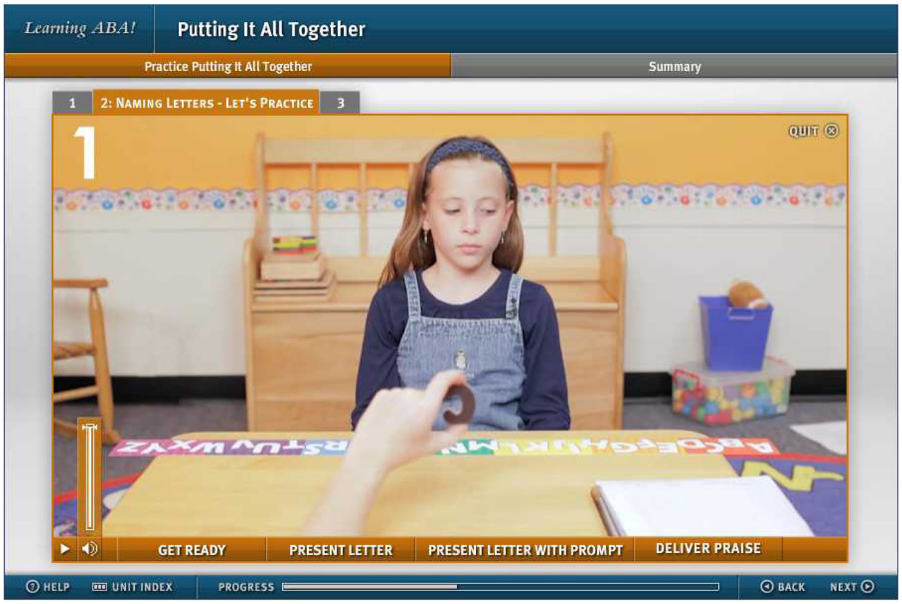

Figure 1.

Screen capture from an Interactive Video Exercise in *LearningABA*. The white number in the upper right-hand corner of the illustration shows the number of the trial in the task, as seen by the learner. Near the bottom of the window are command buttons (e.g., GET READY, PRESENT LETTER, etc.) that the learner can select. Each button controlled action by the onscreen teacher and/or the onscreen child.

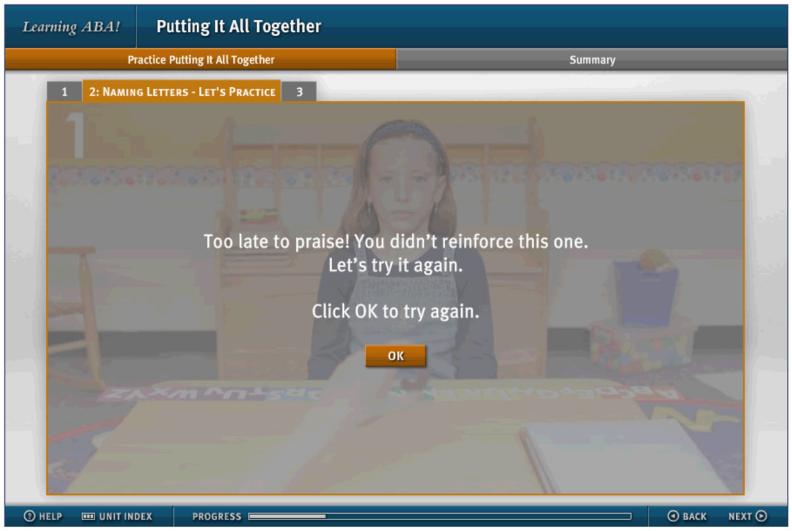

Figure 2.

Screen capture of feedback from an Interactive Video Exercise in *LearningABA*. Here, the learner either did not press the DELIVER PRAISE button within 1.5 sec of the onscreen child's response, or did not press the button at all. Thus, the screen turned a translucent gray, corrective feedback was presented, and the learner was invited to repeat that trial by clicking the OK button.

Table 1

Participant Demographic Characteristics

Characteristic	Experimental Group (N=19)	Control Group (N=31)	p-value
Age in years[a]	35.5(11.9)	33(7.8)	0.37
Race - White[b]	14(74)	17(55)	0.18
Ethnicity - Hispanic[b]	12(63)	10(32)	0.03
Education[b]			
Less than College Degree	6(32)	12(39)	0.61
College Degree or Higher	13(68)	19(61)	

[a] Mean(SD)

[b] N(%)

Table 2

Summary of Findings from the Evaluation of *LearningABA* for the Experimental and the Wait-list Control Groups.

		Pretest (Percent Correct)		Posttest (Percent Correct)		Change (Percent Correct)		Time Between Tests (Days)	
Group	***N***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Experimental	19	39.12	12.36	72.11	15.92	32.98	19.46	12.12	3.97
Control	31	42.26	12.36	50.00	19.32	7.74	18.18	12.82	2.29