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Comprehensive Application

of Behavior Analysis to Schooling in Italy

Coordinatore:

Chiar.ma Prof. ssa Silvia Perini

Tutor:

Chiar. Ma Prof. ssa Silvia Perini

Dottorando: Fabiola Casarini

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1. Introduction: The CABAS® Model and its components

The CABAS® Model. The Comprehensive Application of Behavior Analysis to Schooling (CABAS®) is an international certification for programs characterized by defining quality components: (a) individualized instruction, (b) continuous measurement of teaching and student responses, (c) graphical display of teachers and students performance, (d) use of scientifically-tested tactics, (e) logically and empirically tested curricular sequences, (f) socially significant goals of instruction, (g) positive teaching environments and (h) teachers trained as strategic scientists of pedagogy (Greer, Keohane & Healy, 2002). The CABAS® model was designed since 1981 in the United States, was tested in Italy (Lamm & Greer, 1991), successfully replicated in Ireland, England and Spain, and is continuously modified based on ongoing research (Greer & Ross, 2008). CABAS® classrooms for children with and without disability function as cybernetic systems of education in which the individualized instruction of each student influences the behavior of every component of the education community (Twyman, 1998) and can be defined as research and in-situ training centers (Greer & Ross, 2008). These student-driven schools and programs apply the principles of behavior analysis to all components of the system, including parents, supervisors, administrators and University mentors (Lamm & Greer, 1991). Everybody's progress is continuously measured, graphically displayed, analyzed and individually modified, and the behavior of the entire program is influenced by the performance of each individual within it (Selinske, Greer & Lodhi, 1991). Greer & Ross (2008) defined the objective of the CABAS® programs: providing research, demonstration and training sites for developing procedures that can be used by other behavior analysts, schools and educational systems. Replications of the system and research done by independent evaluators reported four to seven times greater learning, compared with baseline or control conditions, after CABAS® was implemented in schools or home-based interventions (Reed, Osborne & Corness, 2007; Perini & Casarini, 2009).

One of the main characteristics of the CABAS® programs is that all instruction is designed, provided and recorded as Learn Units. A Learn Unit (Greer & McDonough, 1999; Bahadourian, 2000; Greer, 2002) is a basic unit of teaching identified to measure the behavior of a teacher or a teaching device and the student response. It was described as the interlocking three-term contingencies of teacher and learner, with at least two contingencies for the teacher and a potential one for the student (Greer & Ross, 2008). The Learn Unit definition was based on Skinner's programmed instruction frames (Skinner, 1968) and was developed including findings from the applied research about academic engaged time (Greenwood, Horton, & Utley, 2002), corrections (Skinner, 1968) opportunity-to-respond (Cooper, Heron, & Heward, 1984) and computer-based instruction (Kulik & Kulik, 1991). It was defined as an accurate predictor of educational outcomes in the classroom and at home (Bahadourian & Greer, 2005; Bahadourian, Tam, Greer & Rousseau, 2006) and, according to Greer & Ross (2008) "is necessary, if not sufficient, for teaching new operants". Learn Unit's main components are: (a) an antecedent stimulus presentation by the teacher, with unambiguous instruction provided to a student in optimum motivational and attending conditions, and without unwitting prompts; (b) an opportunity to respond (usually within 3 seconds); (c) an appropriate consequence, derived from the student's instructional history (correct responses must be followed by reinforcing consequences and incorrect responses must be followed by a correction operations, with the teacher providing the answer and observing the student's corrected response without delivering reinforcers). In CABAS® schools and programs, Learn Units are used to measure the accuracy of teacher's teaching, student learning and the productivity of instructors (Greer & McDonough, 1999). Learn Unit data collected are daily graphed by curricular areas and individual programs for students, and by daily total instruction for teachers. Moreover, "learn units to criterion" data are calculated as a rate of learning, to measure improvements in the efficacy and efficiency of instruction at the level of the

individual students, instructors, classrooms and program-wide (Keohane, Luke & Greer, 2008).

CABAS® Components. Other key tools and tactics used to teach, improve performance and motivate professionals in the CABAS® system are: the Teacher Performance/Rate Accuracy Observation Protocol (Ingham & Greer,1992), the CABAS® Decision Protocol (Keohane, 1997; Keohane & Greer, 2005), implementation of parent education programs (Bahadourian & Greer, 2005), system monitoring and staff training (Greer, 1996).

The Teacher Performance Rate and Accuracy (TPRA) Scale is conducted by a supervisor and measures the teacher or experimenter's accuracy and rate of Learn Units presentation, and students responding to the presentations. It focuses on each component of the Learn Unit, providing each teacher with contingent feedback about accuracy of data collection, fluency of instruction presentation, and acquisition of contingency-shaped behavior (Greer & Ross, 2008). Its frequent use was identified in literature as a good predictor of students' improvement and quality of teaching (Keohane et al., 2008).

The Decision Tree Protocol was introduced to CABAS® schools since 1997 to outline rule-governed strategies for data-based decisions. Applied researches showed that the implementation of the Protocol can significantly decrease Learn Units to criterion values across all students (Keohane, 1997). In 2005, Keohane and Greer examined the effects of teaching instructors to use this verbally governed problem-solving procedure to solve students' learning difficulties and showed that learners reached a greater number of instructional objectives when their teachers used this analytic algorithm.

Parent Training is also an important component of the model: parent education in the CABAS® programs is usually offered to all parents on a voluntary basis, starting with instruction about how to deliver Learn Units in school and at home, then continuing with at-home consultations (Twyman, 1998). The objective of the 1:1 and group instruction

provided to parents is to give them tools to be better problem –solvers and educators at home. According with recent researches (Hart & Risley, 1995; Greer & Ross, 2008; Greer & Longano, 2010) one of the main goal for parent trainers is to teach parents how to increase language interactions with their children and promote spontaneous speech, to move them through higher verbal behavior development stages.

The CABAS® Board, whose members are behavior analyst supervisors in CABAS® schools, and University professors, serve as mentors to teachers, supervisors and administrators, and continuously analyze all of the components of the program. The CABAS® system for staff training was built on Keller's Personalized System of Instruction (PSI) approach (Keller, 1968) with a rank system. CABAS® trainee move through the ranks or levels of expertise in an individualized fashion and during the internal career must demonstrate mastery of (a) verbal behavior about the science, (b)contingency-shaped repertoires of in class practice, and (c) verbally mediated repertoires to make independent decisions about applications of behavioral strategies (Healy, O'Connor, Leader, & Kenny, 2008).

All these components are necessary to define a CABAS® model of education, a system that, from the beginning, was designed to fulfill the dream of optimum behavioral schools capable of drawing on the other behavioral models of schooling, the tactics from the experimental and applied branches of behavioral analysis, the epistemology of behavioral selectionism and research on the model itself, applied in schools (Greer, 2002). To be complete and self-correcting, the model must be applied to all of the individuals involved in the school community: students, parents, teachers, supervisors and the university training program, and studied as a cybernetic system. As stated by its main representative, Dr. R.D. Greer (2002) "this system-wide analysis is used to determine or evoke […] relationships between all of the parties such that the effects on the students' learning are the controlling variable for the relationships between roles".

1. CABAS® Verbal Behavior Development Theory

Origins of Verbal Behavior. Complex language is recognized as one of the unique repertoires of the human species. Over the last 40 years linguists have proposed theories and provided evidence related to their interpretation of the structure of language (Chomsky & Place, 2000). Neuroscientists have identified neurological correlates associated with some aspects of language (Deacon, 1997, Holden, 2004), while behavior analysts have focused on the source of and controlling variables for the function of language (Catania, Mathews, & Shimoff, 1990; Greer & Ross, 2004; Michael, 1984; Skinner, 1957). More recently, scholars have come to view human language as a product of evolution. The experience of CABAS® schools produced a wide corpus of research that, incorporating Skinner's (1957) Verbal Behavior theory, led to an inclusive new theory about how cultural selection gave rise to the function of language and how verbal behavior development happens for children with and without disabilities (Greer & Keohane, 2005; Greer & Ross, 2008).

Some researchers suggest that oral communication evolved from clicking and sucking sounds to sounds of phonemes, and focus on the existant clicking languages as an evidence for that (Pennisi, 2004). Greer & Keohane (2005) agreed that is likely that sign language and gesture predated both vocal forms; but, in their view, it is the evolution of the spoken and auditory components of language that are seen as critical to the evolution of language. Some of these include changes in the anatomy of the jaw. In Fact, homo sapiens have more flexible jaw than did Neanderthals. Also, the location of the larynx relative to the trachea is different for Homo sapiens, and this anatomical feature made it possible for the humans to emit a wider range of speech sounds (Deacon, 1997). The combination of these anatomical changes, together with the identification of separate, but proximate, sites

in the brain for speaking, listening, and imitation seem to be critical parts of what created the basis for spoken language (Deacon, 1997). The presence of these anatomical and physiological properties made it possible for the evolution of verbal functions through the process of cultural selection (Catania, 2001). The functional effects of speech sounds were acquired by the consequences provided within verbal communities. This latter focus is what, according to Greer & Keohane (2005), constitutes the subject matter of verbal behavior. Interesting, little, if any research work, is devoted to the function of language as behavior per se. Only the research associated with Skinner's (1957) theory of verbal behavior as behavior per se, and expansions of the theory by contemporary behavior analysts, provide the means for analyzing how cultural selection gave rise to the function of language (Greer, 2002; Greer & Ross, 2008; Hayes, Barnes-Holmes, & Roche, 2000;). Currently, the linguistic, neuropsychological, and behavior analytic foci remain separate sciences, even if they need not remain so (Catania, 1998). While the role of cultural selection in the evolution of verbal behavior for the species remains theoretical, the development of verbal behavior within the ontogeny of the individual is considered empirically verifiable (Greer & Keohane, 2005).

From Theory to Research and from Research to Theory. For decades after the publication of Skinner's (1957) book on verbal behavior, the majority of the publications on the theory remained theoretical. There is now a significant body of research supporting and expanding Skinner's theory of verbal behavior. Greer and Keohane (2005) have identified over 100 experiments devoted to testing the theory and its utility for educators. Also, there is a significant amount of research in relational frame theory that includes at least an equal number of studies that can be easily related to the verbal behavior theory (Hayes et al., 2000). In the CABAS® program of research alone, researchers have completed around 50 experiments and a number of replications. Greer and Keohane's

(2005) particular research program was driven by the effort to develop schools that could provide all of the components of education completely based on scientific teaching and schooling. Cognitive psychology offered a great number of theories and findings about schooling too, and when they were compared and contrasted to CABAS® best practices, the findings identified many cognitive pedagogy methods that were operationally synonymous to those identified in behavior analysis. Skinner's Verbal Behavior (1957) was the first publication suggesting a way for a research program to fill in much of what was missing in the literature in a manner that allowed researchers to operationalize complex cognitive repertoires. In their commitment to a thoroughgoing scientific approach to schooling, CABAS® researchers needed functional curricula that could identify repertoires of verbal operants or higher order operants, including "generative" or "productive" verbal behavior: this was their challenge to build a modern theory of Verbal Behavior Development.

Brandon (2008) emphasized that one of the best discussions of the conditions necessary for acquiring the listener behavior was presented by Greer and Keohane (2005). In fact, as explained before, Greer and Keohane (2005) needed findings that worked in the day-to-day practice of their schools, the CABAS® schools, where their goal was to educate the "whole child." Experimental evidences suggested that they identified the verbal behavior cusps necessary for a child to move on from early capabilities to more complex verbal skills. Rosales-Ruiz and Baer (1996, p.166) stated that "*A cusp is a change [a change in the capability of the child] that (1) is often difficult, tedious, subtle, or otherwise problemati to accomplish, yet (2) if not made, means little or no further development is possible in its realm (and perhaps in several realms); but (3) once it is made, a significant set of subsequent developments suddenly becomes easy or otherwise highly probable which (4) brings the developing organism into contact with other cusps crucial to further, more*

complex, or more refined development in a thereby steadily expanding, steadily more interactive realm".

Once Greer and Keohane (2005) identified prerequisites or co-requisites repertoires needed by each child to progress through the verbal behavior capabilities described in Table 1, they developed scientifically based tactics for moving children with the lack of a particular verbal capability from one level of verbal capability to the next level in the continuum. The authors demonstrated the ability to teach the missing repertoires, and when they did, the children made logarithmic increases in learning and emergent relations ensued. That is they acquired behavioral cusps or capabilities. Table 2 lists the verbal capabilities and the components and prerequisites that Greer and Keohane (2005) identified as well as some of the related research.

Greer (2011) focused on defining the critical experiences necessary to develop new behavioral cusps because of the need to identify all the components that, in typically developing children, allow to achieve new capabilities that exponentially expand learning. According to the new Verbal Behavior Theory (Greer & Ross, 2008) these capabilities, induced for children with special needs, would provide them with the means to learn or expand the capability to learn. For example, children would learn from observing others experiences instead of from direct teaching only, and this would lead to emergent or creative responding (Greer, 2011). Recently, research in the experimental and applied behavior analysis has begun to identify certain cusps and the specific experiences that bring about them in students in whom they are missing. CABAS® researchers progressively identified ways to induce them (Pistoljevic, 2008; Greer, Yuan & Gautreaux, 2005; Delgado & Speckman, 2008; Pistoljevic & Greer, 2007; Nuzzolo & Greer, 2004). These ways were called protocols (Greer, 2011) to differentiate them from tactics, and are

continuously applied to improve their property to allow teachers to use minimal instruction to induce untaught or emergent relations.

Greer and Keohane (2005) shown that certain environmental experiences evoked the capabilities for their students. However, they were mindful that providing particular prerequisite repertoires that are effective in evoking more sophisticated verbal capabilities in children with language disabilities or language delays does not necessarily demonstrate that the prerequisites are component stages in all children's verbal or cognitive development. While Gilic (2005) demonstrated that typically developing 2-year old children develop naming through the same experiences that produced changes in children with verbal delays, others can argue effectively that typically developing children don't need specially arranged environmental events to evoke new verbal capabilities. A definitive rejoinder to this criticism awaits further research, as does the theory that incidental experiences are not required, as strongly stated by Pinker (1999).

Fundamental Speaker and Listener Repertoires. Verbal behavior was behaviorally defined as operants whose reinforcement is mediated by a change in behavior of a listener (Brandon, 2004). Many authors also specified that the listener and speaker can exchange roles, or as Ferster (2002) explained, share a common intraverbal repertoire. Greer and Keohane's (2005) classification of children's verbal development adhered to Skinner's (1957) focus on the verbal function of language as distinguished from a structural or linguistic focus. Skinner focused on antecedent and consequent effects of language for an individual as a means of identifying function, clearly distinguishing it from structure (Catania, 1998). Greer and Ross (2004; 2008) suggested that this research effort might be best described as verbal behavior analysis, often without distinction between its basic or applied focus. The authors incorporated the listener role in their work, in addition to the speaker functions.

Pre-Listener Behavior

According to Keohane, Pereira-Delgado and Greer (2009) the basics for language development are observing responses associated with listener and speaker repertoires. These observing responses were defined by the authors as operant responses of looking, listening, tasting, smelling and touching. Greer & Ross (2008) also suggested that complex behaviors can emerge only when the observing operants are "selected out by the consequences that reinforce observation, and the stimuli that reinforce them are established by reinforcement conditioning processes". Greer and Keohane (2005) listed the capabilities needed by each student in order to progress and ordered them as verbal development milestones or cusps. The first prerequisite for instruction was identified as compliance, or the presence of the teacher as a source of conditioned reinforcement. The first components of what was defined "self-awareness" (Keohane et al. 2009) were then behaviorally defined as responding to adults' voices, making eye contact with the stimuli, matching stimuli across the senses and imitation through observation.

Decasper and Spence (1986) report evidence that mothers' voices are conditioned reinforcers for observing shortly after birth, suggesting that the conditioning process occurs before birth with the pairing of nutrients with hearing the mothers' voices. Once the child orients to the mother and can see the mother, the conditioned voice stimulus is paired with the mother's face resulting in the face of the mother reinforcing observation. Other senses are involved also such as tactile stimuli and olfactory stimuli. Simultaneously, independent movements are present and they are separate from observing behavior, as Skinner proposed that they are simply emitted as part of the phylogenetic contribution. For example, Meltzoff and Moore (1983) reported that newborn infants imitate facial movements. Greer (2008) speculated that the conditioned reinforcement for observing the mother and the mother's actions, as the child observes her own actions, leads to

correspondence between the mother's actions and the infant's actions and the acquisition of the correspondence itself as a conditioned reinforcer. In children evolution babbling is emitted early on, without connection with what is heard. When correspondence between the mother's phonemic sounds and the child's babbling occurs, parroting starts. When the child emits the phonemic sounds like those of the mother, the child's response is automatically reinforced since they are producing the sounds like those of her mother. This reinforcement originates from a conditioning history that conditions correspondence between observing and producing itself as conditioned reinforcer. This is not yet verbal but set the basis for it. Sundberg (1996) and Yoon and Bennett (2000) conditioned babbling as automatic reinforcement in children with severe language delays (Esch, Carr, & Michael, 2005). Dinsmoor (1983) and Tsai and Greer (2006) found that preconditioning of stimuli as conditioned reinforcement for observing facilitated discrimination learning. Several studies have shown that conditioning reinforcement for caregivers' voices (Keohane, Luke, *et al.*, 2008) or visual stimuli (Keohane, Greer, & Ackerman, 2006, Pereira-Delgado, Speckman, & Greer, 2008) or combinations of these protocols (Keohane, Luke, & Greer, 2008) in preschool children lacking listener or speaker capabilities resulted in drastic acceleration in learning relevant discriminations. Moreover, developing the capacity to match across seeing, hearing, touching, tasting, and smelling such that the capacity for sameness across senses was mastered resulted in drastic accelerations in learning. These studies together with those described above suggest how conditioned reinforcement for observing stimuli resulted in accelerated learning that was not possible prior to acquiring these kinds of conditioned reinforcement (Keohane, Pereira-Delgado, & Greer, 2010). As in the cases of typically developing infants, acquiring conditioned reinforcement for observing led to developmental cusps that made other learning possible. This "learning to learn" was described as foundational to verbal behavior (Roche & Barnes-Holmes, 1997).

Most of all, mastery of the relation of matching across the senses would appear foundational to verbal behavior (Greer, 2008).

Listener Behavior

While Skinner's research focus was the speaker, a careful reading of Verbal Behavior (Skinner, 1957; 1989) suggests much of his work necessarily incorporated the function of listening (e.g., the source of reinforcement for the listener, the speaker as listener). This makes the behavior of the listener an important contribution to the theory and a necessary part of the analysis of verbal behavior. The behavior of the listener is characterized as rule governed, or as Shimoff and Catania (1998) suggest, defined as "verbally governed behavior". Greer and Ross (2008) reported that for some students, listener behavior is the most important prerequisite for developing the other verbal repertoires such as speaker behavior, echoic responses, and social behavior (Novak & Pelaez, 2004).

The importance of listener instruction was emphasized by many authors not just because it contributes to the teacher gaining students' compliance or "instructional control", but most of all because it provides the child with the prerequisites to acquire the correspondence between his/her own non-verbal responses and the speech of others. This correspondence was defined as "fundamental in order for students to acquire listener and speaker functions, basic discriminations such as matching or discriminating colors, shapes, events and activities and other building blocks for more advanced learning" (Greer, 2008). Greer and Keohane (2005) research on the role of the listener was necessitated by the problems encountered in teaching children and adolescents with language delays, of both native and environmental origin, to achieve increasingly complex cognitive repertoires of behavior. Without a listener repertoire many of their children could not truly enter the

verbal community. The scientists needed to provide the listener roles that were missing, but that were necessary for the advancement of the repertoires of the speaker.

Moreover, new research and theories based on Skinner's work have led to a more complete theory of verbal behavior that incorporates the role of the listener repertoire. These include:

- Research done by relational frame theorists (Barnes-Holmes, Barnes-Holmes, & Cullinan, 1999; Hayes, Barnes-Holmes, & Roche, B., 2000),
- Naming research by Horne and Lowe and their colleagues (Horne & Lowe, 1996; Lowe, Horne, Harris, & Randle 2002),
- Research on auditory matching and echoics (Chavez-Brown & Greer, 2004)
- Research on the development of naming (Greer, et al., 2005b)
- Research on conversational units and speaker-as-own-listener (Donley & Greer, 1993; Lodhi & Greer, 1989), and
- Research on Learn Units (Greer & McDonough, 1999).

The levels of verbal capability identified by Greer and Keohane (2005) incorporate the listener as part of the verbal behavior evolution (Skinner, 1989). The main steps they identified are: (a) the pre listener stage (the child is dependent on visual cues, or, indeed, may not even be under the control of visual stimuli), (b) the listener stage (the child is verbally governed as in following others' directions) (c) the speaker stage (the child independently emits mands, tacts, autoclitics, intraverbal operants), (d1) the stage of rotating speaker-listener verbal episodes with others (the child emits conversational units

and related components of learn units in interlocking operants between individuals), (d2) the speaker-as-own listener stage (the child engages in self talk, naming, speaker-as-own-listener editing function, and say-do correspondence), (e) reader (the child emits textual responding, textual responding as a listener and emergent joint stimulus control, and the child is verbally governed by text), (f) the writer stage (the child verbally governs the behavior of a reader for aesthetic and technical effects), (g) writer-as-own reader (the child reads and revises writing based on a target audience), and uses verbal mediation to solve problems (the child solves problems by performing operations form text or speech). Each of these categories has critical subcomponents, as shown in chapter 3.

Speaker behavior

Skinner (1957) described verbal operants as operant behavior that is mediated by the behavior of others. From the prospective of the speaker, verbal operants function to obtain certain outcomes through the mediation of others. As originally stated, "*the form of a response is shaped by the contingencies prevailing in a verbal community. A given form is brought under the stimulus controls through differential reinforcement of our three-term contingency. The result is simply the differential reinforcement of our three-.term contingency. The result is simply the probability that a speaker will emit a response of a given form in the presence of a stimulus having certain broad conditions of deprivations or aversive stimulation. So far as the speaker is concerned, this is the relation of reference or meaning*" (Skinner, 1957, p. 115).

Who mediates between the person and some other part of the environment is the listener (Greer, 2009). Verbal operants can be acquired through direct or indirect contact with mediated contingencies. The basic verbal operants described by Skinner (1957) are acquired through direct (non-observational) contact with mediated contingencies of a

listener and defined as the echoic, the mand, the tact, autoclitics, intraverbals and textual responses. Skinner (1957) also differentiated between pure and impure verbal operants. The pure verbal operants were defined as verbal operants controlled by the presence of an item or a motivational condition, while impure verbal operants have more than one controlling variable, such as the presence of a verbal antecedent and a motivational condition (Greer & Ross, 2008). In *Verbal Behavior*, Skinner (1957) differentiated pure verbal operants-those controlled by one controlling variable such as the presence of an item or a motivational condition such as hunger or thirst- from impure verbal operants, wich are controlled by more than one controlling variable such as motivational condition and a verbal antecedent. Skinner (1957) defined these spontaneous verbal initiations "pure mand" and "pure tact" verbal operants. Tacts and mands were identified by the author as two of the six elementary verbal functions and are essential acquisitions in children's development because they are the basis for building all the verbal complex responses (Greer & Ross, 2008).

According to Greer and Ross (2008), early speaker behavior, including pure and impure verbal operants (intraverbals) and the speaker component of Naming, is usually first taught by developing the emergence of echoics. When basic teaching operations are ineffective, the authors suggested other procedures as presented in Table 2. Greer and Ross (2008) focused on how to teach all components of early speaker behavior: pure verbal operants, autoclitics, the speaker component of Naming, and impure verbal operants or intraverbals.

In detail, tacts can be defined as see-say point-to-point correspondences. Skinner (1957) created the word "tact" to define the verbal behavior a speaker emits to make contact with his or her environment. According to Greer and Ross (2008), tacts are verbal operants under the control of a prior controlling stimulus (i.e., a picture, a person or an

object). Prior to a tact there is no verbal antecedent and the reinforcing consequences are generalized reinforcers such as social attention or confirmation. In the CABAS® model of schooling (Greer, 1994, 2002), tacts are frequently taught immediately after or together with mands. The term "mand" comes from the words "command" or "demand". Skinner (1957) introduced this term to define the verbal behavior that specifies its reinforcer. Mands are verbal operants emitted under state of deprivation and they specify their own reinforcers. Even when the form for tacts and mands is the same, their functional properties are different: the consequence for a mand is the delivery of the specified item whereas the consequence of a tact results in generalized reinforcement (Pereira Delgado & Oblak, 2007). Skinner (1957) underlined that during a child's development, tacts and mands are learned independently from one another. Many researchers found that mands and tacts have functional independence both for children with developmental disabilities (Nuzzolo & Greer, 2004) and for children without developmental disabilities (Carr & Michael, 2005).

In the CABAS® model of schooling (Greer, 1994, 2002) tacts and mands are taught under the relevant antecedent conditions instead of under a vocal stimulus control. This is a good predictor of inducing spontaneous speech instead of mechanic or teacher-controlled verbal behavior (Pistoljevic & Greer, 2007; Delgado & Oblak, 2008). In fact, when mands and tact are taught with verbal antecedents, such as "what do you want?" or, "What's that?" children often learn to respond to the verbal antecedent and not to the natural motivational conditions that are the real controls for natural verbal behavior. To illustrate the problem, Greer and Ross (2008) reported that the first author, early in his career, spent weeks teaching a child who would only eat peanut butter to eat a variety of foods. This instruction was done in a classroom such that before each bite the child was told "Eat". The child eventually eat a wide variety of foods, but in the school cafeteria, the

child did not eat. However, when Greer told the child to eat, he did so. In other words, eating was not naturally controlled by hunger; the student had been taught to wait until the verbal antecedent occurred. A verbal stimulus was required for the child to eat. This illustrates the need of assessing the establishing operations for each behavior to teach, and the importance of teaching under the relevant antecedent conditions. So, spontaneous speech (e.g. vocal, signing or pictures) should be promoted as speaking behavior under the control of the stimuli and motivational conditions that do not have verbal antecedents. In order to teach spontaneity, the relevant antecedents must be taught and verbal antecedents are not always relevant.

Interlocking Speaker and Listener Responses. After the acquisition of the basic listener and speaker repertoires, effective teaching should help children to develop more complex communicative functions (Greer & Ross, 2008). Before teaching advanced verbal repertoire, Greer & Keohane (2005) suggest to replace all the non functional vocal behavior (i.e. echolalia and palilalia) with functional verbal behavior and replace inappropriate echoic responses with appropriate intraverbals. There is increasing evidence that after the process of teaching basic listener and speaker responses that have a function in the students' verbal community, it's important to build joint listener and speaker function responses (Greer & Keohane, 2005).

Three types of speaker as own listener repertoires are identified by Greer and Ross (2008): Naming, Say and Do correspondence and Self-Talk. Later in the typical evolution, the acquisition of Reader repertoires bring then the students to the capacity of use written text to extend their sensory experiences. The verbal material can be used by the reader without the limitations (time, distance or accessibility) that control the relation speaker-listener. Form the point of view of the writer, the acquisition of a writer status gives to the individual the opportunity to control environmental contingencies without distance or time

limitations, and represents an expansion of speaker repertoires. When writers can read their own written products from the point of view of their potential audience, they can become more effective in controlling their environmental contingencies and they reach the self-editing status (Greer & Keohane, 2005).

Another cue developmental stage for children is what Skinner (1957) called "verbal episode": the acquisition of the repertoire of exchanging speaker and listener roles with others. A marker and a measure of one type of verbal episode is the Conversational Unit (Greer & Keohane, 2005). Epstein, Lanza, and Skinner (1980) demonstrated the existence of verbal episodes between two pigeons. According to Greer & Keohane (2005), these authors demonstrated a particular kind of interlocking verbal operants that CABAS® researchers identify as Learn Units. In the Epstein et al. study, special contingencies were arranged in adjacent operant chambers to evoke or simulate the teaching repertoire. Greer & Keohane, 2005 noticed that the pigeon that served as a student did not emit the reciprocal observation that needs to be present in a verbal episode characterized as a conversational unit. Premack (2004) supported this statement, noting that the kind of teaching observation necessary for a conversational unit to happen is one of the repertoires that are unique to humans. In fact, in a conversational unit both parties must observe, judge, and consequate each other's verbal behavior. Greer & Keohane's (2005) definition of a Conversational Unit includes what Vargas (1982) identified as a "sequelic". According to the authors, in the first step of a conversational unit, a speaker responds to the presence of a listener with a speaker operant that is then reinforced by the listener. Next, the listener assumes a speaker role under the control of the initial speaker. That is, the listener function results in the extension of sensory experiences from the speaker to the listener as evidenced by the speaker response from the individual who was the initial listener. The initial speaker then functions as a listener who must be reinforced in a listener

function (i.e., the initial listener as speaker extends the sensory capacities of the initial speaker as a listener). A new unit begins when either party emits another speaker operant. Greer & Keohane (2005) suggested that conversational units are essential markers of and measures of social behavior and, they argued, their presence is a critical developmental stage for each individual. Moreover, they stated that coming under the contingencies of reinforcement related to the exchange of roles of listener and speaker is the basic component of being social. Donley and Greer (1993) induced first instances of conversation between adolescents who had never before been known to emit conversation with their peers through manipulation of the establishing operations for speaking and listening. Others (Chu, 1998; Carr and Durand, 1985) found that mand training with a training for social skills increased conversational units and decreased assaultive behavior between children with autism and typically developing peers.

Speaker as own listener

Greer & Keohane (2005) pointed out that the speaker may function as her own listener in the case of "self-talk." Lodhi and Greer (1989) empirically identified speaker as own listener behavior in young typically developing children and suggested that this was the early identification of conversational units in self-talk. Horne and Lowe (1996)' s studies on Naming suggested that speaker as own listener interchange occurs in this phenomenon as well. In Greer & Keohane' s (2005) definition, Naming occurs when an individual hears a speaker emit a tact, and that listener experience allows the individual to emit the tact speaker function without direct instruction and further to respond as a listener without direct instruction. Horne and Lowe (1996) identified the phenomenon with typically developing children. Many (Greer &Keohane, 2005; Greer & Ross, 2008) described Naming as a basic capability that allows children to acquire verbal functions by observation. It is a bidirectional speaker listener episode that was found to be missed in

children with and without disabilities (Pistoljevic, 2007). Naming was also defined as a generative verbal repertoire that Skinner (1957) described as responding in different media to the same stimulus and Catania (1998) included in his definition of "higher order operant." The Relational Frame Theorists described this particular higher order operant as an incidence of transformation of stimulus function (Hayes, Barnes-Holmes, & Roche, 2000).

The phenomenon of missed acquisition of this learning capability is often described as a lack of the capability to emit generative responses in which "understanding" is the automatic given of exposure to stimuli. In Greer's and Keohane's (2005) theory, the lack of Naming is a source learning difficulties for typically and non-typically developing children, as well as college students who demonstrate differences in their responses to multiple-choice questions (selection responding) versus their responses to short answer or essay questions (production responding). Greer, Stolfi, Chavez-Brown and Rivera-Valdes (2004) found that the instructional history that led to Naming might be isolated and produced experimentally. A multiple exemplar instructional intervention was implemented, with a subset of stimuli involving rotating match, point to, tact, and intraverbal responding to stimuli. Further research demonstrated that multiple exemplar instruction (MEI) experiences can induce Naming capability while single exemplar instruction (SEI) training can't (Pistoljevic & Greer, 2008).

Reading

According to some authors (Greer & Keohane , 2005; Sidman, 1994), reading involves textually responding (seeing a printed word and saying the word), matching various responses to the text as comprehension (printed stimulus to picture or actions, the spoken sound and all of the permutations of this relationship). Despite the reader stage

appears to be simply an extension of the listener repertoire, Greer and Keohane, 2005 suggested that reading is necessarily an advanced speaker as own listener repertoire because the reader must hear what is read. In fact, in this view, reading consists of speaker-listener relationships under the control of print stimuli, actions or pictures. Textually responding requires fluent responding to print stimuli in order to "hear" the spoken word, something that Greer and Keohane (2005) defined as "effortless responding to print stimuli". Listening and hearing the words was defined crucial for reading comprehension beyond the sixth grade, as suggested by studies with participants who are deaf from birth (Kretchmer, 2003). Good phonetic instruction results in children textually emitting untaught combinations of morphemes and if those words are in their listener repertoire they comprehend (Becker, 1992) However, Greer and Keohane (2005) highlighted that even if a child can textually emit an accurate response to the printed stimuli, if the listener comprehension is not present the child "will not understand" what she has read or will not demonstrate reading comprehension. The lack of reading comprehension can easily be demonstrated by measuring the students' capability to match the sounds to corresponding pictures or actions. As pointed out by the authors, assessing this function is a critical component for individualizing instruction and setting appropriate goals for each student based on his/her learning prerequisities; in fact reading fluently a foreign language does not necessarily mean to understand what is written.

Printed words and pictures as conditioned reinforcers is the basic prerequisite (Tsai & Greer) for accurate reading but the listener behavior appears to be the key component. The listener component of reading is as important as the textual speaking component; thus, a reader must be a reader as own listener (Greer & Keohane 2005).

Writing

In Greer and Keohane's (2005) view, writing represents a separate repertoire from reading and represents an advancement in the verbal scale sequence. But, writing from a functional verbal perspective requires that the writer affect the behavior of the reader; that is they must observe the effects of their writing and in turn modify their writing until the writing affects the behavior of the reader. Writing, to be defined truly verbal, needs to be under the control of the relevant establishing operations, as in the case of speaking. Several authors contributed to define a tactic called writer immersion (Gifaldi & Greer, 2003; Keohane, Greer & Mariano-Lapidus, 2004; Jadlowski, 2000; Madho, 1997), based on manipulation of establishing operations. In this studies, experience taught the students to write such that they read as they were the target readers, or target audience. The editing experience appears to evoke writer as own reader outcomes of self editing, as an advanced speaker as own listener repertoire (Jadlowski, 2000). In other words, Greer and Keohane (2005) suggested that almost all difficulties in writing and reading are probably traceable to missing components of the speaker, listener, or speaker as own listener components.

2. The CABAS® Verbal Developmental Sequence

Identifying and Inducing the Preverbal Foundational Cusps and Capabilities and the Listener Cusps

#	1
TACT "product"	**Teacher presence results in instructional control over the student**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: No. "The 5 attentional programs are designed to teach the attentional prerequisites to learning true listener responses" (Greer & Ross, p.73)
IDENTIFICATION	20-trials probes for the Five Attention Programs: Sit, Sit Still, Eye Contact (look at me), Imitation (do this), Generalized Imitation (pp. 73-74, Greer & Ross, 2008)

TACT "process"/ PROTOCOL TO INDUCE IT	**The Five Attention Programs** (pp.73-76 Greer & Ross, 2008) Procedure: implement 5 20-learn units programs for the attentional programs. Sit: Antecedent: "sit", Correct Response: student sitting down within 3 seconds. Intersperse with nonsense commands and use visual cues and prompts if needed. Sit still: Vocal antecedent"sit still". Correct response: the child sit nicely (from 1 to 10 sec) with hands in lap within 3 sec. Eye contact: Antecedent "look at me"; Correct Response: the child immediately looks at the teacher for 1 to 10 seconds. Correction for incorrect response: ignoring. Imitation: Antecedent "do this" with teacher's model; Correct Response: the child imitates the action with point-to point correspondence within 3 sec. (also use point to body parts). Generalized Imitation: extension of the prior program, implement after the student has 3-4 responses in repertoire. Use novel actions.
CRITERION/EVIDENCE OF ACQUISITION	Sit/Sit Still: 19/20 correct responses across two 20-trials sessions (p. 74 Greer & Ross, 2008) Eye Contact: 90% accuracy across two 20-trials session Imitation: 90% across 2 consecutive 20-trials sessions Generalized imitation: LTO = 80% correct during one session of 20 unreinforced probe trials (p. 59 Keohane, Pereira-Delgado & Greer)
IF THE PROTOCOLS DON'T WORK	Sit and Sit Still: use visual & gestural prompts Eye Contact: use reinforcer as prompt and fade it out or zero-second time delay Imitation & Generalized Imitation: zero-second time delay (pp. 74-76 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	All subsequent listener programs can be taught (p. 73 Greer & Ross, 2008). Probe for basic listener literacy through Listener Emersion (p. 76 Greer & Ross, 2008).

#	2
TACT "product"	**Human Faces as Conditioned Reinforcers**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008) Rationale: Implement if child does not look at others in the presence of antecedents or when attention is required in instructional and free play setting
IDENTIFICATION	Duration of eye contact with individuals in 3 selected settings (10-20 probe trials per setting)

TACT "process"/ PROTOCOL TO INDUCE IT	**Conjugate Reinforcement for Observing Faces Protocol** Procedure: Stimulus-stimulus pairing, with continuous reinforcement delivered by the experimenter by looking at the child, emitting sounds, words, songs (even using a gum) when the child looks at the face (and the mouth) of the experimenter. The teacher stops to move her mouth and emit sounds when the student stops making eye contact.
CRITERION/EVIDENCE OF ACQUISITION	160 cumulative seconds of sustained eye contact in 1 to 20 trials per 2 sessions.
IF THE PROTOCOLS DON'T WORK	Set short-term objectives: gradually increase duration of targeted eye contact, intersperse of known items, add tactile stimuli (touch)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The child will learn at a faster rate. All programs should be re-introduced

#	3
TACT "product"	**Adult Voices as Conditioned Reinforcers**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite: Teacher Presence Results in Instructional Control Over the Student and Auditory Matching of Words (if the A.M. Protocol doesn't work, you can condition voices first, then go back to Auditory Matching) Rationale: Implement if child does not orient toward adult voices and/or look at speakers (after controlling for the presence of hearing deficit (p. 46 Keohane et al., 2009)
IDENTIFICATION	20-probe trials using duration recording of each trial (for 1 or more sec trials) consisting of a variety of novel opportunities for child to respond to adult's attention (e.g. student turns toward adult when his/her name is called, when an adult enters the room or speaks to a child nearby, or rearranging environment) in 1:1, small group and free-play setting (p. 46 Keohane et al, 2009).
TACT "process"/ PROTOCOL TO INDUCE IT	**Conditioning Adult Voices Protocol** (p. 85-92 Greer & Ross, 2008; p. 46 Keohane et al, 2009) Procedure: Pairing-Test conditioning procedure, with edibles delivered while the student pushes a button that starts a voice (paining) followed by an interval of observation.

CRITERION/EVIDENCE OF ACQUISITION	90% of 5-sec whole interval recordings (90, 5 sec intervals) over 2 5-min consecutive sessions; Test of conditioned reinforcement = 90% correct resp. during the tests of the pair-test trials for 2 consecutive sessions with no stereotypy or passivity (p. 48 Keohane et al., 2009)
IF THE PROTOCOLS DON'T WORK	If after 5-sec pairing-test procedure the child doesn't reach criterion for Adult Voices conditioning, go to 10-sec, 15-sec, 20-sec… pairing-test. (Provide only 2 or three pairings until child meets criterion). If the intervention is still unsuccessful, it can be because of lack of prerequisites, incorrect use of the procedure or faulty reinforcement pairing. (p. 91 Greer& Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Probe/teach basic listener literacy. Accelerated learning rates & increased attention should occur, student will attend to voices, Lu to criterion for listener programs will decrease (p. 87 Greer & Ross, 2008)

#	4
TACT "product"	**Conditioned Reinforcement for Visual Stimuli-a Observing 3D Tabletop Stimuli as Conditioned Reinforcement**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite: Teacher Presence Results in Instructional Control Over Child (p. 72 in Greer& Ross, 2008). Rationale: Implement when child does not attend to print stimuli, can't master basic listener literacy sets after 1-2 days of instruction and/or has high number of LU to criterion on matching programs (p. 82 Greer& Ross, 2008 and p. 49 Keohane et al., 2009).
IDENTIFICATION	20- trials probe measuring the duration of sustained eye contact of a neutral or a non-preferred stimulus (1 or more sec-trials. (p. 53 Keohane et al., 2009).
TACT "process"/ PROTOCOL TO INDUCE IT	**Visual Tracking Protocol** (pp. 82-83 Greer & Ross, 2008; p. 49 Keohane et al.) Procedure: Stimulus-stimulus pairing to pair reinforcers with the stumulus the student is tracking. Duration of eye contact with the stimulus is recorded for 20 trials. The timer is stopped when the child looks away. 2-3 identical transparent containers should be used (vary shape, size…) and preferred items and edibles should be used to track.

CRITERION/EVIDENCE OF ACQUISITION	160 cumulative seconds of sustained eye contact with the target stimulus in 20 or less trials. Then re-introduce previous programs and calculate Lu to crit. (Keohane et al. 2009)
IF THE PROTOCOLS DON'T WORK	If student doesn't meet criterion after post-probe, go to 10, 15… pairing-test. If necessary, prompt the student to look at the container during the first STO, complete one-two rotations of the containers on the table for STO 2. Gradually increase duration of targeted eye contact, intersperse of known items and use the preferred item the student is tracking as a reinforcer for correct responding to the interspersed trials for previously mastered stimuli. If there are still problems with matching, probe for sensory-matching. (p. 83 Greer & Ross, 2008 and p. 52 Keohane et al.).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Return to basic attentional programs (p. 83 Greer & Ross, 2008).

#	5
TACT "product"	**Conditioned Reinforcement for Visual Stimuli-b. Conditioning sustained eye-contact with Print Stimuli**
CUSP/ CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite : Observing 3D Tabletop Stimuli as Conditioned Reinforcement & Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008). Rationale: Implement when child does not attend to print stimuli and/or has high number of LU to criterion on matching programs (p. 53 Keohane et al. 2009)
IDENTIFICATION	Record if the child looks at a page (use 5 different pages presented one at a time) of printed stimuli for 10 consecutive seconds. (p. 53 Keohane et al. 2009)
TACT "process"/ PROTOCOL TO INDUCE IT	**Conditioning Print Stimuli on a Page Protocol** (Pereira Delgado et al. 2008) Procedure: conditioning procedure with delivery of edibles (or non-interfering reinforcers) paired with observing at different pages with a variety of pictures, symbols, letters, numbers.
CRITERION/EVIDENCE OF ACQUISITION	For the conditioning intervention: 90% correct resp. across 2 consecutive sessions (5-min 5-sec intervals with whole int. recording) Probes for the protocol = 4/5 probe-trials (looking at

	the page for 10 s) Keohane et al, 2009
IF THE PROTOCOLS DON'T WORK	Design short-term objectives: gradually increase duration of targeted eye contact and/or intersperse of known items. If the student doesn't reach criterion after the first conditioning intervention, go to 10, 15…. Sec trial/test. You can also include preferred pictures.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Re-introduce matching and point-to programs. (p. 53 Keohane et al. 2009) Repertoires that require child to observe print material may now be taught (e.g. matching 2D stimuli) (p. 65 Greer & Ross, 2008).

#	6
TACT "product"	**Capacity for Sameness Across the Senses**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child & Observing 3D Tabletop & Print Stimuli as Conditioned Reinforcement (p. 72 in Greer & Ross, 2008) Rationale: if adult voices and visual stimuli are conditioned reinforcers but LU to crit.are too high (over 80-120 Lu to c.) and matching programs are not successful. (p. 54 Keohane et al.)
IDENTIFICATION	20 trial probes in 3 different settings (1:1 instruction, small group and free play area) for child orientating toward others calling name, orientating toward others initiating a conversational unit, child emitting sustained eye contact of a stimulus relocated by an adult, child responding to instructions, & child emitting functional self-talk in play area (p. 55, Keohane et al. 2009)
TACT "process"/ PROTOCOL TO INDUCE IT	**Sensory Matching Protocol** (p. 83 Greer & Ross, 2008; p. 54 Keohane et al. 2009) Procedure: stimuli to match are rotaded across the senses with 20-learn units presentation sessions.
CRITERION/EVIDENCE OF ACQUISITION	90% accuracy across 2 consecutive 20-trial sessions (p. 55 Keohane et al. 2009)
IF THE PROTOCOLS DON'T WORK	Use the student's preferred items intersperse of known items (p. 83-85 Greer & Ross, 2008).

WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Return to previous programs. Return to the basic attentional instruction or begin the listener emersion program (p. 84 Greer & Ross, 2008). Accelerated learning rates & increased attention should occur; pointing and echoing programs should be successful (p.56 Keohane et al.).

#	7
TACT "product"	**Auditory Matching of Words**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence result in Instructional Control, Capacity for Sameness, Visual Tracking, Voices as Conditioned Reinforcers (p.91 Greer & Ross, 2008) Rationale: Use when you need to induce the capacity to be governed by spoken words and sentences emitted by a speaker. Implement when students have difficulties emitting/pronunciating echoics, achieving listener literacy or are not meeting the listener emersion criterion (pp. 91-92 Greer & Ross, 2008).
IDENTIFICATION	The student can emit accurate echoic behavior and discriminate vocal directions
TACT "process"/ PROTOCOL TO INDUCE IT	**Auditory Matching Protocol** Procedure: the student discriminate by matching sounds/no sounds, then different sounds, then different words/than similar words (using Big Mac or similar recordable buttons) in 20-learn units presentations sessions.
CRITERION/EVIDENCE OF ACQUISITION	Matching a set of novel word sounds during probe session (p. 98 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	If the child has difficulties with this protocol, go to conditioning voices as reinforcersand then back to auditory matching
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	You can teach using echoics to Tacts or Mands. Pronunciation should improve. Achieving Listener Literacy should be asier. The listener component of Naming may emerge.

#	8

TACT "product"	**Basic Listener Literacy**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence results in Instructional Control and Voices as Conditioned reinforcers
IDENTIFICATION	Fluent responding to commands (basic attentional programs)
TACT "process"/ PROTOCOL TO INDUCE IT	**Listener Emersion Protocol** (p.76 Greer & Ross, 2008) Procedure: Select 16 target commands and 4 nonsense commands, divide them in 4 instructional sets and present them in 20-learn units sessionsFor impossible commands reinforce the absence of response.
CRITERION/EVIDENCE OF ACQUISITION	Acquisition of mastery (90% correct responses per 2 consecutive sessions of 100% correct responses per 1 session) and rate of responding (30 per minute) criteria.
IF THE PROTOCOLS DON'T WORK	For children responding slowly (delayed response, physical problems) you can set al slower rate criterion (12 minute was once used). Check for accuracy of Learn Units presentation and for management and motivation problems, you can put the edibles that you deliver as reinforcers in a cup and allow the student to have them at the end of the session. (p. 76 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Should drastically improve the rate of learning (p. 76 GREER & ROSS, 2008). The student can move to more advanced listener stages. Re-introduce all suspended programs (during the "immersion", only listener and mand/tact programs can be run)

#	9
TACT "product"	**Generalized Imitation**
CUSP/CAPABILITY	Capability
PREREQUISITES/ RATIONALE	Prerequisite: Presence of the Teacher resulting in Instructional Control and Observing responses, Voices as Conditioned Reinforcers and Faces as Conditioned Reinforcers.

	Rationale: the student doesn't have Generalized Imitation in his/her repertoire (or it's not progressing in the attentional programs, including imitation) (p. 58 Keohane et al., 2009)
IDENTIFICATION	The child can imitate novel behavior without direct reinforcement
TACT "process"/ PROTOCOL TO INDUCE IT	**Mirror Protocol** Procedure: teach sets of actions presented by the experimenter in front of a mirror with 20-learn units presentation sessions.(Make sure the student had mastered 3-4 actions before starting the protocol)
CRITERION/EVIDENCE OF ACQUISITION	80% correct responses to unconsequated 20-trials probe with novel actions (p. 59 Keohane et al.)
IF THE PROTOCOLS DON'T WORK	You can use time delay and response prompts to teach the actions in the mirror.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student doesn't need direct instruction and response prompts to learn to imitate novel actions. The see-do capability, which is a key stage for observational learning acquisition, is now present. You can teach using Model Learn Units.

#	**10**
TACT "product"	**Listener component of Naming**
CUSP/ CAPABILITY	Component of Naming Capability
PREREQUISITES/ RATIONALE	Prerequisite : Teacher Presence resulting in Instructional Control and basic listener literacy (p. 72 in Greer & Ross, 2008) Rationale: Implement when child does not have the listener capability of naming (p.98. In Greer & Ross, 2008)
IDENTIFICATION	Teaching match and probe with the same stimuli for pointing responses
TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction across listener responses** (p. 105 Greer & Ross, 2008) Procedure: teach a novel set of 2D and/or 3D stimuli rotating the instruction across exemplars and response topographies (match and point to).

CRITERION/EVIDENCE OF ACQUISITION	80% correct untaught listener responses during probe (post matching) session
IF THE PROTOCOLS DON'T WORK	The student may not have the point to response topography, so you teach "point here" first. If, during probes, the child doesn't emit pointing responses at criterion level, you can go to MEI instruction providing matching responses followed by pointing responses for the same stimulus. (p. 107 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student can respond as a listener without direct instruction. Probe for Speaker Half of Naming. (p. 108 Greer & Ross, 2008)

Developing the Basic Speaker Verbal Operants

#	1
TACT "product"	**Parroting** (vocally producing sounds or words that match those in the environment resulting in automatic reinforcement)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al, 2009), and Auditory Matching (p. 98 Greer & Ross, 2008). Rationale: Implement when child does not emit parroting or echoic behaviors (p. 62 Greer & Ross, 2008)
IDENTIFICATION	Record sounds that student emits in free play area during three 10-min sessions & during one 20-min instructional setting(p. 135 Greer & Ross, 2008).
TACT "process"/ PROTOCOL TO INDUCE IT	**Stimulus-Stimulus Pairing Procedure** to induce new sounds or words (p. 135-138 Greer & Ross, 2008).Procedure: After identifying one sound that the student doesn't emit in any setting and use it as a target for the conditioning procedure. Each pairing session is 1 minute, during which different sensory reinforcers are paired with hearing an audio prompt (every 4 seconds) and saying the target sound.

CRITERION/EVIDENCE OF ACQUISITION	The student reliably and independently emitting the targeted sound before the teacher does it for 80% of the pairing trials (p. 138 Greer & Ross, 2008).
IF THE PROTOCOLS DON'T WORK	Make sure the student doesn't have a vocal impairment. If so, substitute the production of vocal behavior with either sign, electronic devices, or pictures (p. 139 Greer & Ross, 2008). If there isn't any evidence of vocal impairment, and the student has GMI, implement the Rapid Motor Imitation Procedure (Tsiouri & Greer, 2007)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Replace the targeted sounds with words for the pairing procedure, then you can go back to the basic mand instructional procedure. Make sure you introduce echoic-to-mand and tact programs with corresponding establishing operations in place (e.g. brief deprivation) (p. 138 Greer & Ross, 2008).

#	2
TACT "product"	**Echoic-to-Mand** (repeating words sounds with mand function, reinforced by listeners)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009) and Auditory Matching (p.98 Greer & Ross, 2008). Rationale: implement when child cannot learn new forms for verbal functions from verbal models (p. 62 in Greer & Ross, 2008)
IDENTIFICATION	Table 4.1 in Greer & Ross, 2008, p. 120 probe record for speaker behavior. Criterion 18/20 or 5 days of observation (for using appropriate verbal behavior rather than crying and not emitting palilalia or echolalia.
TACT "process"/ PROTOCOL TO INDUCE IT	**Echoic-to-Mand Procedures** (Level 1 of Mand Instruction) (p. 124, 128 and 139 Greer & Ross, 2008) Procedure: Select words for known reinforcers under the appropriate motivational conditions, say the name of the reinforcer (echoic model), wait 3 seconds for the student to emit an echoic. Deliver the item as a consequence for a correct response and provide the student with a new opportunity to emit the echoic (without delivering the item) as a correction for incorrect response.

CRITERION/EVIDENCE OF ACQUISITION	Criterion for echoic (and go to independent mand): 3 to 5 consecutive echoic responses. When a student emits 2 captured mands in a non-instructional setting and when student mands a certain item 2 times before the teacher presents an echoic model go to independent or Level 2 (p. 125 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Use signs, electronic devices or pictures or, if the student has GMI, implement Rapid Motor Imitation Procedure (p. 124 Greer & Ross, 2008 and Tsiouri & Greer, 2007)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	When the student meets the criterion, go to independent mand training (Level 2 of Mand Instruction) (p. 127 Greer & Ross, 2008). You can start training autoclitics (e.g. "I want" "sizes like big/little" "colors" "quantities"). (p. 120 Greer & Ross, 2008).

#	3
TACT "product"	**Echoic-to-Tact** (repeating words sounds with tact function, reinforced by listener)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite:Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008) and Echoic-to-Mand. (p.124 GREER & ROSS, 2008) Rationale: Implement when child needs to learn new forms and the tact function from echoics (p. 62 Greer & Ross, 2008)
IDENTIFICATION	Table 4.1 in Greer & Ross, 2008, p. 120 probe record for speaker behavior Criterion 18/20 or 5 days of observation (for using appropriate verbal behavior rather than crying and not emitting palilalia or echolalia
TACT "process"/ PROTOCOL TO INDUCE IT	**Echoic-to-Tact Procedure** (Level 1 of Tact Instruction) (p. 126, 128, & 139 in Greer & Ross, 2008) Procedure: Say the name of an object or picture you are presenting the student with and wait 3 seconds for the student to emit an echoic. Praise the child and give an opportunity to mand a preferred item as a consequence for a correct response and, after re-presenting the target object or picture, provide the student with a new opportunity to emit the echoic as a correction for incorrect response.

CRITERION/EVIDENCE OF ACQUISITION	Criterion for echoic (and go to independent tact): 3 to 5 consecutive echoic responses. When a student emits 2 captured tacts in a non-instructional setting go to independent or Level 2 (p. 126 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Switch tact form, determine if student has prerequisites (e.g. listener capabilities) (p. 126 in Greer & Ross, 2008). Provide partial vocal prompts by forming and/or saying beginning sound with your lips. If a correct response is emitted with lip prompt, fade it out (p. 127 in Greer & Ross, 2008). Also, may implement the Rapid Motor Imitation Procedure (p. 139 in Greer & Ross, 2008).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	When the student meets the criterion, go to tact training (Level 2 of Tact Instruction) once student meets criterion (p. 127 in Greer & Ross, 2008). You can start training autoclitics (e.g. "I see" "sizes like big/little" "colors" "quantities"). (p. 120 Greer & Ross, 2008).

#	4
TACT "product"	**Independent Mands**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisite:Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008) and Echoic-to-Mand. (p.124 Greer & Ross, 2008) Rationale: Implement when child meets the criterion for echoic-to-mand.
IDENTIFICATION	Table 4.1 in Greer & Ross, 2008, p. 120 probe record for speaker behavior Criterion 18/20 or 5 days of observation (for using appropriate verbal behavior rather than crying and not emitting palilalia or echolalia
TACT "process"/ PROTOCOL TO INDUCE IT	**Mand Function Procedures** (Level 2 of Mand Instruction) (p. 125 Greer & Ross, 2008) Procedure: Using two items that were taught to mastery during echoic-to-mand procedure, present the student with the items and obtain his/her attention. Deliver the item specified by the mand as a consequence for correct responding (independent mand emitted within 3 seconds).
CRITERION/EVIDENCE OF ACQUISITION	Criterion for a specific mand: 90% correct responses for 20-learn units trials. When some mands are mastered concentrate on tacts and reinforce correct responses with

	opportunities to mand and praise for tacts. Also provide an opportunity-to-mand after correct responses during other instruction (pp. 125-126 in Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Go back to Echoic-to-Mand Training (p. 124 Greer & Ross, 2008) if the student emits 3 to 5 consecutive incorrect responses. Make sure that adequate establishing operations are in place (e.g. brief deprivation). May implement an interrupted chain that involves removing items the student needs, contriving a situation that puts the reinforcer in the student's view but is out of reach, or use vicarious reinforcement (p. 116 in Greer & Ross, 2008). If the student doesn't emit the verbal behavior mastered during instruction in Non-Instructional Setting (NIS), implement Speaker Immersion (p.144) tactic.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Go to tact training. You can also teach new mand form with autoclitics (e.g. "I want __"). If necessary teach it using echoic-to-mand training (p. 125 in Greer & Ross, 2008).

#	5
TACT "product"	**Independent Tacts**
CUSP/ CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites:Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008) and Echoic-to-Tact. (p.126 Greer & Ross, 2008) Rationale: Implement when child meets the criterion for echoic-to-tact
IDENTIFICATION	Table 4.1 in Greer & Ross, 2008, p. 120 probe record for speaker behavior Criterion 18/20 or 5 days of observation (for using appropriate verbal behavior rather than crying and not emitting palilalia or echolalia
TACT "process"/ PROTOCOL TO INDUCE IT	**Tact Function Procedures** (Level 2 of Tact Instruction) (p. 127 Greer & Ross, 2008) Procedure: present the student with an item(object or picture), obtain his/her attention by pointing to the item and wait 3 seconds for the student to emit the target response reinforced during the echoic-to-tact procedure. Praise the student and give an opportunity to mand as a consequence for a correct response.

CRITERION/EVIDENCE OF ACQUISITION	Criterion for a specific tact: 90% correct responses for 20-learn units trials. (p. 127 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Go back to Echoic-to-Tact Training (p. 126 Greer & Ross, 2008) if the student emits 3 consecutive incorrect responses. If, after the first echoic the student emit the correct response, for the following echoic just move your lips (or form part of the sign) without vocalizing the sound. If a correct response is emitted with only the lip form prompt, you can go back to independent tact program immediately. If the student doesn't emit the verbal behavior mastered during instruction in NIS, implement Speaker Immersion tactic(p.144).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	You can teach new tact form with autoclitics (e.g. "I want __"). If necessary teach it using echoic-to-tact training (p. 127 in Greer & Ross, 2008). Implement the Intensive Tact Instruction Protocol to expand the Tact repertoire and increase the use of vocal verbal behavior in non-instructional settings. (p. 161 Greer & Ross, 2008 and Pistoljevic & Greer, 2006)

#	6
TACT "product"	**Transformation of Establishing Operations** (Leaning Mand or Tact Results in Untaught Function Also)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites:Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008), Echoic-to-Mand (p. 124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008) and Independent Mand (p.125 Greer & Ross, 2008) Rationale: Mands and Tacts are initially functionally independent and must be taught separately (p.62 Greer & Ross, 2008) then you can induce the transformation of their establishing operations.
IDENTIFICATION	Table 4.1 in Greer & Ross, 2008, p. 120 probe record for speaker behavior

TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction (MEI)** to Present Establishing Operations Across Mands and Tacts (p. 145 Greer & Ross, 2008)Procedure: Select three sets of novel (never taught) items, one for mand probes, one for tact probes and one for instruction. Teach one set to mastery as tact or mand (use echoic-to tact or echoic-to-mand instruction). Rotate stimuli presentation. When the student master the responses to the target stimuli in the trained function, probe for the emergence of the untaught function (p. 147 Greer & Ross, 2008).
CRITERION/EVIDENCE OF ACQUISITION	Teach one set of stimuli on one function and probe for the other one (p. 149 Greer & Ross, 2008). When a student learns one form in one function and uses it in another function the transformation of establishing operations across mands and tacts is accomplished. For example you teach "juice" as a tact and the student mand for "juice" (p. 62 and 146 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Use Multiple Exemplar Instruction to teach additional sets until the untaught function emerges (p. 149 Greer & Ross, 2008). Return to the echoic-to-mand and tact and/or Mand and Tact Function procedures to teach mand and tacts. Assess the student's prerequisite repertories and implement protocols if needed.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The child can learn learns mand and tact function of a stimulus with direct instruction on only one of the two. (p. 149 Greer & Ross, 2008). Keep increasing the tact repertoire. Probe for speaker component of Naming and/or full Naming.

#	7
TACT "product"	**Speaker Component of Naming**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Basic Listener Literacy (p. 73 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008), Echoic-to-Mand (p. 124 Greer & Ross, 2008), Echoic-to-Tact (p.126 GREER & ROSS, 2008) Independent Mand (p.125 Greer & Ross, 2008), Independent Tact (p. 127 Greer & Ross, 2008). Rationale: Implement when the student doesn't have the speaker capability of Naming (p. 149 Greer & Ross, 2008;

	Greer et al. 2005)
IDENTIFICATION	Teach the match response to criterion (90% accuracy across 2 sessions of 20-learn units) and conduct 20-probe trials each for the tact and intraverbal responses (p. 150 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction (MEI)Across (**Listener and) **Speaker Topographies** (p. 156-158 in Greer & Ross, 2008) Procedure: Select novel (untaught) items and teach them by rotating exemplars and response topographies. (Greer et al. 2005)
CRITERION/EVIDENCE OF ACQUISITION	80% accuracy during one session of 20-probe trials of the tact and intraverbal responses (p. 107 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Teach 2 other sets of 5 pictures of common objects using MEI. After mastery of each set, immediately teach the next set, if untaught responses do not emerge, repeat matching responses to criterion (p. 109 in Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Probe for Full Naming. Once acquired, the children can acquire speaker and listener responses without direct instruction. After only hearing another person tact a stimulus, the students can point to the stimulus (listener response) and tact the stimulus in response to verbal and non erbal antecedents (speaker responses). After having Naming, children can expand their mands and tacts through incidental experiences (e.g. by observing others) (p. 149-150 Greer & Ross, 2008)

#	8
TACT "product"	**Full Naming**
CUSP/CAPABILITY	Capability
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Basic Listener Literacy (p. 73 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008), Echoic-to-Mand (p. 124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008) Independent Mand (p.125 Greer & Ross, 2008), Independent Tact (p. 127 Greer & Ross, 2008). Rationale: Implement when the student doesn't have Naming (can only learn through direct contact with learn units)(p. 98 and 149 Greer & Ross, 2008; Greer et al. 2005)

PROBE	Teach the match response to criterion (90% accuracy across 2 sessions of 20-learn units) and conduct 20-probe trials each for pointing, tact and intraverbal responses (p. 150 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction (MEI)Across Listener and Speaker Responses** (p. 156-158 in Greer & Ross, 2008) Procedure: Select novel (untaught) items (2D and/or 3D) and teach them by rotating exemplars and response topographies (match, point, pure and impure tact). (Greer et al. 2005). Match instruction is alternated with point instruction, followed by a tact instruction, followed by intraverbal instruction. The rotation of stimuli, exemplars and topographies needs to be counterbalanced, so that the student can't simply echo the previous response. For exemple, with the target stimuli ball, pen, book and ring, the student will match ball, point to pen, tact book and respond ring to the antecedent "what is this?". A new topography rotation is then started, using different stimuli and exemplars for each topography. A session is concluded after 20 MEI learn units.
CRITERION/EVIDENCE OF ACQUISITION	Criterion for MEI intervention: 90% correct responses for two consecutive 20-learn units blocked sessions (including all topographies, es suggested by Greer, Stolfi & Pistoljevic, 2007, or 3 consecutive correct responses or 4 out of five for each topography) Criterion for probes: 80% accuracy during one session of 20-probe trials for each topography (p. 107 GREER & ROSS, 2008).
IF THE PROTOCOLS DON'T WORK	Teach 2 other sets of 5 pictures of common objects using MEI. After mastery of each set, immediately teach the next set, if untaught responses do not emerge, repeat matching responses to criterion (p. 109 in Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	As a capability, Naming allows the student to learn in a new way. Once acquired, the children can acquire speaker and listener responses without direct instruction. After only hearing another person tact a stimulus, the students can point to the stimulus (listener response) and tact the stimulus in response to verbal and non erbal antecedents (speaker responses). After having Naming, children can expand their mands and tacts through incidental experiences (e.g. by observing others) (p. 149-150 Greer & Ross, 2008). It's a key prerequisite for vocabulary building and reading comprehension. You may probe Self-Talk and Say-Do as speaker as own listener function

Joining of Listener and Speaker Function

#	1
TACT "product"	**Say and Do Speaker-as-Own-Listener Function** (also called verbal correspondence or correspondence between saying and doing)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008) and Echoic-to-Tact (p.126 Greer & Ross, 2008) Rationale: Implement when child does not have speaker-as-own-listener capability (e.g. the child says "I will play with blocks" and then plays with blocks.) (pp. 63-64 in Greer & Ross, 2008).
IDENTIFICATION	If a child has verbal governance of speaker responses or, in other words, can demonstrate the relation between his/her verbal and non-verbal behavior, this cusp is present. (p.64 Greer & Ross, 2008) Children who have the correspondence between what they say and what they do can in fact who follow their own directions (p. 19, 300 in Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	Using learn unit to teach the student to follow his/her own directions.
CRITERION/EVIDENCE OF ACQUISITION	The student is able to follow his/her own directions with 90% accuracy during a set of 20 probe trials.
IF THE PROTOCOLS DON'T WORK	Make sure all the prerequisites are in place. You can implement the Listener Emersion Protocol (p. 76 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student can now acquire more advanced self-management repertoires (p.23 Greer & Ross, 2008). Probe for self-talk, conversational units, and Naming repertoires (p. 19 in Greer & Ross, 2008). Use anthropomorphic toys as an establishing operation for the emission of self-talk.

#	2
TACT "product"	**Self-Talk** (Rotating Speaker and Listener Roles within Own

	Skin)
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), Naming (p. 155 Greer & Ross, 2008) and Speaker-as-own-listener (pp. 63-64 Greer & Ross, 2008) Rationale: Implement when the child cannot emit conversational units where he/she can first speak , then listen, then respond as a speaker to him/herself (p. 64 in Greer & Ross, 2008).
IDENTIFICATION	Observation of the student alone in the Toy area (p. 188 Greer & Ross, 2008) PIRK assessment: Engages in one conversational unit with anthropomorphic toys (dolls, puppets) for 2 consecutive 10 minute sessions.
TACT "process"/ PROTOCOL TO INDUCE IT	**Induce self-talk with 3D anthropomorphic toys (puppets)** Procedure: Use anthropomorphic toys like figures and puppets to model conversational unit exchanges that the child must imitate. A conversational unit of self-talk is described as the student functioning as speaker and listener while playing with an anthropomorphic toy. A session consists of 20 learn units where the teacher models self-talk with puppets and then gives the puppets to the student, setting the occasion for an exchange. Criterion is 90% or higher accuracy across 2 session or 100% accuracy for 1 session (p. 189, GREER & ROSS, 2008 and Lodhi & Greer, 1989)
CRITERION/EVIDENCE OF ACQUISITION	During a 10-min probe session in the play area, this repertoire is present if the student emits 3 or more self-talk conversational units (p. 189 Greer & Ross, 2008).
IF THE PROTOCOLS DON'T WORK	Make sure all the prerequisites are present. If prerequisites are not present implement the protocols needed. If self-talk doesn't emerge naturally, go to two conversational exchanges between puppets modeling followed by student's imitation with 20-learn unit sessions. You can also use computer games, DVDs, or videotapes of preferred cartoons. Stop the tapes and give echoics for tacting the figures and the actions they are engaging in until the student uses novel storylines. (p. 189 in Greer & Ross, 2008)

WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once acquired students will emit self-talk behaviors during play (p. 64 in Greer & Ross, 2008). You can probe the emission of conversational units with others. Once the student acquire the listener reinforcement component of social exchanges, conversational units with others should emerge (p. 191 Greer & Ross, 2008)

#	3
TACT "product"	**Book Stimuli Conditioned Reinforcement for Observing**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Condioned Reinforcement for Visual Stimuli on Desktop (p.65 Greer & Ross, 2008) Rationale: Implement when observing books doesn't function as a conditioned reinforcer for the student.
IDENTIFICATION	The student emit book-observing responses for 5-minute 5-second interval in a free-play area where books, toys, games and other play item are available for the 90% of the intervals (Greer & Ross, 2008 p. 223). According to Hshin-hui & Greer, 2006, 70% of the intervals.
TACT "process"/ PROTOCOL TO INDUCE IT	**Book Conditioning**. Pairing-test procedure with 20 trials per session. Conduct post-probes after criterion is met for 5-sec pairing-test, then, if probes show that books are not conditioned as reinforcers yet, new pairing-test intervention is conducted for 10-sec, 15-sec,20-sec intervals.
CRITERION/EVIDENCE OF ACQUISITION	70% correct observing intervals during 2 5-minute sessions with 5-second intervals (Hshin-hui & Greer).
IF THE PROTOCOLS DON'T WORK	If the protocol don't work, you can condition observing visual stimuli on a tabletop or probe for voice conditioning.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	After acquiring books as conditioned reinforcers, you can work on listener and speaker responses using books (point to, match, tact, intraverbal). You can teach word-picture discrimination. You may probe for Naming and you can start teaching reading.

#	4
TACT "product"	**Naming Accrues from Listening to Story Read by Others**

CUSP/CAPABILITY	Capability
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008). Rationale: Implement when child does not have the full capability of naming (p.98 Greer & Ross, 2008)
IDENTIFICATION	Teach the point response until criterion of 90% accuracy across 2 sessionsof 20-learn units in a novel storybook read by another and conduct 20-probe trials each for tact and intraverbal responses (p. 98 and 230 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Word-Picture/Matching Discrimination Protocol** (p. 230 Greer & Ross, 2008) Procedure: Multiple Exemplar Instruction (delivering opportunities to point to, match, tact and intraverbally respond to pictures on a book.
CRITERION/EVIDENCE OF ACQUISITION	80% accuracy during one session of 20-probe trials of untaught point, tact and intraverbal responses (p. 107 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Make sure all the prerequisites are in place and implement protocols if needed. You can also use the procedure to induce Naming when the capability doesn't emerge easily by teaching 2 sets of pictures of common objects using MEI. After mastery of each set, immediately teach the next set and if untaught responses do not emerge, repeat matching until criterion (p. 109 Greer & Ross, 2008).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Naming allows the student to learn in a new way. Once acquired, the children can acquire speaker and listener responses without direct instruction. After only hearing another person tacting a stimulus while reading a story, the students can point to the stimulus (listener response) and tact the stimulus in response to verbal and non verbal antecedents (speaker responses). After having Naming, children can expand their mands and tacts through incidental experiences (e.g. by observing others) (p. 149-150 Greer & Ross, 2008). It's a key prerequisite for vocabulary building and reading comprehension. You may probe Self-Talk and Say-Do as speaker as own listener.

#	5
TACT "product"	**Textually Responds 80 Words Per Minute**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008) and Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008). Rationale: Implement to acquire listener literacy component of textual responding (p.231 Greer & Ross, 2008)
IDENTIFICATION	While the student reading a passage (e.g. from Edmark®) calculate the number of correct and incorrect responses per minute(pp. 229-230 Greer & Ross, 2008).
TACT "process"/ PROTOCOL TO INDUCE IT	**Rate Criterion Training** (p. 229 Greer & Ross, 2008). Procedure: Teach Edmark® frames to criterion (90% accuracy for each lesson). Then divide the lesson in sets of five frames with rate criterion (from 30 correct responses per minute, according to Greer & Ross, 2008, to 80 correct responses per minute). Each set is a learn unit and reinforcement should be delivered as a consequence for fluent responding. Separate graphs for mastery and rate should be separate.
CRITERION/EVIDENCE OF ACQUISITION	Textually Responds to 80 Words Per Minute
IF THE PROTOCOLS DON'T WORK	Use Edmark® or Reading Mastery®. You can divide the rate criterion steps into smaller short term objectives and progressively reinforce the responses that meet the target rate criterion. Simultaneously teach mastery and rate.(p. 230 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student can now acquire the listener literacy component of textual responding , which is an important prerequisite for reading comprehension and is a key component of phonetic reading. (p. 230-231 Greer & Ross, 2008)

#	6
TACT "product"	**Responds to Own Textual Responding as Listener** (Textually Respond and Hear-Do, or Hear-Name)
CUSP/ CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) and Textually Responds 80 Words Per Minute (p. 229 Greer & Ross, 2008). Rationale: Implement to acquire reading comprehension from hearing one's own textual responses (the student is not under the listener control of his/her textual responses) and fix listener-reading comprehension problems (p. 231 Greer & Ross, 2008)
IDENTIFICATION	Probe students' matching responses on Edmark® picture/phrase cards under 3 conditions: a) using Edmark® picture/phrase cards, b) with student's recorded voice without print stimuli, c) with teacher's recorded voice without print stimuli in 20-trial sessions. Counterbalance the probe presentation and run as many probes as necessary (three or more probes) to have a stable baseline using same level lessons (pp. 232 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Reading Listener Protocol** (p. 231-233 Greer & Ross, 2008) Procedure: MEI across voice and text conditions. The instructional procedure is the same used for probes (condition a, b and c learn units rotated randomly so that each phrase card is presented under each condition). Reinforcement is delivered for correct responses and correction is delivered for incorrect responses.
CRITERION/EVIDENCE OF ACQUISITION	Select novel Edmark® picture/phrase card lessons and provide the student with 20 learn unit sessions where responses are rotated across the three conditions (text, teacher's voice and student's voice). Criterion is 90% accuracy for each condition (p. 233 Greer & Ross, 2008)

IF THE PROTOCOLS DON'T WORK	Conducts sets of MEI until responses to the probes show students can respond correctly to untaught item. Can modify procedure by using the zero-second time delay tactic. If post probes show that the student doesn't have met the criterion, omit the textual condition and use voice conditions only until he/she can respond at both a mastery (90% accuracy) and rate criterion (30 or 80 per minute) (p. 233 Greer & Ross, 2008).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student can now acquire phonetic textual responding (p. 233). You can also start working on the "need to read" (p. 238 Greer & Ross, 2008) and teaching the topography of writing in a MEI fashion (textual responses, transcription and dictation) (p. 239 Greer & Ross, 2008).

#	7
TACT "product"	**Print Transcription (See-Write)**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli As Conditioned Reinforcement (p. 82 Greer & Ross, 2008) Rationale: Implement to establish the topography of writing (p.239 in Greer & Ross, 2008)
IDENTIFICATION	Provide the student with print (letters, numbers, shapes, etc) to transcribe or copy (p. 239 Greer & Ross, 2008) and observe the response topography
TACT "process"/ PROTOCOL TO INDUCE IT	**Establishing the Topography of Writing protocol** (p. 239 Greer & Ross, 2008). Procedure: Deliver learn units using worksheets comprised of print in dotted lines that are progressively faded out. After the student can independently (without dotted line) write the letters to criterion, go to letters and words dictation. Then he/she have to tact and mand by writing. The same procedure can be done by typing. (p. 240 Greer & Ross, 2008)

CRITERION/EVIDENCE OF ACQUISITION	The student can copy letters/words at criterion level (90% or higher accuracy across 2 consecutive sessions or 100% accuracy in 1 session).
IF THE PROTOCOLS DON'T WORK	The student can type the words instead of writing. Some computers programs may have touch-typing available (p. 240 Greer & Ross, 2008). You can also use MEI including transcription, and dictation to teach the relation between seeing and writing and hearing and writing. (p. 239 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Teach student to write from dictation. Alternate transcription and dictation in MEI fashion so that child learns relationship between seeing and writing and between hearing and writing. Then have student write words for their mands, then tacts (pp. 239-244 in Greer & Ross, 2008). If the acquisition of the independent correct responses is slow, teach typing to teach the function of writing. (p. 240 Greer & Ross, 2008). To improve the structure and the function of writing you can also implement the writer immersion protocol (p. 244 Greer & Ross, 2008)

#	8
TACT "product"	**Dictation (Hear-Write)**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli As Conditioned Reinforcement (p. 82 Greer & Ross, 2008) Print Transcription (p. 239 Greer & Ross, 2008). Rationale: Implement to establish the capability of hear-write (p.239 in Greer & Ross, 2008)
IDENTIFICATION	The student can write dictated words at criterion level (90% or higher accuracy across 2 consecutive sessions or 100% accuracy) (p. 239 Greer & Ross, 2008)

TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction** Across Response Topographies for transcription (see-write)and dictation (hear-write). (pp 234 and 239 Greer & Ross, 2008). Procedure: after the student masters some responses for transcribing and writing dictated letters, alternate transcription and dictation of words. The instruction is delivered with learn units with the response topographies and the target words continuously rotated in 20 trial sessions.
CRITERION/EVIDENCE OF ACQUISITION	90% correct responses across 2 sessions of 20-learn units for each topography
IF THE PROTOCOLS DON'T WORK	Have the students type the words instead of write. Students should type the words dictated to them. Some computers programs may have touch-typing available (p. 240 Greer & Ross, 2008).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	The student can now write words for mands and tacts (pp. 239-244 Greer & Ross, 2008) and start working on the "need to write".

#	9
TACT "product"	**Reading Governs Responding**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008). Rationale: Implement to establish the "need to read" (p.238 Greer & Ross, 2008) when the motivational function of reading is missing.
IDENTIFICATION	If the student behavior can be governed by written directions. (e.g. the student can find hidden items by reading words on the containers or by following written directions or reading directions to find things and places).

TACT "process"/ PROTOCOL TO INDUCE IT	**Establishing the "Need to Read"** Tactic 1 & 2 (p. 238 Greer & Ross, 2008) Procedure: Use three containers to hide a preferred and two non preferred items and label them with the corresponding words (e.g. "tape", "clip" and "cookie"). Present the student with the containers and the antecedent "Find the…" A correct response is defined as the student finding the item (e.g. cookie) within 5 seconds. You can also hide preferred items in the classroom and give the student (or a group of students) directions (use cards or game board) to follow to find the items.
CRITERION/EVIDENCE OF ACQUISITION	When student is able to find items by reading words affixed on the containers or when students are able to find item by reading directions (p. 238 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Use a yoked-contingency game board and create a team game (p. 238 Greer & Ross, 2008). You can also condition reading as a reinforcer with a stimulus-stimulus pairing procedure by delivering edibles or tokens while the student reads
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Probe/teach Textual Responding Joins Naming Repertoire (p. 66 Greer & Ross, 2008). Also you can simultaneously use MEI involving textual responses, transcription, and dictation (p. 239 Greer & Ross, 2008) to establish the foundation for the transformation of stimulus function across the topographies.

#	10
TACT "product"	**Textual Responding Joins Naming Repertoire**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) and Reading Governs Responding (p. 238 Greer & Ross, 2008). Rationale: Implement to join textual responding and Naming

	(p. 233 Greer & Ross, 2008) for children who have naming but cannot use naming in the reader function.
IDENTIFICATION	If the student textually respond to a printed word and then point to the corresponding picture, he/she has jointing naming and textual responses (p. 235 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction** Across Response Topographies of Matching printed words with printed words and matching their spoken words to what they hear (p. 234 Greer & Ross, 2008). Procedure: Use typed index cards or a book with a few words and pictures in each page. After ensuring that the student can match the books' picture with copies of them, have the student match and point to words and pictures in a rotated fashion, so that a matching word with word learn unit is followed by matching word to picture, followed by pointing to the picture, followed by pointing to word and then say the word while touching it. The five topographies are rotated across 4 targets words and presented in 20 learn unit sessions. After the student meets criterion (100% accuracy), teach 4 word-picture combinations in 20 learn unit sessions by presenting the student with a printed word, having him/her textually respond to the word and then pointing to the corresponding picture. Criterion is 100% accuracy for all picture-word combinations. Next you build response fluency with 50 accurate textual response-picture selection responses per minute.
CRITERION/EVIDENCE OF ACQUISITION	The student can respond to 50 printed words-picture combinations in one minute. (p. 235 Greer & Ross, 2008)
IF THE PROTOCOLS DON'T WORK	Make sure the prerequisites are in place and implement the corresponding protocols if needed (p. 234 Greer & Ross, 2008). You can also establish the "need to read" or condition reading using positive reinforcement pairings.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Now instruction for that student will only need a single topography of a particular stimulus/word and the other topographies will not have to be taught directly (e.g. if the word "cat" is in the student's naming repertoire, but the student has never encountered the printed word for "cat" he will immediately comprehend what he reads when he sounds out the components of the word, and he can match the picture of cat as a listener to his/her own textual response (p. 235 Greer & Ross, 2008). Once student acquires joint

	stimulus control across saying and writing, sounding out the word will result in reading comprehension and writer responses (p. 236 in Greer & Ross, 2008).

#	11
TACT "product"	**Textual Responses Function as Auditory Conditioned Reinforcer**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) and Reading Governs Responding (p. 238 Greer & Ross, 2008). Rationale: Implement when textual responses do not function as auditory conditioned reinforcers (p. 238 Greer & Ross, 2008)
IDENTIFICATION	If the student read as a mean to obtain information (p. 238 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Establishing the "Need to Read"** Tactic 1 & 2 (p. 238 Greer & Ross, 2008) Procedure: Use three containers to hide a preferred and two non preferred items and label them with the corresponding words (e.g. "tape", "clip" and "cookie"). Present the student with the containers and the antecedent "Find the…" A correct response is defined as the student finding the item (e.g. cookie) within 5 seconds. You can also hide preferred items in the classroom and give the student (or a group of students) directions (use cards or game board) to follow to find the items.
CRITERION/EVIDENCE OF ACQUISITION	When the student can find items by reading words affixed on the containers, when students are able to find item by reading directions or when they can follow directions to complete a task (p. 238 Greer & Ross, 2008)

IF THE PROTOCOLS DON'T WORK	Use a yoked-contingency game board and use as a team game (p. 238 Greer & Ross, 2008). You can also condition reading with positive reinforcement pairings (p. 238 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Probe for Textual Responding Joins Naming Repertoire (p. 66 Greer & Ross, 2008). You can also simultaneously use MEI involving textual responses, transcription, and dictation (p. 239 Greer & Ross, 2008) to establish the foundation for the transformation of stimulus function across these topographies.

#	12
TACT "product"	**Joint Stimulus Control Across Saying and Writing**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) and Print Transcription (p. 239 Greer & Ross, 2008) Rationale: Implement to establish the capacity of hearing and writing (p.239 Greer & Ross, 2008)
IDENTIFICATION	80% accuracy during one session of 20-probe trials of saying and writing responses (p. 107 Greer & Ross, 2008)
TACT "process"/ PROTOCOL TO INDUCE IT	**Multiple Exemplar Instruction** Across Response Topographies of Saying and Writing Words (p. 233-234 Greer & Ross, 2008).
CRITERION/EVIDENCE OF ACQUISITION	Once student acquires joint stimulus control across saying and writing, sounding out the word will result in untaught writing responses (p. 236 Greer & Ross, 2008)
IF THE PROTOCOLS	Make sure all the prerequisites are in place and implement the corresponding protocols if needed (p. 233-234 Greer &

DON'T WORK	Ross, 2008). You can also work on establishing the "need to read and write" and condition reading and writing using positive reinforcement pairings.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once student acquires joint stimulus control across saying and writing, sounding out the word will result in reading comprehension and writer responses (p. 236 Greer & Ross, 2008). Now instruction for that student will only have to involve a single topography of a particular stimulus/word and the other topographies will not have to be taught directly (e.g. if the word "cat" is in the student's naming repertoire but the student has never being taught to write "cat", he will be able to do it just after listening to the teacher saying "write the word cat" (p. 234).

#	13
TACT "product"	**Technical Writing Precisely Affects Reader's Behavior**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) and Print Transcription (p. 239 Greer & Ross, 2008) Rationale: Implement to acquire the ability to make a student's technical writing precisely affect the reader's behavior (pp.244 Greer & Ross, 2008)
IDENTIFICATION	Accurate structural components of writing should be mastered. Measure the function of the student's writing by the effects the writing has on a naïve reader. Give the student a simple picture with various components (e.g. colored shapes in various positions on the page) and tell the student to write description of the picture so that someone who has never seen it before will be able to draw it. Record the number of components the naïve reader drew correctly. A description is determined to be functional if the naïve reader drew the component of the picture correctly based on

	the student's description (Reilly Lawson & Greer, 2006)
TACT "process"/ PROTOCOL TO INDUCE IT	**Writer Immersion protocol** (p. 244 Greer & Ross, 2008) Procedure: During the school day arrange periods when all the communications (student to student and teacher to student) is written Create teams of two students where one student has to write directions for a task and the other one has to correctly perform the task: in this case they both win a point (as for yoked-contingency game board). Every writing, performing and editing response is recorded as a learn unit during 20 learn unit sessions. Short term objectives may include descriptions about how to make a sandwich, start a computer, find a hidden item, recognize a peer, toy, animal, seasonactivity or book without saying the name.
CRITERION/EVIDENCE OF ACQUISITION	The student's writing must affect the naïve reader such that the reader draws all the components correctly (100%) and there are no structural errors (Reilly Lawson & Greer, 2006).
IF THE PROTOCOLS DON'T WORK	Edit the student's writing by providing the student with learn units. Provide praise for correct responses and corrections for incorrect responses. Have the student's rewrite their descriptions until the naïve reader can draw all components accurately (Reilly Lawson & Greer, 2006). You can also have the students write directions on how to go to a new place, mands and tacts and jokes to induce peers' laughing. (p. 244 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once acquired students can control environmental contingencies through the mediation of a reader (p. 19 Greer & Ross, 2008). You can now probe the students for whether or not aesthetic writing affects emotions, textually responding for problem solving, and whether or not their writing governs complex operations.

#	14
TACT "product"	**Aesthetic Writing Affects Emotions**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching

	(p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008), Print Transcription (p. 239 Greer & Ross, 2008) and Technical Writing Precisely Affects Reader's Behavior (p. 244 Greer & Ross, 2008). Rationale: Implement to acquire the ability to make a student's aesthetic writing precisely affect the reader's emotions (pp.244-246 Greer & Ross, 2008)
IDENTIFICATION	Measure the function of the student's writing by the effects the writing has on a naïve reader. Give the student a simple picture that depicts a specific emotion and instruct the student to write a written description of how that picture makes them feel so that someone who reads their writing will be able to tact the picture the student wrote about. Record the accuracy of the naïve reader's ability to tact the student's emotions from the picture. A description is determined to be functional if the naïve reader accuracy tacts the picture the student described in the his writing.
TACT "process"/ PROTOCOL TO INDUCE IT	**Writer Immersion for Aesthetic Writing** (pp. 244-250 in Greer & Ross, 2008)
CRITERION/EVIDENCE OF ACQUISITION	The student's writing must affect the naïve reader such that the reader correctly tacts (100% correct responses) the picture the student wrote about without structure errors.
IF THE PROTOCOLS DON'T WORK	Make sure the prerequisites are in place and implement the necessary protocols (p. 233-234 Greer & Ross, 2008). You can also implement MEI with metaphors.
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once acquired students may control environmental contingencies through the mediation of a reader (p. 19 Greer & Ross, 2008). Probe students for textually responding for problem solving and whether or not their writing governs complex operations.

#	15
TACT "product"	**Writer Self-Editing** (Writer-As-Own-Reader for Target Audiences)
CUSP/CAPABILITY	Cusp

PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008), Print Transcription (p. 239 Greer & Ross, 2008) and Technical Writing Precisely Affects Reader's Behavior (p. 244 Greer & Ross, 2008). Rationale: Implement for children who need to acquire the ability to self-edit (pp.244-246 in Greer & Ross, 2008)
IDENTIFICATION	Measure the function of the student's writing by the effects the writing has on a naïve reader. Give the student a simple picture with various components (e.g. colored shapes in various positions on the page, etc.) and instruct the student to write a written description of the picture so that someone who has never seen it before will be able to draw it. Record the number of components the naïve reader drew correctly. A description is determined to be functional if the naïve reader drew the component of the picture correctly based on the student's description (Reilly Lawson & Greer, 2006)
TACT "process"/ PROTOCOL TO INDUCE IT	**Writer Immersion** with Self-Editing (pp. 244-250 in Greer & Ross, 2008)
CRITERION/EVIDENCE OF ACQUISITION	The student's writing must affect the naïve reader such that the reader draws all the components correctly (100%) and there are no structural errors (Reilly Lawson & Greer, 2006)
IF THE PROTOCOLS DON'T WORK	Edit the student's writing by providing the student with learn units. Provide praise for correct responses and corrections for incorrect responses. Have the students rewrite and self-edit their descriptions until the naïve reader can draw all components accurately (Reilly Lawson & Greer, 2006).
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once acquired students can read their own writing from the perspective of an eventual audience and will be able to adapt their writing to different audiences without immediate responses from the target audience (p. 19 Greer & Ross, 2008)

#	16
TACT "product"	**Textually Responding For Complex Operations (Solving Problem Verbally Mediated)**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) Rationale: Implement for children who cannot solve problems using written directions
IDENTIFICATION	The student can solve novel problems following written rules
TACT "process"/ PROTOCOL TO INDUCE IT	**Establishing the "Need to Read"** Tactic 1 & 2 (p. 238 Greer & Ross, 2008) Procedure: Use three containers to hide a preferred and two non preferred items and label them with the corresponding words (e.g. "tape", "clip" and "cookie"). Present the student with the containers and the antecedent "Find the…" A correct response is defined as the student finding the item (e.g. cookie) within 5 seconds. You can also hide preferred items in the classroom and give the student (or a group of students) directions (use cards or game board) to follow to find the items. For more complex problems you may train following scripts with written rules.
CRITERION/EVIDENCE OF ACQUISITION	The student can independently solve a novel problem (or follow complex directions) with the only guide of written rules.
IF THE PROTOCOLS DON'T WORK	You can teach it in group (with teams, as a game) or with a game board. You can also condition reading with positive reinforcement pairings (p. 238 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Following acquisition, students can solve problems independently following scripts (without direct or model learn units).

#	17
TACT "product"	**Writing Governs Complex Operations of Other**
CUSP/CAPABILITY	Cusp
PREREQUISITES/ RATIONALE	Prerequisites: Teacher Presence Results in Instructional Control Over Child (p. 72 Greer & Ross, 2008), Adult Voices as Conditioned Reinforcers (p. 46 Keohane et al. 2009), Book Stimuli Conditioned Reinforcement for Observing (p. 72. Greer & Ross, 2008), Auditory Matching (p.98 Greer & Ross, 2008) Echoic-to-Mand. (p.124 Greer & Ross, 2008), Echoic-to-Tact (p.126 Greer & Ross, 2008), speaker and listener components of Naming (p. 155 Greer & Ross, 2008), Observing Print Stimuli as Conditioned Reinforcement (p. 82 Greer & Ross, 2008) Print Transcription (p. 239 Greer & Ross, 2008) and Technical Writing Precisely Affects Reader's Behavior (p. 244 Greer & Ross, 2008). Rationale:
IDENTIFICATION	Measure the function of the student's writing by the effects the writing has on a naïve reader. Give the student a complex task and tell the student to write a detailed description of the task so that someone who has never done it before will be able to do it. Record the number of components the naïve reader perform accurately (Reilly Lawson & Greer, 2006)
TACT "process"/ PROTOCOL TO INDUCE IT	**Writer Immersion protocol** (p. 244 Greer & Ross, 2008) Procedure: During the school day arrange periods when all the communications (student to student and teacher to student) is written Create teams of two students where one student has to write directions for a task and the other one has to correctly perform the task: in this case they both win a point (as for yoked-contingency game board). Every writing, performing and editing response is recorded as a learn unit during 20 learn unit sessions. Short term objectives may include descriptions about how to complete complex tasks.
CRITERION/EVIDENCE OF ACQUISITION	The student's writing must affect the naïve reader such that the reader draws all the components correctly (100%) and there are no structural errors (Reilly Lawson & Greer, 2006).
IF THE PROTOCOLS DON'T WORK	Edit the student's writing by providing the student with learn units. Provide praise for correct responses and corrections for incorrect responses. Have the student's rewrite their descriptions until the naïve reader can perform the target task accurately (Reilly Lawson & Greer, 2006). You can also

	have the students write directions on how to go to a new place, mands and tacts and jokes to induce peers' laughing. (p. 244 Greer & Ross, 2008)
WHAT/HOW CAN BE TAUGHT AFTER ACQUISITION	Once acquired students can control environmental contingencies through the mediation of a reader (p. 19 Greer & Ross, 2008). You can probe the students for whether or not aesthetic writing affects emotions, textually responding for problem solving.

3.The Pilot Project

This study is a systematic replication of previous implementations of CABAS® in different countries (Lamm & Greer, 1991) and educational environments (Bahadourian et al., 2006), including the most of the model key components. All of the participants in this Pilot Project were preschoolers with multiple disabilities, who previously received 1:1 behavior-based instruction in a learning centre in Italy. Their performance and learning was measured before and during a CABAS® Early Intervention Classroom implementation, using a partial CABAS® package (12 hours per week) followed by a full CABAS® package (25 hours per week) program.

Data were encouraging (the criteria met increased every month and problem-behaviors tremendously decreased during the CABAS® intervention) but the implementation was suspended due to the national law about full inclusion of children with disabilities in regular education public schools. The outcomes of this experience were discussed in terms of future possible implementations of such evidence-based educational models in the public schools in Italy to help students with learning difficulties in full inclusion environments.

Method

Participants

The Participants were two male and two female preschool students. Prior to the study the Participants were enrolled in regular public kindergartens, fully included in 17 to 30 kids classrooms, with the assistance of a 1:1 teacher using traditional teaching methods. During the study, they attended the CABAS® classroom instead. Their parents were advocating for them to receive intensive instruction and they were selected as members of the Pilot classroom because they were all functioning as pre-listener pre-speaker (Greer & Keohane, 2005; Greer & Ross, 2008; Greer, 2008). This verbal behavior development status was described as total dependency. According to Greer and Ross (2008), "individuals without listener repertoires are entirely dependent on others. Interdependency and entrance to the social community are not possible". They were all diagnosed with autism and mental retardation. Participant A, B and D were following gluten, sugar and milk free diets. None of them were under instructional control and none were toilet trained.

Participant A was a 6 year old female with high rates of vocal stereotypy and self injurious behavior (SIB). Participant B was a 4 year old boy with high rates of disruptive behavior, gestural stereotypy and SIB. Participant C was a 5 year old boy with high rates of gestural stereotypy, SIB and aggressive behavior. Participant D was a 5 year old female with high rates of vocal and gestural stereotypy, SIB and high rates of aggressive behavior.

Setting

The study was conducted in a private learning centre, located in a suburb outside a metropolitan area. The experimenters created a classroom with cubbies, children sized tables and chairs, a teacher's desk and a toy area with toys and books, to simulate a regular Italian kindergarten environment with the design of a U.S. CABAS® classroom (Greer, 1994). The classroom was used to provide 4 hours of 1:1 and small group instruction for 3 days per week from March to June, and to provide the full CABAS® package, 5 hours

per day 5 days per week, during the month of July. The student-teacher ratio of the classroom was 4:4:1, with four students, four trainee teaching assistants and one teacher serving as both teacher and supervisor. The classroom consisted of 2 male students and 2 female students from 4 to 6 years old, 12 volunteer teaching assistants rotating every week and a teacher certified as CABAS® Rank II. Data were collected by each teacher about students and their own performance every day and publicly displayed on graphs. Children behavior data, classroom's cumulative data and data about the teacher's performance as staff trainer were also graphed and displayed in the classroom. The classroom had a one-direction mirror, daily used to show the students' performance to parents and professionals.

Definition of Behaviors

Dependent Variable. Many response classes were measured throughout baseline and treatment including (a) occurrences of self-injurious behaviors (SIB); (b) non-compliance; (c) aggressive-assaultive behaviors; (d) correct, incorrect, total responses to all program instruction; (e) number of instructional objective achieved by each child and each teacher, (f) teacher's rate accuracy scores during supervisor's observations; (g) daily and monthly number of Learn Units (Albers & Greer, 1991; Greer, 1994; Greer, 2002) to criterion for each child, teacher, and for the classroom.

Independent Variable. The independent variable in this study was the implementation of a CABAS® package, from partial (12 hours per week) to full (25 hours per week) time. In this experiment, Learn Units (Albers & Greer, 1991; Greer, 1994; Greer, 2002) were used to teach all repertoires, including listener and speaker behaviors, general repertoires, self management, community of reinforcers and physical development. "The learn unit includes an opportunity to respond, a student' s response, the teacher's antecedent-consequence, and the student's antecedent-consequence. It's an interlocking three-term contingency between the teacher and the student, and it is an immediate

outcome measure" (Greer, 1996, p.161). Teaching throughout Learn Units provided CABAS® with an absolute unit to measure students' learning and teachers' performance (Greer, 2002), so that it's considered to be the main tactic for school implementation. Other CABAS® components that were fully implemented were the Decision Tree Protocol for data based decisions through graph analysis (Greer, 2001) and the Teacher Performance Rate Accuracy (TPRA). This procedure was developed by Ingham and Greer (1992) to collect data on students and teachers responding. Each student had his/her own book showing data for individualized programs of instruction, and the supervisor used the graph analysis to make decisions regarding the progression of each short-term goal. Teaching tactics based on behavior principles (Cooper, Heron & Heward, 1987; Catania, 2007; Greer, 2002) were implemented according to the Decision Protocol.

Data Collection

Data were collected by 13 experimenters (12 trainee teaching assistants and 1 teacher-supervisor) using a pen, a clipboard, a timer, and 20-Learn Units data collection sheets. During instruction, students' correct responses were recorded as plus (+), while students' incorrect or non-target responses were recorded as minus (-). When tactics with stimulus or response prompt (Cooper et al., 1987; Halle, Marshall & Spradlin,1979; Wolery, Holcombe, Billings, & Vassilaros, 1993) were used, the students' prompted responses were recorded as Prompt (P). Number of correct responses and prompted responses were graphed on 20-Learn Units or percentage graphs. During assessment and experimental probes, data were usually collected based on a whole interval recording procedure for the correct responses and a partial interval recording for stereotypy or incorrect response. Correct responses were recorded as plus (+), incorrect responses as minus (-), passivity as "P" and stereotypy as "S". For both instruction and probes, criterion was usually set as at least 90% of correct responses for two consecutive times.

Interobserver Agreement

During assessment and instruction, Interobserver Agreement (IOA) was continuously recorded with two or three observers simultaneously collecting the data. Each trainee teacher was considered to be independent in running a program following 3 observation showing 100% agreement with the supervisor or another previously trained teaching assistant. Interobserver agreement was also collected using the Teacher Performance Rate and Accuracy (TPRA) observations. For the whole classroom, IOA was collected for the 45% of the non-instructional settings probes, with a range of 86% to 100% agreement (mean 93%) and for the 23% of the instruction, with a range of 94% to 100% agreement (mean 97%).

Design

The CABAS® implementation was conducted as an AB design (Cooper et al, 1987) Pilot experiment, with data collected as different levels of system performance. Data pre and during intervention were collected and graphed for each repertoire taught, including the cumulative performance of the classroom per day and per month, the supervisor and the teachers' performance.

Procedure

Assessment and Curriculum Design: In the first phase of the experiment every Participant's repertoire was measured through a complete criterion-based assessment called CABAS® Preschool Inventory of Repertoires for Kindergarten (C-PIRK®) (McCorkle & Greer, 2009). Curricular goals were all derived from this tool for use within CABAS® accredited schools only. The C-PIRK® covers the curricular objectives for teaching the repertoires necessary for a child to excel in Kindergarten and first to second grade, including the repertoires associated with academic literacy, communication, self-

management for school self sufficiency, social self management, community of reinforcers to assess students' interests and preferences, and physical development. (Healy et al., 2008). The individualized goals were selected as Long Term Objectives (LTO) in the C-PIRK® list, and taught, based on an accurate task analysis, as Short Term Objectives (STO) components.

Instruction: All instruction was provided using Learn Units. A Learn Unit is a measure of teaching defined by a 3 term contingency for the student and 2 or more three term contingencies for the teacher (Albers & Greer, 1991; Greer, 2002). The Learn Unit was identified by Greer (2002) as the basic unit of teaching and learning and teachers in the CABAS® system need to demonstrate fluency when they provide it and when they collect data on it.

Supervision: For this study, a teacher with the role of both head-teacher and supervisor was included in the teaching staff every day, providing continuous training and feedback to the trainee teaching assistants. Supervision included the use of the TPRA tool (Ingham & Greer, 1992) to evaluate the accuracy of the measurement of the students' responses and the fidelity of implementation of Learn Units by the instructor (Ross, Singer-Dudek & Greer, 2005). During instruction, the supervisor also analyzed the context of Learn Units and trained each teaching assistant to identify and produce optimum conditions of attention and motivation for each student prior to the presentation of each Learn Unit. The context analysis (Cooper et al., 1984; Hogin, 1996) included identifying each component (antecedent, behavior, consequence) but also the other variables that affect moment-to-moment learning, such as teacher's contingency shaped and rule governed behavior, student's motivational conditions and his/her phylogenic and ontogenetic history (Greer & Ross, 2008). Data about teachers' performance were collected and publicly posted on graphs as well as data about the supervisor performance using the TPRA. Individualized written or vocal feed-back about their performance was

continuously provided to the trainee teachers for motivation, with high rates of approvals, high rates of corrections and no disapprovals.

Decision Tree Protocol: At the end of each CABAS® class day, data were used to update the graphs and take data-based decisions. Teaching assistants were trained to apply the Decision Tree Protocol (Greer, 2001; Keohane & Greer, 2005) to the daily student programs data. According to the protocol, a decision about the curriculum is to be made after three ascending or three descending data paths, three data paths with no trend, after five data paths have been established, and each time a student meets criterion. Furthermore, if there are three ascending data paths and five data paths with an ascending trend, a decision should be made to continue with the current curriculum and tactic. If there are three descending data paths and five data paths with descending data paths, a decision should be made to change the tactic. For this Pilot study, each time the student met the criterion following instruction, a decision was made directly by the supervisor about the next STO and tactic. A phase change line, in the form of a broken vertical line, was drawn on the graphs following each criterion or a necessary change in the student program. Criterion was usually defined as 90% correct responses to Learn Units for two consecutive sessions.

Results

The classroom's total amount of Learn Units per month (Figure 1) increased from 8.882 for the first month of implementation to 18.843 for the last month with the full time CABAS® package. The efficacy of teaching increased, as shown by the cumulative number of criteria achieved, from 9 to 38 per month (Figure 2). The efficiency of the instructional system also improved, with Learn Units to criterion for the whole classroom coming from 836 to 480 (Figure 3).

Participant A inappropriate behavior, recorded as minutes of the student engaging in SIB or screaming per day, decreased from 200 minutes to 2, following an initial extinction burst (Cooper et al., 1987) during the implementation of CABAS® 12 hours per week (Figure 5). Instances of problem-behavior (SIB, assaultive and disruptive behavior) were calculated for Participant B, C and D as number of events per day and they went to 0 for all of them (Figure 4).

Discussion

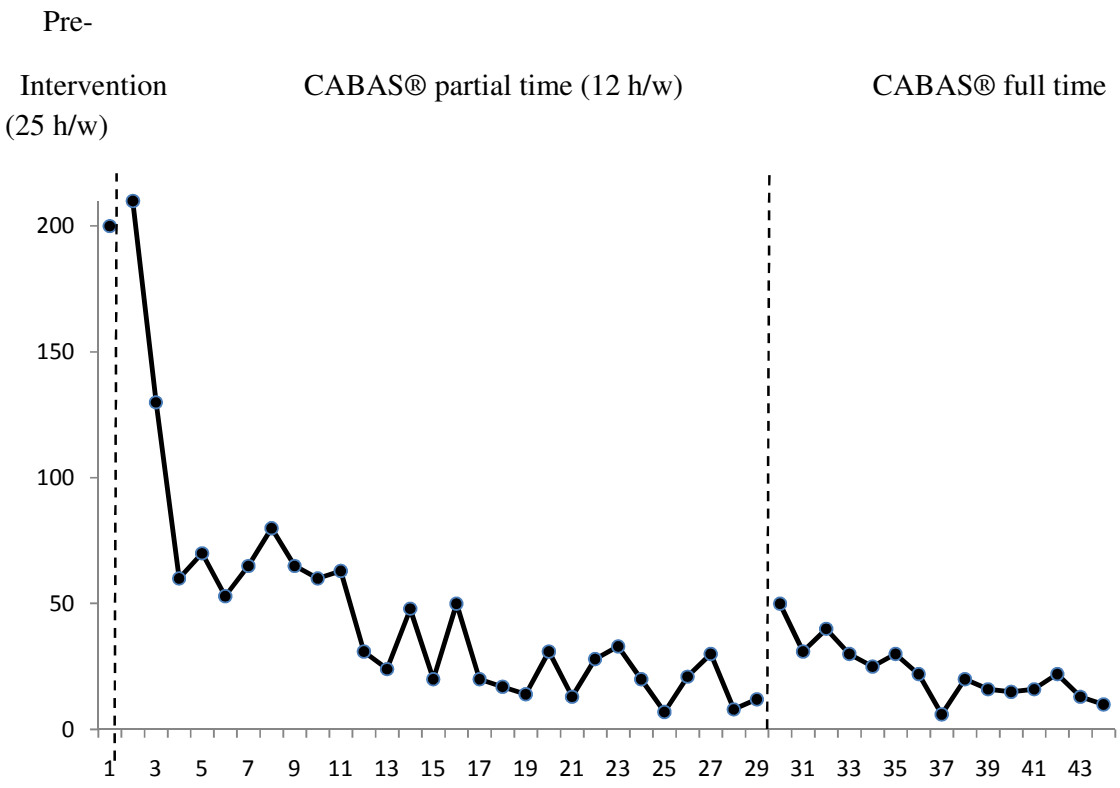
This study was conducted to test the effects of implementing a self-correcting research-based and intensive system of education for preschoolers with early diagnoses and complete dependency on others who were eventually going to be included in regular education classrooms. CABAS® demonstrated to be an effective model to teach all Participants and improve their compliance with adults. It also represented a unique opportunity to work intensively on habilitation and self-management, so that at the end of the Pilot experimentation, three out of four children were fully or partially toilet trained and could sit appropriately at a small group table while eating and using utensils. Unfortunately not every component of the CABAS® system was in place: parent trainers and University mentors were not directly and consistently included in the cybernetic teaching program. The experience, replicated in Italy for the second time (Lamm & Greer, 1991) attracted many observers, including parents, teachers, psychologists and journalists but was not identified as a need by the local Health and School representatives, despite the data and parents advocacy. The experience provided the hosting learning centre with a laboratory to spread science and good practices in the local area and with a system to intensively train teachers as strategic scientists of the pedagogy and the science of behavior.

Also, the CABAS® Pilot Project opened a nationwide debate about full inclusion as a goal instead as a rule and produced some projects about including CABAS® supervisors in public kindergartens promoted by local school directors.

A limitation for this study was that all Participants were allowed to participate in the Project since the end of the summer, then the public schools in which they were regularly enrolled made attendance mandatory. Due to this sudden interruption, follow-up data about maintenance of improvements were not collected.

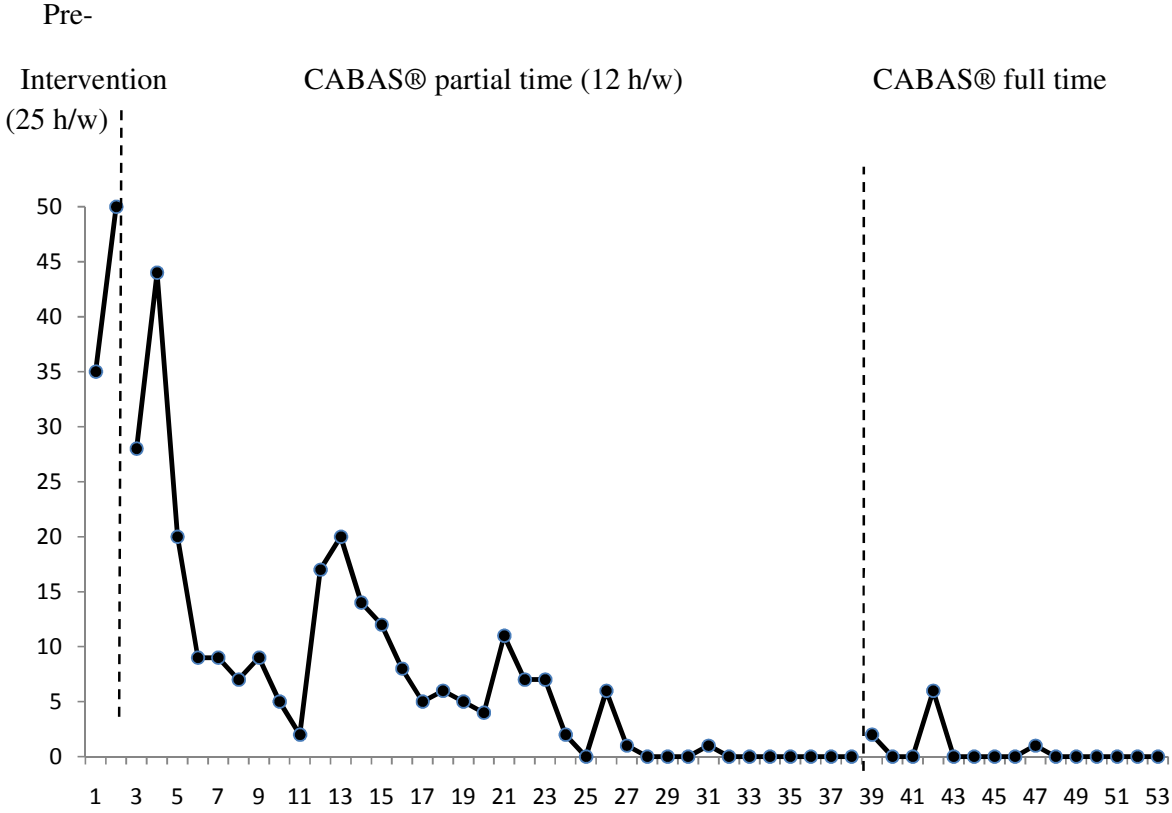
Participant A

Minutes of problem behaviors per session. (Problem behaviors for Student B: SIB and screaming)



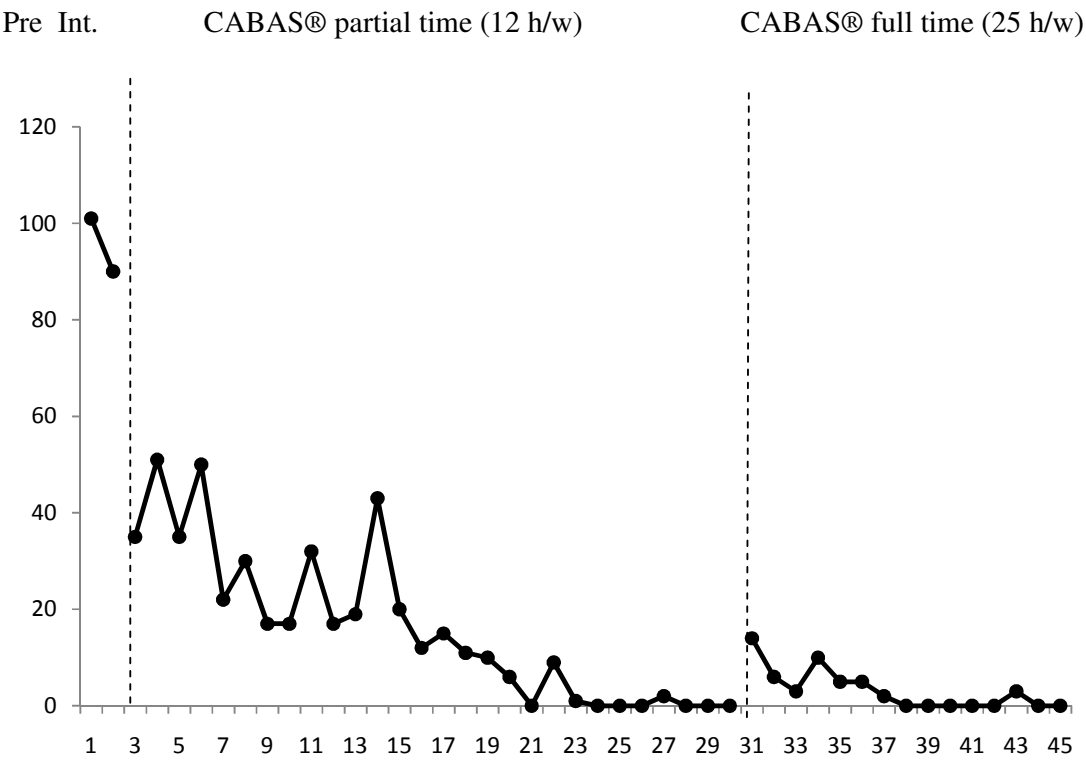
Participant B

Number of problem behaviors per session. (Problem behaviors for Student B: SIB and disruptive behavior)



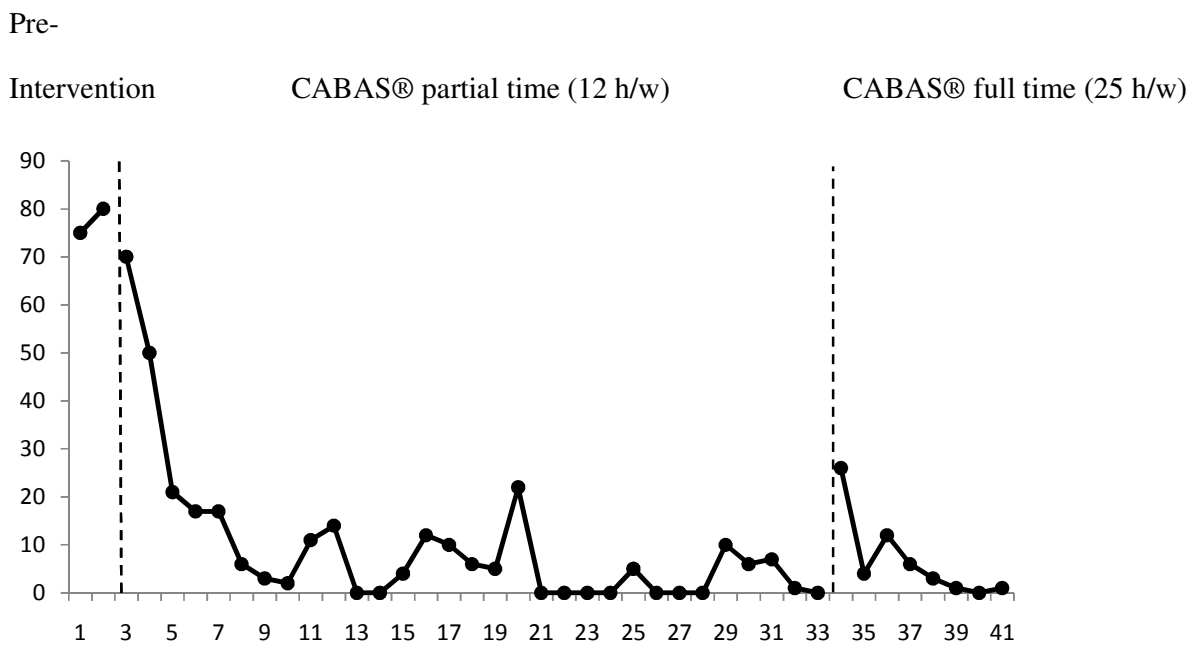
Participant C

Number of problem behaviors per session. (Problem behaviors for Student C: SIB and aggressive- assaultive behavior)



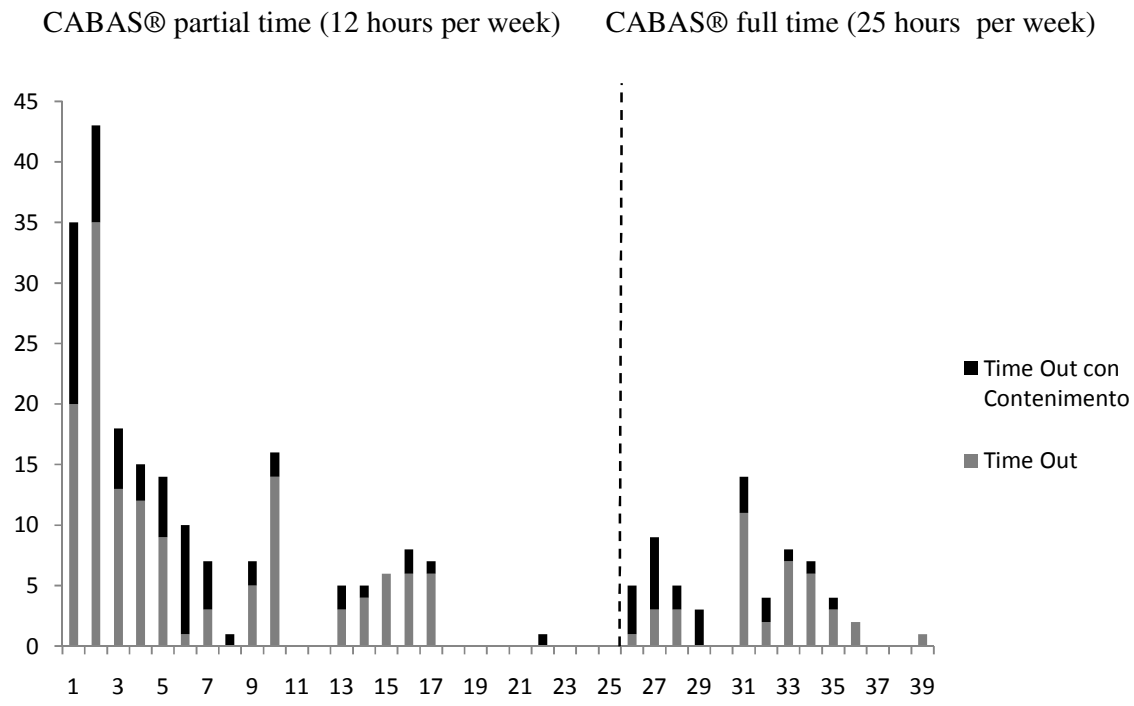
Participant D

Number of problem behaviors per session. (Problem behaviors for Student D: SIB, disruptive and assaultive behavior)



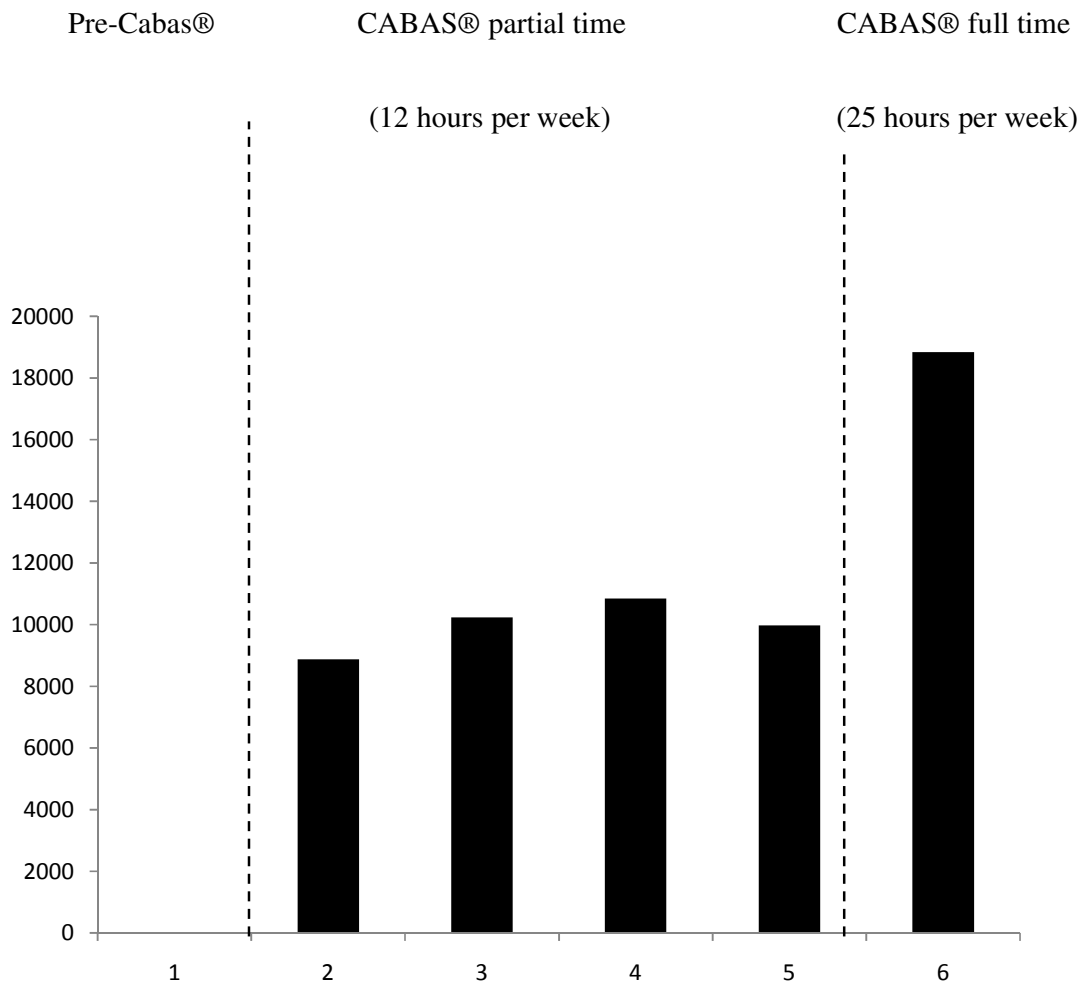
Behavioral Intervention (time out and time out with aversive physical block) for specific aggressive behavior (biting teacher's legs, hands and arms)

Participant D

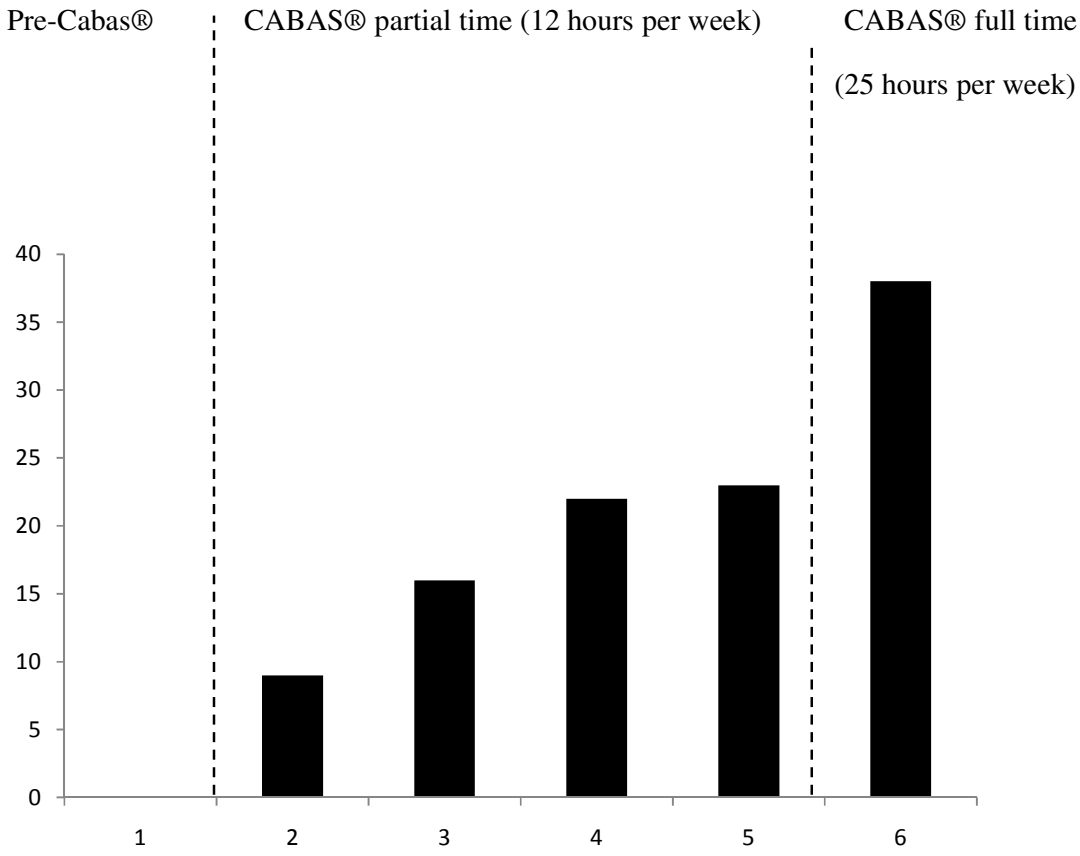


Classroom Monthly Cumulative Data

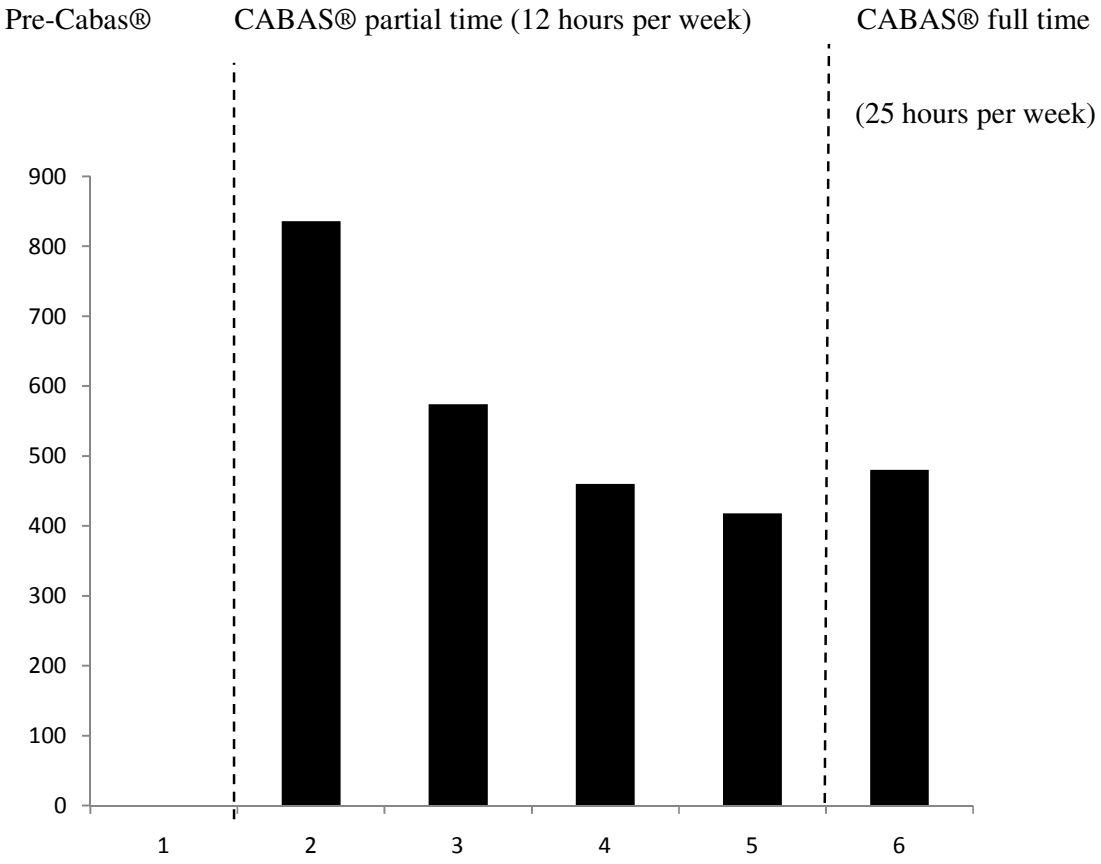
Number of total Learn Units provided to the classroom per month



Number of Classroom's Monthly Criteria Achieved



Classroom's Monthly Number of Learn Units to Criterion (students)



5. Implementation in Regular Education Environment

CABAS® programs were implemented in regular kindergartens for three Participants previously taught in a CABAS® environment (Experiment 1). The educational outcomes for the two conditions were compared and discussed as significant data in the national debate about the mandatory full inclusion law.

Each Participant, following attendance of a CABAS® Pilot Project classroom, was included back in the regular kindergarten environment. The local Public School representatives allowed the experimentation of assigning a CABAS® trained teacher to the target students, teaching for 12 hours per week in the inclusive environment of the regular kindergarten classroom . Data about number of Learn Units delivered, number of criteria achieved and cumulative number of minutes with problem behavior were collected for each 4-hours session during four months for the CABAS® environment condition and four months for the regular kindergarten environment condition. The number of educational programs selected for each student was based on C-PIRK® (Greer & McCorkle, 2009) assessment and kept constant in each condition.

Method

Participants

The Participants were two male and one female preschool students. Prior to the study the Participants were enrolled in regular public kindergartens, fully included in 17 to 30 kids classrooms, with the assistance of 2 1:1 teacher using traditional teaching methods. During the study, they attended a CABAS® classroom for 4 months for 12 hours per week in Condition 1, and their kindergarten with a1:1 CABAS® teacher for 4 months for 12 hours per week in Condition 2.

Participant A was a 5 year old female with high rates of vocal and gestural stereotypy, SIB and high rates of aggressive behavior. Participant B was a 4 year old boy with high rates of disruptive behavior, gestural stereotypy and SIB. Participant C was a 5 year old boy with high rates of gestural stereotypy, SIB and aggressive behavior. They all functioned at an emergent listener pre-speaker level of verbal behavior (Greer & Ross, 2008).

Setting

For Condition 1, data were collected about students' performance attending a CABAS® classroom set in a private learning centre, located in a suburb outside a metropolitan area. The classroom was used to provide 4 hours of 1:1 and small group instruction to 5 students, 3 days per week, for 4 months.. The student-teacher ratio of the classroom was 5:4:1, with five students, four trainee teaching assistants, one teacher. A supervisor was daily in charge of measuring teachers' and students' performance. Children behavior data, classroom's cumulative data and data about the teacher's performance as staff trainer were also graphed and displayed in the classroom. The classroom had a one-direction mirror, daily used to show the students' performance to parents and professionals. While attending the CABAS® classroom, Participants were also attending their regular kindergartens for 13 hours per week. The target students' kindergartens were public schools with mandatory full inclusion; all Participants' kindergartens had an inclusion classroom with child-sized chairs and tables, a teacher's desk and a toy area. Participant A and C's schools also had a gym classroom, a music classroom and a religion classroom, Participant B's kindergarten also had a playground and a soft-walls room. Participant A's classroom included 17 students without disability, Participant B's classroom counted 25 and Participant C's classroom 21 typically developing children. For Condition 2, Participants only attended their public kindergartens.

Definition of Behaviors

Dependent Variable. In this study, data were collected for (a) minutes of non-compliance or problem behavior (SIB, assaultive behavior, tantrum, throwing objects); (b) number of Learn Units (Albers & Greer, 1991; Greer, 1994; Greer, 2002) provided by CABAS® teachers to each Participant; (c) number of instructional objective achieved by each child and each teacher.

Independent Variable. The independent variable in this study was the implementation of a 12 hours-per week CABAS® classroom package during Condition 1 and the implementation of a 12 hours-per week CABAS®-based instruction in traditional school environments during Condition 2. All instruction was provided and recorded as Learn Units (Albers & Greer, 1991; Greer, 1994; Greer, 2002). A C-PIRK assessment (Greer & Mc Corkle, 2009) was conducted as the basis for individualized curriculum previous to each experimental condition and the number of programs selected for each student was the same in the CABAS® classroom and in the kindergarten's classroom. Learn Units were used to teach all repertoires: listener and speaker behaviors, general repertoires, self management, community of reinforcers and physical development.

Data Collection

Data were collected by 13 experimenters (12 trainee teaching assistants and 1 teacher-supervisor) during Condition 1 using a pen, a clipboard, a timer, and 20-Learn Units data collection sheets. During Condition 2 data were collected by 3 CABAS® trained teachers and a supervisor, using a pen, a clipboard, a timer and Learn Units data sheets.

During instruction in both conditions, students' correct responses were recorded as plus (+), while students' incorrect or non-target responses were recorded as minus (-).

When tactics with stimulus or response prompt (Cooper et al., 1987; Halle, Marshall & Spradlin,1979; Wolery, Holcombe, Billings, & Vassilaros, 1993) were used, the students' prompted responses were recorded as Prompt (P). Number of correct responses and prompted responses were graphed on 20-Learn Units or percentage graphs. During assessment and experimental probes, data were usually collected based on a whole interval recording procedure for the correct responses and a partial interval recording for stereotypy or incorrect response. Correct responses were recorded as plus (+), incorrect responses as minus (-), passivity as "P" and stereotypy as "S". For both instruction and probes, criterion was usually set as at least 90% of correct responses.

Interobserver Agreement

Interobserver Agreement (IOA) was recorded for the 34 % of the CABAS® Classroom sessions, with a range of 86 % to 100% agreement (mean 93%) with two or three observers simultaneously collecting the data. During the CABAS®-based instruction in kindergarten condition, IOA was recorded for the 6% of the sessions, with a range of 92% to 100% (mean 96%) agreement between the teacher and the supervisor. Interobserver agreement was collected using the Teacher Performance Rate and Accuracy (TPRA) (Ingham & Greer, 1992) observations.

Design

The experiment was conducted with an AB design (Cooper et al, 1987).

Procedure

Assessment and Curriculum Design: Both in the CABAS® classroom and in the CABAS®-based instruction in inclusion classroom condition, during the first week of implementation a complete criterion-based assessment with the CABAS® Preschool

Inventory of Repertoires for Kindergarten (C-PIRK®) (McCorkle & Greer, 2009) was conducted for each Participant.

Instruction: Eighteen curricular goals were selected from listener, speaker, self management, community of reinforcers and physical development areas for each student. The number of programs was the same in Condition 1 and Condition 2. In other words, each teacher was working on 18 different individualized goals or Short Term Objectives (STO) for each student, both in the CABAS® classroom and in the regular kindergarten. All instruction was provided using Learn Units (Albers & Greer, 1991; Greer, 2002), the basic unit of teaching and learning identified in the CABAS® system. Teaching tactics based on behavior principles (Cooper, Heron & Heward, 1987; Catania, 2007; Greer, 2002) were implemented according to the Decision Protocol in both conditions. Also, during both conditions each Participant was receiving 13 hours per week of 1:1 instruction provided by traditionally trained teachers in full inclusion regular kindergarten classrooms.

Supervision: For this study, a supervisor was included in the teaching staff every day in the CABAS® classroom condition, providing continuous training and feedback to the trainee teaching assistants and every 2 weeks to the target teachers in the regular kindergarten classroom . Supervision was conducted using the TPRA tool (Ingham & Greer, 1992) to evaluate the accuracy of the measurement of the students' responses and the fidelity of implementation of Learn Units by the instructor (Ross, Singer-Dudek & Greer, 2005). Individualized written and vocal feed-back about their performance was continuously provided to the 12 teachers rotating in the CABAS® classroom for Condition 1and to the target teachers included in the traditional environment for Condition 2.

Results

The total number of Learn Units received by each student during the entire CABAS® classroom attendance was higher than in the regular school condition:

Participant A went from receiving 6300 to 2951 Learn Units in four months, Participant B from 7000 to 3998 and Participant C from 10130 to 3445. The total number of educational objectives or criteria achieved by each student decreased in Condition 2. The number of minutes during which students showed non-compliance or problem behavior decreased in both conditions for Participant B and C, while they went to extinction in Condition 1 only for Participant A

Discussion

Data supported other studies (Lamm & Greer, 1991; Greer & Ross, 2008) suggesting that implementation of CABAS® programs in a CABAS® full context is critical to accelerate students' achievements. As shown by graphs, implementation of CABAS®-based programs and instruction with Learn Units produced improvement for each Participant both in the CABAS® and in the regular kindergarten setting, but intensivity of instruction and number of criteria was consistently higher in the CABAS® setting condition. Moreover, Condition 1 started without teachers' instructional control over students but was the only one to show complete extinction of non-compliance and problem behavior for one Participant. The design of this experiment, due to the specific contingencies of implementation (agreements with the Public School representatives and with students' families) has many limitations: it does not include reversal of conditions, doesn't cross conditions between Participants and does not control for Participants' maturation. Moreover, data about a third condition, represented by traditional teaching in the particular "1:1 instruction in group" provided by special teachers provided by the Public School system should be recorded and compared with behavior-based instruction in and out the CABAS® setting. For this study, data about 1:1 traditional teaching to the target students were not collectable. In fact, each school manager denied permission to measure schools' employees performance and to supervise teachers other than CABAS®

trained target ones. So, further studies should be conducted including data about students' achievements in kindergarten-only condition.

Table 1. Comparison between characteristics of the environment consistent across Condition 1 and 2 and differences between the two settings.

SAME	DIFFERENT	
• 12 hours/week (4-hours sessions, 3 times per week) of individualized instruction provided by CABAS® trained teacher • Data collected for 4 consecutive months • Number of programs taught to each student • Instructional design based on C-PIRK assessment, conducted during the first week.	CABAS® Classroom	Kindergarten Classroom
	• 5 kids in the classroom • No previous CABAS® experience • No teachers' instructional control • Social environment based on level of verbal behavior (all students were pre-listeners pre-speakers) • Daily supervision • 12 CABAS® teachers continuously rotated teaching each student • Small group setting only during lunch and afternoon activities	• Average of 21 kids in the classroom • 4-monts previous CABAS® experience • Teachers had instructional control • Social environment based on the age of the students (full inclusion) • Supervision every 2 weeks • 1 CABAS® and 1traditional teacher for each student • All individualized instruction was delivered in group

Table 2. Participants' repertoires taught in Condition 1 and 2

Student A-CABAS® Classroom for pre-listeners pre-speakers	**Student A-Kindergarten (full inclusion)**
Listener	
• Generalized Motor Imitation • Follow Vocal Direction • Matching objects and pictures • Pointing objects	• Generalized Motor Imitation • Follow Vocal Direction • Matching colors and letters • Pointing written names
Speaker	
• Gestural Mand with objects	• Gestural Mand with pictures
General Repertoires	
• Finding hidden object • Sorting objects	• Pointing picture of self and of classmates • Sorting objects
Community of Reinforcers	
• Conditioning toys as reinforcers (1:1) • Conditioning books as reinforcers (1:1) • Conditioning play doh as a reinforcer (1:1) • Conditioning lego as reinforcers (1:1)	• Conditioning toys as reinforcers (small group) • Conditioning puzzles as reinforcers (small group) • Conditioning books as reinforcers (small group) • Conditioning listening to story (whole group)
Self Management	
• Morning routine • Afternoon routine • Sitting at the table (small group) • Toilet training	• Morning routine • Afternoon routine • Sitting for snack (small group) • Bathroom routine
Physical Development	
• Pencil grasp • Drinking with cup • Catch the ball	• Prerequisite skills for writing (mazes, graphic imitation) • Throw the ball • Ring around a rosie

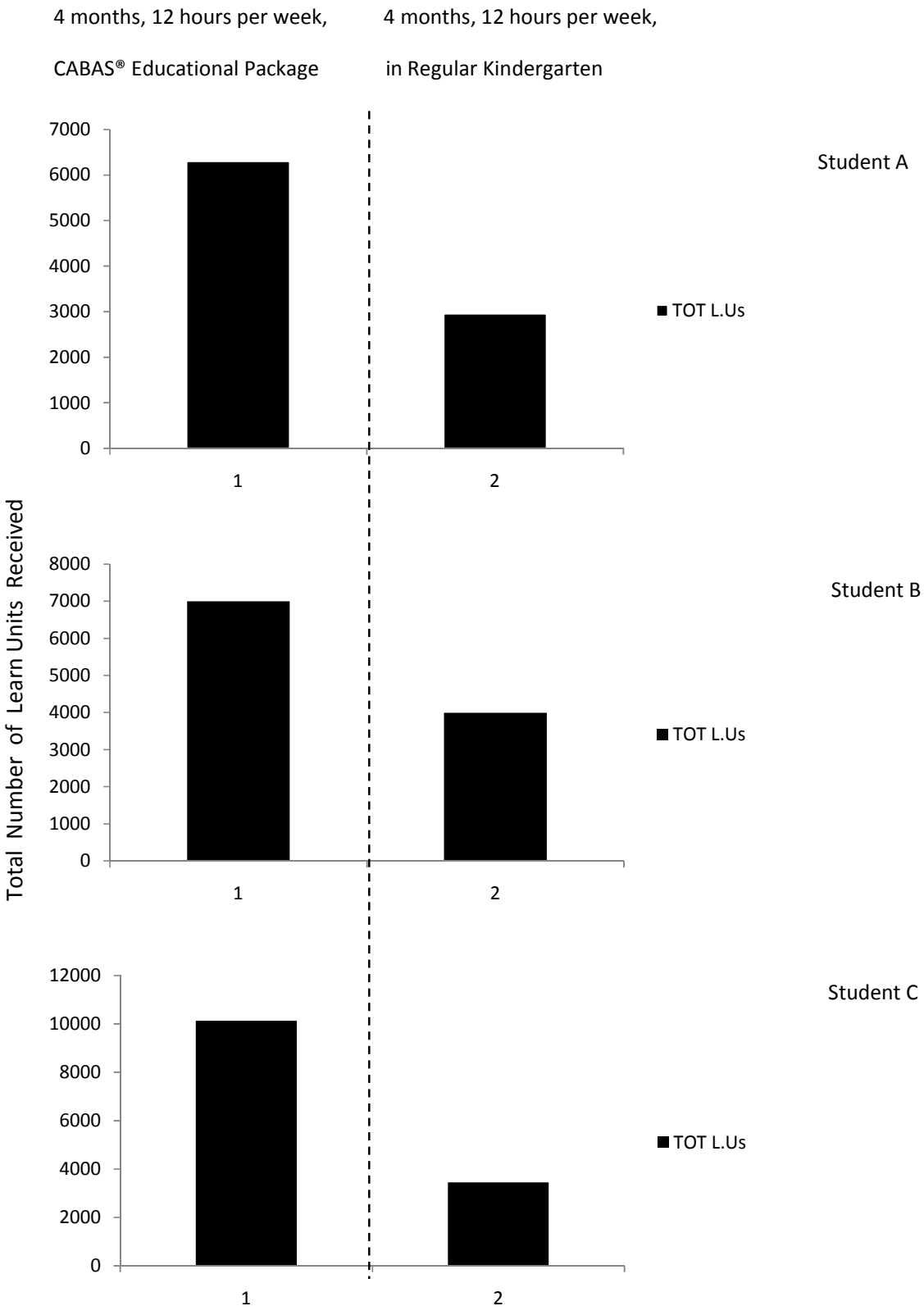
Student B-CABAS® Classroom for pre-listeners pre-speakers	**Student B-Kindergarten (full inclusion)**
Listener	
• Generalized Motor Imitation • Follow Vocal Direction • Matching objects • Pointing objects	• Generalized Motor Imitation • Follow Vocal Direction • Matching objects with pictures • Pointing objects
Speaker	
• Gestural Mand with objects	• Gestural Mand with objects • Echoic training for phonemes

General Repertoires	
• Finding hidden object • Sorting objects	• Sorting objects
Community of Reinforcers	
• Conditioning toys as reinforcers (1:1) • Conditioning books as reinforcers (1:1) • Conditioning lego as reinforcers (1:1)	• Conditioning toys as reinforcers (small group) • Conditioning listening to story (whole group) • Conditioning performing actions during songs (whole group)
Self Management	
• Morning routine • Afternoon routine • Sitting at the table (small group) • Toilet training	• Morning routine • Afternoon routine • Sitting for snack (small group) • Bathroom routine
Physical Development	
• Puzzle (one piece at a time) • Building a tower (one piece at a time) • Using fork • Catch the ball	• Jump with two feet • Clean mouth • Throw the ball • Catch the ball

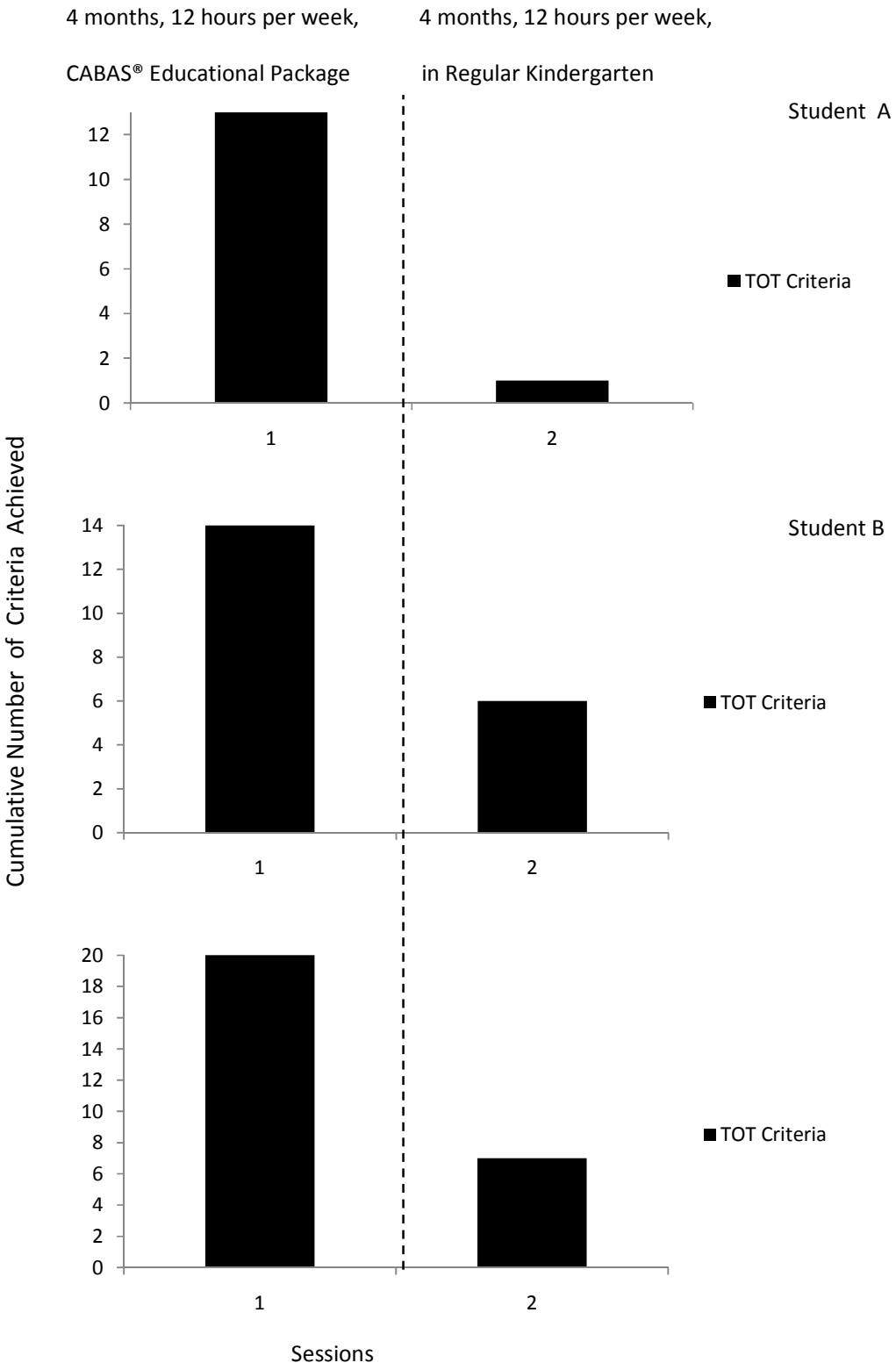
Student C-CABAS® Classroom for pre-listeners pre-speakers	Student C-Kindergarten (full inclusion)
Listener	
• Eye contact • Generalized Motor Imitation • Follow Vocal Direction • Matching objects • Imitating object use	• Generalized Motor Imitation • Follow Vocal Direction • Matching colors • Imitating object use
Speaker	
• Gestural Mand with objects	• Gestural Mand with pictures
General Repertoires	
• Finding hidden object • Sorting objects	• Finding hidden object
Community of Reinforcers	
• Conditioning musical toys as reinforcers (1:1) • Conditioning books as reinforcers (1:1) • Conditioning cause-effect toys as reinforcers	• Conditioning toys as reinforcers (1:1) • Conditioning puzzles as reinforcers (small group) • Conditioning listening to story (whole group) • Conditioning sitting while others are singing songs
Self Management	
• Morning routine • Afternoon routine	• Morning routine • Afternoon routine

• Sitting at the table (small group) • Toilet training	• Sitting for snack (small group) • Bathroom routine
Physical Development	
• Catch the ball • Walk with appropriate gait	• Throw the ball • Ride a tricycle

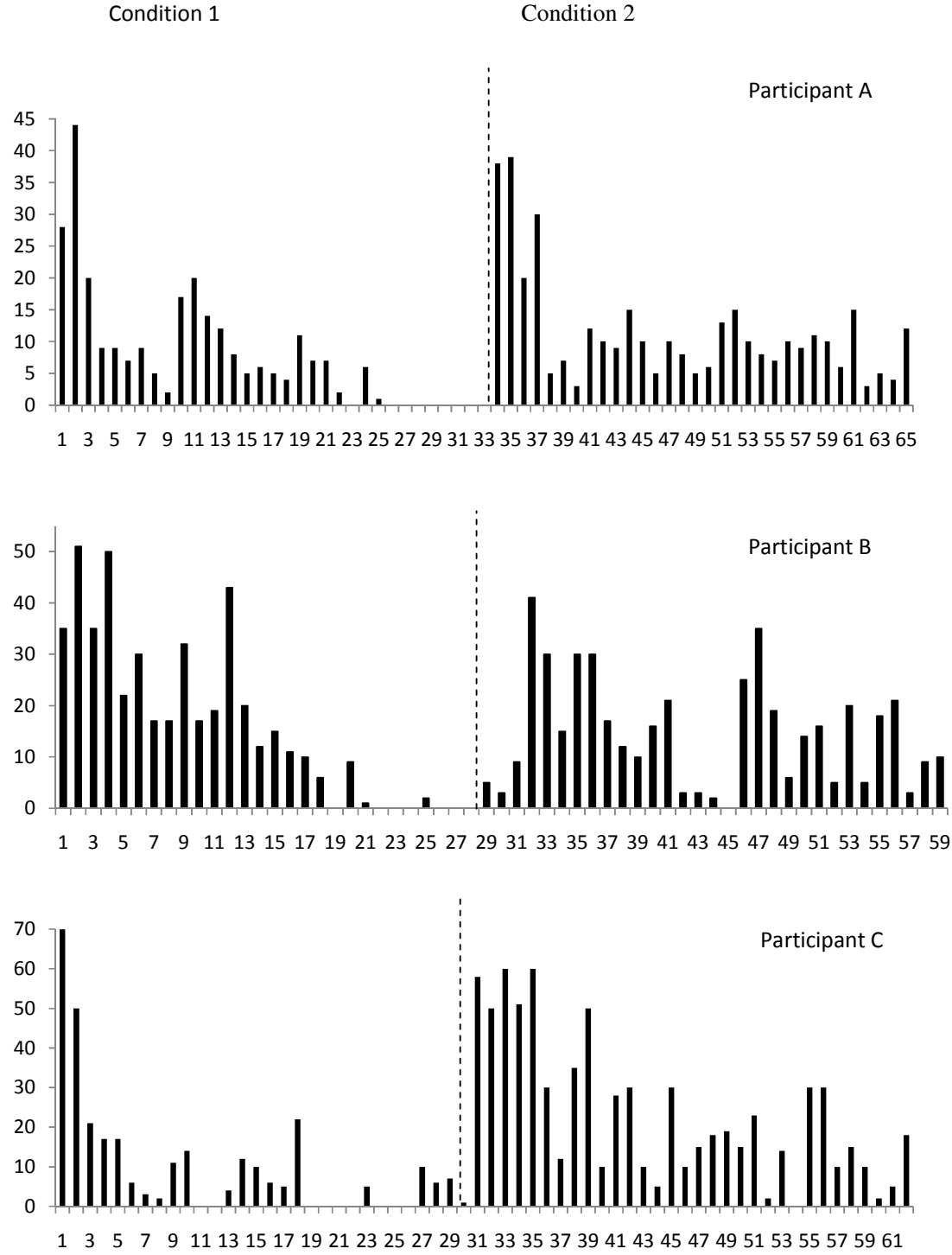
Total Number of Learn Units Received by Student A, B and C attending the 12-hours-per-week CABAS® School and Regular Public Kindergartens



Cumulative Number of Criteria Achieved Attending the 12-hours-per-week CABAS® School and Regular Public Kindergarten



Number of minutes per day (4 hours session) emitting non-compliance or problem behavior (tantrum, assaultive behavior , SIB, throwing objects) measured in the CABAS® Classroom (Condition 1) and Regular Public Kindergarten (Condition 2) during 1:1 CABAS®-based instruction



6. CABAS® As a Teacher Training Camp

From the very beginning of its implementation in Italy, CABAS® showed to be a challenging environment for trainee teachers: instruction received and delivered is intensive and exposure to daily supervision can create high levels of initial reactivity (Cooper, Heron, & Heward, 1984). Anecdotally, teaching assistants reported to be empowered by the training experience and were rapidly conditioned to collect accurate data, deliver fluent instruction, analyze the context of Learn Unit and motivate students the best they could. From the supervisor point of view, a few months of working in the CABAS® system seemed to guarantee more modeling, reinforcement and corrections than ever, and for many trainee teachers at the same time. Also, the host learning centre manager started to notice that CABAS®, as a model of good practices and research advancement, might attract the interest of teachers willing training as well as students and families. This research was conducted to compare the effect of CABAS® training with regular school and learning centre environments on teacher's performance, measured as acquisition of 5 "good teaching" behaviors.

Method

Participants

The Participants were 9 just-graduated teachers. They all were female, ranging in age from 24 to 27 years old. Teacher A, D and G graduated from Scienze della Formazione Primaria, the University course Italian students attend to become primary school teachers. Teacher B, C, E, F, H and I attended the Faculty of Psychology. They were selected because none of them had any previous experience working in the education field and never studied or applied principles and methods derived from the science of behavior. As students, 5 volunteer children attending the same elementary school and the same learning

centre participated in the study. They were all males, from 9 to 10 year-old, randomly paired and assigned to each teacher before and after teaching training.

Setting

This study was conducted in a classroom with a teacher's desk and three chairs, a board, and a computer. On the teachers' table, 3 pen, paper, scissors and glue were available. All 30-minute teaching sessions were video typed with a digital live camera and observed by one or more experimenters from another room.

Definition of Behaviors

Dependent Variable. In this study, the independent variable was the acquisition of 5 main teacher's behaviors experimentally identified as good predictor of teaching efficacy: a) high rates of approvals (), b) instruction provided as Learn Units (Albers & Greer, 1991; Greer, 1994; Greer, 2002) , c) accurate data collection (Bernhardt, 1998; Stigler & Hiebert, 1999) , d) intensive instruction with high rates of response opportunities (Heward 2003), (e) production of individualized materials. Data were also collected for number of novel English words accurately learned by each student.

Independent Variable. The independent variable in this study was the teachers' exposure to 3 different models of professional training. Teachers A, D and G taught in primary school classrooms with indirect supervision, Teachers B, E and H were trained to teach children with learning difficulties in a learning centre and Teachers C, F and I received their training in a CABAS® classroom for preschoolers with disabilities.

Data Collection

Data were collected by experimenters using a pen, a clipboard, a timer, and data collection sheets. Teachers' approvals, opportunities to respond and learn units were measured through event recording, checking a box in the data collection sheet for every

instance. A box in the data sheet was checked if production of individualized teaching material occurred. Data collection accuracy was calculated comparing data collected by the experimenter and by the target teacher and recorded as percentage of agreement. Data for teachers' performance were collected on a data sheet designed to record all the target operants emitted and graphically represented with bar graphs as number of performance objectives met out of 5. Criteria for the teacher's performance were set as a mean of 4 or more approvals (vocal and non vocal) emitted per minute, 60 opportunities to respond or more provided to each student, 100% of flawless Learn Units delivered and 100% of data collection accuracy .

Following the 30-minute teaching session , students' performance was measured by the experimenters as number of correct responses out of 10. Student's correct responses were defined as the student textually responding to the words and saying the Italian translation correctly. Data for correct independent responses were recorded as a plus (+), while student's incorrect responses (the student textually responding to the words incorrectly and/or translating the words incorrectly) were recorded as minus (-). Data for each student performance were collected separately and visually displayed on a cumulative graph.

Interobserver Agreement

Interobserver Agreement (IOA) was calculated with two or three observers simultaneously collecting data about teachers' performance. The second and the third observers measured the target behaviors with the experimenter watching the lessons recorded with a digital live camera for the 31 % of the sessions, with a range of 94 % to 100% agreement (mean 97%) . IOA was also calculated for students' responses to the words taught by each teacher for 28% of the pre and post training sessions, with 100% of agreement.

Design

The experiment had a delayed multiple baseline across subjects design (Cooper et al, 1987), to compare the teaching performance of teachers grouped based on the training they received.

Procedure

Pre-training measurement: Teachers' performance was measured as a) rate of approvals, b) number of learn units, c) number of data accurately collected d) number of opportunities to respond provided to students, e) production of teaching materials. Pre-training teaching sessions consisted of the teacher sitting at the table in front of 2 students and provided with a list of 10 English words (novel to the students), a list of the words' translation in Italian and basic school materials (paper, pens, scissors, glue). The experimenter told each teacher to teach accurate textual responding and translation of the words to both students the best she could in a 30-minute teaching session. No feedback was provided to the teacher at the end of the session and data were collected on teacher and student performance. Students' performance was measured at the end of each session by the experimenter and recorded as number of correct textual responses and translation out of ten.

Training: Teachers were grouped based on the training they received after University graduation: Teachers A, D and G were trained to be regular classroom teachers in public elementary schools. According with the Italian law, teachers' training consists of experiencing teaching in a classroom for one year under the indirect supervision of an expert colleague. Their students were typically developing children, from 6 to 9 years old, who attended regular public school. For this study, their performance was measured after doing this training for 200 hours. Teachers B, E and H were trained to serve as specialized educators in a learning centre that apply behavioral based teaching principles and

techniques. The learning centre training includes constant measurement of students and teachers' performance and random direct supervision. Their students were 6 to 11 year-old kids with disability or with learning difficulties who received 1:1 or 2:1 instruction during 1-hour sessions in the centre. For this study their performance was measured after 200 hours of practice. Teachers C, F and I were trained as teaching assistants in a CABAS® classroom, receiving daily supervision. The setting they were trained in was an emergent-listeners pre-speakers classroom, for 5 students with autism or multiple disabilities, from 3 to 6 year old, who received 1:1 instruction continuously rotating instructors for 4-hour sessions. Their performance was measured for this study after 200 hours of work in this environment. Eighteen curricular goals were selected from listener, speaker, self management, community of reinforcers and physical development areas for each student.

Post-training: Teachers' performance was measured in the same experimental conditions produced in pre-training probes: each teacher was told to teach the best she could, for 30 minutes, a list of 10 novel English words to 2 typically developing students, and was provided with 2 pages with the words in English and Italian and basic school materials. Every performance was measured in terms of criterion acquisition for the 5 target indicators (approvals, learn units, data collection, intensivity, production of materials). Students' learning was also measured as number of correct textual responses and translation of the words.

Discussion

In this study, data showed that being trained in educational environments using behavioral based principles and procedures and high rates of supervision was a better predictor of teaching expertise than exposure to regular school environments. The behavioral-based environment connected with the higher level of teacher performance improvement resulted to be the CABAS® classroom. This results were particularly

meaningful because, despite being trained to teach 1:1 to preschoolers with autism or multiple disabilities who were emergent listeners and pre-speakers, teachers trained in the CABAS® classroom showed the best performance, both in terms of best practices and students' learning, with typically developing older students who were at a reader-writer level of verbal behavior. In other words, data suggested that providing teachers with the amount of modeling, written and vocal feedback and establishing operations contained in a CABAS® environment can be an efficient way to promote mastery of science-based teaching practices with different populations of students. A limitation for this study could be some teachers' performances being affected by reactivity to observation: teachers in the learning centre and in the CABAS® classroom groups were constantly exposed to supervision during their training, while teachers in the regular school group didn't. Also, IOA was collected only for a small number of pre and post-training probe sessions. Further studies should increase the number of Participants and measure a wider number of teachers' and students' repertoires.

Number of Criteria Achieved by Each Teacher Before And After Regular Elementary School, Learning Centre and CABAS® Training

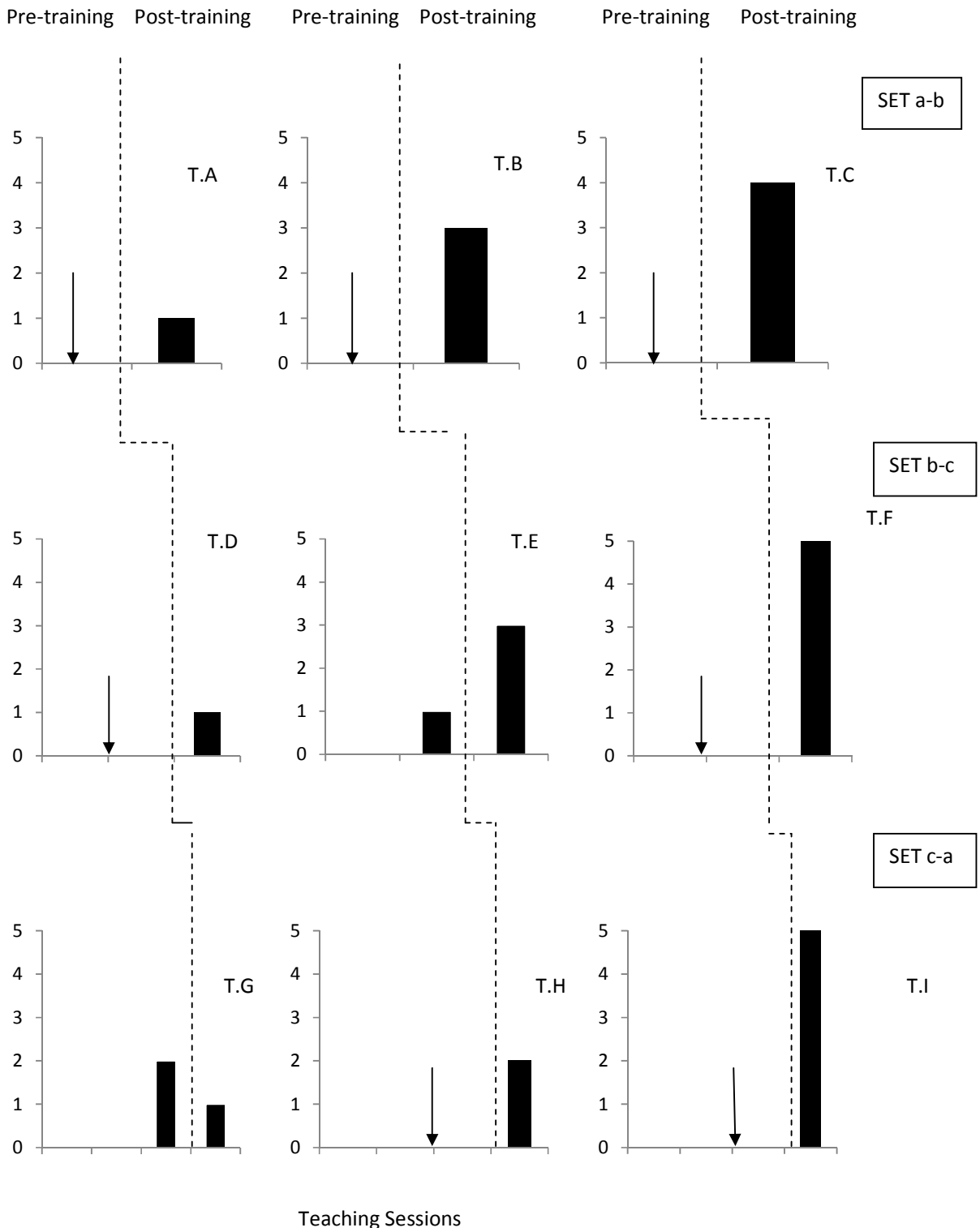


Table 1. List of words a, b, and c provided as teaching targets to the teachers during pre and post-training probes

SET a	SET b	SET c
Break	Lettuce	Bundle
Seller	Kingdom	Ahead
Mistake	Frame	Beads
Loop	Burglar	Engine
Grass	Carrier	Bruise
Fighter	Bunch	Chalk
Eyelash	Canvas	Degree
Drawer	Bollard	Gabble
Bidder	Chess	Health
Bride	Truffle	Fare

Table 2. Number of correct responses provided by each pair of students before and after each teacher's training.

Cumulative Number of Students' Correct Responses to SET a		
Before Teacher training	T.A (RE condition)	9
	T.B (LC condition)	8
	T.C (CABAS® condition)	9
After Teacher Training	T.G (RE condition)	10
	T.H (LC condition)	12
	T.I (CABAS® condition)	15
Cumulative Number of Students' Correct Responses to SET b		
Before Teacher training	T.D (RE condition)	4
	T.E (LC condition)	11
	T.F (CABAS® condition)	7
After Teacher Training	T.A (RE condition)	10
	T.B (LC condition)	13
	T.C (CABAS® condition)	14
Cumulative Number of Students' Correct Responses to SET c		
Before Teacher training	T.G (RE condition)	10
	T.H (LC condition)	6
	T.I (CABAS® condition)	9
After Teacher Training	T.A (RE condition)	9
	T.B (LC condition)	15
	T.C (CABAS® condition)	17

Table A. Evolution of Verbal Milestones and Independence

Verbal Milestones	Effects on Independent Functioning
1) Pre Listener Status	Humans without listener repertoires are entirely dependent on others for their lives. Interdependency is not possible. Entrance to the social community is not possible.
2) Listener Status	Humans with basic listener literacy can perform verbally governed behavior (e.g., come here, stop, eat). They can comply with instructions, track tasks (e.g., do this, now do this), and avoid deleterious consequences while gaining habilitative responses. The individual is still dependent, but direct physical or visual contact can be replaced somewhat by indirect verbal governance. Contributions to the well being of society become possible since some interdependency is feasible and the child enters the social community.
3) Speaker Status	Humans who are speakers and who are in the in the presence of a listener can govern consequences in their environment by using another individual to mediate the contingencies (e.g., eat now, toilet, coat, help). They emit mands and tacts and relevant autoclitics to govern others. This is a significant step towards controlling the contingencies by the speaker. The culture benefits proportionately too and the capacity to be part of the social community is greatly expanded.
4) Speaker Listener Exchanges with Others (Sequelics and Conversational Units)	a) Sequelics. Humans with this repertoire can responds as a listener-speaker to intraverbals, including impure tacts and impure mands. Individuals can respond to questions for mand or tact functions or to intraverbals that do not have mand or tact functions. The individual can respond as a speaker to verbal antecedents and can answer the queries of others such as, "what hurts?" "What do you want? "What's that?" "What do you see, hear or feel?" One is reinforced as a listener with the effects of the speaker response. b) Conversational Units. Humans with this repertoire carry on conversational units in which they are reinforced as both speaker and listener. The individual engages in

	interlocking verbal operants of speaker and listener. The individual is reinforced both as a listener for sensory extensions, and also as a speaker in the effects speaking has on having a listener mediate the environment for the speaker.
5) Speaker as Own Listener Status Say Do Conversational Units Naming	a) Say and Do. Individuals with this repertoire can function as a listener to their own verbal behavior (e.g., first I do this, then I do that), reconstructing the verbal behavior given by another or eventually constructing verbal speaker-listener behavior). At this stage, the person achieves significant independence. The level of independence is dependent on the level of the person's listener and speaker sophistication. b) Self-talk. When a human functions as a reinforced listener and speaker within the same skin they have one of the repertoires of speaker-as-own-listener. The early evidence of this function is self-talk; young children emit such repertoires when playing with toys, for example (Lodhi & Greer, 1990). c) Naming. When an individual hears a speaker's vocal term for a nonverbal stimulus as a listener and can use it both as a speaker and listener without direct instruction, the individual has another repertoire of speaker as own listener. This stage provides the means to expand verbal forms and functions through incidental exposure.
6) Reader Status	Humans who have reading repertoires can supply useful, entertaining, and necessary responses to setting events and environmental contingencies that are obtainable by written text. The reader may use the verbal material without the time constraints controlling the speaker-listener relationship. The advice of the writer is under greater reader control than the advice of a speaker for a listener; that is, one is not limited by time or distance. Advice is accessible as needed independent of the presence of a speaker.
7) Writer Status	A competent writer may control environmental contingencies through the mediation of a reader across seconds or centuries in the immediate vicinity of a reader on a remote continent. This stage represents an expansion of the speaker repertoires such that a listener need

	not be present at the time or at the same location as the writer. The writer affects the behavior of a reader.
8) Writer as Own Reader: The Self- Editing Status	As writers increase their ability to read their own writing from the perspective of the eventual audience, writers grow increasingly independent of frequent reliance on prosthetic audiences (e.g., teachers, supervisors, colleagues). A more finished and more effective behavior-evoking repertoire provides the writer with wide-ranging control over environmental contingencies such that time and distance can be virtually eliminated. Writing can be geared to affect different audiences without immediate responses from the target audience
9) Verbal Mediation for Solving Problems:	A sophisticated self-editor under the verbal expertise associated with formal approaches to problem solving (e.g., methods of science, logic, authority) can solve complex problems in progressively independent fashion under the control of verbal stimuli (spoken or written). The characterization of the problem is done with precise verbal descriptions. The verbal descriptions occasion other verbal behavior that can in turn direct the action of the person to solve the particular problem. A particular verbal community (i.e., a discipline) is based on verbal expertise and modes of inquiry are made possible.

Table B. Verbal Milestones and Components

Mile-stones	Components (Does the Child Have These Capabilities?)
Pre-listener	* Conditioned reinforcement for voices (voices of others controls prolonged auditory observation and can set the stage for visual or other sensory discriminations) (Decasper & Spence, 1987)
	* Visual tracking (visual stimuli control prolonged observation) (Keohane, Greer, & Ackerman, 2005a)
	* Capacity for "sameness" across senses (multiple exemplar experiences across matching across olfactory, auditory, visual, gustatory, tactile

	results in capacity for sameness across senses) (Keohane, Greer, & Ackerman, 2005b)
	* Basic compliance based on visual contexts and the teacher or parent as a source of reinforcement (The child need not be under any verbal control.)
Listener	* Discrimination between words and sounds that are not words (Conditioned reinforcement for voices occasions further distinctions for auditory vocal stimuli)
	* Auditory matching of certain words (as a selection/listener response) (Chavez-Brown, 2005; Greer & Chavez-Brown, 2003)
	* Generalized auditory matching of words (as a selection/listener response) (Chavez-Brown, 2005)
	* Basic listener literacy with non-speaker responses (Greer, Chavez-Brown, Nirgudkar, Stolfi, & Rivera-Valdes, 2005)
	* Visual discrimination instruction to occasion opportunities for instruction in naming (Greer & Ross, in press)
	* Naming (Greer, Stolfi, Chavez-Brown, & Rivera-Valdes, 2005)
	* Observational naming and observational learning prerequisites (Greer, Keohane, Meincke, Gautreaux, Pereira, Chavez-Brown, & Yuan, 2004)
	* Reinforcement as a listener (A listener is reinforced by the effect the speaker has on extending the listener's sensory experience; the listener avoids deleterious consequences and obtains vicarious sensory reinforcement.) (Donley & Greer, 1993)
	* Listening to one's own speaking (the listener is speaker) (Lodhi & Greer, 1989)
	* Listening to one's own textual responses in joining print to the naming relation (Park, 2005)
	* Listening and changing perspectives: Mine, yours, here, there, empathy (extension of listener reinforcement joins speaker) (Heagle & Rehfeldt, 2006)
Speaker	* Vocalizations

* Parroting (Pre-echoic vocalizations with point-to-point correspondence, here-say joins see-do as a higher order operant), auditory matching as a production response (Sundberg, Michael, Partington, & Sundberg, 1996)

* Echoics that occur when see-do (imitation) joins hear-say (echoic) as a higher order duplic operant (Ross & Greer, 2003; Tsiouri & Greer, 2003)

* [Faulty echoics of echolalia and palilalia related to faulty stimulus control or establishing operation control] (Karmali, Greer, Nuzzolo-Gomez, Ross, & Rivera-Valdes, 2005)

* Basic Echoic-to-mand function (a consequence is specified in and out of sight, here-say attains function for a few verbalizations leading to rapid expansion of echoics for functions mediated by a listener) (Ross & Greer, 2003; Yoon, 1996)

* Echoic-to-tact function (generalized reinforcement control, the child must have conditioned reinforcement for social attention) (Tsiouri & Greer, 2003)

* Mand and tacts and related autoclitics are independent (learning a form in one function does not result in use in another without direct instruction) (Twyman, 1996a, 1996b)

* Mands and tacts with basic adjective-object acquire autoclitic functions (a response learned in one function results in usage in another under the control of the relevant establishing operation) (Nuzzolo-Gomez & Greer, 2005). This Transformation of establishing operations across mands and tacts replicated by Greer, Nirgudkar, & Park (2003)

* Impure mands (mands under multiple control-deprivation plus verbal stimuli of others, visual, olfactory, tactile, gustatory stimuli) (Carr & Durand, 1985)

* Impure tacts (tacts under multiple controls-deprivation of generalized reinforcers plus verbal stimuli of others, visual, olfactory, tactile, gustatory stimuli) (Tsiouri & Greer, 2003)

* Tacts and mands emerging from incidental experience

	(naming and the speaker repertoires) (Fiorile, 2004; Fiorile & Greer, 2006; Greer, et al, 2005b; Gilic, 2005)
	* Comparatives: smaller/larger, shorter/longer, taller/shorter, warmer/colder in mand and tact functions as generative function (Speckman, 2005)
	* Generative tense usage (Greer & Yuan, 2004)
	* "Wh" questions in mand and tact function (i.e., what, who, why, where, when, which) (Pistoljevic & Greer, 2006)
	* Expansion of tact repertoires resulting in greater "spontaneous" speech (Pistoljevic & Greer, 2006; Schauffler & Greer, 2006)
	* Speaker Listener Exchanges with Others: Does the Child Have These Capabilities?
	* Sequelics as speaker (Becker, 1989)
	* Sequelics as listener-speaker (Becker, 1989; Donley & Greer, 1993)
	* Conversational units (reciprocal speaker and listener control) (Donley & Greer, 1993)
Speaker as Own Listener	* Basic naming from the speaker perspective (learns tact and has listener response) (Fiorile & Greer, 2006; Horne & Lowe, 1996)
	* Observational naming from the speaker perspective (hears others learn tact and has tact) (Fiorile & Greer, 2006; Greer, et al., 2004b)
	* Verbal governance of own speaker responses (say and do correspondence as extension of listener literacy for correspondence for what others say and nonverbal correspondence that is reinforced) (Rosales-Ruiz & Baer, 1996)
	* Conversational units in self-talk (listener and speaker functions within one's own skin in mutually reinforcing exchanges) (Lodhi & Greer 1989)
Early Reader Reader	* Conditioned reinforcement for observing books (Tsai & Greer, 2006)
	* Textual responses: see word-say word at adequate

	rate improved by prior conditioning of print stimuli as conditioned reinforcement for observing (Tsai & Greer, 2006)
	* Match printed word, spoken word by others and self and printed word, spoken word and picture/object, printed word and picture/action (Park, 2005)
	* Responds as listener to own textual responding (vocal verbalization results in "comprehension" if the verbalizations are in the tact repertoire, e.g., hearing tact occasions match of speech with nonverbal stimuli)
Writer	* Effortless component motor skills of printing or typing (see-write as extension of see-do)
	* Acquisition of joint stimulus control across written and spoken responding (learning one response either vocal or written results in the other) (Greer, Yuan, & Gautreaux, 2005)
	* Writer affects the behavior of a reader for technical functions (mand, tact, autoclitic functions) (Reilly-Lawson & Greer, 2006)
	* Transformation of stimulus function for metaphoric functions (word used metaphorically such as in, "she is sharp as a pin") (Meincke-Mathews, 2005; Meincke, Greer, Keohane & Mariano-Lapidus, 2003)
	* Writes to affect the emotions of a reader for aesthetic functions (mand, tact, autoclitic functions as well as simile and metaphor for prose, poetry, and drama and meter and rhyme scheme for poetry)
Writer as Own Reader	* Is verbally governed by own writing for revision functions (finds discrepancies between what she reads and what she has written, writer and reader in the same skin) (Madho, 1997; Reilly-Lawson & Greer, 2006)
	* Verbally governs a technical audience by reading what is written as would the target audience (editing without assistance from others, acquire listener function of target audience requiring joint stimulus control between the writer and the listener audience) (Reilly-Lawson & Greer, 2006)

	* Verbally governs an aesthetic audience as a function of reading what is written as would the target audience (editing without assistance from others, acquire aesthetic listener function of target audience with tolerance for ambiguity) (Meincke-Mathews, 2005)
Verbal Mediation for Problem Solving	* (Is verbally governed by print to perform simple operations (verbal stimuli control operations) (Marsico, 1998)
	* Is verbally governed by print to learn new stimulus control and multiple step operations (the characterization of the problem is done with precise verbal descriptions). The verbal descriptions occasion other verbal behavior that can in turn direct the action of the person to solve the particular problem (Keohane & Greer, 2005). A particular verbal community, or discipline, is based on verbal expertise tied to the environment and modes of inquiry are made possible.

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