# Teaching with a Self-Determination Focus Using Constant Time Delay with Least to Most Prompting

# Gina L. Ciani

# Lehigh University

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# Dr. Starosta

# Abstract

Self-determination skills are vital to creating meaningful learning for students. The present study taught two skills (name identification and a toy exchange routine) to a first-grade student with developmental delays in the context of self-determination using constant time delay with least to most prompting. Generalization probes and embedded learning were included to achieve maintenance of the skills across a variety of settings. Although skills were not learned to mastery, data suggest that learning was effective and would likely lead to mastery with more training. Generalization was effective in most of the probes. Despite study limitations, the student had a high level of impending success with the target skills.

# Teaching with a Self-Determination Focus Using Constant Time Delay with Least to Most Prompting

Modern special education practices focus on using effective teaching methods to help students acquire personalized objectives towards concrete goals that lead to meaningful outcomes. In order to succeed in this mission, teachers must focus not only on functional student needs, but academic skills and student preferences as well. Ford, Davern, and Schnorr (2001) suggested that teachers do this by: (1) giving priority focus to foundational skill development, (2) creating an individualized curriculum and instruction plan, (3) respecting students’ educational community membership when planning for schedules and locations, (4) providing opportunities for success, and (5) attending to students’ quality of life (QOL) in both an immediate and long-term sense. Although this appears challenging, developing a student-focused plan for education is necessary to provide the best learning experience with the most meaningful outcomes for each student. Furthermore, by using Ford and colleges’ approach, teachers can carefully consider student needs and interests in a systematic way that will provide for meaningful outcomes one learning objective at a time.

Possibly the most meaningful focus of a person-centered educational plan, self-determination (SD) skills are at the core of a student’s ability to communicate interests and needs in a way that will increase their quality of life in an independently established manner. Nota, Ferrari, Soressi, and Wehmeyer (2007) looked at 141 individuals with intellectual disabilities (ID) residing in Italy to investigate relationships between social settings, intelligence quota (IQ), SD skills and QOL. Their findings suggested that both IQ and SD contribute to identification in groups with either a high or low QOL life, where high IQ and high SD are correlated with the high QOL group membership. Furthermore, their findings showed that although IQ and SD were positively correlated, SD was also correlated with more social living arrangements (i.e. group home versus institutionalization) independent of IQ. This suggested that SD may be increased despite IQ and lead to an increase QOL for individuals with ID.

The importance of working to increase SD skills for students with severe disabilities is backed by the voices of the students (Shogren & Broussard, 2011). When 17 students with ID were questioned about SD skills, the students reaffirmed that these skills were important to them and their QOL. The researchers summarized the students’ definition of SD as, “being able to make choices and be in control of one’s life and setting as well as being able to work towards goals and engage in advocacy” (Shogren & Broussard, 2011, p. 86). Two main themes that came out of these interviews included choice making and accessing environmental opportunities. In detail, students with ID were particularly interested in the SD skills involved in making more choices that were more meaningful to their particular lives and interests, and students were interested in using the skills to actively participate in their own life by setting and working towards their own goals through an environment with which they could personally engage. Understanding these key interests and following the advice to listen to those you are supporting put forth in “A Credo for Support” (Kunc & Van der Klift, 2006), one must aim to teach the SD skills needed to enhance choice-making and environmental opportunity access.

Choice making skills are well researched in the literature regarding those with severe disabilities (Bambara, Koger, Katzer, & Davenport, 1995; Brown, Belz, Corsi, & Wenig, 1993; Cooper & Browder, 1998; Katz & Assor, 2007; Wood, Fowler, Uphold, & Test, 2005). In a review of the SD skills literature, Wood and colleges (2005) found that more than half of the studies appearing in peer reviewed journals using an empirical approach to study the efficacy of SD skill instruction focused on choice-making skills, and that all of those articles found increased choice making was correlated with increased levels of SD. In these studies, all instances used systematic instruction methods while most used time delay and least-to-most prompting in conjunction with this strategy. While the link between SD and choice-making was clearly established in this review, Katz and Assor (2007) established that only some kinds of choices are motivating for students. The authors suggested only choices that are aligned with students’ needs for, “autonomy, competence, and relatedness” (Katz & Assor, 2007, p. 429) will motivate the child to learn. In other words, choices must allow for student independence, learning opportunities, and meaningful relevance to the particular individual in order to allow for reinforcement of the skill. When applied to students with severe disabilities, this indicates that choices must meet these qualities to be inherently reinforcing for the choice-making skills and ultimately learning of SD skills. These findings are similar to those of Brown, Belz, Corsi, and Wenig (1993) who noted that choices must be diverse and include all kinds of choices such as within activities, between activities, refusals, participant determinations, location determinations, time determinations, and terminations in order to approach those typical of an individual without disabilities (p. 320). Together, the considerations of these two papers provide evidence that choices must be diverse and meaningful to the individual in order to provide for realistic learning that will result in increased SD.

Even with choice established, SD is multifaceted and requires other foci for instruction such as those that encourage access to environmental opportunities. Problem solving skills allow for individuals to interact with their environment using SD skills despite both minor and major challenges that might occur (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). Cote, Pierce, Higgins, Miler, Tandy, and Sparks (2010) taught four students with ID to use a self-regulated problem solving procedure where they identified a problem, how it could be fixed (at least two ways), chose the best fix, and why that method would work for problem situations as they encountered them. The students were successful with this method and showed success in generalization and retention probes as well. This suggests that students with disabilities are capable of learning and applying problem solving skills.

With the ability to learn problem solving skills, students with severe disabilities may have more control over accessing various environmental opportunities. Dattilo and Rusch (2012) suggested that students can use problem solving skills to promote leisure engagement in a variety of settings such as the home, school, family interactions, and peer interactions. One method the authors suggested for promoting this kind of problem solving is by embedding problem solving learning opportunities as generalization strategies across various learning objectives. With problem solving instruction included as a generalization strategy, students can use SD skills even when challenges arise, as they inevitably will. For example, when one uses the restroom sink a dispenser might be out of soap. In this instance, one would typically continue with the rest of the routine or check another soap dispenser. This decision is a problem solving technique that would be part of a generalization for hand washing in public restrooms, which allows for independence only for those understanding the problem solving skills required.

An important consideration for allowing for the highest level of problem solving and related opportunity access is literacy. Many solutions for simple problems found in daily life can be solved by reading text in one’s environment. As such, academic skills for literacy are important for ensuring SD skills can be used to their fullest potential. McNair (2004) noted that one of the earliest literacy skills exists in name writing, spelling, and identification. The author went on to describe that name skills included letter name and sound identification, concepts of print, sound clustering, and environmental print recognition—all vital pre-literacy skills. In fact, many children’s first recognizable printed word is their own name and this leads to their understanding of the concept of a word (High/Scope Educational Research Foundation, 2005). These literacy firsts eventually develop the pillars of literacy for students from alphabetic principals to phonics. With such, an important skill to develop SD related to environmental control exists in name recognition and production skills.

With a large amount of learning tasks associated with acquisition of vital SD skills, teachers must determine effective means for teaching these skills. Constant time delay (CTD) is an effective method for teaching both discrete skills and chained tasks (Dogoe & Banda, 2009; Hudson, Browder, & Wood, 2013; Odluyurt, 2011; Riesen, McDonnell, Johnson, Polychronis, & Jameson, 2003). Hudson, Browder, and Wood (2013) showed that across a wide range of instructional contexts, embedded CTD was an effective means for teaching students with severe disabilities new skills. Furthermore, their review displayed that by using a system of least prompts (also referred to as least to most (LtM) prompting), CTD methods were even more effective across contexts.

Similarly, Dogoe and Banda (2009) found that CTD was effective for both skill acquisition and maintenance in all subjects receiving a full cycle of CTD instruction across 12 studies involving chained task instruction. In their research, they searched two databases for all studies between 1996 and 2006 appearing in peer reviewed journals that concerned both CTD and at least one student with ID. This resulted in a population of 56 students receiving CTD interventions in high school or elementary school to learn behaviors such as food preparation and acquisition, leisure skills, and vocational skills. This compilation displayed all but one study using a zero second delay learning phase, and all studies teaching with a CTD between two and five seconds. Students were prompted with either physical, verbal, gestural, or modeling levels of prompting in different combinations and reinforced in a variety of ways. In 10 of the studies the CTD worked for all students (even without the full cycle of phases), and those studies without 100% mastery were only due to losses in participants. In the eight studies that looked at generalization and maintenance of the learned skills, all reported maintenance of learned skills and most reported generalization of the skill to outside environments (however, particular generalization teaching was often included as well). Moreover, in the one study that investigated social validity using CTD, professionals and family members of the students described high levels of validity and un-intrusiveness of the instruction. Undoubtedly, this meta-review revealed convincing evidence that CTD is effective for many individuals with special needs in a broad manner.

In one study, four students with ID in a general education elementary classroom were taught vocabulary words similar to those of their non-disabled peers using either CTD with LtM prompting or simultaneous prompting (Riesen, McDonnell, Johnson, Polychronis, & Jameson, 2003). Students in the CTD group learned vocabulary words first with a zero-time delay training session and then with a three second time delay using LtM prompting beginning with no prompt, then a gesture, then a verbal prompt, and finally modeling. The simultaneous prompting group was presented with the words and made to repeat the word and definition after the teacher during training and simply presented with words and asked to read or define each during test probes. Results revealed that all students achieved mastery, displaying efficacy of both approaches. Two students of the four excelled more quickly using the CTD procedure despite being new to the general education setting. These results indicated that individual results for efficiency of the learning paradigms vary, but CTD with LtM prompting was effective for acquiring skill mastery of academic skills in a natural setting. Clearly, CTD is an effective method for instruction for students with severe disabilities.

When applied to preschool students with developmental disabilities, CTD was effective for teaching a clothes naming task (Odleyurt, 2011). In the study, three preschool-aged students with various developmental disabilities were instructed using CTD to name different types of clothing. After 24, 26, and 27 sessions of CTD instruction and testing, the students were able to name the clothing types with 100% accuracy. Undoubtedly, CTD was effective for teaching the clothing type names, a discrete naming task, to the children in this study.

With an understanding that CTD is an effective means for instruction of a variety of skills, including those necessary for SD, the purpose of the current study was to teach and evaluate instruction of two separate skills related to increased SD in a first grade student attending an extended school year (ESY) program. These skills were a toy swapping routine allowing for embedded choice and problem solving opportunities and a name identification task which would work towards developing pre-literacy skills. These skills were taught using CTD and LtM prompting in an environment which was as natural as possible under the circumstances of the ESY program.

# **Methods**

**Participant**

# The participant, Lily (pseudonym), was an adorable girl with an engaging personality and a perfect amount of sass diagnosed with developmental delays and being evaluated for an Autistic Spectrum Disorder (ASD). At the time of the intervention, Lily was first grade aged, but worked at a pre-school/ kindergarten level with goals such as discerning circles and squares; identifying colors, numbers one through five, and her name; and using letter cards to spell her name. During the present instruction, Lily participated in an ESY program in an Eastern Pennsylvania middle school that runs for four weeks in July. She worked in a physical support classroom with peers from kindergarten to fifth grade ages progressing towards goals from pre-kindergarten through third grade level.

# In a typical day, students arrived and were assisted off busses and to the classroom by teachers. They came in and completed a morning activity and then began independent work on a selection of toys specifically selected to help the students practice items relevant to their individualized education plan (IEP) goals. During this time, teachers circulated first to allow time for changing or bathroom breaks, and next to provide one-on-one instruction of specific IEP goals and collect respective data. After this time, various activities occurred including operational therapy (OT), physical therapy (PT), speech therapy (ST), art projects, cooking projects, or other special activities. Finally, the students participated in a classroom activity for the week (usually a craft) and then packed up to go home. The students were assisted to the pickup area and onto the busses when leaving.

# Although Lily did not use any specific supports, she had toys that meet her IEP goals available in the play area such as colored items to sort, number puzzles, and shape puzzles. Some of these toys reflected her particular interests in cars and funny items such as a fire truck puzzle, transportation sorting toys, and wooden screws with bolts (which she found funny). Lily was also interested in foods and snacks, stickers, and drawing. Lily excelled at cleaning up after all kinds of activities, mobility, physical social interaction skills, many basic life skills, and her strong will. She continued to grow in areas such as verbalization, academic skills, focus, and staying seated during class. She was working on potty training although she still used a diaper, but clothed and fed herself very well. Lily did most tasks with verbal prompting (sometimes multiple prompts were needed) and responded very well to instruction when she was allowed time for play breaks to refocus on the academic learning. Although Lily’s lack of focus from time to time was a challenge, she was motivated to work hard and completed tasks with up to hand-over-hand prompting when she was focused. She wandered around the classroom on occasion, but returned to her seat with some verbal prompting or gesturing. Furthermore, Lily’s clarity when talking was improving, and as she continued to echo words from instructors she became easier to understand with each learning opportunity.

**Target Skills**

# **Name identification.** The name identification skill is aligned to Lily’s IEP where she identifies her name from a matrix of three names of classmates. Before the intervention, this goal was currently un-embedded and out of context. In an effort to place the goal in a meaningful context, Lily was presented with the same task using contextual items. Lily selected her name from three baggies labeled with student names and filled with a reward (usually stickers) or took her collection of rewards and placed them in a “mailbox” labeled with her name from an array of three boxes. Before the intervention, Lily could sometimes identify her name and on rare occurrences did so with high levels of accuracy. Lily appeared to have trouble with variations in the task and with maintaining focus on tasks associated with literacy. This task had a frequent reinforcement schedule to help maintain focus so that literacy, rather than attention, could be better evaluated.

# Although this skill is independently irrelevant with a non-meaningful outcome, the long-term effects of this skill provided for important, meaningful outcomes. First, the skill would be very relevant in an inclusive classroom placement as student often are required to place items in a labeled cubby or gather supplies from a labeled desk. In this situation, the name identification skill would provide the opportunity for Lily to complete these tasks more independently with a higher level of SD. Second, name skills are an important element of pre-literacy (High/Scope Educational Research Foundation, 2005: McNair, 2004). Third, name identification may be relevant in Lily’s future as an independent citizen when getting her mail from a group mailbox or sorting mail in an employment placement. Undoubtedly, this skill’s surface insignificance is disintegrated when long-term outcomes are considered.

# **Toy exchange procedure.** In an effort to increase Lily’s current level of SD skills through increased choice opportunities and opportunities for problem solving instruction, a toy exchanging task was chosen as an instructional goal for Lily that could be seamlessly embedded into her daily school routine. Although this task was only relevant to her current placement, the underlying skills involved a pattern that may be present in future classroom routines (returning an item, getting a new one, and returning to her desk). Furthermore, the skill gave Lily practice making choices in a school context and provided opportunities to teach problem solving skills in a natural setting through generalization trials. With these important elements of SD, Lily could increase participation in preferred tasks and display preferences to teachers and staff that could be used in future IEP planning.

In the toy exchange task, Lily cleaned up her current toy, returned it to the toy area, selected a new toy, brought the toy to her desk, sat at her desk, and began playing. Before the intervention, Lily was able to do each of these steps independently at some point, but rarely progressed through all the steps without teacher prompting. By acquiring the ability to progress through these steps independent of prompting, Lily could make new toy choices without assistance and increase her SD regarding play choices, how long to play with different toys, when to terminate play, the order of the toys she played with, and refusals for specific toy types. Furthermore, Lily could be challenged with changes to toy locations, other students using preferred toys, or sitting in a new location for the day to help develop relevant problem solving skills related to the specific task as well as typical social sharing and equipment acquisition activities.

**Setting and Materials**

All data collection and instruction was conducted in the physical support classroom at the ESY program that Lily attended. Data was collected no more than one day per week and was collected so that the participant and her peers could not see that data. The classroom was maintained at a comfortable temperature with constant clear lighting that was typical of a normal classroom setting.

Student desks were arranged in a U-shape with spaces between each facing a center table in which the toys were stored beneath. Lily typically sat at a desk that faced the toys near the bottom of the U-shape, but sat at a desk on the left side of the U-shape for some trials which occurred on the second day of data collection. She moved to this location after a restroom break and the seat change was maintained in order to provide for generalization opportunities. During generalization probes for the toy exchange task, the toys were moved to behind the U-shaped seating arrangement for the first probe and to the window ledge (to the left of the U) for the second probe. Lily sat at the same desk for sessions of the name identification task, but got up from her chair to put the rewards in her mailbox (along the window ledge) during the generalization session.

Materials for the toy exchange task included two toy boxes which held all of the toys, 14 toy options that were available to all the students, and the student’s desk. The name identification task used the following materials: 12 bags with the student’s names on them (one side in a computer print, one side in handwriting print) filled with various stickers as reinforcers (used three at a time always inclusive of Lily’s name), three mailboxes with student names along the window sill including Lily’s name and those of two of her classmates, and the sticker rewards that were in the bags and ultimately placed in the mailboxes. The adaptation of the name bags rather than cards as put forth in Lily’s IEP was aimed at making the task more natural and more motivating by including the reinforcers where Lily could see them. In addition, four teachers were available in the classroom to help support Lily with tasks as needed. All teachers were instructed to follow the procedures set forth in this paper when working with Lily on the target tasks.

**Procedures**

 **Baseline.** All baseline observations were made with an effort to exclude opportunities for teaching. The name identification task baseline data was collected in three sessions of five trials each. During each trial the experimenter presented Lily with three bags containing the same reward and using the same font for her name and two other student’s names. The experimenter prompted Lily to pick the bag that said, “Lily,” and waited 5 seconds or until a response was made. After 5 seconds, the experimenter repeated the prompt and waited another 5 seconds or until the response was made. Once a response was made or two 5 second periods occurred, a correct or incorrect response was recorded for that trial. A correct response was made if Lily touched that bag with “Lily” printed on it. An incorrect response was made if Lily touched a different bag or did not make a response. During the baseline period, Lily was not given any of the reinforcers contained in the bags in order to discourage instruction during this phase.

The toy exchange procedure was initiated by prompting Lily to get a new toy or watching her make a toy exchange as it naturally occurred. The experimenter marked each of the six parts of the TA (see Figure 1) as correct (+) or incorrect (-) on the task analysis data collection sheet. A correct response was recorded when Lily independently performed that part of the task with no prompts or assistance. An incorrect response was recorded when Lily skipped a part of the TA or required a prompt/assistance to complete a part of that TA. Prompts were given to the student in a least to most fashion to encourage Lily to move on to the next step of the task as needed, but were aimed to be as non-instructive as possible. The toy exchange was conducted as a single TA with three baseline sessions/opportunities. For both tasks (toy exchange and name identification) no positive or negative feedback was given to the student to indicate correct or incorrect responses. Instead, neutral feedback thanking the student for working with the experimenter was given at the end of each session.

 **Intervention.** During the intervention phases, data was collected no more than one day per week. The name identification task began with one session of five trials of a zero-time delay instructional phase where the initial prompt, “Pick the bag that says, Lily” was given and then hand-over-hand (HoH) prompting was immediately used to help Lily place her hand on that bag that read, Lily. This was followed by seven sessions of five trials in the same format as baseline where the initial prompt was given, the experimenter waited 5 seconds to give a reminder prompt, “Touch the bag that says, Lily,” and if a response did not occur after 5 additional seconds, the experimenter used HoH prompting to make Lily’s correct response. This procedure is referred to as the normal name identification procedure henceforth, and was repeated for sessions 9 through 15. After the seventh and fifteenth sessions, an instructional decision was made as how to continue or discontinue instruction according to the decision criterion in Browder (1997). On trials 8 and 16, generalization probes were administered as described below. Reinforcement was given after every five correct responses during sessions 1-8 and increased to after every two correct responses due to instructional decision for sessions 9-16. The name identification task was taught in a one-on-one teaching format with the experimenter and the student working together for no more than seven sessions of five trials per day. The student was considered to achieve mastery when she was able to produce an independent correct response at a rate of 100% for five consecutive sessions.

 The toy exchange task occurred naturally and in a teaching format when toy swaps were not naturally occurring enough for meaningful data collection. When toy exchanges did not occur naturally, the experimenter prompted the student by suggesting that she switch toys now (to which she always responded). Natural opportunities and prompted trials were used to elicit up to eight toy exchanges per day. The task analysis was taught using total task learning where the student was praised for each correct response rather than requiring mastery at one step to move to the others. The task analysis included the following six steps: (1) clean up current toy, (2) return toy to toy box, (3) select a new toy, (4) bring new toy to desk, (5) sit at desk, and (6) begin play. The student did not need to complete one step to succeed with a subsequent step. Prompting was administered in a LtM format where no prompting was the only method of achieving a correct response. Prompting progressed in the following order: gesture, verbal, modeling, HoH. Similar to that of the name identification task, sessions 1-7 and 9-15 were typical while sessions eight and sixteen were generalization probes. The student was considered to achieve mastery when she was able to complete the task with independent correct responses at a rate of 83% (5/6 independent correct responses) for five consecutive opportunities.

 **Generalization**

 The goal of the generalization probes for both tasks was that Lily could perform these tasks in a variety of contexts even when elements of the tasks differed in some way. The name identification task had three levels of generalization built into the learning paradigm including training sufficient exemplars, training sufficient responses, and intermittent reinforcement. Sufficient exemplars were produced by variations in the font used for the names. The baggies had Arial print on one side and a hand written print on the other which was randomly chosen by which side of the bag faced up for each trial. During generalization probes, a third font, Times New Roman, was presented on the mailboxes to train an additional exemplar. Training of response variations was presented by having Lily bring her rewards to her mailbox. In this trial and handful of rewards was passed to Lily five times to place in her mailbox. These trials were not conducted in a tight sequence but occurred whenever she had a handful of rewards available. They were recorded as sessions 8 and 16, but occurred at various points during sessions 1-7 and 9-15, respectively. Mailbox labels were shuffled and contents were not visible so that no location or visual confounds were present. Intermittent reinforcement was produced artificially by rewarding Lily after two to five correct responses (based on session number). Lily was not yet able to master numerical concepts so by reinforcing her after only a set amount of correct responses, Lily was unsure when reinforcement would occur. This is conducive to generalization because it reflects a more natural reinforcement schedule that is typical of real-world conditions (Westing & Fox, 2004).

 Generalization foci for the toy exchange task included training sufficient exemplars, using natural cues, and self mediation instruction. Sufficient exemplars were included through the use of various toys and movement of the student’s seat during trials on the second day, as well as movement of the toy bin during generalization probes. Natural cues were used in steps two through six of the task analysis. The student was cued to return the toy by her cleared desk, to get a new toy by returning the previous toy, to bring the toy to her desk by requiring a play space, to sit at her desk by having the toy on her desk, and to begin playing with the toy by sitting at her desk with the new toy on it. Furthermore, many of these steps were naturally reinforcing due to allowing for choice and acquisition of a new toy. Finally, self mediation was included by teaching problem solving skills when opportunities arose. When the toy box was moved for generalization probes (sessions 8 and 16) the student had to figure out where the box was. She was instructed to think about the problem (toy box is missing), think of solutions (look for toy box, ask teacher where toys are), pick the best solution (look for the toy box since teachers are busy), and do that (look for the toy box). The same procedure of problem solving training was commonly used in her classroom during the regular school year, so she was familiar with the steps. This procedure was also available for use when the student’s desk was switched but was not necessary.

 For both tasks’ probes, generalization mastery was considered successful if the percent of correct responses for that session was greater than or equal to the mean of the previous seven data collection sessions.

**Measurement**

 The percent of correct responses were graphed using a broken line graph to show changes in behavior between baseline and intervention phases. The zero time delay instructional phase used in the name identification task was not graphed as it served only to make sure the student fully understood what she was expected to do during that task, and because she did not have an opportunity to make a correct response during that session. Graph points of generalization probes were clearly identified as they might not reflect the same data.

For the name identification task, responses were marked as correct when Lily touched the bag that said her name within the first 10 seconds. Responses were marked as incorrect when Lily touched a bag that said another student’s name or if no response was made and the experimenter used the HoH prompting to elicit a response. All responses were collected on the data sheet presented in Figure 2. Each session was calculated as the number of correct responses per five trials in that session to acquire a percentage of correct responses for that respective session.

For the toy exchange task, correct responses could only be made if no prompting was required for completion of that step of the task analysis. Incorrect responses were marked with the highest level of prompting required to complete that step of the task. All responses were collected on the TA data collection sheet presented in Figure 1. Each toy exchange session/opportunity was scored as a percentage of correct response over incorrect responses to acquire a percentage of correct responses for that instance.

**Design**

 The intervention was conducted in an AB design where baseline represents the A or non-instructive portion and intervention represents the B or instructive portion of the data. The name identification task included a teaching phase between A and B where the responding skill was taught using HoH prompting to ensure complete comprehension of the task expectations by the student. Generalization probes occurred during the B portion of the design, but are not included in overall data analyses. Instructional decisions were made after the sixth and fifteenth trials for each skill and excluded the generalization probes on sessions seven and sixteen. Data was considered according to Browder’s (1997) specification to determine if instruction was working and should continue, instruction was not working and should be re-considered, if there was a motivation problem, or if the student had mastered the skill.

**Results**

**Name Identification**

 During baseline, Lily had a mean of 40% correct responses on the name identification task with no particular error pattern. In the first seven sessions, Lily produced a mean of 34% correct responses (a lower mean than baseline) with a positive trend in the data indicating that there might be a motivation problem according to Browder’s rules for data decisions (1997). At this point, reinforcement was increased from after five correct responses to after every two correct responses to increase motivation. In sessions 9 through 15 (trials 8 and 16 were generalization probes), correct responses occurred at a mean rate of 57% (greater than a 5% increase from baseline and the previous seven sessions) with a steep positive trend and no error patterns. This indicated adequate process, although the student did not yet achieve skill mastery of 100% correct responses over five consecutive sessions. This data set indicated that instruction should be continued in the same style. Generalization probes revealed successful generalization of the name identification task with 40% correct responses after the first set of seven trials ($\overbar{x}$ = 34%), and 60% correct responses after the second set of seven trials ($\overbar{x}$ = 57%); both probes having means higher than the previous set of trials. Data and graphical representations are presented in *Figure 3*.

**Toy Swap Procedure**

 During baseline, Lily displayed a mean of 33% correct responses with an error pattern on the toy return and new toy selection steps of the TA. In the first seven sessions, Lily produced a mean of 71% correct responses (a higher than 5% increase in mean from baseline) with a positive trend in the data and no error patterns indicating adequate progress with no changes necessary in the teaching paradigm according to Browder’s rules for data decisions (1997). During trials 9 through 15 (8 and 16 were generalization probes), correct responses occurred at a mean rate of 76% (greater than a 5% increase from baseline and the previous seven sessions) with a slightly positive trend. An error pattern was seen in the sitting down step of the TA. This indicated adequate progress with a possible need for extra help with the sitting down step. As the student did not yet achieve skill mastery of 83% correct responses over five consecutive sessions, the data indicated continued instruction. Generalization probes revealed successful generalization of the toy exchange task after the first set of seven trials ($\overbar{x}$ = 71%), with 83% correct responses, but unsuccessful generalization after the second set of seven trials ($\overbar{x}$ = 76%) with 67% correct responses. Data and graphical representations are presented in *Figure 4*.

**Discussion**

 Although Lily did not achieve mastery of either task, data indicate effective learning of both tasks that would likely produce mastery with more learning opportunities. On both the name identification task and toy exchange task, Browder’s rules for decision making indicated adequate process during the last seven sessions (1997). With this, instruction should continue with no changes. Hypothetically, this continued already effective, CTD instruction would produce effective learning that would lead to mastery of each skill as was seen in the CTD studies reviewed by Dogoe and Banda (2009). Even with the error pattern seen in Lily’s sitting down step of the toy exchange task, continued instruction would allow for many more opportunities for success and learning. This error pattern might be related to some of Lily’s challenges when focus are concerned and be more related to distraction than toy exchange task errors.

 Efficacy in the name identification task seemed highly related to motivation due to the drastic increase in performance after the reinforcement frequency was increased. When Lily received frequent reinforcement her motivation to stay on task and focus on making a correct response increased, leading to a higher percentage of correct responses per session. This increase in extrinsic motivation as a result of increased reinforcement frequency is consistent with research additionally suggesting little to no detrimental effects on intrinsic motivation as a result of frequent token reinforcement (Cameron, & Pierce, 1994). Undoubtedly, Lily was much more successful with this beginning literacy task when motivation was considered as an important modifier.

 Similarly, Lily’s learning of the toy exchange task was quite effective. The drastic change in correct responses between baseline and the first seven sessions indicated that the combination of LtM prompting with CTD was very effective for instructing Lily. Furthermore, Lily had little challenges with regard to focus and motivation on this task as indicated by the positive trend and increasing means seen in the data. In this task, the inherent motivation SD and toy acquisition appeared sufficient to sustain Lily’s motivation to learn the task. This task might have been more quickly learned due to the built-in, natural reinforcers (Hineline, & Morris, 1992) as well as it’s alignment to SD skills (Brooks, & Young, 2011). Moreover, Lily’s strong personality aligned with choice making skills might have led to a higher likeliness of success for Lily in this task. Nonetheless, Lily’s quick success with the toy exchange task supported research naming CTD and embedded SD skill instruction as effective learning paradigms (Brooks & Young, 2011; Dogoe & Banda, 2009).

 Unfortunately, the present case suffers from some limitation in addition to its strengths. First, the intervention only occurred in one student. With this, results cannot be generalized to the larger population and might only be relevant to Lily. Second, the learning occurred in a classroom environment only and may not generalize to natural settings such as the home and community. Although efforts were made to increase generalization through embedded exemplars and probes, a lack of real-world implementation and practice limit the extent of the results to the natural world. Third, a lack of time resulted in non-achievement of mastery levels for each task. As such, it is impossible to know for certain whether mastery of each skill would occur although results indicate success was likely.

 In a reproduction of this study, multiple students should be exposed to similar learning paradigms to extend the reach of the results’ implications. Furthermore, more than one experimenter should be involved in order to provide for inter-observer reliability trials where more than one person could confirm adherence to the operational definitions for correct and incorrect responses. Plenty of time should be allotted to the instruction so that mastery is possible for all students involved and a proper analysis of instructional time to mastery could be conducted. Perhaps, experimental conditions could be included to see if this paradigm is more or less effective than others. Finally, generalization probes should be included for real world skill implementations—perhaps inclusion of opportunities for community-based instruction. With these elements, the study could be more effective and yield much more useful results that could further the knowledge base regarding LtM prompting when combined the CTD for both discrete and chained tasks.

 Lily’s successful learning as seen in the present study is undeniably indicative of the power of embedded SD skill learning when used with CTD and LtM prompting. Despite a short period of intervention for instruction, Lily approached mastery on both skills quickly. The probable efficiency and efficacy of the given learning paradigms is clear and needs further investigation to enhance the research body concerning these approaches to instruction for student with special needs. With more research, the present paradigm may shift teaching practices towards an embedded SD focus that uses effective teaching methods to increase student QOL.

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# **Appendix A**SYSTEMATIC INSTRUCTIONAL PLAN

**General Information:**

Name: Lily Date: July 2013

Target Skill: Name Identification Chained Task \_\_ Routine \_\_ Discrete Skill x .

**Instructional Objective:**Condition: Given a set of three labeled items with Lily’s name and those of classmates

Behavior: Lily will choose the item labeled with her name by independently touching or pointing

Criterion (last phase):with 100% accuracy for 5 consecutive sessions.

PA Standard (if applicable):not applicable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Measurement:**

Graph:  **\_\_**percent correct responses**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Data collected on: \_correct responses\_\_\_\_\_\_\_\_

How often? \_\_5 trials per session with 8 session per week \_\_

Correct Response Definition: ­­­­­­­­­­­ student chooses her name from set of three names\_

**(Mini) Activity Matrix**

|  |  |  |
| --- | --- | --- |
| Activity | InstructionalOpportunities | EnvironmentalArrangements/Adaptations |
| Arrival/Opening | Take bag with opening activity supplies on it, when presented with three sets of labeled supplies. | Put opening activities in bags for target student and have distracter labeled bags available. |
| IEP Goal Work | Work one-on-one with student for many trials. | Put items (ideally reinforcers) in bags with labels. |
| Art/Cooking/Following Directions Practice | Student’s supplies for particular activity could be in labeled bags. | Put activity supplies in bags for target student and have distracter labeled bags available. |
| Departure | Student can get items to bring home out of a mailbox with her name on it. | Set of three student mailboxes labeled with student names. |

**Instructional Phases (Stages):**

|  |  |  |
| --- | --- | --- |
| Phase | General Procedure | Phase Change/Criterion |
| **Baseline**Pre-instructional assessment) | Three bags will be placed in front of the student labeled with names. The teacher will ask the student to pick the bag that says, “Lily.” Bags will be switched around (with other 5 distracters after each trial. | Three sessions of 5 trials. |
| **Phase 1**Instruction | Zero time delay.Three bags will be placed in front of the student labeled with names. The teacher will ask the student to pick the bag that says, “Lily.” Immediately after the command, the teacher will move Lily’s hand to the bag with her name and say, “This bag says Lily.” Bags will be switched around (with other 5 distracters) after each trial. | One session of 5 trials. |
| **Phase 2**Testing/Instruction | 10 second time delay.Three baggies will be placed in front of the student labeled with names. The teacher will ask the student to pick the bag that says, “Lily.” If a correct response is not made within 10 seconds, teacher will move Lily’s hand to the bag with her name and say, “This bag says Lily.” Bags will be switched around (with other 5 distracters) after each trial. | Fourteen sessions of 5 trials or mastery. (Plus 2 sessions of generalization probes after each 7 trials)  |

**Prompting Strategies:**

*Phase 1:*

Initial Cue: Teacher says, “Pick the bag that says Lily.” (Note: this is a repeat of the initial cue to refocus student who often loses focus on discrete tasks)\_\_\_\_\_\_\_\_\_\_\_\_\_

Prompting System: \_zero time delay and hand over hand prompting with verbal prompt\_

 Level 1 ~~Level 2 Level 3 Level 4 Level 5~~

 prompt HOH, Verbal \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_

 examples Teacher moves Lily’s hand to the correct bag and says, “This bag says Lily”, immediately after the cue.

Latency of Prompt(s): \_not applicable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Feedback:

 Correct: \_ not applicable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Error Correction: \_ not applicable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Phase 2:*

Initial Cue: Teacher says, “Pick the bag that says Lily.”\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Prompting System: \_time delay and over hand prompting with verbal prompt\_\_\_\_

 Level 1 Level 2 ~~Level 3 Level 4 Level 5~~

 prompt verbal HOH, Verbal \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_

 examples Lvl 1- Teacher says: “Touch the bag with your name on it, Lily”

Lvl 2- Teacher moves Lily’s hand to the correct bag and says, “This bag says Lily.”

Latency of Prompt(s): \_5 seconds per for each level (10 sec to error)\_\_\_\_\_\_\_\_

Feedback:

 Correct: \_Right, that bag says, “Lily” on it. Good job.\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Error Correction: Try again, Lily. Which one says, “Lily?”\_\_\_\_\_\_\_\_\_\_\_

**Generalization Instructional and Assessment Plan:**

Generalization Goal: *As an outcome of instruction, the student will be able to generalize by:* recognizing her name in different fonts and in different contexts\_\_\_\_\_\_\_\_\_\_

Generalization Strategies Used During Instruction

|  |  |  |
| --- | --- | --- |
| Phase | Strategy Name | How used (describe) |
| Phase 2 | Training sufficient stimulus exemplars | Two different name fonts will be used during non-generalization phases (arial and handwritten) and a third (times new roman) during the generalization probe |
| Generalization Probes | Training sufficient response exemplars | The student will choose her name from mailboxes to put an item into rather than identifying the name on a bag placed on a desk. |
| All Phases | Intermittent Reinforcement | A reinforcing item will be in the named bags. After every 5-10 trials the student will be given the reinforcer to motivate her in an inconsistent manner that is similar to real life (checking a mailbox and only sometimes finding mail). |

Generalization Test (Probe):

Describe how you will test? \_The student will put an item into a mailbox labeled with her name (beside two distracter names). These mailbox labels will be in a novel font (Times New Roman).

When will you test? At the end of each decision set (after every seven Phase 2 trials)

Criterion (expected level of performance) \_Although mastery is set at 100% accuracy, the criterion for generalization set to meet or exceed the mean of the previous six sessions.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# **Appendix B**

SYSTEMATIC INSTRUCTIONAL PLAN

**General Information:**

Name: Lily Date: July 2013

Target Skill: Toy Exchange Chained Task \_x\_ Routine \_\_ Discrete Skill .

**Instructional Objective:**

Condition: Given a selection of toys in a predetermined area

Behavior: Lily will independently complete a six part task analysis to change toys and return to her chair after being told to “pick a new toy”

Criterion (last phase):with 83% accuracy (5/6 independent responses) for 5 consecutive toy exchange opportunities.

PA Standard (if applicable): not applicable\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Measurement:**

Graph:  **\_\_**percent correct responses**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Data collected on: \_correct responses and level of prompting\_\_\_\_\_\_\_\_

How often? \_\_16 sessions as they naturally occur (including 2 generalization probes) or with prompting for up to 8 opportunities a day over 3 once a week observation periods\_\_

Correct Response Definition: ­­­­­­­­­­­ Student completes TA item with no prompting other than initial cue

**(Mini) Activity Matrix**

|  |  |  |
| --- | --- | --- |
| Activity | InstructionalOpportunities | EnvironmentalArrangements/Adaptations |
| Arrival/Opening | Toy play after opening activities | Toys available, movement of toys for generalization probes, prompting to change toys as needed, movement of student desk for generalization; teacher will be available to teach problem solving skill |
| IEP Goal Work | Toy play between one-on-one sessions | Toys available, movement of toys for generalization probes, prompting to change toys as needed, movement of student desk for generalization; teacher will be available to teach problem solving skill |
| Art/Cooking/Following Directions Practice | Toy play during down time as occurs | Toys available, movement of toys for generalization probes, prompting to change toys as needed, movement of student desk for generalization; teacher will be available to teach problem solving skill |
| Departure | Toy play when waiting for busses | Toys available, movement of toys for generalization probes, prompting to change toys as needed, movement of student desk for generalization; teacher will be available to teach problem solving skill |

**Instructional Phases (Stages):**

|  |  |  |
| --- | --- | --- |
| Phase | General Procedure | Phase Change/Criterion |
| **Baseline**Pre-instructional assessment) | Teacher will cue Lily to put away the toy she is using and get a new toy and record independent responses as correct and non-independent responses as incorrect in task analysis. | Three sessions. |
| **Phase 1**Instruction | Teacher will use least to most prompting to guide Lily through each step of the task analysis. | Although instructional decisions will be made to guide instruction, this phase ends with mastery. |

**Prompting Strategies:**

*Phase 1:*

Initial Cue: \_Teacher says: Let’s switch toys now, Lily.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Prompting System: \_\_Least to most\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Level 1 Level 2 Level 3 Level 4 ~~Level 5~~

 prompt gesture verbal model hand on hand

Level 1 – point at toy bin or chair at appropriate part of task analysis

Level 2 – teacher says, “Go bring the toy to your desk, Lily”

Level 3 – teacher will act out sitting in the desk to show Lily what to do her desk

Level 4 – teacher will moved Lily through performing that step

Latency of Prompt(s): \_30 seconds\_(long due to student’s focus challenges)\_\_\_\_\_\_\_\_\_\_

Feedback:

 Correct: \_Teacher says, “Great job, *doing this part of the task*, Lily”\_\_\_\_\_\_

 Error Correction: continue to next prompt level

**Generalization Instructional and Assessment Plan:**

Generalization Goal: *As an outcome of instruction, the student will be able to generalize by: putting away/selecting different kinds of toys and returning them to different areas of the room even when the student’s work location or toy location have changed.*\_\_\_\_\_

Generalization Strategies Used During Instruction

|  |  |  |
| --- | --- | --- |
| Phase | Strategy Name | How used (describe) |
| Phase 1 | Train sufficient exemplars | Many different toys will be used during this task analysis |
| All Phases | Natural Cues | Cues for steps 2-6 of the task analysis are natural and should continue to maintain behaviors in different environment. |
| Phase 1 and Generalization Probes | Self mediation | During phase 1 the student’s work area will be moved at random throughout the trials, so she will need to learn how to locate the toy basket from her location and return to the same work location where ever that may be. Explicit instructions may be given to help the student with this task after trials with less than 50% accuracy. During generalization probes, the toy basket will be moved to a new location and the student need to locate the bin using the same self-mediation skills that she used with respect to her desk location. |

Generalization Test (Probe):

Describe how you will test? \_The toy bin will be moved for two sessions at the end of testing and the student will need to locate it to return her toys and get a new one\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 When will you test? \_after the end of Phase 1\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Criterion (expected level of performance) \_ Although mastery is set at 83% accuracy, the criterion for generalization set to meet or exceed the mean of the previous fourteen sessions.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# **Figures**

Target Skill: Toy Exchange Mastery: 83% (5/6) for 5 consecutive opportunities

|  |  |  |
| --- | --- | --- |
| Task Analysis | Cue | Date |
|  |  | 7/10/13 | 7/18/13 | 7/24/2013 |
|  |  | Baseline | Phase 1 |
|  |  | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 6. Begin play | Student sees toy at desk and other students are doing the same |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. Sit at desk | Toy is at desk, and other students sitting |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Bring toy to desk | Student needs a place to play with toy |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Select new toy  | Student is at the bin and toy is put back |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Return to bin | Toy is cleaned up and student needs a new toy |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Clean up current toy | Done with toy or teacher prompt: “Let’s switch toys now, Lily.” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | % Independent/Correct |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

 = Generalization Probe

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date of Decision | Data Period | Trend/Mean | Error Analysis | Instructional Decision |
| 7/10/2013 | Baseline |  |  |  |
| 7/18/2013 | Op 1-6 |  |  |  |
| 7/24/2013 | Op 7-14 |  |  |  |

G = Gesture Prompt

V= Verbal Prompt

M = Model Prompt

H = Hand Over Hand Prompt

- = Incorrect Response

+ = Correct Response

 Note: Generalization sessions are not included in decision data.

*Figure 1.* Task Analysis Data Sheet

Target Skill: Identify Name Mastery: 100% over 5 consecutive sessions

|  |  |  |
| --- | --- | --- |
| Target | Cue | Date |
|  |  | 7/10/13 | 7/18/13 | 7/24/13 |
|  |  | Baseline | P1 | Phase 2 |
|  |  | 1 | 2 | 3 | 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| Point/Touch Your Name | “Which one says, “Lily” ?” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Point/Touch Your Name | “Which one says, “Lily” ?” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Point/Touch Your Name | “Which one says, “Lily” ?” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Point/Touch Your Name | “Which one says, “Lily” ?” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Point/Touch Your Name | “Which one says, “Lily” ?” |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | % Independent/Correct |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*Figure 2.* Discrete Skill Data Sheet

 = Generalization Probe

V= Verbal Prompt

H = Hand Over Hand Prompt

- = Incorrect Response

+ = Correct Response

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date of Decision | Data Period | Trend/Mean | Error Analysis | Instructional Decision |
| 7/10/2013 | Baseline |  |  |  |
| 7/18/2013 | Op 1-7 |  |  |  |
| 7/24/2013 | Op 9-15 |  |  |  |

Note: Generalization sessions are not included in decision data.

**

Phase change

Instructional Decision

Sessions

 Baseline (7/10/13) Intervention 1-7 (7/18/2013) Intervention 8-16 (7/24/2013)



*Figure 3.* Name identification task data and graph



Sessions

Phase change

Instructional Decision

Baseline (7/10/13) Intervention 1-7 (7/18/2013) Intervention 8-16 (7/24/2013)



*Figure 4.* Toy exchange task data and graph