Meghan Harris
Gonzaga University

TF McLaughlin,
Gonzaga University

K Mark Derby
Gonzaga University

Alison Clark
West Valley Public Schools
Spokane Valley, WA

Using DI Flashcards with and Without a Prompt to Increase Social Questions for a Preschool Student with Autism with Measures of Generalization across School Personnel

Meghan Harris, TF McLaughlin, K Mark Derby, Alison Clark

Abstract
The main purpose of this study was to evaluate the effectiveness of the use of Direct Instruction (DI) flashcards to teach a student to answer age appropriate social questions in a preschool setting with a single child who had developmental delays and a suspected diagnosis of Autism. Data were collected during individual instruction time at the end of the preschool day. The behavior measured was the student's ability to independently and accurately answer the social question, with no other response for three seconds after answering the question, when given a prompted question by the researcher. After baseline, the intervention employed the DI flashcard system to first teach the accurate response to the social questions. DI flashcards were removed, reapplied, and removed again. Finally generalization training was employed. The overall outcome of the DI flashcards to teach accurate, age appropriate responses to social questions was successful in teaching the student with developmental delays and suspected autism.

Keywords: social questions, accurate, DI Flashcards, Autism, ASSIST, ABABC reversal design,

1. Introduction

Using DI Flashcards with and Without a Prompt to Increase Social Questions for a Preschool Student with Autism with Measures of Generalization across School Personnel

Autism (ASD) is a complex neurobehavioral disorder, present from early childhood, and affects the brain's normal development of social and communication skills (Heward, 2013) [11]. It is characterized by the difficulty in communicating and forming relationships with other people and in using language and abstract concepts (Thompson, 2007; Williams & Williams, 2011) [27, 30]. Autism disorder has a large spectrum and is somewhat different for each child. Persons with autism have difficulty in a wide range of social areas (Thompson, 2007; Williams & Williams, 2011) [27, 30].

The importance of answering social questions for persons with ASD has been widely documented. When these skills are taught, they permit students with autism to learn to interact and respond to peers in an age appropriate ways (Williams & Williams, 2011) [30]. Students with ASD often have difficulty with communication and by teaching a student to accurately respond to a social question without adding unnecessary information to the question allows for better communication with peers [5]. This should lead to more inclusion and group play with other students. In preschool social skills are being developed and learning how to interact and respond to questions accurately may well allow the student to properly participate in age appropriate activities. The earlier students with ASD are able to interact with peers appropriately, the more inclusion with non-disabled peers can occur. This should allow for greater social skills to be developed. Learning these social skills may well decrease the frustration that we see in young children with ASD, when they have the skills to properly communicate their thoughts [5].

The DI flashcard system was first developed by Silbert, Carnine, and Stein, (1981)\ to teach students basic math facts. Since that time, it has been employed to teach a wide range of skills ranging from letter sounds and names to colors and shapes

Correspondence
Meghan Harris
Gonzaga University

[29, 9, 17, 20]. DI flashcards have been shown to help students learn basic skills who have developmental disabilities as well as ASD [26]. With DI flashcards, students can be taught explicitly and directly the skills they need to function in age appropriate settings.

DI flashcard procedures include the following. First, a pretest is administered to the student(s). The outcomes from this pretest are then employed to determine which skills does the student have and which ones he or she does not. The teacher then develops sets or stacks of sight words, math facts, sounds and places them on flashcards. The number of facts per set or stack can vary from anywhere from five to 15 cards. The ratio of know to unknown facts can be adjusted up or down depending on the student. Silbert *et al.* recommended 12 known facts and three unknown facts per set. However, Basch *et al.* [3] found that these sets may contain a wide range of know to unknown math facts without any decrement in student performance. Next, the DI flashcards are then placed in a stack or piles. The flashcard presented to the student contains the word, fact, or sound to be taught. The back of the flashcards contains the correct answer. I This is placed on the side of the card seen by the instructor. If the student states the problem and solution correctly within 2 or 3 seconds, he or she receives praise and that flashcard is placed at the bottom of the stack or pile (Skarr *et al.*, 2014) [22]. If the student makes an error, the model, lead, and test error correction procedure (Marchand-Martella, Slocum, & Martella, 2004) [19] is then employed. The teacher models the correct sound or solution. Next the student must state the item to be leaned with the teacher. Finally, the student is presented with the error card and must independently give the correct response. This has been called the "I do," "we do," "you do' procedure. Once the student can independently answer the fact correctly three times in a row, the flashcard is then placed at the bottom of the stack. Before that, the error card is placed two or three from the top. This is done to provide students additional practice with their errors [8, 12, 18]. The instructor tries to teach these skills with the student each school day. DI flashcards have been successfully implemented in different classroom settings (Skarr, Ruwe, Zielinski, Sharp, Williams, & McLaughlin, 2014) [22] with a wide range of students (Bechtoldt *et al.*, 2014; Erbey, McLaughlin, Derby, & Everson 2011; Skarr *et al.*, 2014) [2, 8, 22], as well as in the home [18].

Students with ASD have difficulty with abstract questions and DI flashcards may help students learn in a way that is direct, but still learning how to interpret abstract questions and respond appropriately. Bechtolt, McLaughlin, Derby, and Blecher (2014) [2] were able to teach three preschool students with developmental delays letter sounds and names. DI flashcards have been employed to improve student performance in math (Hayter, Scott, McLaughlin, & Weber, 2007; Skarr, Zielinski, Ruwe, Sharp, R. Williams, & McLaughlin, 2014) [10, 22], reading (Kaufman, McLaughlin, Derby, & Waco, 2011) [12], and preacademic skills such as knowing ones shapes, colors, or numbers (Fitting *et al.*, 2013; Mangundayo *et al.*, 2013) [9, 17].

Evaluating interventions in terms of their ability to generalize has been a continuous and contentious debate in the behavioral literature [12, 13, 16, 23, 24]. In the present case report we assessed the ability of our procedures to generalize to another adult in the classroom. Providing this type of information would be helpful to teachers and others interested in generalization of skills across individuals.

The purpose of study was to study was to evaluate the effectiveness of the use of DI flashcards to teach a student to answer age appropriate social questions in a preschool setting with a single child who had developmental delays and a suspected diagnosis of Autism. The goal of the study was to have a student independently answer social questions with one researcher and the second goal was to generalize with a different adult in answering the same questions.

Method
Participant and Setting
The child of this study was a preschool student who attended in an Early Childhood Education Assistance Program (ECEAP) and the (ASSIST) program. This program was administered and located in the Pacific Northwest. The participant was a five-year-old boy with developmental delays with an unofficial diagnosis of autism (ASD). His areas of concern, included in the child's IEP were cognitive, fine motor, social/emotional, communication, and adaptive. The child had difficulty in those, impeding on his ability to fully and successfully participate in age appropriate activities. Receptively, he had difficulty listening, processing and following directives, repeating back directions, making inferences, and identifying negatives in a sentence. Expressively the child was echoic and repeated everything said to him with jargon mixed into the sentence. He would verbally get stuck on things and would have repetition when forming sentences. He had difficulty using language to answer questions.

The student participated in an inclusive classroom integrated with typically developing peers as well as being taught part-time in the ASSIST program the preschool consisted of two different sessions: a morning and an afternoon session with a break in the middle of the school day when the ASSIST program took place. The student was in the ASSIST program from 11:30 a.m. to 1:15 p.m. The student then went to the afternoon preschool from 1:15-3:00 and from 3:00-3:20 a pull out program. The preschool afternoon program was an integrated setting containing students from low-income families, students with Individualized Education Plans, English Language Students (ELS) Developmental Delays, and typically developing peers. All students were ages four to five years. The ASSIST program consisted of all students who had been officially and unofficially diagnosed with autism. The students participated in small group and whole group instruction, mainly focusing on social/emotional, adaptive, and communication. Students in ASSIST all received explicit, with individual education plans.

The classroom was staffed with a lead teacher, three instructional assistances, and the researcher. In addition the child received services from the Speech and Language Pathologist and an Occupational Therapist. The child was in the general education classroom two hours with the general education teacher, two teacher assistants, and an Instructional assistant from the ASSIST program. This school and special education preschool classroom have been employed in a wide range of research projects documenting special education candidate skills for effectively teaching young children with disabilities [1, 4, 7, 25, 28, 29].

Data Collection and Measurement
Data collection occurred during discrete trial training (Cowen, Amerine-Dickens, & Smith, 2006) [6] at the end of the school day. Data collection took place in an area of the classroom with minimal distraction in the corner of the room.

This area of the classroom was a familiar and comfortable, spot for our participant. Our participant, who had participated in explicit instruction in this part of the classroom for two years, so he was familiar to such a teaching procedure. The participant worked one-on-one with the first author the child sat across the table, from the researcher, in a height appropriate chair.

Materials

The study utilized DI flashcards to teach the student how to properly answer social questions. The student had his own flashcards, one for each answer to the question. The flashcard had the desired answer for the student to read off of. In addition, the teacher also had flashcards, one for each of the questions being asked. A data sheet with the each question was listed with columns for marking whether the student answered correctly or incorrectly. The student was presented with a PEC that said questions with a question mark on the PEC as well to prompt the student that it was time to answer questions. Puzzles were used as a reward for the student completing the work.

Dependent Variable and Measurement

The purpose of this study was to increase the student's ability to answer social questions at an age appropriate level. The questions included: (a) "What is your first name?" (b) "What is your last name?" (c) "Do you have a brother?" (d) "What is your brother's name?" (e) "How old are you?" (f) "Where to you go to school?" (g) "What is your teacher's name?" and (h) "Where do you live?" A simple frequency count was taken for each question. A session lasted for eight questions.

The participant's accuracy was recorded on a data sheet with a plus or minus sign. A plus sign meant the student answered correctly and had waited for 3s after stating the answer to the social question. A minus was tallied if our participant continued talking about material that was not related to the question or expanded his answer that did not correspond to the question being asked. Each question was recorded independently with it's own score. If the student made an error, the model, lead and test error correction procedure (Marchand-Martella, Slocum, & Martella, 2004) was implemented. The participants data were collected throughout the intervention.

Experimental Design and Conditions

The design of the study was an ABCBCD single case research design (Kazdin, 2011; McLaughlin, 1983) [13, 15]. A description of each condition follows.

Baseline: During baseline the student was placed at the typical workstation he is familiar with. He was then asked, one at a time, the selected social questions. This condition was in effect twice for five sessions.

DI flashcards (DI FC): Following baseline, the student was provided with the DI flashcards with the desired answer to each social question on a different flashcard, individually presented to the student. For each session the instructor conducted intervention and would present the DI flashcard to the student with the desired answer and then ask the corresponding social question. This condition was in effect twice for a total of 8 sessions.

No DI flashcards as a prompt (No DI FC): When the student had showed mastery with using the DI flashcards the DI flashcards were removed. The student was then asked the social questions without the DI flashcards. If the student regressed or was not showing mastery the DI flashcards were implemented again until the student showed mastery and the removal of DI flashcards was attempted again and used until the student showed mastery in answering the social questions appropriately with three seconds afterwards of silence for three consecutive days. Positive feedback, contingent praise, and puzzles were used as a reward for accurately answering the social questions. This was in effect twice for a total of six sessions.

Generalization training to other classroom staff: To assess the generalization of skill taught with the first author, a classroom instructional assistant was also employed. This phase was in effect once for a total of three sessions.

Interobserver Agreement of Implementation of Experimental Conditions

Event data were taken as the intervention was occurring during each session. The student was given the DI flashcards and as they answered correctly or incorrectly the researcher would mark a plus or minus on the data sheet. The researcher used an instructional assistant in the classroom to conduct reliability every third session completed. The aide was explicitly taught how to take data, what was considered a correct, and what was considered an error. Interobserver agreement was calculated by dividing number of agreements by the number of disagreements and multiplying by 100. The interobserver agreement was 98.4 % with a range of 87.5 to 100%.

Reliability as to the correct implementation of DI flashcard procedures were taken by recording the sessions for baseline as well as intervention. A check list was employed and when these data were taken there was perfect agreement that either baseline or the DI flashcard procedure was being implemented correctly.

Results
Baseline

During baseline, the student answered three of the social questions accurately twice in a row, then answered one accurately, then two accurately on the fourth session of baseline. For the last day of baseline our participant answered three social questions correctly out of the eight total.

DI Flashcards for Answering Age Appropriate Social Questions

As can be seen in Figure 1, the student's progress toward the learning target was 100% correct or 8 out of 8 questions with the DI flashcards prompt. The mean for this condition was 8.0.

No DI Flashcards for Answering Age Appropriate Social Questions

When DI Flashcards were withdrawn, our participant's accuracy remained high for the first two sessions. However, for third session, the participant only answered three of the questions accurately out of the eight possible. The mean for this condition was 6.3 with a range of 3 to 8.

DI Flashcards for Answering Age Appropriate Social Questions

DI flashcard system again to regain mastery of accurately answering the social questions to the above criteria. Our participant was able to answer got eight out of eight for 100% accuracy.

No DI Flashcards for Answering Age Appropriate Social Questions

Next, we went back to removing the DI flashcards. The student answered seven out of eight correctly on the next two sessions without the DI flashcards. The student for the next session answered all eight out of eight questions accurately. The mean for this phase was 7.3 with a range of 7 to 8 correct answers.

Generalization to other School Personnel

The first author then used one of the instructional assistants in the classroom. This was carried out to determine if the social questions would generalized from the first author to another adult in the classroom.

For three sessions, our participant was asked the same social questions with the same criteria with the instructional assistant. Our participant's performance showed only a slight decline (M = 7.7; range 7 to 8).

Discussion

The results of this study indicated that a single preschool student with ASD could be prompted using DI flashcards to correctly answer social questions. We were able to teach our participant in a preschool program to answer social questions in an age appropriate manner.

The implementation of the DI flashcard system and then fading of the DI flashcards provided our participant an opportunity to use this skill without being prompted with a flashcard. This provided a measure as to the efficacy or removing the prompting employed with our DI flashcards. When DI flashcards were again employed, our participant was able to regain mastery. When DI flashcards were removed, our participant would answer social questions with high accuracy. The student then showed generalization to anther person in the classroom for three sessions. In the last condition, our participant was able to generalize this skill to another adult in the classroom.

An additional strength of this case report was the increase in our participant's ability to answer social questions in an age appropriate manner. He was able to generalize this skill to different individuals asking our questions. It was easy to implement and very cost effective. The classroom already had the materials of DI flashcards and markers to write the questions. This allowed our student to also work on his reading skills. An additional strength of the study was the generalization that occurred with the student across two different people. This adds to efficacy of DI flashcards and their use to establish generalization (McLaughlin, 1980; McLaughlin, & Connis, 1991; Stokes & Baer, 1977, 2003) [14, 16, 23, 24]. However, the brevity of this condition requires a replication of the present research with a longer time period to assess generalization of age appropriate answers.

A weakness of this study was that it did not allow our participant to generalize his new skills across multiple settings or individuals. An additional weakness was that our sessions did not take place each school day. At times our participant was absent or the parent came early to pick the student up from school. Also approximately halfway through the study the student started expressing non-compliance behavior at the workstation and this produced an increase in the time needed to get the student to respond.

The present results provide an additional use of DI flashcards. In this case report DI flashcards were employed as a prompt for our participant to respond. Most of our previous research has employed DI flashcards to teach academic (Fitting *et al.*, 2013; Kaufman *et al.*, 2011; Skarr *et al.*, 2014) [9, 12, 22] rather than answering questions in an age appropriate manner for a single preschool student with ASD. Clearly, additional research is needed with a wide set of age ranges on this issue.

References

1. Armstrong B, McLaughlin TF, Clark A, Neyman J. A case report: Using augmentative and alternative communication to teach a preschool student with autism to respond and request appropriately. International Journal of Brain and Cognitive Sciences. 2012; 1(4):26-29. Retrieved from: http://www.sapub.org/journal/aimsandscope.aspx?journalid=1025

2. Bechtoldt S, McLaughlin TF, Derby KM, Blecher J. The effects of direct instruction flashcards and a model, lead, and test procedure on letter recognition for three preschool students with developmental disabilities. Journal on Developmental Disabilities. 2014; 20(1):5-15.

3. Brasch TL, Williams RL, McLaughlin TF. The effects of a direct instruction flashcard system on multiplication fact mastery by two high school students with ADHD and ODD. Child & Family Behavior Therapy, 2008; 30(1):51-59.

4. Carnes H, McLaughlin TF, Neyman J, Clark A. Using a model, lead, test error correction procedure with consequences and 1: 1 correspondence to increase the number of objects a 4-year-old preschool student could count. International Journal of Basic and Applied Science, 2015; 3(3):52-60. Retrieved from: http://www.insikapub.com/

5. Charman T, Stone W. (Eds). Social and communication development in autism spectrum disorders: Early identification, diagnosis, and intervention. New York, NY: Guilford Press, 2009.

6. Cohen H, Amerine-Dickens M, Smith T. Early intensive behavioral treatment: Replication of the UCLA model in a community setting. Journal of Developmental & Behavioral Pediatrics. 2006, 27. S145-S155.

7. Dundon M, McLaughlin TF, Neyman J, Clark A. The effects of a model, lead, and test procedure to teach correct requesting using two apps on an ipad with a 5-year-old student with autism spectrum disorder. Educational Research International, 2013; 1(3):1-10. Retrieved from: http://www.erint.savap.org.pk/nextissue.html

8. Erbey R, McLaughlin TF, Derby KM, Everson M. The effects of using flashcards with reading racetrack to teach letter sounds, sight words, and math facts to elementary students with learning disabilities. International Electronic Journal of Elementary Education. 2011; 3(3):213-226. Retrieved from: http://www.iejee.com/index.html

9. Fitting E, McLaughlin TF, Derby KM, Blecher J. The effects of DI flashcards with a DI discrimination and match to sample on letter identification for four preschool students with documented developmental

delays. International Journal of English and Education. 2013; 2(2):495-517. Retrieved from: Retrieved from: http://www.ijee.org/.

10. Hayter S, Scott E, McLaughlin TF, Weber KP. The use of a modified direct instruction flashcard system with two high school students with developmental disabilities. Journal of Physical and Developmental Disabilities. 2007; 19:409-415.

11. Heward WL. Exceptional children: An introduction to special education (10th ed.). Upper Saddle River, NJ: Pearson Education, 2013.

12. Kaufman L, McLaughlin TF, Derby KM, Waco T. Employing reading racetracks and DI flashcards with and without cover, copy, and compare and rewards to teach of sight words to three students with learning disabilities in reading. Educational Research Quarterly, 2011; 34:24-44.

13. Kazdin AE. Single case research designs: Methods for clinical and applied settings (2nd ed.). New York, NY: Oxford University Press, 2011.

14. McLaughlin TF. A critical analysis of some possible strategies to shift behavioral control from programmed reinforcers to consequences in the natural environment. Behavioral Engineering, 1980; 6:25-31.

15. McLaughlin TF. An examination and evaluation of single subject designs used in behavior analysis research in school settings. Educational Research Quarterly, 1983; 7:35-42.

16. McLaughlin TF, Connis RT. Generalization and analysis of behavior: An analysis. Corrective and Social Psychiatry, 1991; 37(4):58-63.

17. Mangundayao J, McLaughlin TF, Williams RL, Toone E. An evaluation of a direct instructions flashcard system on the acquisition and generalization of numerals, shapes, and colors for preschool-aged students with developmental delays. Journal of Developmental and Physical Disabilities. 2013; 26:461-473.

18. Mann Z, McLaughlin TF, Williams RL, Derby KM, Everson M. The effects of direct instruction flashcards and rewards with math facts at school and in the home: acquisition and maintenance. Journal of Special Education Apprenticeship. 2012, 1(2). Retrieved from: http://josea.info/index.php?page=archives.

19. Marchand-Martella NE, Slocum TA, Martella RC, R. (Eds.), Introduction to direct instruction. Boston, MA: Pearson Education, Inc, 2004.

20. Ruwe K, McLaughlin TF, Derby KM, Johnson K. The multiple effects of direct instruction flashcards on sight word acquisition, passage reading, and errors for three middle school students with intellectual disabilities. Journal of Developmental and Physical Disabilities. 2011; 23:241-255.

21. Silbert J, Carnine DW, Stein M. Direct instruction mathematics. Columbus, OH: Charles E. Merrill, 1981.

22. Skarr A, Zielinski K, Ruwe K, Sharp H, Williams RL, McLaughlin TF. The effects of direct instruction flashcard and math racetrack procedures on mastery of basic multiplication facts by three elementary school students. Education and Treatment of Children. 2014; 37:77-93.

23. Stokes TF, Baer DM. An implicit technology of generalization. Journal of Applied Behavior Analysis. 1977; 10:349-367.

24. Stokes TF, Baer DM. Mediated generalization: An unfinished portrait. In K. S. Budd & T Stokes (Eds.), A small matter of proof: The legacy of Donald M. Baer Reno, NV: Context Press, 2003, 125-138.

25. Talkington N, McLaughlin TF, Derby KM, Clark A. The effects of using augmentative and alternative communication to teach a preschool student with developmental delays to request assistance and attention. i-manager's Journal on School Educational Technology. 2013; 8(4):16-21.

26. Thomas R, McLaughlin TF, Derby KM. Employing direct instruction flashcards to teach academic skills to students with high incidence disabilities: a review. International Journal of English and Education. 2015; 4(4):404-421. Retrieved from: http://www.ijee.org/current_issue

27. Thompson T. Making sense of autism. Baltimore, MD: Paul H. Brookes, 2007.

28. Ward M, McLaughlin TF, Neyman J, Clark A. Use of an ipad application as functional communication for a five-year-old preschool student with autism spectrum disorder. International Journal of English and Education, 2013; 2(4):231-238. Retrieved from: http://www.ijee.org/

29. Wasson K, McLaughlin TF, Derby KM, Clark A. The effects of using functional communication training and verbal imitation to teach two preschool students with developmental delays the word "help." International Journal of English and Education. 2013; 2(2):571-578. Retrieved from: http://www.ijee.org/.

30. Williams BL, Williams RL. Effective programs for treating autism spectrum disorder: Applied behavior analysis models. New York, NY: Routledge, 2011.