Teaching Reading Comprehension and Language Skills to Students with Autism Spectrum Disorders and Developmental Disabilities Using Direct Instruction

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Abstract: There is limited research demonstrating Direct Instruction (DI) as an effective reading comprehension intervention for students with autism spectrum disorders (ASD) and developmental disabilities (DD). Previous research has shown that DI, when portions of the program were implemented, resulted in increased skills (Flores & Ganz, 2007; Flores & Ganz, 2009). The purpose of this pilot study was to implement DI comprehension programs without modification, using whole lessons. Eighteen elementary students with ASD or DD participated in the study and data were collected using curriculum-based assessments. One-way analyses of variance indicated that there were significant differences in students’ skills over time. Results and their implications will be discussed.
DI instructional approaches with individuals with ASD and DD has shown that this may be a promising instructional method for teaching language and reading comprehension. Flores and Ganz (2007) investigated the effects of a DI program, *Corrective Reading Comprehension A Thinking Basics* (Engelmann, Haddox, Hanner, & Osborn, 2002), on the reading comprehension skills of four individuals with DD and ASD. The researchers provided instruction using three strands of the program, statement inferences, using facts, and analogies. Results indicated that a functional relation existed between DI and reading comprehension skills, as all students met criteria for mastery across each of the three skill areas.

Flores and Ganz (2009) extended the line of research, investigating the effects of *Corrective Reading Comprehension A Thinking Basics* (Engelmann et al., 2002) on the reading comprehension skills of three individuals with ASD and DD. Within this study, the researchers taught three different instructional strands of the program, picture analogies, deductions, and inductions. Using a multiple probe across behaviors design, the authors demonstrated a functional relation between the DI program and reading comprehension as all participants met the criterion in each of the three areas.

In another study, Ganz and Flores (2009) investigated the effects of *Language for Learning* (Engelmann, & Osborn, 1999) on the oral language skills for three participants with ASD. The researchers taught students how to identify the materials of which objects are made, utilizing a single subject changing criterion design. Results indicated a functional relation existed between the program and language acquisition; the students met criterion with replications over three changes in criterion.

In a study by Zayac (2009), the author found that the DI program, *Reading Mastery Plus* (Engelmann, 2002), was effective in teaching children with DD (including children with ASD) letter-sound correspondences, blending, segmenting, and word reading. Unlike other DI research for this population, the program was implemented without modification. A functional relation could not be determined due to the use of an A–B design. However, the author concluded that individuals with DD can acquire beginning reading skills using DI.

Research in the area of DI reading comprehension instruction for students with ASD and DD is limited. Of the existing research, single subject designs have been employed to show a functional relation between DI and improved comprehension and language skills. In addition, portions of DI programs (Flores & Ganz, 2007; Ganz & Flores, 2009; Flores & Ganz, 2009) have been shown to be effective. The line of research regarding DI reading comprehension and language interventions for students with ASD and DD is missing investigation of a comprehensive implementation of a DI program, meaning whole lesson presentation over time. Therefore, the purpose of this pilot study was to investigate the efficacy of DI comprehension and language programs for students with ASD and DD by implementing the programs as they were designed within classroom settings.

**Method**

**Participants**

Eighteen male students in grades one through seven participated in the study. The students were chosen to participate based on their performance on the program placement tests. The researchers administered the placement for the *Corrective Reading Comprehension A Thinking Basics* program (CR) (Engelmann et al., 2002) to all students. Eleven students placed within that program, beginning with the first lesson. However, seven students’ placement scores indicated that a beginning language program such as the *Language for Learning* program (LL) (Engelmann, & Osborn, 1999) would be appropriate. The LL placement test was administered to these students and their scores indicated that it was an appropriate program. Therefore, two subgroups were formed.

The group of students who received instruction using CR was comprised of students ages eight to thirteen in grades two through seven. All of the students were eligible for special education services, seven under the category of ASD and four under the category of multiple disabilities (intellectual disability and other health impairment or intellectual dis-
ability and orthopedic impairment). The students’ intellectual functioning was assessed using the *Leiter International Performance Scale Revised* (Roid & Miller, 2002) and their intellectual abilities (IQ) ranged from significantly below the average range to within the average range. The students’ language performance was measured using the *Test of Language Development: Intermediate, 4th Edition* (Hammill & Newcomer, 2008a) or *Test of Language Development: Primary 4th Edition* (Hammill & Newcomer, 2008b). The students’ overall language standard scores ranged from significantly below the average range to within the average range.

The group of students who received instruction using LL included seven students, ages seven and nine in grades one through four. All of the students were eligible for special education services, three under the category of developmental delay and four under the category of ASD. The students’ intellectual functioning was assessed using the *Leiter International Performance Scale Revised* (Roid & Miller, 2002) and their intellectual abilities (IQ) ranged from significantly below average to within the average range. Based on their age, the students’ language performance was measured using the *Test of Language Development: Intermediate, 4th Edition* (Hammill & Newcomer, 2008a) or *Test of Language Development: Primary 4th Edition* (Hammill & Newcomer, 2008b). The students’ overall language standard scores were significantly below the average range. See Table 1 for a summary of participant characteristics.

**Setting**

The study took place in a university-sponsored summer program, created for the provision of extended school year services for students with disabilities. Extended school year services were indicated in the individualized educational programs (IEPs) of all students in attendance. Staff in the classrooms consisted of two graduate students (who held teaching certificates in special education) and one undergraduate student, each majoring in special education. Classroom structure and instructional programs were tailored to students’ needs as stated in their IEPs and statements of extended school year needs. These included strategies such as small group direct instruction in academic areas (reading, written expression, and mathematics), incidental teaching, social skills instruction, and the use of visual supports. The current study took place during reading instruction within each classroom. DI comprehension instruction lasted for approximately thirty minutes each day. Instruction was provided by certified teachers enrolled in a Master’s program in special education who received professional development in the implementation of DI within two of their required university courses. In addition, one day of professional development was devoted to program delivery prior to the start of the program. Prior to program implementation, each instructor demonstrated proficiency in program implementation using a fidelity checklist (Marchand-Martella, Lignugaris-Kraft, Pettigrew, & Leishman, 1995).

**Instructional Procedures**

Classroom instructors administered the CR placement test prior to beginning instruction. Based on placement test performance, students were grouped homogeneously for instruction. Students, who did not place into the CR program, were given the LL placement test. Based on students’ performance, instruction began with the lesson prescribed by the program. Seven students received instruction through LL, beginning at lesson forty-one. The instructional content included the following: (a) differentiation of *whole* and *part*; (b) opposites, such as *full/empty* and *big/small*; (c) use of the prepositions *on*, *over*, and *in front*; (d) use of pronouns when describing actions or pictures; and (e) general information such as stating the days of the week. Eleven students received instruction through CR, beginning at lesson one. Instructional content included the following: (a) appropriate use of the terms *all*, *some*, and *none*; (b) classification of objects; (c) deductive reasoning using the terms *all*, *every*, *don’t*, *no*, and *some*; (d) statement inferences; (e) using facts to provide evidence; and (f) general information such as stating the months of the year and the seasons in a year.

Instructional groups varied in size from two to four students, based on classroom enrollment and placement test performance. Instruction occurred during regularly scheduled reading instructional time, for approximately
thirty minutes per day, five days per week. The instructors followed the programs’ prescribed scripts for the particular behavior or skill. This included modeling the particular skill for the students, leading, as the students demonstrated the skill or behavior, and asking the students to perform the behavior independently without the instructor. The students responded to questions chorally as a group. The instructor followed program procedures for ensuring that the students responded together. Errors in responses were corrected immediately through the following: (a) modeling the correct response; (b) leading the students in the correct response; (c) and asking the students to respond independently. The program included instances when the students were asked questions individually and these procedures were followed as well.

Assessment Procedures

The students’ placement test performance served as the first performance assessment.

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TABLE 1

Participant Demographics

<table>
<thead>
<tr>
<th>Language for Learning Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>7 years 6</td>
</tr>
<tr>
<td>Disability Category</td>
<td>autism spectrum disorder 4</td>
</tr>
<tr>
<td>Cognitive Ability (IQ)</td>
<td>above 85 1</td>
</tr>
<tr>
<td>Language Performance</td>
<td>55–70 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Corrective Reading Thinking Basics Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>8–9 years 3</td>
</tr>
<tr>
<td>Disability Category</td>
<td>autism spectrum disorder 7</td>
</tr>
<tr>
<td>Cognitive Ability</td>
<td>above 100 2</td>
</tr>
<tr>
<td>Language Performance</td>
<td>above 100 1</td>
</tr>
</tbody>
</table>

* Standard score using *Leiter International Performance Scale Revised*

* Spoken Language (total) standard score using *Test of Language Development: Primary 4th Ed. or Test of Language Development: Intermediate, 4th Ed.*
Each student’s placement test was analyzed based on the number of items correct, representing the concepts and skills included in the twenty instructional lessons that would follow. For example, the LL placement test included items which asked the student to name the days of the week and this skill was included within the instructional lessons forty-one through sixty, the lessons one might expect a typical student to encounter over twenty days of instruction. The second performance measure was administered after two weeks of instruction. It consisted of curriculum-based assessments which were the mastery tests included within the LL program after every tenth lesson. The third performance measure was administered after four weeks of instruction and it was the following appropriate mastery test from the program. The students in the LL group took the mastery tests located after lessons fifty and sixty. Assessments were administered to students one-on-one, before daily instruction, in order to more accurately assess the students’ learning. Student performance was reported as the percent of items correct.

The same procedures were followed for students who received instruction from the CR program. The first performance measure was the placement test. Each student’s placement test was analyzed based on the number of items correct, representing the concepts and skills included in the first twenty instructional lessons. Each student’s performance was reported in terms of percent of instructional items correct. The CR program includes mastery tests after lesson twenty. Therefore, for the second performance measure, it was not appropriate to administer the first mastery test after two weeks of instruction since students could have only completed lessons one through ten or fewer, if repetition was necessary. A curriculum-based assessment was created by the first author using the same format as the program mastery test; however, items assessed the skills taught in lessons one through ten. The second performance measure consisted of the mastery test included in the CR program without modification (located in the program after lesson twenty). Performance measures were administered one-on-one, at the beginning of a lesson, prior to instruction. Student performance was reported as the percent of items correct.

Treatment Integrity/Inter-observer Agreement

Instruction was carried out according to a checklist of teacher behaviors (Marchand-Martella et al., 1995). These behaviors corresponded to the procedures and behaviors prescribed in the Direct Instruction program. Once per week, one of the researchers observed instruction. The fidelity of treatment was 92% across instructional groups. Treatment fidelity for instructional groups ranged from 62% to 100%. Approximately 30% of the curriculum-based assessments were checked for inter-observer agreement. This was calculated as the total number of agreements divided by the total number of disagreements and agreements, multiplied by 100. Inter-observer agreement for instructional probes was 100%.

Results

Because the sample sizes were small, the researchers checked assumptions for normality, linearity, and variability prior to analysis. For each sub-group, a one-way within subjects analysis of variance ANOVA statistical procedure was conducted with the factor being time and the dependent variable being the percent correct on each curriculum-based assessment. The progress measures for students receiving instruction using CR were analyzed separately from students who received instruction using LL because the content within the curriculum-based measures were different. The means and standards deviations for curriculum-based assessments are presented in Table 2. For the CR group, the results for the ANOVA indicated a significant time effect, Wilk’s $\Lambda = 0.075$, $F(2, 9) = 55.37$, $p < .01$, multivariate $\eta^2 = .93$. Follow-up polynomial contrasts indicated a significant linear effect with means increasing over time, $F(1, 10) = 149.28$, $p < .01$, partial $\eta^2 = .94$. For the LL group, the results for the ANOVA indicated a significant time effect, Wilk’s $\Lambda = .014$, $F(2, 5) = 173.1$, $p < .01$, multivariate $\eta^2 = .99$. Follow up polynomial contrasts indicated a significant linear effect with means increasing over time, $F(1, 6) = 569.38$, $p < .01$, partial $\eta^2 =$
These results suggest that the instructional programs made a statistically significant difference in students’ growth in skill over time.

### Discussion

The purpose of this study was to extend the line of research regarding DI language and comprehension instruction for students with ASD and DD by implementing a pilot study in which students with ASD and DD received more comprehensive instruction than in previous research. The researchers implemented programs as they were designed, addressing multiple skills by teaching whole lessons. Eighteen students with ASD and DD participated in either Language for Learning (Engelmann, & Osborn, 1999) or Corrective Reading Comprehension A Thinking Basics (Engelmann et al., 2002) for four weeks during an extended school year program. Their performance was measured over time using curriculum-based assessments included in the programs or developed based on the programs.

Results indicate that DI programs had a strong effect on students’ learning ($\eta^2 = .94$ and $\eta^2 = .99$). This extends prior research in which single case research designs indicated that there was a functional relation between DI and increased language skills by investigating specific instructional strands within DI programs (Flores & Ganz, 2007; Flores & Ganz, 2009; Ganz & Flores, 2009). In contrast to these previous studies, the current study provided a more realistic implementation of DI programs. The programs were implemented by classroom teachers without modification of the programs’ content organization.

Previous research demonstrated that students with ASD and DD could successfully participate in DI, including its unique instructional formats such as frequent questioning, choral and individual responding, and the presentation of multiple skills within one lesson (Flores & Ganz, 2007; Flores & Ganz, 2009; Ganz & Flores, 2009). Within the current study, students with ASD and DD were able to participate in all portions of the lessons and successfully move from one lesson to the next, replicating previous research. The current findings extended previous research from the use of portions of programs to presentation of the programs as prescribed, without modification. This study extended this investigation by exposing students to lessons in which they learned multiple skills (more than presented in previous research) and demonstrated that students could participate appropriately and transition between different formats within each lesson.

#### Implications

The results of this study have implications for instructional design and content for students with ASD and DD. This study further demonstrates that students with ASD and DD can benefit from group instruction. One-on-one instruction in the form of discrete trial teaching represents the largest body of intervention research for this population (National Research Council, 2001). However, students in the current study successfully participated in DI which required sustained attention, fre-
quent responding, and choral responses in a group format. This is significant since group instruction may provide for greater efficiency in meeting students’ needs in diverse classrooms. In addition, providing instruction to students with ASD and DD in a group format may also better prepare them for participation in group situations within general education classrooms.

The majority of the students demonstrated below average performance in both language and cognitive ability (IQ). Four out of eighteen students’ IQs were within the average range and the remaining students’ IQs ranged from 51 to 83. The students’ language skills were significantly below average as well. One participant’s language standard score was within the average range (104). The remaining students’ language standard scores ranged from 44 to 61, with an average of 57. There is a limited body of reading research that includes students with ASD and DD who have significant cognitive and language deficits (Bradford et al., 2006; Flores & Ganz, 2007; Flores & Ganz, 2009; Flores et al., 2004). This study extended the research for that population by showing that students made progress after participating in comprehensive implementation of DI programs.

Future Research

The current pilot study was limited in the amount of time available for program implementation. Although students made progress and statistically significant gains, it is not known how a comprehensive implementation of DI comprehension and language instruction over the course of a school year would impact student performance. Future research is needed to assess the effects of a full-scale implementation. The setting was another limitation since it was conducted within a university-sponsored program with teachers who had received preparation for DI implementation with their coursework. This type of preparation may not be similar to the professional development received by typical classroom teachers. It is not known whether similar results would have been obtained if the implementation site were a typical public school. Future research should investigate the results of DI when instruction is delivered within typical classroom settings by teachers who receive typical professional development.

Although the current study extended the line of DI research to include a larger group of students, using a different research design, additional research is needed. Before this type of instruction can be recommended as an evidence-based practice, larger groups of students must participate. In addition, DI comprehension and language instruction should be compared to other instructional formats or strategies. It is not known whether DI resulted in learning that would have been different if the same content were delivered in one-on-one formats or through discrete trial teaching. Furthermore, it is not known whether DI resulted in gains different than may have been demonstrated by other explicit methods that research has shown effective for students with high incidence disabilities. Therefore, future research should include comparison between DI and other research-based methods as well as more sophisticated research designs and analyses.

References


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