Mc Graw Hill Education

CT INSTRUCTION

Special Education and Direct Instruction: An Effective Combination

Contents

Part I: An Overview of Special Education and Effective Instruction

Overview

Because special education students fall signi cantly behind peers in academic, behavioral, and/or functional living skills, intensive instruction is crucial for their academic success.

Though the level of intensity will likely di er for individual students, research shows that explicit, individualized, and validated instruction—like that o ered by Direct Instruction programs—is key for optimal learning opportunities among students who have special needs.

IDEA (Individuals with Disabilities Education Act, reauthorized in 1997 and amended in 2004) requires specially designed instruction for students with disabilities. Specially designed instruction pertains to adapting content, methodology, or delivery of instruction to meet students' needs and to ensure their access to the general curriculum [(34 CFR 300.24(b)(3) as cited in Bateman & Linden, 1998)].

Special Education

Special education has been de ned as "individually planned, specialized, intensive, goal-directed instruction" (Heward, 2003, pg. 38).

This instruction may di er in terms of:

How it is provided.

- One-on-one
- Small groups

Where it is provided.

- Resource room
- Separate classroom
- Residential school

Whatcurriculum is used.

This combination of features makes special education e ective for students with disabilities.

Achieve Maximum Bene ts With Individualization and Validation

Two critical elements of e ective special education are individualization and validation (Fuchs, 1996; Fuchs & Fuchs, 1995):

- Individualizationrefers to developing instruction with an individual student's needs in mind—as the student's needs change, so does the treatment (Fuchs, 1996). Thus, progress monitoring is a key aspect of individualization.
- Validation pertains to rigorous experimental studies that have been conducted over time yielding converging evidence. "When practiced most e ectively and ethically, special education is [also] characterized by the use of research-based teaching methods" (Heward, 2003, pg. 38).

Therefore, curricular programs selected for students who have special needs should provide evidence of su cient eld-testing or results from experimental studies. This ensures that instructional time yields maximum bene ts. In addition, programs should meet the needs of each student by monitoring individual student performance through:

- Placement testing.
- In-program progress monitoring.
- Mastery tests.
- Review opportunities.

Set Special Education Apart Through Intensive, Explicit Support

Special education di ers from general education (Torgesen, 1996) because it is typically more:

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Effective Instruction

Build Understanding Through Systematic, Explicit Instruction

Explicit or direct instruction (lowercase “d,” “i”) o ers a systematic method of teaching with emphasis on (Rosenshine, 1987, pg. 34):

- Proceeding in small steps.
- Checking for student understanding.
- Achieving active and successful participation by all students.

Rosenshine (1986) provided highlights of research on explicit instruction of well-de ned knowledge and skills such as math procedures, grammatical rules, and vocabulary. These highlights include daily instruction techniques such as:

- Starting every lesson by correcting the previous day’s homework and reviewing what students have recently been taught.
- Describing the goals of today’s lesson.
- Presenting new material in small steps, giving clear and detailed explanations of the skill(s) to be learned (modeling), often checking for student understanding through strategic questioning.
- Providing repeated opportunities for students to practice in an active manner and to obtain feedback on their performance (guided practice).
- Monitoring student learning through varied exercises (i.e., seatwork).
- Providing continual practice opportunities until students are performing skills independently and with ease (independent practice).
- Reviewing previous week’s lesson at the beginning of each week and reviewing what students have learned over the past four weeks at the end of each month.

Explicit instruction can be summarized as unambiguous, clear, and direct teaching (Arrasmith, 2003). Show students what to do, provide opportunities to practice with feedback, and then provide opportunities to apply these skills on their own over time.

Build Success Through the Design and Delivery of Direct Instruction

The Unique Elements of Direct Instruction Make the Di erence

Most academic programs require modi cations to meet the needs of students who receive special education services (Carnine et al., 2004). These modi cations include:

- Identifying the most important tasks to teach in order to cover priority topics.
- Providing clear directions on how to structure active student responses and teacher feedback.
- Determining where students should be placed and how to monitor progress.
- Adjusting the rate of instruction to ensure adequate practice and mastery.
- Controlling the vocabulary/syntax used to ensure student understanding.

These modi cations take time and energy to complete; essentially, programs must be changed to meet the unique needs of students who struggle.

In contrast, Direct Instruction programs do not require teacher modi cation to achieve student success. The design and delivery of Direct Instruction programs make them e ective and uniquely designed for special education populations. Direct Instruction programs feature a unique program design, instructional organization, and presentation techniques that make them highly successful for special education populations.

Direct Instruction is Proven E ective for Students with Special Needs

Elements of Direct Instruction That Make the Di erence

“More than any other commercially available instructional program, Direct Instruction is supported by research” (Watkins & Slocum, 2004, pg. 57). Several independent reviews of research add to this strong support with a particular focus on students with special needs (Carnine, Silbert, Kame’enui, & Tarver, 2004).

For example:

- White (1988) found 25 investigations where Direct Instruction was compared to some other treatment. Not one of the 25 studies showed results favoring the comparison groups; 53 percent of the outcomes signi cantly favored Direct Instruction with an average e ect size of .84 (considered a large magnitude of change from pre- to post-assessments).
- Adams and Engelmann (1996) analyzed 37 research studies that compared Direct Instruction to other treatments. When those studies involving special education students (n = 21) were analyzed separately, the mean e ect size was .90 (considered a large magnitude of change from pre- to post-assessments).
- Forness, Kavale, Blum, and Lloyd (1997) conducted an analysis of various intervention programs for students receiving special education services and found Direct Instruction to be one of only seven interventions with strong evidence of success.

Positive e ects on at-risk populations have been noted by the American Federation of Teachers (1999), American Institutes of Research (Herman et al., 1999), and the Center for Research on the Education of Students Placed at Risk (Borman, Hewes, Overman, & Brown, 2002). Direct Instruction o ers su cient validation as noted by Fuchs (1996) to warrant its use with special education populations.

Thus, it is no surprise that Direct Instruction is often referred to as a program for special education or at-risk students; however, it is important to note that Direct Instruction is appropriate for talented and gifted students, grade-level students, and those with diverse language backgrounds or “learning styles”(Watkins & Slocum, 2004).

Three main components of McGraw-Hill Education Direct Instruction programs—program design, instructional organization, and presentation techniques—make them uniquely e ective for special education populations.

Program Design

- Careful Content Analysis: The content in Direct Instruction programs is carefully analyzed to identify central concepts, rules, strategies, and “big ideas” (those strategies that promote generalization of learning). Thus, teachers do not have to develop lessons or modify curriculum to help students gain pro ciency in areas critical to success.
- Clear Communication: The instructional language used in Direct Instruction programs is carefully written to be clear and consistent to reduce student confusion. “Teacher talk” is kept to a minimum and phrases used in teaching routines are repeatedly used. Instructional examples are introduced and carefully planned to promote student success. Teachers do not have to invent “learner friendly” instruction.
- Clear Instructional Formats: Direct Instruction formats are teaching routines that model new content, provide guided practice, and implement independent practice opportunities. As students master skills, formats evolve to accommodate their progress and growing independence. These formats are, “written, tested, rewritten, retested—polished in a cycle of classroom eld testing and revision that ends only when trials show that 90 percent of students grasp a lesson the rst time around” (AFT, 1999, pg. 4). Teachers do what they do best—teach—rather than develop instructional plans to try to ensure student success day after day.
- Sequencing of Skills: In Direct Instruction programs, skills are taught in a cumulative and carefully integrated scope and sequence to help students reach mastery level and generalize their learning to new, untaught situations (AFT, 1999). Students learn rules before exceptions and easy skills before more di cult ones. Appropriate sca olding is utilized, moving students from teacher-directed activities to independent ones.
- Track Instruction: Each Direct Instruction lesson consists of multiple “tracks” (strands) and skills to teach the tracks. Rather than introduce skills in isolation, multiple tracks are taught in unison, and each is related to provide e cient instruction. Tracks ensure that:
  - Lessons are made up of several relatively short exercises.
  - Di cult tasks are interspersed with easier ones.
  - New skills are interspersed with well-practiced skills.
  - Practice is distributed so that students do not forget skills over time.

In-track instruction, error reduction, and skill integration is enhanced.

Instructional Organization

- Instructional GroupingDirect Instruction programs are generally presented to small groups—and can be used one-on-one—to provide intensive instruction when promoting individual student growth. Students are placed in a group according to skill level and move in the program depending upon how rapdemmnine pr15 (wq (al u-16 (c)ill) (rdi 0 s 5 (an b (w)J 0 cepa)16 (r.0.489 0.761 0.275 scn 37 414 3.9 317

- Teaching to Mastery Direct Instruction programs are engineered so that every student can perform every skill without making a mistake. The exception is that students begin each new activity ready to achieve at least 80 percent accuracy on their rst try, with 100 percent accuracy after error correction. Individual turns and in-program assessments con rm that each student has mastered the activity. Teaching to mastery communicates that what is learned today is important because it will be needed tomorrow.
- Motivation Success is motivating to even the most challenging students. Direct Instruction lessons keep students focused and engaged. New information in each lesson is minimal, while the majority—80 to 90 percent—is review and application. Students make few errors, success rates are high, and enthusiasm for learning is enhanced. The early introduction of Direct Instruction in these areas led to its use among students with special needs today. From 1968 to 1976, Direct Instruction was part of the largest educational study in U.S. history: Project Follow Through. After the success of Head Start with at-risk preschool students, Project Follow Through was designed to compare educational approaches to determine best practice for instruction of low income, at-risk children in kindergarten through third grade.

Much of the Project Follow-Through research took place prior to national legislation requiring special education for students with disabilities. Although many children with severe disabilities were not included in schools at that time, students with mild disabilities—learning disabilities, language delays, behavior problems, and slightly lower IQs–were typically taught in general education classrooms.

Students With Diverse Learning Needs

In the earliest e orts to assess the e ectiveness of Direct Instruction for students with disabilities, Gersten, Becker, Heiry, and White (1984) classi ed the data from 1,500 Direct Instruction Follow-Through students into six IQ groups. Then achievement gains made by students in each of the groups were compared statistically to see if the growth patterns from year to year di ered for high IQ students as compared to low IQ students.

Results

It is not surprising that the higher IQ students started with higher achievement in reading and math than the lower IQ students, nor is it surprising that at the end of third-grade students with higher IQs ended with higher achievement.

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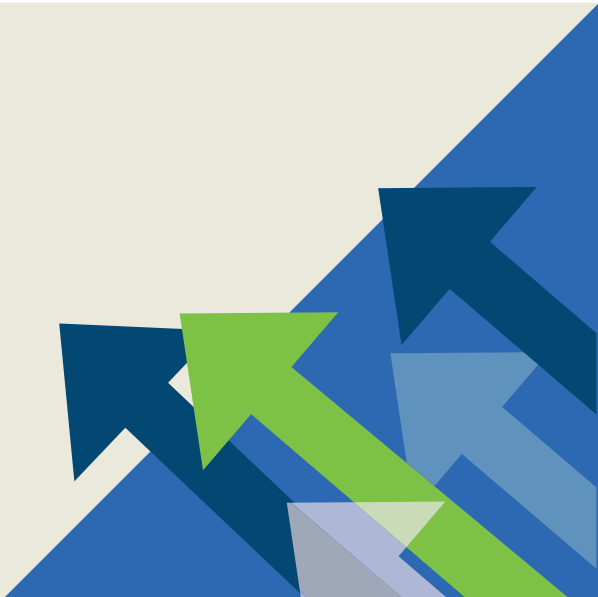
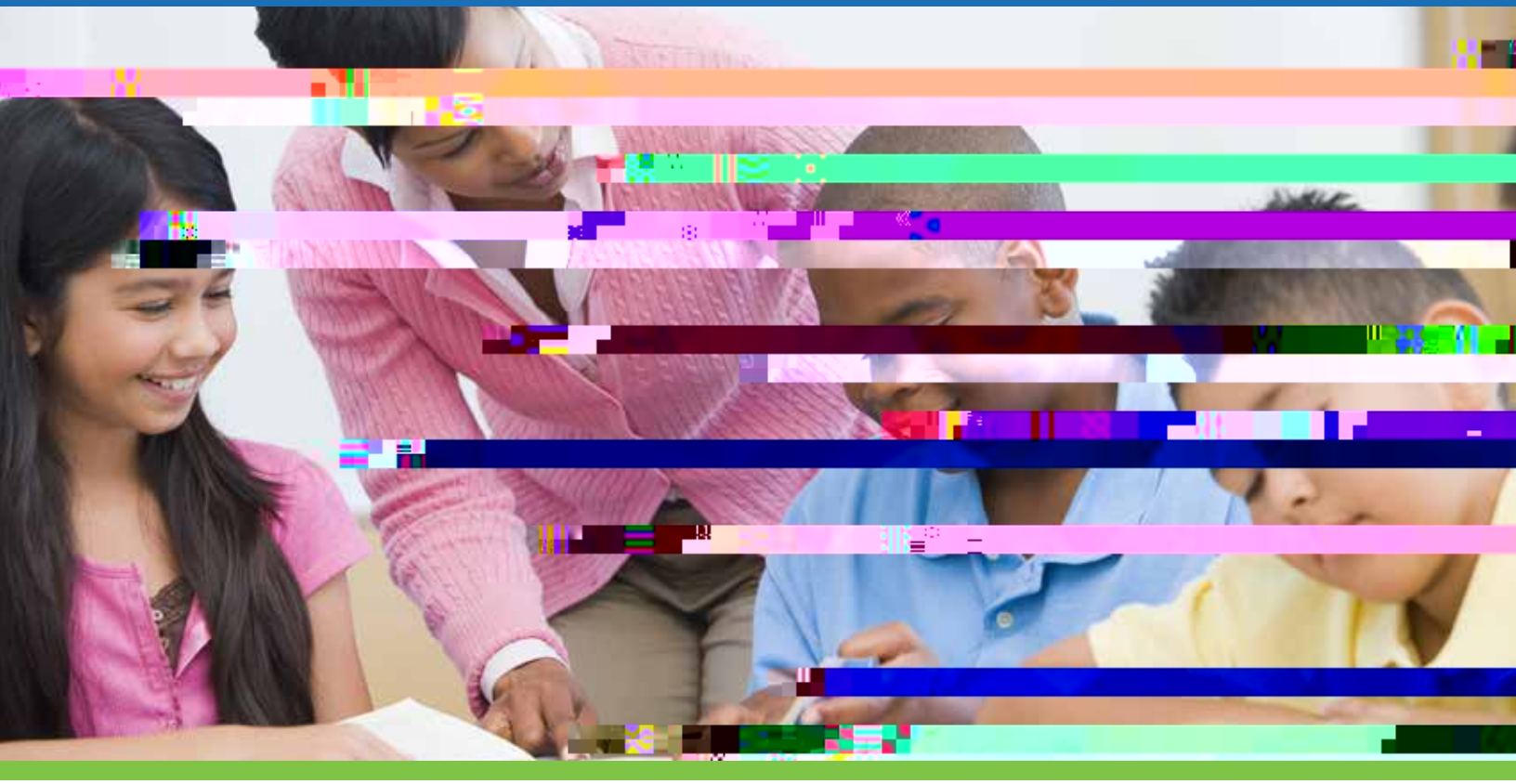
Summary

Research shows strong evidence of success when Direct Instruction programs are used with students with special needs. In fact, Direct Instruction is one of only seven interventions proven e ective (Forness, Kavale, Blum & Lloyd, 1997). With its research-supported design and systematic delivery, Direct Instruction is often referred to as a program for special education or at-risk students.

Direct Instruction programs are structured for success, and successful students are motivated to continue the path of achievement.



Part II: Description of Research Review and Project Follow Through



Overview

This research includes an analysis of published investigations where Direct Instruction programs were used with special education populations. Speci cally, the review centered on two populations of students with special needs:

1. High-incidence disabilities

- Learning disabilities
- Communication disorders
- Behavior disorders
- Mild developmental disabilities

2. Low-incidence disabilities

- Autism
- Traumatic brain injuries
- Moderate to severe developmental disabilities

Investigations were grouped within special education population areas by academic program (i.e., language, reading, spelling, writing, and mathematics), where appropriate. This research includes tables of study details. Each table identi es:

- The study's researchers and year of publication.
- Direct Instruction programs used.
- Number of participating students.
- Participant information including disability, mean age, age range, intelligence quotient (IQ), and IQ range.
- Research design.
- Research purpose.
- Intervention details.
- Outcome measures.
- Findings.

If information is missing from the tables, it was not provided in the studies.

Search procedures for the articles in this review included:

- Hand searches of all issues of publications produced by the Association for Direct Instruction (www.adihome.org), which includes ADI News, DI News, E ective School Practices, and Journal of Direct Instruction.
- Ancestral searches of references in key Direct Instruction texts including Research on Direct Instruction: 25 Years Beyond *DISTAR* (Adams & Engelmann, 1996), Designing E ective Mathematics Instruction: A Direct Instruction Approach (Stein, Silbert, & Carnine, 1997), Direct Instruction Reading (Carnine et al., 2004), and Introduction to Direct Instruct trcDirect

Students With Diverse Learning Needs

In the earliest e orts to assess the e ectiveness of Direct Instruction for students with disabilities, Gersten, Becker, Heiry, and White (1984) classi ed the

Summary

These results provide evidence that Direct Instruction is appropriate for and e ective with a wide variety of students. In reading, the group with the lowest IQ scores (under 70) improved nearly as much each year in reading as students with much higher IQ scores. In math, the results were even more pronounced—the growth rate for all groups of students corresponds to one grade equivalent for each year in school. In addition, because students in Project Follow Through were taught in small groups, the gains of students with lower IQ scores were not made at the expense of other students.

TABLE 1: LANGUAGE RESEARCH WITH PRESCHOOLERS WITH HIGH-INCIDENCE DISABILITIES

Study	D1 Program	(N) Participants	Research Design/Purpose	Intervention Details	Outcome Measures	Findings
Cole, Dale, & Mills (1991)	DISTAR Language, DISTAR Arithmetic, and DISTAR Reading	(107) Children (ages 3 to 7 years, mean 5.0) with mild to moderate developmental delays	Experimental — Pretest/posttest control group Determining the relative effectiveness of Direct Instruction programs versus Mediated Learning with preschool and Kindergarten children with mild to moderate developmental delays.	Implemented DISTAR Language, DISTAR Arithmetic, and DISTAR Reading (DI), and Mediated Learning (ML) 2 hours a day, 5 days per week for 180 school days (preschool) and 5.5 hours a day, 5 days per week over 180 school days (kindergarten). Program provided over a 4-year period.	Peabody Picture Vocabulary Test-Revised (PPVT-R), Test of Early Language Development, Preschool Language Assessment Inventory (PLAI), Mean Length of Utterance, Basic Language Concepts Test, and McCarthy Scales of Children's Abilities (MSCA).	Both groups had gains on several measures. No statistically significant differences were found between the two programs except for the PPVT-R Standard Score favoring the ML group. Higher performing children on MSCA General Cognitive Index and PLAI pretest measures benefited more from Direct Instruction whereas lower performing children benefited more from Mediated Learning.
Dale & Cole (1988)	DISTAR Language, DISTAR Arithmetic, and DISTAR Reading	(83) Preschool (N = 61, ages 3 years to 5 years 11 months of age) and kindergarten/primary (N = 22, ages 6 to 8) developmentally delayed children	Experimental — Pretest/posttest control group Determining the relative effectiveness of Direct Instruction programs versus Mediated Learning with preschool and Kindergarten children with mild to moderate developmental delays.	Implemented DISTAR Language, DISTAR Math, and DISTAR Reading (DI) and Mediated Learning (ML) 2 hours a day, 5 days per week for 180 school days (preschool) and 5.5 hours a day, 5 days per week over 180 school days (kindergarten). Implemented over 1 academic year.	McCarthy Scales of Children's Abilities, Peabody Picture Vocabulary Test-Revised, Test of Early Language Development, Mean Length of Utterance, Basic Language Concepts Test, Test of Early Reading Ability, Test of Early Mathematics Ability, and Stanford Early School Achievement Test.	The DI group scored significantly higher on Tests of Early Language Development and the Basic Language Concepts Test while the ML group scored significantly higher on the McCarthy Verbal and Memory Scales and Mean Length of Utterance. Higher performing children did better on the posttest in Mediated Learning, while lower performing children did better on the posttest in Direct Instruction programs on 18 of the 24 analyses (although the authors reported these results did not reach statistical significance).
Ganz and Flores (2008)	Language for Learning	(3) Students with severe, moderate, and mild Autism Spectrum Disorder (ASD) and developmental delays ages 10 and 11. Nonverbal IQ = 95, 85, 76	Experimental — Pretest/posttest control group Determining the relative effects of the Language for Learning with oral language skills.	Language for Learning implemented 20 minutes a day, 2–4 days per week for 12 weeks.	Childhood Autism Rating Scale (CARS), Test of Nonverbal Intelligence-3 (TONI-3), Test of Developmental-Intermediate -3 (TOLD-I-3)	All participants responded positively to treatment and had high PNDs ranging from 90%–95%.
Shillingsburg, Bowen, Peterman, Gayman (2015)	Language for Learning	(18) Children (7) with pervasive developmental disorder not otherwise specified (PDD-NOS), one child with Asperger's syndrome, and 10 children with Autism Spectrum Disorder (ASD) ranging in ages from 4 to 12.	Experimental — Pretest/posttest control group Determining the relative effects of Language for Learning oral language skills and children with language delays.	Implemented Language for Learning 3 hours per week for 16 weeks.	One-way analysis of variance (ANOVA) for pretest/posttest one-way ANOVA and Bonferroni to compare language acquisition skills.	All groups had statistically significant gains and exhibited significantly great language skills. Even higher language skills were exhibited immediately following the intervention.
Waldron-Soler, Martella, Marchand-Martella, Warner, Miller, & Tso (2002)	Language for Learning	(36) Preschool children (3 to 5 years of age) 28 typical children, 8 with developmental delays: Preschool A (12 children without developmental delay, 4 children with developmental delay), Preschool B (16 children without with developmental delay), cs7e (developmlopmental lery)50 (PsvelO u)]TJ Tcnrimental ldren without				

DISTAR Reading/

Study	Duration	Participants	Research Design/ Purpose	Intervention Details		

Corrective Reading Research

Sixteen studies were found that included Ꮷ,, c R a with students with high-incidence disabilities. As seen in Table 3 (on pg. 20), most participants were speci cally identi ed as having learning disabilities or whose descriptions matched the de nition of learning disabilities (i.e., other countries). Most investigations were conducted in elementary and/or middle school settings. One study investigated the e ects of the amount of teacher training on student performance.

Eight of these studies compared the relative e ectiveness of Ꮷ,, c R a to other programs. Results showed that students who received Ꮷ,, c R a signi cantly outperformed comparison groups in all but one of these studies (Lewis, 1982). Results of one of two studies conducted by Lewis found that both the Ꮷ,, c R a group and English Colour Code (a reading intervention program) group outperformed the school's own remedial program. However, results of the second study found that gains for all three groups were similar.

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> Principal,
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Six studies evaluated the e ectiveness of Ꞷ,, c R a by comparing pretest and posttest scores. Each of these studies reported that students who received Ꞷ,, c R a made gains. Polloway, Epstein, Polloway, Patton, and Ball (1986) found that students with learning disabilities and developmental disabilities made signi cantly greater gains with Ꞷ,, c R a than they had made in the previous year when they were taught with di erent materials.

Study	DI Program	(N) Participants	Research Design/ Purpose	Intervention Details	Outcome Measures	Findings
Arthur (1988)	Corrective Reading	(6) Learning disabilities Junior-high school students Grades 7 and 8, age range 12.2 to 14.2	Pre-experimental — One-group pretest/posttest Determining the effects of Corrective Reading with junior-high school special education students.	Provided students Corrective Reading Decoding and Comprehension over a 1 year academic period-	Test of Language Development, Test of Reading Comprehension, Test of Written Language, Sequential Test of Educational Progress, Woodcock-Johnson Psycho- Educational Battery, Wide Range Achievement Test.	Large gains in standard scores and grade equivalents were seen on all measures.
Benner, Kinder, Beaudoin, Stein, & Hirschmann (in press)	Corrective Reading Decoding B1	(41) Learning disabilities, behavior disorders, Title 1 Elementary school and middle school students (Grades 3–8)	Quasi-experimental — Nonequivalent control group Comparing the effects of Corrective Reading with another reading intervention.	One group received Corrective Reading taught by students and cooperating teachers for 4 months; other group received current reading program.	Woodcock-Johnson Achievement Tests-III, DIBELS, Child Behavior Checklist: Teacher Form.	Corrective Reading did significantly better than comparison on all measures; significant decrease in the number of treatment nonresponders.
Campbell (1984)	Corrective Reading	(55) Poor readers, likely learning disabilities (more than 1 standard deviation below the mean) Grades 7 and 8	Quasi-experimental — Nonequivalent pretest/posttest control group Assessing the effects of the Corrective Reading program vs. regular English classes.	Corrective Reading program provided to the experimental group 50 minutes per day for 6 to 9 months.	Woodcock Reading Mastery Test.	Corrective Reading group made greater grade-equivalent and standard score gains than did the comparison group. Further, the students initially at a higher
						n.

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Direct Instruction Writing and Spelling Research

Our search identi ed ve studies using Direct Instruction spelling and writing programs (See Table 4 on pg. 23). The participants in four studies were students with learning disabilities whose ages ranged from eight to 11 years. Two other studies included students with learning disabilities, behavior disorders, and traumatic brain injuries. One study identi ed participants as special education resource room students in grades three through ve.

Three studies investigated Direct Instruction spelling programs. Darch and Simpson (1991) compared the e ectiveness of 40 lessons of Ş Maą 、 and found that the students who received Direct Instruction signi cantly outperformed those students who were taught using another program. In a study that took place in Australia using Mb、ˇ o 、aą . c Ş , Maggs, McMillan, Patching, and Hawk (1981) found that students whose academic problems t our description of learning disabilities made gains of over 11 months after only eight months of instruction. More recently, Owens et al. (2004) investigated the e cacy of Ş Maą 、 taught bb/1 5 (r)8 (e)h,stigfo8 (o)7.59 (f)-24 (i)-10po8 (o)7.59 (f)-77 TD [(M)A(t)-23 (t th)8 ((u)8)-8 5s whcti SSs(denn(o dis w)k)(r)-6.9 ion stt ts(dent)n. Morinutg 42 (W)6 pnt723ight us((1 mo)(t p991) c)--16 (s5 (ning(w)3 (h)1) fc (rc)-8 (h as spe)-16 (ght (t)-2

TABLE 4: WRITING AND SPELLING RESEARCH WITH STUDENTS WITH HIGH-INCIDENCE DISABILITIES

Study	DI Program	(N) Participants	Research Design/ Purpose	Intervention Details	Outcome Measures	Findings
Anderson & Keel (2002)	Reasoning and Writing	(10) Learning disabilities; behavior disorders 4th and 5th graders	Pre-experimental — One group pretest/posttest Determining the gains using Reasoning and Writing for a short period.	25 lessons of Reasoning and Writing Level C were taught in 6 weeks.	Test of Written Language-2 (TOWL-2).	Educationally important gains were found.
Darch & Simpson (1991)	Spelling Mastery	(28) Learning disabilities (mean age = 10 years, 6 months) (mean IQ = 92)	Experimental — Pretest/posttest control group Comparing two models of spelling instruction.	Two groups (Spelling Mastery and visual imagery) used same practice words, 25 30 min. daily instruction for 5 weeks, Spelling Mastery students completed 40 lessons.	Probes every 8 10 lessons, posttest of all words in unit, Test of Written Spelling (TWS).	Spelling Mastery group performed statistically significantly better on the probes, posttest, and each subtest of the TWS than the visual imagery group.
Maggs, McMillan, Patching, & Hawke (1981)	Morphographic Spelling	(31) Likely learning disabilities from description — remedial with severe spelling problems 9 year, 9 months–11 years, 3 months (mean = 11 years, 3 months)	Pre-experimental — One group pretest/posttest Determining the efficacy of Morphographic Spelling (only remedial student results included here).	35 min. of daily instruction in Morphographic Spelling, 8 months, all 140 lessons completed, fidelity checks indicated strict adherence to procedures	Schonell Graded Word Spelling Test.	Remedial students made 11.63 months growth on the Schonell in 8 months.
Martella & Waldron-Soler (in press)	Language for Writing	(126) General education students in 2nd to 3rd grade, special education students in 3rd to 5th grade (60% African American and/or Hispanic) 105 general education, 21 special education	Pre-experimental — One group pretest/posttest Determining the effects of the Language for Writing program on 2nd- to 3rd-grade general education students and 3rd to 5th-grade special education students.	Language for Writing program implemented for 5 months (Classrooms 1–5) and 14 months (Classroom 6) (Evaluation I) and 1 academic year (Classrooms 7–10) (Evaluation II).	Test of Written Language-3, student errors, lesson duration, lesson ratings, mastery test performance, social validity survey, and curriculum-based measure.	General and special education students made statistically and educationally significant improvements in their writing performance.
Owens, Fredrick, & Shippen (2004)	Spelling Mastery	(61) Learning disabilities, 1 with traumatic brain injury 7 years, 10 months– 9 years, 8 months Mean age = 8 years, 9 months	Single-case — Multiple baseline across participants Determining if: 1) a para-professional could effectively and efficiently be trained to implement Spelling Mastery and 2) if Spelling Mastery was effective	All students received Spelling Mastery in pairs; implementation was staggered; while waiting for Spelling Mastery, probes were given; pairs received 4, 9, and 12 weeks of instruction.	CBM of spelling using taught and untaught words, Test of Written Spelling-2 (TWS-2).	97% errors corrected and 97% script compliance were noted. Correct letter sequence mprovement on CBM ranged from 9.6% (student with TBI) to 29.8%; improvement on TWS-2 from 0% (student with TBI) to 50% was found.

Direct Instruction Mathematics Research

We found one study on mathematics instruction conducted by McKenzie, Marchand-Martella, Moore, and Martella (2004). This study used a prepublication program, Connecting Math Concepts-K, to teach typically developing three- to ve-year-old children and children with developmental delays (see Table 5 on page 25). Positive ndings were noted on various measures after completing 30 lessons of this program.

It should be noted that Cole et al. (1993) described in Table 1 used *DISTAR A c* as part of an intervention package for preschoolers, however,

Part IV: Direct Instruction Research With Students With Low-Incidence Disabilities

Overview

Eight investigations were found. These studies spanned the mid-1970s to 2004. The majority of these investigations included students with developmental disabilities (n = 4). Some studies also included students with:

- Traumatic brain injury or TBI (n = 1).
- Moderate intellectual disabilities and autism/ moderate intellectual disabilities (n = 1).
- Intellectual disabilities (n = 1).
- Those identi ed as “educationally subnormal” (n = 1).

Our analysis is presented in one table (Table 6 on page 27) given the small number of studies found.

The eight studies* examined a range of Direct Instruction programs, including:

- *DISTAR R a* (n = 4).
- *La a* (n = 4).
- *A c* (n = 1).
- *G.. c R a* (n = 2).
- *R a Ma .* (n = 1).

Participants ranged in age from six to 16 years (mean age = 10) and had IQ scores between 30 and 81 (average IQ of participants = 52, which is approximately three standard deviations below the mean of 100). Such scores, coupled with other factors, lead to the classi cation of moderate to severe developmental disabilities for a number of the participants.

The research review uncovered common themes despite the various classi cations of students with low-incidence disabilities. One theme pertained to the low expectations we often have for this population. Perhaps because of the low levels of vocabulary, de cits in language and communication skills, and a history of repeated failure with “typical” curricula, low expectations for how these individuals acquire complex skills exist. Another common theme involved the use of less sophisticated interventions.

The Direct Instruction studies did not support these themes; students were held to high standards using sophisticated interventions resulting in generalizable skills. Overall, all eight studies showed positive e ects for this population of students.

*Note: The number of studies does not equal eight given t

TABLE 6: DIRECT INSTRUCTION RESEARCH WITH STUDENTS WITH LOW-INCIDENCE DISABILITIES

Study	DI Program	(N) Participants	Research Design/ Purpose	Intervention Details	Outcome Measures	Findings
Booth, Hewitt, Jenkins, & Maggs (1979)	DISTAR Language I, II, III and DISTAR Reading	(12) Age range 8 to 14 years at beginning of study Age range 12.7 to 17.8 years at end of study IQ range 35 to 55	Pre-experimental — One shot case study Longitudinal study over a 5 year period Determining the outcomes of the DISTAR Language program with children with mental Intellectual and developmental disabilities.	Provided DISTAR Language I, II, and III and DISTAR Reading over a period of 4 to 5 years.	Peabody Picture Vocabulary Test, DISTAR Mastery in language and reading, Baldie Language Ability Test, Neale Analysis of Reading Ability, and Schonell Word Recognition Test.	Children mastered most language objectives on the Baldie Language Ability Test. Participants had an average gain of 34 (range = 15 to 49) language age months in 32 months of daily instruction. Most children read at or above the 3rd-grade language and reading levels. DISTAR Language children outperformed "normal" children on 31 of 66 objectives on the Baldie Language Ability Test.
Bracey, Maggs, & Morath (1975)	DISTAR Reading I	(6) Intellectual and developmental disabilities 7 to 14 years IQ range = 30–40	Pre-experimental, One group, pretest/posttest Demonstrating that students with moderate mental Intellectual and developmental disabilities can learn to read using an explicit phonics program.	Students received instruction for 15 to 30 min. per day during their school day in DISTAR Reading I.	Difference between pretest and posttest on specified mastery objectives from the DISTAR Reading I program.	Significant gains made in blending sounds, identifying letter-sound correspondences, spelling by sounds, and sounding words out and saying them the fast way.
Flores, Shippen, Alberto, & Crowe (2004)	Corrective Reading: Decoding A	(6) Moderate Intellectual Disabilities/ Autism 7 to 13 years IQ range = 38–52	Single-case — Multiple baseline across behaviors with embedded conditions Investigating the effects of Corrective Reading on learning letter-sound correspondences, blending sounds in CVC words, and decoding.	Baseline and intervention conditions using Corrective Reading Decoding A over 11 to 27 training sessions.	Percentage of correct letter-sound correspondences identified in isolation, in a discrimination format, and blended together; percentage correct of letter-sound correspondences blended and telescoped into words (instruction, generalization, and maintenance conditions).	Five of 6 students correctly identified all letter-sound correspondences and blended letter sounds and correctly blended and telescoped words composed of targeted letter sounds. A high degree of maintenance was shown.
Gersten & Maggs (1982)	DISTAR Language I, II, and III and DISTAR Reading I, II, and III	(12) Children with moderate/ severe mental Intellectual and developmental disabilities; ages at the beginning of the study ranged from 6 years, 10 months to 12 years, 6 months, mean 10.34 years	Pre-experimental, One group, pretest/posttest Determining the long-term effects of DISTAR Language and DISTAR Reading with children with mental Intellectual and developmental disabilities.	DISTAR Language I, and II and DISTAR Reading I, II, and III given over 5 years, language instruction was provided 30 minutes a day (average) for 195 schools days per year.	Pretest nly: Peabody Picture Vocabulary Test, Baldie Language Ability Test, and Neale Analysis of Reading. Pretest/posttest: Stanford-Binet Intelligence Test.	Statistically significant improvement was noted on Stanford-Binet Intelligence Test. Good performance levels were found at end of program on other measures.
Glang, Singer, Cooley, & Tish (1992)	Corrective Reading Comprehension A, Corrective Mathematics, DISTAR Language I, Reading Mastery I*	(2) Traumatic Brain Injury Case study 1: 8 years Case study 2: 6 years Case study 1: 81 IQ Case study 2: 65 IQ	Case study 1: Multiple baseline across behaviors Case study 2: A-B design Evaluating the effects of Direct Instruction programs with students with traumatic brain injury.	Case study 1: 1 week of baseline and 6 weeks of intervention. Case study 2: baseline and intervention; included various Direct Instruction programs (two different programs for each student).	Case study 1: Percentage of correctly answered reasoning problems; percentage of correctly answered story problems; and number of math facts per minute. Case study 2: Percentage of sentences correctly repeated; number of letter sounds correctly identified.	Case study 1: Increases in story problem completion and math fact computation. Case study 2: Improved skills in repeating sentences and number of letter sounds identified.
Gregory & Warburton (1983)	DISTAR Reading II	(8) Educationally subnormal 6 to 7 years	Pre-experimental, One group, pretest/posttest Investigating how much progress learners made with a well-designed teaching program.	Instruction provided for 25 min. per day over 5 months.	Gains on Burt Rearranged Graded Word Reading test.	Gains of an average of 0.9 years in reading in 5 months were found.
Maggs & Morath (1976)	DISTAR Language I	(28) Institutionalized (for 5 years) children with moderate or severe mental Intellectual and developmental disabilities from Stockton and Marsden Hospital schools in the state of New South Wales (age range 8 to 16 years at posttest)	Experimental — Pretest/posttest control group Determining the relative effectiveness of DISTAR Language I versus Peabody Language kit IP-level) with institutionalized children with moderate to severe Intellectual and developmental disabilities.	DISTAR Language I implemented 1 hour per school day over a 2-year period (experimental group) and Peabody Language program (P-level) or programs utilizing some components of the Peabody Language kit with variations (control group).	Basic Concept Inventory, Reynell Verbal Comprehension, Stanford-Binet (L-M) Intelligence, Piaget's Class Inclusion, Piaget's Seriation, and Bruner's Matrix.	Significantly greater gains were found for children instructed with DISTAR Language I than children instructed with the Peabody Language program on all six measures.
Young, Baker, & Martin (1990)	DISTAR Arithmetic I	(5) Intellectual Disabilities 8 to 10 years IQ range = 35–54	Single-case — Multiple baseline across participants Assessing the effects of two mathematics interventions.	Participants received Discrimination Learning Theory (DLT) based on content from DISTAR Arithmetic I and DISTAR Arithmetic II, baseline from 6 to 20 days, intervention ended on day 26, maintenance data gathered days 52–56.	Percentage of academic engagement and scores on mastery tests.	DLT plus DISTAR Arithmetic I produced higher percentages of academic engagement; students scored higher on the mastery tests in this condition.

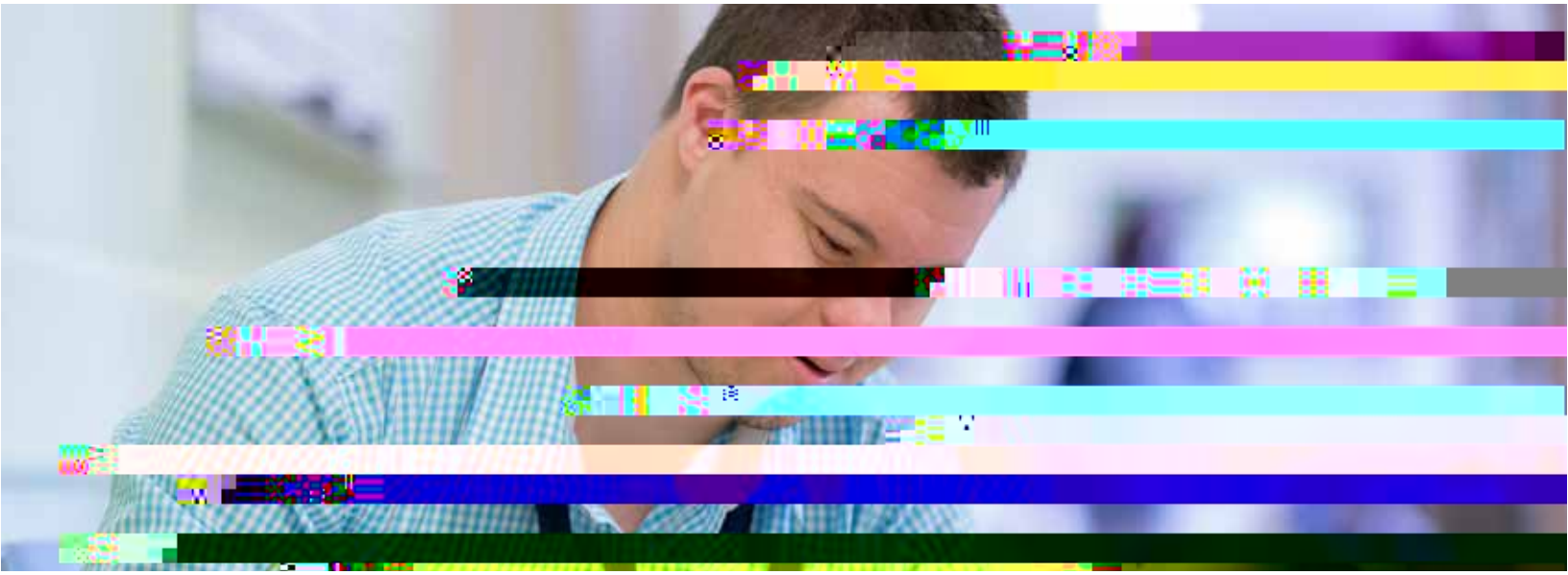
DISTAR Reading Research

The search found two studies that involved *DISTAR R a* . As shown in Table 6 on page 27, researchers identi ed the participants in these studies as students with developmental disabilities (i.e., Bracey, Maggs, & Morath, 1975) or those who were “educationally subnormal” (Gregory & Warburton, 1983). One common theme expressed in these investigations related to the notion that these individuals could not ever be expected to learn to read or read very well (e.g., they should be provided only with sight words). These studies set out to show that students with developmental disabilities could learn to read. Additionally, these studies focused on how rapidly these students could learn to read. Overall, the two studies showed students with low incidence disabilities could learn sophisticated reading strategies such as decoding words and sentences (i.e., using phonic analysis strategies as opposed to sight words). Furthermore, the studies showed the students learned to read at an accelerated pace.

Bracey et al. (1975) showed the robust e ects of *DISTAR R a* with six institutionalized students with IQ scores ranging from 30 to 40. These students had various speech di culties and were unable to read any words. *DISTAR R a* (*R a Mą* 、) asks students to identify sounds, blend these sounds into words, and say the words the fast way. Results showed these students made signi cant improvements in learning to wor Td 8(s)-7 (t)-8 (dis ranging fr9 (s o)15 (nali2 -o)7 (t)-8 (u)8 (die)nt)-8 (s w)-23 (i)-8,osth st(9 (e)-g. 88029-1.21

DISTAR Reading and Language Research

The search yielded two studies that combined *DISTAR R a* and *La a* programs with students with



Research Involving the Combination of Programs

One interesting investigation used combinations of Direct Instruction programs (see Table 6 on page 27). Glang, Singer, Cooley, and Tish (1992) provided two case studies conducted with students with traumatic brain injuries. In the rst case study, an eight-year-old student received instruction in Ꮷ、、 c R a , Comprehension A (lessons in reasoning from the deduction strand) and Ꮷ、、 c Ma a ç (two di erent exercises involving math story problems and math facts). Results showed that this student could complete more reasoning problems after receiving instruction. Further, he demonstrated an increasing RtmpmJ 0 -1.2. FDly8 (Tf (37 (t4 (e)-16 11.5 0 0 112 (d 7.9 (e in,stores involve.pses

Deaf Students Using Direct Instruction Make Signi cant Reading Gains

Similarly, Trezek (2002) asked, “Does Direct Instruction in phonics bene t deaf students? If so, how?” Trezek discussed the ndings of the National Reading Panel (NICHD, 2000) and highlighted the importance of phonological processing and its role in learning to read. She presented evidence that students who are deaf can access phonological information even though they cannot do so through audition. For instance, students might rely on speech reading or cued speech.

Trezek described a pilot study showing how deaf students who received instruction from Direct Instruction reading programs (Ω‥ c Ra , Decoding B2 and C) gained 1.2 to 2.5 grade levels in basic reading and comprehension measures after only seven months of instruction. Although the implementation of the DI programs used by Trezek (2002) and Kraemer et al. (2001) produced gains, both studies report making some adaptations and modi cations to the programs to accommodate the students’ needs. Adaptations included extending the time to present the lesson to practice pronunciations, reviewing previously presented concepts, and using pictorial representations of selected vocabulary.

Summary

Direct Instruction programs show clear evidence of their e cacy with students who have low-incidence disabilities. Many of these students had IQs in the 30 to 50 range, yet the majority of these students learned to read and master language skills otherwise thought unattainable. Studies about Direct Instruction show evidence of rapid learning gains. It seems that students with more severe disabilities can learn at high levels

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