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Teaching Letter–Sound Correspondence to Students With Moderate Intellectual Disabilities

Abstract: This study examined the efficacy of systematic and explicit instruction in phonic decoding for 6 elementary students with moderate intellectual disabilities. A multiple probe across behaviors with embedded changing conditions design was employed in order to analyze the effect of Direct Instruction on teaching the following skills with regard to consonant–vowel–consonant (CVC) words: letter–sound identification, continuous sound blending, sounding out, and decoding (sounding out then telescoping). One student did not master the letter–sound correspondences. The remaining 5 students mastered all of the instructed items in letter–sound identification, continuous sound blending, sounding out, and the decoding of CVC words. In addition, all 5 students demonstrated a generalized understanding of letter–sound correspondence and a generalized skill in sounding out untaught words. However, only 2 students were able to fully decode (sound out then telescope) untaught words. These findings provide evidence that Direct Instruction techniques can be used to teach letter–sound correspondence and decoding to some students with moderate intellectual disabilities. The results have implications for instructional methods and reading expectations for students with moderate intellectual disabilities.

Students with moderate intellectual disabilities (MoID) are identified by (a) intellectual functioning measured by a test of cognitive ability standard score from an upper limit of approximately 55 and a lower limit of 40, and (b) deficits in adaptive behavior that significantly limit the individual's effectiveness in meeting the standards of maturation, learning, personal independence or social responsibility, and especially school performance that is expected of the individual's age-level and cultural group as determined by clinical judgment (Georgia Department of Education, 2000).

Numerous researchers have demonstrated that students with MoID can learn to read individual words through various sight-word approaches (Barudin & Hourcade, 1990; Browder & Lalli, 1991; Browder, Hines, McCarthy, & Fees, 1984; Browder & Xin, 1998; Dorry & Zeaman, 1973; Gast, Ault, Wolery, Doyle, & Belanger, 1990; Koury & Browder, 1988; McGee & McCoy, 1981; Worall & Singh, 1983). However, sight-word approaches do not teach generalizable strategies that can enable students to read untaught words. It is not surprising that Browder and Xin's meta-analysis of the literature on sight-word instruction for students with disabilities did not mention issues of generalization. As a result of this failure to teach generalizable skills, sight-word approaches produce very limited reading vocabularies.

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Phonic decoding is a generalizable strategy for reading words based on three components: (a) letter–sound correspondence—the ability to say the most common sound for each letter, (b) blending—the ability to say consecutive letters in a word without stopping between sounds, and (c) telescoping—the ability to convert a blended word into the word said in the normal way (Carnine, Silbert, Kame'enui, & Tarver, 2004).

A number of researchers have proposed that students with MoID can develop generalized reading skills such as letter–sound correspondence, phonic decoding, and contextualized reading (Bracey, Maggs, & Morath, 1975; Cossu, Rossini, & Marshall, 1993; Hoogeven, Smeets, & Lancioni, 1989; Katims, 1991; Katims, 1996; Nietupski, Williams, & York, 1979); however, few studies have been conducted on this topic.

Bracey et al. (1975) studied the effects of *Distar Reading* (Engelmann & Bruner, 1969), a Direct Instruction program designed to teach phonic decoding, on students with MoID over the period of a year. The students in their study demonstrated significant gains in three areas: (a) identifying the sounds of letters and digraphs, (b) reading by blending sounds, and (c) spelling words by using sounds. The researchers concluded that students with MoID could learn to read using this task-analyzed, structured, phonetic approach.

Nietupski et al. (1979) also demonstrated that students with MoID could learn letter–sound correspondence through explicit instruction. However, they did not use a specific Direct Instruction program. The instructional sequence they employed involved four stages: isolated consonant sounds, isolated vowel sounds, vowel-consonant combinations, and CVC combinations. In the first step of the instructional sequence, the instructor presented each letter sound using flashcards; the teacher modeled the correct sound and then asked the students to say the sound. If the students responded incorrectly, the teacher modeled the sound again and asked the students to imitate the model. Students moved from one instructional stage to the next after they met a criterion of saying 50 correct sounds or words per minute. By the end of a school year, five out of the six students met the criterion for each of the four instructional stages. Nietupski et al. found that students with MoID could decode words systematically through the use of explicit instruction. The researchers also reported that the students transferred their decoding skills from isolated activities to basal reading texts.

Both Bracey et al. (1975) and Nietupski et al. (1979) called for reforms in reading instruction for students with MoID. Yet, more than 20 years later, there have been no significant changes in reading instruction for this population (Conners, 1992; Katims, 2000). A review of the research found that no other researchers have replicated or extended this research.

Therefore, the purpose of this study was to substantiate the previous research suggestions that students with MoID can learn phonic decoding from Direct Instruction. This study focused on three research questions: (a) Can elementary students with MoID learn letter–sound correspondence? (b) Can elementary students with MoID learn to blend the sounds in CVC words? (c) Can elementary students with MoID learn phonic decoding, including telescoping sounds into words said in the normal way? Each of these questions includes important generalizations. In order to learn all of the letter–sound correspondences, a student must learn the general relationship that written letters correspond with spoken sounds. In order for blending and telescoping to be useful as decoding skills, the student must be able to apply them successfully to words on which they have not received specific instruction. This study investigates these important questions of generalization.

Method

Participants and Setting

The participants were 3 males and 3 females, ages 8–13, served in a self-contained setting for students with MoID in a public elementary school in a large Southeastern city. The school was chosen based on recommendation by the district director of special education. The classroom teacher recommended 3 students, Andy, Dani, and Joe, based on their functioning in the classroom. The other 3 students in the class, Rae, Sam, and Gail, were not originally recommended for this instruction because they had additional challenges. Rae and Sam received additional services in the area of speech/language disorders, and Rae demonstrated selective mutism. Gail demonstrated behavior problems, such as refusal to complete academic tasks and follow directions, which interfered with her progress in the classroom. However, due to scheduling constraints, Rae, Sam, and Gail were included in the instruction and they appeared to be making good progress on learning the first letter sound. Therefore, they were subsequently included in the study.

Table 1 provides descriptions of the participants. The students' cognitive ability (IQ) scores ranged from 38–52, and their adaptive behavior scores ranged from 44–63. Prior to the reading intervention, the students received sight-word reading instruction using the *Edmark Reading Program* (1992) and teacher-designed instruction in letter–sound correspondence. Before beginning instruction, the original 3 students, Andy, Dani, and Joe, were given a criterion-referenced assessment of letter–sound correspondence, and none of the participants correctly identified any of the letter sounds employed in this study. Furthermore, according to the teacher and confirmed by researchers' screening, none of the students had any prior knowledge of the CVC words that were employed in the decoding component of the study.

Table 1
Description of Participants

Student	Exceptionality	Age (years)	Cognitive ability	Adaptive behavior[a]
Andy	MoID	12	<45 (WISC-III Full Scale)	44
Dani	MoID	8	38 (Stanford Binet Composite)	53
Joe	Autism/MoID	7	51 (Diff. Abilities Scale Comp.)	63
Rae	MoID	11	45 (Stanford Binet Composite)	45
Gail	MoID	13	52 (Stanford Binet Composite)	52
Sam	MoID/SI	11	42 (WPPSI-R Full Scale)	42

[a]All Adaptive Behavior Scores reflect Vineland Classroom Edition Composite scores.

Instructional Materials and Procedures

The framework for the instructional materials was taken from the Direct Instruction program, *Corrective Reading: Word-Attack Basics, Decoding A* (*Decoding A;* Engelmann, Carnine, & Johnson, 1988). This program was chosen over other Direct Instruction programs such as *Reading Mastery I* (Engelmann & Bruner, 1995) because *Decoding A* focuses exclusively on teaching decoding skills, rather than addressing broader developmental reading skills.

Modifications were made to some aspects of the instructional sequence and formats used in *Decoding A*. The first lesson in the program presents the letter sounds *a*, *e*, *m*, *s*, and *t*. However, this study did not include the letter *e* because it is visually similar to the letter *a*, and there were concerns that students would confuse the two letters. In addition, the modified program presented the letter *m* before the letter *a* because the students had previously been taught the letter *a* as a sight word. The rationale for the modified sequence was to begin instruction and to familiarize students with the instructional sequence without confusing new information with previously learned information.

The sequence of instruction is presented in Table 2. The first condition included instruction on the letters *m* and *a*. The first letter, *m*, was presented in isolation and practiced until the student correctly produced /*m*/ in response to the teacher pointing to the letter in three consecutive probes. Next, the letter *a* was introduced in isolation and practiced until the student correctly produced /*a*/ in three consecutive probes. Finally, *a* and *m* were presented together in order to teach discrimination between the two and blending.

Table 2

Sequence of Conditions

Condition 1:	Letter–sound identification, discrimination, and blending *m* and *a*
Phase 1:	Identify *m*
Phase 2:	Identify *a*
Phase 3:	Discriminate and blend *m* and *a*
Condition 2:	Letter–sound identification, discrimination, and blending *s* and *t*
Phase 1:	Identify *s*
Phase 2:	Identify *t*
Phase 3:	Discriminate and blend *s* and *t*
Phase 4:	Discriminate and blend *m*, *a*, *s*, *t*
Condition 3:	Word decoding
Phase 1:	Blend *mat*
Phase 2:	Decode (blend then say fast) *mat*
Phase 3:	Blend *sam*
Phase 4:	Decode (blend then say fast) *sam*

This task was practiced until the student produced the correct sound for each letter and held that sound until the subsequent sound was called for in three consecutive trials. The second condition introduced and practiced the letters *s* and *t* following the same sequence as in the first condition. The second condition also included a final phase that required discrimination among all four letters, *m*, *a*, *s*, and *t*; again, this skill was practiced until students performed it correctly on three consecutive trials for each letter.

In the third condition, students were presented with the CVC words *sam* and *mat*. The students were instructed to decode the words by saying the sound for each letter, holding that sound, and blending it with the sound for the subsequent letter (e.g., sam would be read as "sssaaammm") and then telescoping the sounds and saying the word fast (e.g., "sam" as it is pronounced normally).

The teacher followed an instructional script provided by the researchers. The instructional script was based on the standard script from *Decoding A* but was modified to align with the modified sequence and tasks.

During single-letter lessons, the teacher showed the student a sheet of paper with the letter, pointed to the letter, and said its sound. For example, instruction in the letter m proceeded as follows:

1. Pointing to the letter, the teacher said to the group, "This is /mmm/," holding the sound for 2–3 s.

2. The teacher guided the students saying, "Say it with me…/mmm/."

3. The teacher gave individual turns by pointing to the letter and asking, "What is this?"

4. The teacher corrected all errors with a model, lead, test procedure. She said, (a) "This says /mmm/." (b) Say it with me…/mmm/." (c) "What is this?"

The teacher used a single-switch augmentative communication device (Big Mac) for reinforcement during the individual turns portion of the lessons. This is a circular-shaped device that, when pushed, plays a short previously recorded word or phrase. After each student correctly produced the sound, the student pushed the Big Mac button and heard a recording of the teacher correctly saying the sound.

After students learned a pair of individual letter sounds (*m/a* in the first condition, and *s/t* in the second condition), instruction in discrimination and sound blending began. The teacher presented a sheet of paper with an array of the two previously mastered letters. With the exception of *t*, a stop sound, the teacher pointed to each letter for several seconds and the students were to say the letter continuously for as long as the teacher pointed to it. Then the teacher would point to another letter and the students would say that letter sound.

After the students mastered letter sounds and sound blending for each letter pair, the same blending procedure was used with all four letters. The teacher followed a script that involved the modeling, leading, and testing that was employed in the previous lessons. The students used the Big Mac as reinforcement during instruction in sound blending as well.

During the first two conditions, the second portion of each lesson involved instruction in the concepts of *slow* and *fast*. Before students could learn to say words slowly (i.e., blended) and fast (i.e., in the normal way), we reasoned, they needed to learn what these concepts meant and how to carry out these behaviors. The teacher presented the students with a picture depicting a previously learned compound word such as *toothbrush*, *backpack*, and *hamburger*. The teacher modeled saying the word slowly (e.g., "tooth…brush") and then fast (e.g., "toothbrush"). The model program, *Decoding A*, uses a horizontal line as a visual prompt for slow and fast; the instructor moves a finger across the line slowly and then fast. However, in this study, the teacher used a rubber band as a visual prompt for slow and fast. When saying a word slowly, holding the rubber band horizontally, she pulled the rubber band slowly. When saying a word fast, she quickly pulled and released the rubber band. Next, she used the rubber band and led the students in saying the word in unison slowly and then fast. Finally, the teacher tested the students, asking them to say the words slowly and fast independently. Concerned about the complexity of the concepts slow and fast, the teacher incorporated instruction on slow and fast throughout each day. For example, while lining up at the door, the teacher and her assistant would model walking slowly and fast and then she would ask the students to line up slowly and then fast. Activities such as this were used during classroom transitions, recess, and morning circle.

The third condition involved instruction in word decoding. The teacher presented a sheet with a CVC word composed of the letters that had been taught in the previous conditions (mat or sam). She modeled saying the sounds slowly (e.g., sssaaammm), then saying the word fast (e.g., sam). Next, she guided the students through saying the word slowly and fast with a lead procedure. Finally, the students independently and individually said the word slowly and then fast.

The classroom teacher carried out all instruction during the regularly scheduled reading period in the late morning approximately three times per week. Initially, instruction was carried out with all 6 students at once. Following phase one, the group of 6 was divided into two groups of 3 in order to accommodate differences in student progress. The teacher's assistant participated by role-playing as an additional student in order to provide an appropriate model during group instruction.

The first author trained the teacher in the instructional procedures until she was able to demonstrate these procedures at a criterion of 100% accuracy. The teacher learned how to carry out the instructional procedures through modeling, guided practice, and independent responding. Instructional procedures included (a) presentation of materials, (b) following a script provided by the researchers throughout the interventions, (c) correct modeling of letter sounds, (d) following a specific correction procedure using a script provided by the researchers, and (e) recording student data. The teacher implemented instructional sessions using a checklist of instructional steps, scripts for instruction and correction, and a data-recording sheet.

Measures and Data Collection Procedures

Dependent measures. The five kinds of measures used in this study correspond with the main phases of instruction. *Probes for single letter identification* presented the student with the target letter and several distracter pictures. The student was instructed to say the sound for the letter. Probes targeted each of the letters (*m*, *a*, *s*, *t*). Several versions of each probe, with items rearranged, were constructed so that students could not learn positional cues. *Probes for discrimination and blending* used an array of two or four letters, and the student was asked to say the sound for target letters. Probes were constructed for the discrimination between *m* and *a*, between *s* and *t*, and among all four letters. Multiple versions of each probe, varying the position of the letters, were produced. *Probes for decoding—slow* presented a CVC sequence and asked the students to say the words slowly (e.g., "sssaaammm"). *Probes for blending—fast* used the same presentation and asked students to say the words fast (e.g., "sam"). Blending probes were constructed for words that were explicitly taught in the instruction (*sam* and *mat*) and for words that had not been taught (*sat* and *mas*). In addition, probes for decoding were readministered to 3 of the students 4 weeks after school ended while they participated in extended school year services.

The probes were administered approximately three times per week at a time that was separate from reading instruction, either during the last period in the afternoon or the following morning during the first period of the day.

Interobserver agreement and treatment fidelity measures. Interobserver reliability was measured by comparing the teacher and researcher's data collection sheets for 25% of the treatment sessions. Both occurrence and nonoccurrence reliability were calculated and reported. Interobserver reliability was 100% for all sessions.

Treatment fidelity was measured using a checklist of instructional and probe procedures. Checklists included instructional procedures and materials, instructional language (i.e., use of given script), and correction procedures. Thirty-three percent of sessions were checked for treatment fidelity either through direct observation or audiotape. Treatment fidelity was calculated by dividing the number of procedural items carried out correctly by the total number of procedural items and multiplying by 100.

Research Design

This study's design included three conditions with three phases embedded within each condition. The conditions were (a) identification of the letters *m* and *a*, (b) identification of the letters *s* and *t*, and (c) decoding CVC words. Embedded within each of the first two conditions were the phases of (a) identifying each letter in isolation, (b) discriminating between a particular letter and pictures, and (c) discriminating between letters and blending sounds continuously. The criterion for phase changes was three consecutive probes at 100% accuracy.

There was a maintenance phase at the end of the second condition in which the students discriminated between all four letters and blended the sounds. There was a transfer phase at the end of the word-decoding condition in which the students were asked to blend and decode (blend then say fast) untaught words made up of previously taught letters. A follow-up was conducted 4 weeks after the school year ended for the 3 students who participated in extended school year services.

The independent variable was explicit instruction in letter–sound correspondence, blending, and telescoping (saying the word fast). Instruction followed a Direct Instruction format for reading (Carnine et al., 2004) based on *Decoding A*. However, as has been noted, modifications were made to accommodate the needs of the elementary students with MoID.

Results

Figures 1, 2, and 3 show the performance of each student on learning, discriminating, and blending letter sounds. Each student's performance is shown in a pair of graphs. The top graph for each student shows performance on the letters *m* and *a*; the bottom graph shows performance on the letters *s* and *t* as well as discrimination among all four letters. The horizontal axis represents the order of probes and the vertical axis represents the percent of correct trials. Table 3 shows the number of trials that each student required to reach criterion in each of the phases.

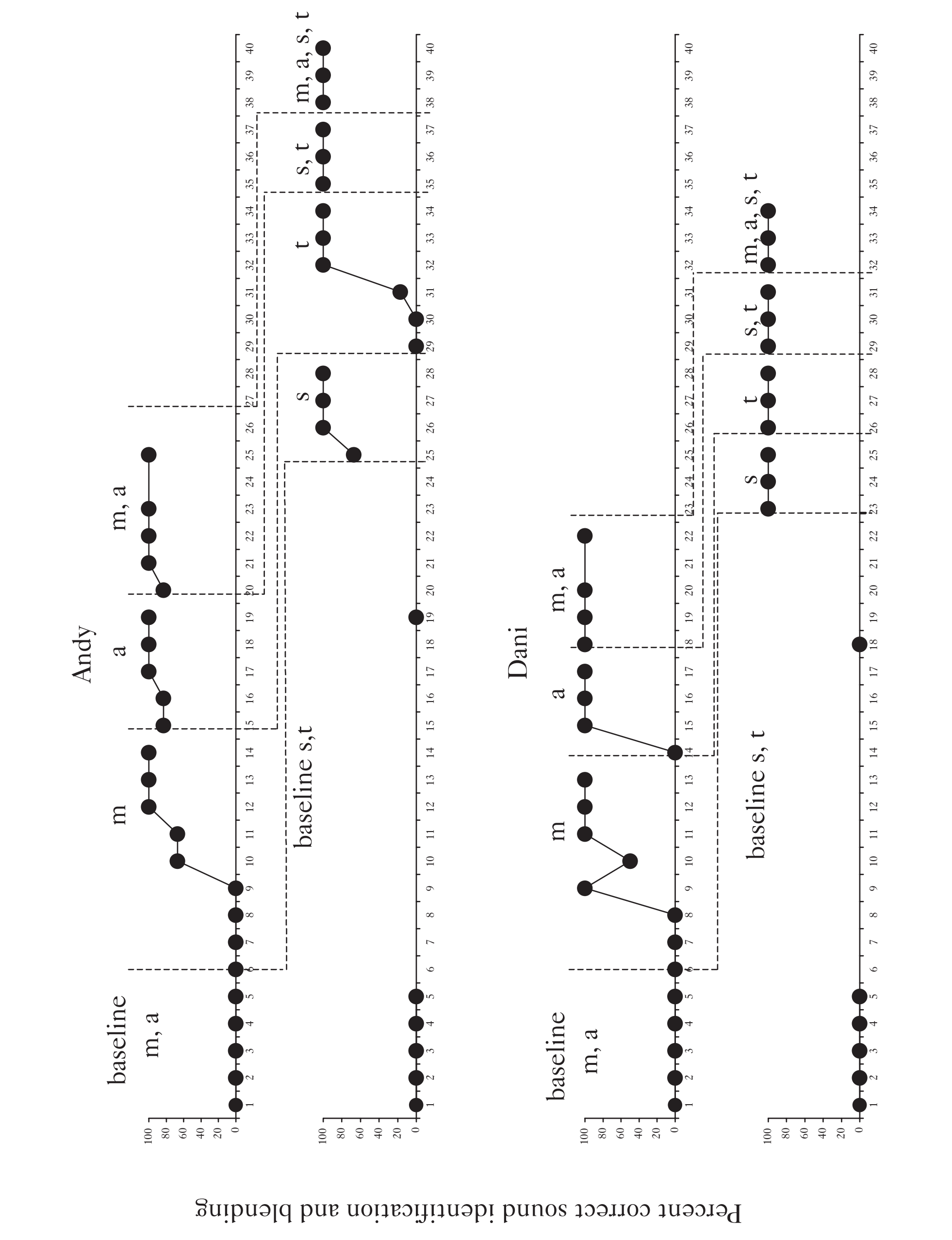
Baseline

During baseline, all of the students identified the letters *m*, *a*, *s*, and *t* with 0% accuracy. Baseline probes of *s* and *t* were continued during instruction on *a* and *m*. These probes also showed no correct responses.

Individual letter sounds and discriminations. All of the students reached the criterion of 100% accuracy in letter–sound identification for the letter *m* over three consecutive probes. At a minimum, three trials were required to reach the criterion. The number of probes that each student needed to reach criterion ranged considerably—from 5 for Joe, to 16 for Gail. Across the 6 students, the average number of trials to reach criterion was 9.5.

Figure 1

Sound identification and blending for Andy and Dani.

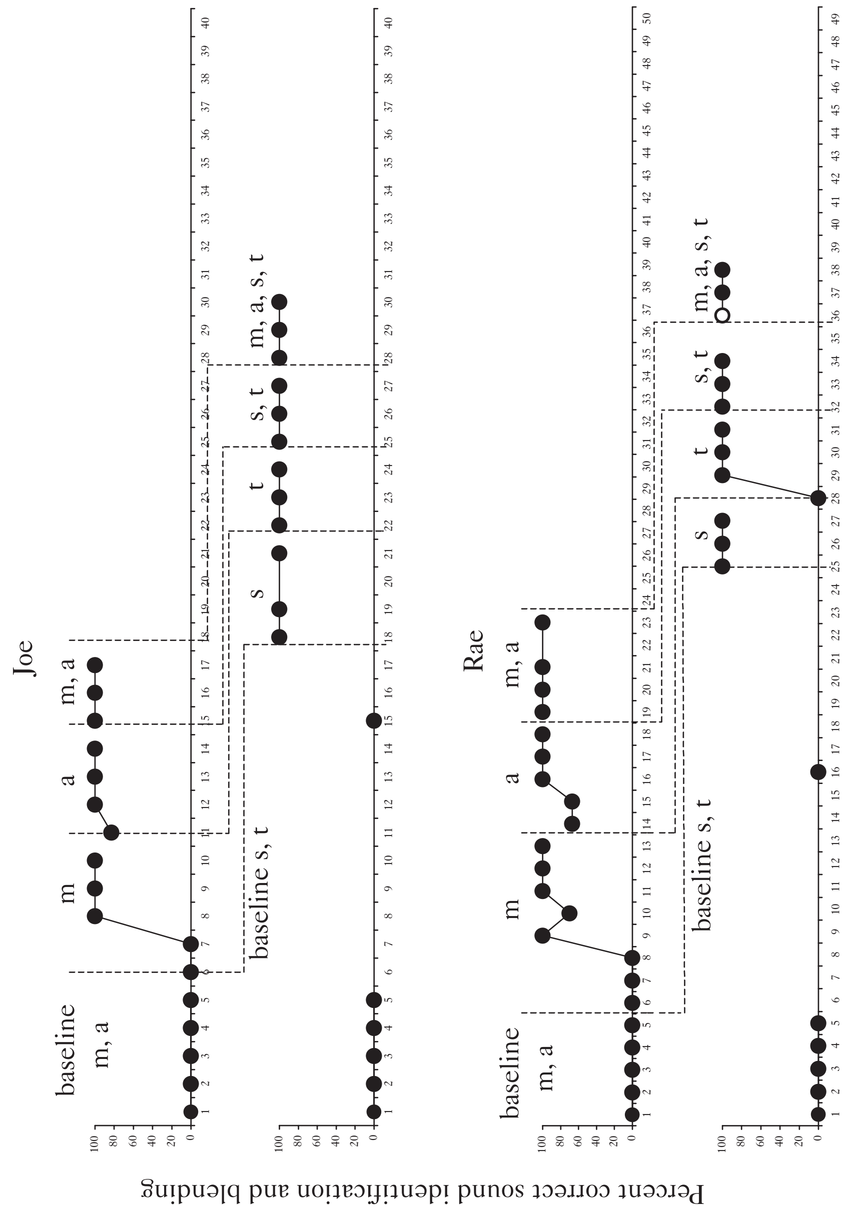


All students reached the criterion of 100% accuracy on the letter *a* over three consecutive probes. On average, students required 4.5 trials to reach criterion; this was less than half of the number required for learning the letter *m* in the first phase. Every student reached criterion on *a* in fewer trials than were required for *m*.

All students achieved 100% accuracy in letter–sound discrimination/blending over

Figure 2

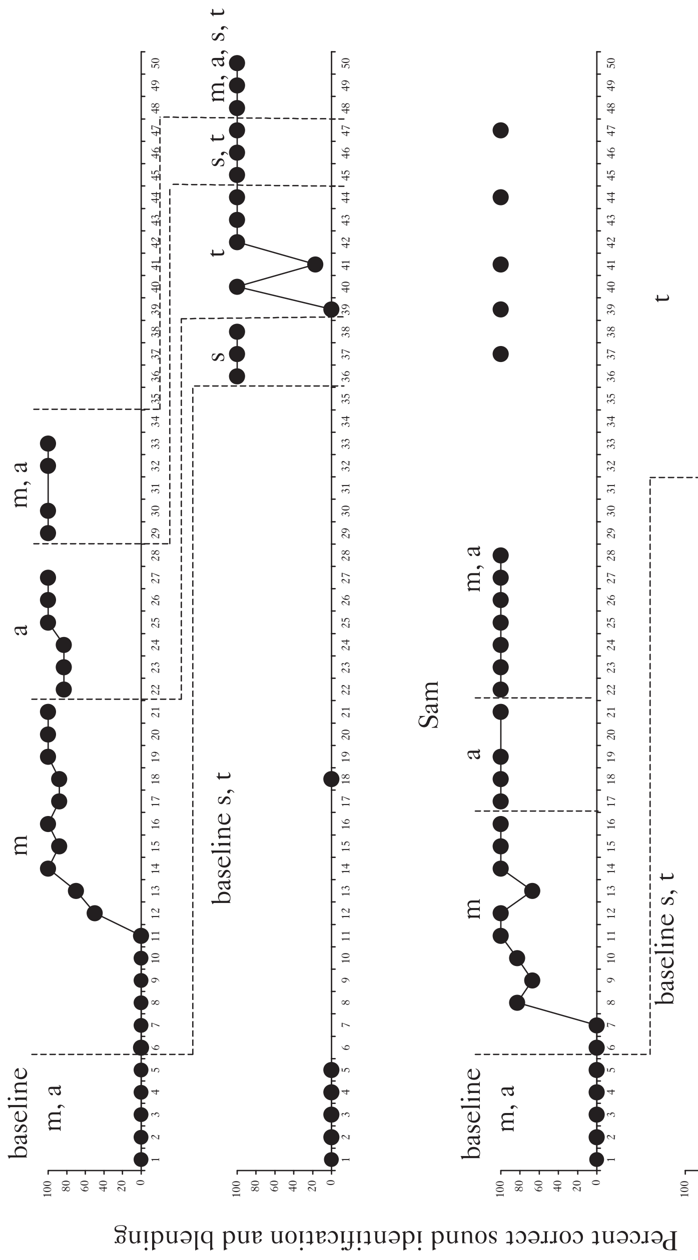
Sound identification and blending for Joe and Rae.



three consecutive trials. Four of the 5 students reached this criterion in three probes, the minimum possible. Andy required one additional probe, reaching criterion in four probes. The average number of probes to criterion was 3.2. All students except Sam reached criterion for the *s* sound within three to four probes. As a result of Sam's language disability, he was not able to produce the *s* sound. This information was available before the research study began.

Figure 3

Sound identification and blending for Gail and Sam.



The mean number of probes to criterion (excluding Sam) was 3.2.

All of the students except Sam reached criterion on *t* in three to six probes, with an average of 4.4 probes to criterion. Sam did not perform above 0% accuracy during this condition. Sam did not articulate the *t* sound; rather, he said the letter name. As a result of failing to meet this criterion, Sam did not experience the subsequent phases of instruction. Therefore, results for these later phases will include the remaining 5 students.

All 5 students achieved the criterion for *s*/*t* discrimination and blending in their first three probes. All 5 students reached criterion on *m*/*a*/*s*/*t* discrimination and blending on the first three probes.

Word Decoding: Instructed Words, Generalization, and Follow-Up

Figure 4 shows performance of each of the five students on blending (saying slowly) and telescoping (saying fast) instructed words and generalization words. The figure also shows results from a follow-up phase conducted with 3 students 4 weeks after the end of the generalization phase.

All of the 5 students who mastered the letter–sound relations demonstrated criterion-level performance in blending and telescoping the instructed words (*sam* and *mat*) in three or four probes. Two of the students (Andy and Dani) performed perfectly on all of these probes; 2 students (Rae and Gale) required one extra probe on saying *mat* slowly and then performed perfectly after that, and the remaining student (Joe) required one extra probe on each task.

All of the students showed perfect performance on saying the two untaught words (*mas* and *sat*) slowly. One student (Dani) was able to telescope both of the transfer words (saying them fast) on two of three trials. On both transfer words, she made an error on the first probe, then performed perfectly thereafter. The other 4 students made no correct responses when asked to read the transfer words fast.

Follow-up probes of blending and telescoping the taught and untaught words were adminis-

Table 3
Probes to Criterion

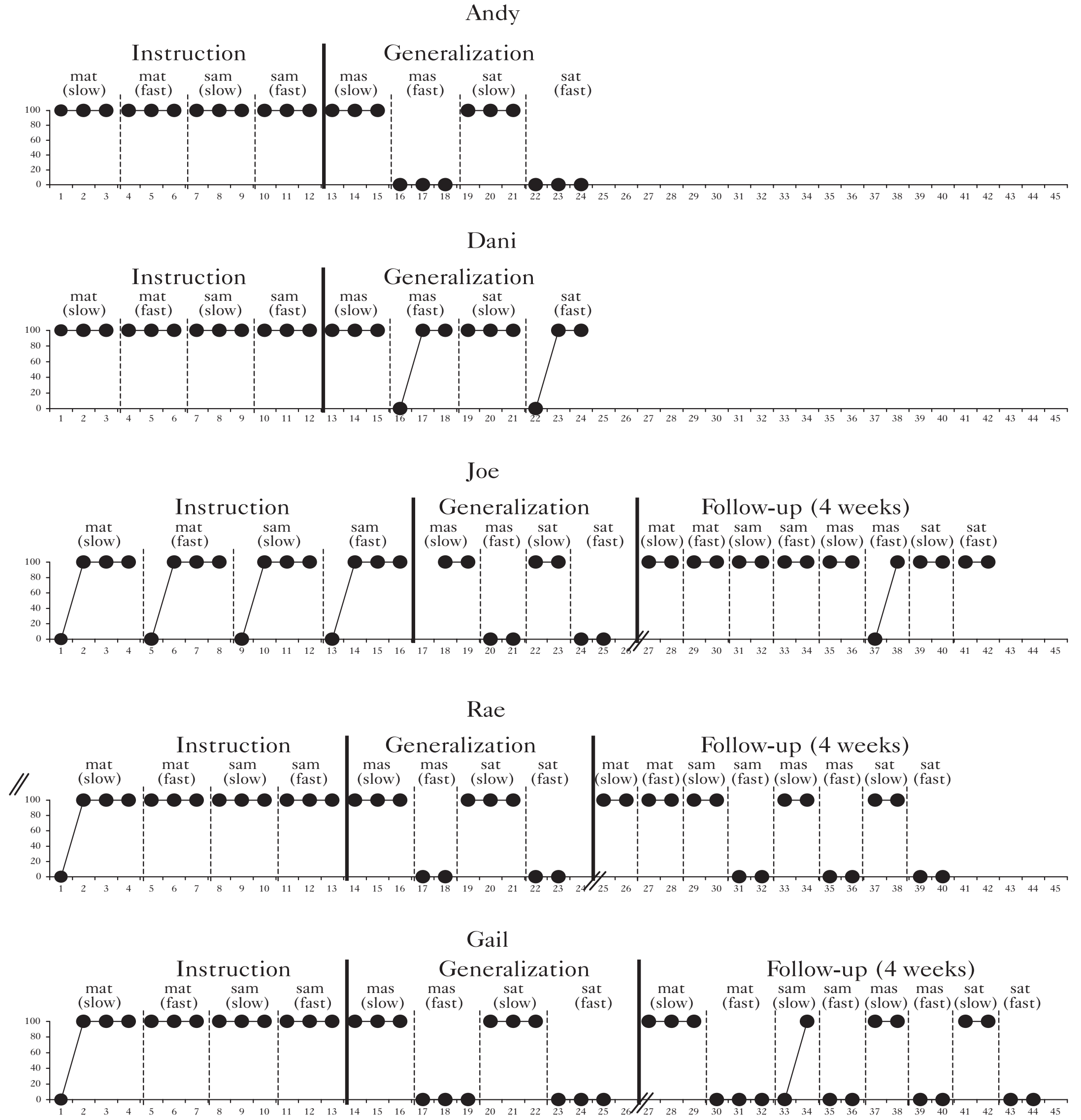
Student	*m*	*a*	*m, a*	*s*	*t*	*s, t*	*m, a, s, t*
Andy	9	5	5	4	6	3	3
Dani	8	4	3	3	3	3	3
Joe	5	4	3	3	3	3	3
Rae	8	5	3	3	4	3	3
Gail	16	6	3	3	6	3	3
Sam	11	3	3	—	—	—	—
Mean	9.5	4.5	3.3	3.2	4.4	3.0	3.0

tered to Joe, Rae, and Gail, who received extended school year services. Two of these 3 students performed perfectly on blending both taught and untaught words, and the third made only a single error.

Performance on telescoping words was less consistent. Joe showed this skill on seven of eight trials (4/4 on taught words and 3/4 on untaught words). Rae telescoped one taught word and made errors on the other taught

Figure 4

Blending and telescoping of CVC words: Instruction, generalization, and follow-up.



word and the two untaught words. Gail did not telescope any of the taught or untaught words.

Treatment Fidelity and Interobserver Agreement

Treatment fidelity was measured using a checklist of instructional and probe procedures. Thirty-three percent of sessions were checked for treatment fidelity either through direct observation or audiotape. The treatment was carried out with 100% accuracy on all observations. Interobserver agreement on probe results was measured through direct observation and audiotapes. Interobserver agreement was 100% on all probes that were observed.

Social Validity

After the study ended, the teacher completed a social validity questionnaire. She responded that she believed that the Direct Instruction reading intervention was beneficial and was a positive experience for her students. She also agreed that she would use the intervention again and would recommend this method to other teachers. However, she reported that the effort involved in implementation was not worthwhile and that she preferred sight-word instruction. She reported that she did not like the group format of Direct Instruction and preferred individual instruction. She felt that sight-word instruction was more efficient and effective. The teacher reported that she observed students using their knowledge of letter sounds to differentiate between sight words, reporting that she would use both methods of reading instruction in the future.

Discussion

The purpose of this study was to investigate the efficacy of teaching explicit phonic reading strategies to students with MoID. The Direct Instruction sequence clearly resulted in students learning letter–sound correspondence. All 6 students met criterion across the *m*, *a*, and *m/a* conditions, and 5 of the 6 students continued this trend throughout the *s*, *t*, and *s/t* conditions. With the exception of Sam and the letter *t*, all of the students reached criterion for each successive letter in fewer and fewer trials. The decrease in trials to criterion suggests that students learned the generalized relationship between letters and sounds. Throughout the study, all of the students maintained their knowledge of the letters that were mastered to criterion. The 5 students who reached criterion for the letters *m*, *a*, *s*, and *t* maintained their performance through the *m/a/s/t* condition and later blending conditions. In addition, the 3 students who were available for follow-up probes 4 weeks after instruction concluded all demonstrated these letter–sound correspondences as a component of the sounding out tasks.

Although Sam did not acquire the letters *s* and *t*, he did maintain his performance with the letters *m* and *a*. Sam's lack of progress leads to questions about which students may benefit from this type of instructional approach. Sam's articulation deficit interfered with his performance with the letter *s* sound. However, there is question as to whether Sam's lack of progress with the letter *t* sound was a result of his speech/language disorder. Sam consistently responded to the presentation of the letter *t* by saying the letter name rather than the sound, indicating that he could produce an auditorily similar sound. Strategies such as modeling the physical aspects of sound production (i.e., using a mirror to observe lip and tongue positions when pronouncing the letter) were employed with no success. Although Sam could identify and blend *m* and *a*, teaching systematic decoding may not be a realistic or practical method of instruction for him. Although this is still unclear and further research is needed, language skill may be a determining factor in choosing appropriate reading instruction for students with MoID. This raises questions about a possible marker for discontinuation of this type of instruction. According to

Engelmann et al. (1988), students who do not speak or understand the English language are not appropriate for the *Decoding A* program. Although Sam understands spoken English, his difficulty with articulation seems to indicate that reading through systematic decoding is not an appropriate reading approach.

The Direct Instruction sequence clearly resulted in students learning the generalized skill of blending. All 6 students demonstrated that they could blend combinations of the letters. All of the students blended the letter sounds *m* and *a* continuously during the *m/a* condition. The 5 students who mastered the *m*, *a*, *s*, and *t* sounds blended them during the *m*, *a*, *s*, *t* condition. The students said the sounds *m*, *a*, and *s* continuously while saying the *t* sound quickly. In the word reading probes, all 5 of the students who mastered the four letter–sound correspondences demonstrated the ability to blend CVC words, including those that had not been taught. All of the students who completed follow-up probes maintained this skill across the 4-week break.

All 5 students who mastered letter–sound correspondences were able to blend and telescope the sounds into words said the normal way (i.e., the fast way) after instruction on specific words. However, only 1 student telescoped sounds on untaught words. This failure to produce generalized telescoping of sounds is not surprising, as this skill was taught with only two words prior to the tests for generalization. Teaching this skill with more words may result in generalization.

The results of this study suggest that Direct Instruction techniques are effective for teaching the critical components of decoding to some students with moderate intellectual disabilities. The progress made by Rae and Gail was particularly noteworthy due to multiple disabilities and/or the severity of their disabilities. Initially, the teacher did not expect Rae, Gail, and Sam to be able to attend to instruction or complete the instructional tasks. Rae demonstrates selective mutism as well as a moderate intellectual disability. Gail exhibits inappropriate behaviors such as refusing to respond or participate in academic tasks or follow directions. However, soon after the first phase began, these students demonstrated learning contrary to the teacher's prior judgment, and they went on to master the main components of phonic decoding.

The IQs and adaptive behavior scores of the students in this study were not predictive of their reading progress. For example, Andy's and Dani's full-scale IQ scores (< 45 and 38) were lower than the other students. However, these 2 students mastered all skills that were taught, and Dani was the 1 student to demonstrate generalized decoding of untaught words. These students' performance demonstrates that Direct Instruction with appropriate modifications can be an effective instructional strategy for students with very low intellectual scores.

These results also have implications for which students should or should not receive this type of instruction. Behavioral concerns such as refusing to participate in academic tasks and selective mutism did not prevent Gail and Rae from participating in Direct Instruction and learning systematic decoding skills. However, as discussed earlier, severe language articulation disorders may be an exclusionary characteristic for this type of reading instruction, or the instruction may have to be modified in substantial ways. Students such as Sam may be better served through a functional sight-word approach to reading instruction.

The results of this study also have potential implications regarding teacher expectations and interest. Prior to instruction, the teacher did not feel that Rae, Gail, and Sam could learn letter–sound correspondence, much less decoding. Furthermore, according to her response to the social validity questionnaire, the teacher had mixed feelings about Direct

Instruction. Although contrary to the results of this study, the teacher stated that individual sight-word instruction was more efficient for this population. Despite these beliefs, neither treatment integrity nor student performance appeared to be affected. The script and the structure provided by Direct Instruction resulted in effective instruction which produced successive increases in student learning.

The next step in research on the use of Direct Instruction and phonic decoding strategies for students with MoID may be the continuation of the kind of program demonstrated here. Letter–sound correspondence instruction could be extended to include all letters, and blending and telescoping practice could be extended to many more words than were taught in this study. Only 1 student in this study demonstrated the generalized skill of telescoping blended sounds into words. An important direction for future research is the investigation of methods for teaching this critical skill. The present study provided instruction in sounding out and telescoping on only two words. Thus, an obvious extension is to provide instruction on more words and test for generalization. One issue that was not addressed in this study was the presentation of letters that are visually and/or auditorily similar. Future research is needed to investigate instruction in similar letters for students with MoID. Future research might focus on the Direct Instruction program *Reading Mastery I* (Engelmann & Bruner, 1995) to investigate these issues. This program includes components for introducing visually and auditorily similar letters and provides extensive practice sounding out and telescoping.

Another question for further research is how decoding skills might enhance students' functional reading in the community. There are advantages to adding decoding strategies to the functional reading repertoire of students with MoID. For example, when outside the school environment, students would have a strategy for reading untaught words that may appear throughout the community. Further, having an understanding of decoding strategies for regular words would change how functional words are taught. A number of functional words follow regular letter–sound patterns. Therefore, students with MoID could use their decoding skills to read these words rather than through rote memorization, thereby decreasing the time needed for learning functional words.

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