Instructive Feedback: Review of Parameters and Effects

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We present a review of the existing research on instructive feedback. Instructive feedback is a method of presenting extra, non-target stimuli in the consequent events of instructional trials (e.g., during praise statements). Students are not required to respond to those additional stimuli and are not reinforced if they do. The research is reviewed in terms of the characteristics of participants involved, the settings and instructional variables used, and the findings that emerged. The findings indicate that a wide range of students by age and disability were included and that most studies occurred in special education contexts. When used with response prompting procedures in a variety of direct instructional arrangements, students acquire and maintain some of the instructive feedback stimuli. Thus, teachers are encouraged to use instructive feedback in their direct instructional activities. Areas of future research include using instructive feedback in new contexts and examining methods for presenting instructive feedback. In addition, the use of instructive feedback to influence future learning and stimulus class formation should be investigated.

KEY WORDS: instructive feedback; direct instruction; incidental learning; students with disabilities; response prompting strategies.

In the past 30 years, a large literature emerged on the instruction of students with a wide range of disabilities (Mercer & Mercer, 1989; Snell,

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1993). Using principles related to stimulus control as a conceptual base, researchers developed response prompting procedures—strategies in which stimuli are presented, prompts are provided and faded, opportunities to respond are given, and differential reinforcement is delivered (Demchak, 1990). Examples include most-to-least prompting (Kayser, Billingsley, & Neel, 1986), system of least prompts (Doyle, Wolery, Ault, & Gast, 1988), constant and progressive time delay (Handen & Zane, 1987; Wolery, Holcombe, et al., 1992), simultaneous prompting (Schuster, Griffen, & Wolery, 1992), and milieu procedures (Kaiser, Yoder, & Keetz, 1992). Investigators have compared these procedures to evaluate their relative effects on the rapidity of learning (Ault, Wolery, Doyle, & Gast, 1989) and studied procedures for increasing instructional efficiency and generalization (Wolery, Ault, & Doyle, 1992).

Instructive feedback is a manipulation of instructional strategies conducted to increase the efficiency of instruction (i.e., to allow students to acquire additional behaviors in the same amount of instructional time). Instructive feedback involves consistently presenting extra, non-target stimuli during the consequent events of instructional trials. Students are not expected to respond to the extra stimuli (called instructive feedback stimuli) and reinforcement is not delivered if they do. It is "instructive," because new or additional information is provided; and it is "feedback" because it is delivered after students respond (Werts, Wolery, Gast, & Holcombe, in press). A trial may occur as follows: The teacher secures the student's attention, presents the target stimulus and task direction, and provides a response interval. If the student responds correctly, the teacher reinforces the behavior and simultaneously presents a second stimulus (the instructive feedback stimulus). To illustrate: the teacher holds a card with a word written on it, asks the student to look, and says, "What's this?" If the student answers correctly, the teacher praises the student and says, "(*Word*) is spelled (*says the letters of the word in order*)." The spelling of the target word is the instructive feedback. The student is not expected to imitate the spelling verbally or in writing; and the student is not reinforced if s/he does. The instructive feedback stimuli (spellings) are simply presented as feedback. The intent of using instructive feedback is to cause students to acquire the responses related to the respective instructive feedback stimuli. If students learn to respond correctly to the instructive feedback stimuli and if the procedure does not add appreciably to the time required for instructional sessions, then the efficiency of instruction can be enhanced— children can learn more in about the same amount of time.

The purpose of this review was to summarize the existing research on instructive feedback by answering several questions: Who has served as participants in instructive feedback studies? What settings and instructional

arrangements have been used? How has instructive feedback been employed? What effects occur from using instructive feedback? What recommendations can be drawn from the existing research for practice?

METHOD

The review progressed through several stages. First, reports were identified that used instructive feedback through the following mechanisms. All reports that used instructive feedback and were known to us were identified. Their respective reference lists were analyzed for additional reports. An ERIC search was conducted of the following terms: "incidental learning," "observational learning," and "instructive feedback." Finally, a list of reports identified through these mechanisms was circulated to various authors who had conducted instructive feedback research. Three criteria were specified for selecting identified reports. These were (a) a stimulus other than reinforcement or correction had to be added to the consequent events of instructional trials, (b) the student was not required or prompted to respond to the added stimulus during instructional sessions, and (c) the student was not reinforced for responding to that stimulus.

Second, the dimensions on which each report was analyzed were identified. These included: the demographics of the subjects, instructional arrangements, characteristics of the target and instructive feedback stimuli, types of instructive feedback, methods of presenting the instructive feedback, acquisition of the instructive feedback responses, and methodological issues.

Third, two reviewers read the reports and completed data sheets on each dimension. Each reviewer read and rated half of the reports. Fourth, 2 to 4 reports of each reviewer also were analyzed by the other to collect inter-rater agreement; agreement was 95.8%. Disagreements occurred because one reviewer had personal knowledge of studies, alternative interpretations were made, and some coding errors occurred. Any disagreements were checked with the written article and resolved. Personal knowledge of extra factors of the study beyond the written product was not included.

RESULTS

A total of 24 research reports were initially identified. Three were unpublished master's theses and two were unpublished doctoral dissertations. The remainder were articles published in professional journals (17) or manuscripts submitted for publication (2). One published study (Janssen

& Guess, 1978) was identified but not analyzed. The researchers in this study taught students to identify objects and added the respective object's function in the consequent events. The procedures matched those defined for instructive feedback in three ways. The function of the object was embedded in the consequent events for trials, no response was required following correct responses to a trial, and subjects were not reinforced for performing the function following correct trials. However, subjects were required to perform the function following incorrect trials. Additionally, data on acquisition of the function were not reported. Although the procedure was similar to instructive feedback as defined for this review, the intent of the procedure was different (i.e., to promote learning of the target rather than instructive feedback stimuli); thus, it was not included in the review. A total of 23 reports were analyzed.

Purpose of Studies

The studies using instructive feedback were conducted for various purposes. Eight studies focused on variables related to small group instruction and whether use of instructive feedback would result in more efficient learning (Carper, 1990; Doyle, Gast, Wolery, Ault, & Farmer, 1990; Gast, Doyle, Wolery, Ault, & Farmer, 1991; Gast, Wolery, Morris, Doyle, & Meyer, 1990; Keel & Gast, 1992; Shelton, Gast, Wolery, & Winterling, 1991; Stinson, Gast, Wolery, & Collins, 1991; Wise, 1990). Six studies focused on instructive feedback in combination with another instructional procedure to evaluate the acquisition of instructive feedback behaviors. These included combinations with constant time delay (Doyle, Wolery, Gast, Ault, & Wiley, 1990), with simultaneous prompting (Wolery, Holcombe, Werts, & Cipollone, 1993), with individually administered (Werts, Wolery, Holcombe, Vassilaros, & Billings, 1992) and group administered transition-based teaching trials (Werts, Wolery, Venn, Demblowski, & Doren, 1994), constant time delay with specific and general attending cues (Wolery, Cybriwsky, Gast, & Boyle-Gast, 1991), and constant time delay with independent and inter-dependent group contingencies (Harrell, 1990).

Five studies focused on methods of presenting instructive feedback. These studies included a demonstration that instructive feedback could be presented through computer-assisted instruction (Edwards, 1989), a comparison of presenting the extra stimuli before the trial to instructive feedback (Gast, Doyle, Wolery, Ault, & Baklarz, 1991), a comparison of using instructive feedback that was related and unrelated to the target behaviors (Werts, Wolery, Holcombe, & Frederick, 1993), an analysis of the number and type of instructive feedback stimuli presented (Gast, Doyle, Wolery,

Ault, & Kolenda, 1994), and a comparison of methods for presenting two instructive feedback stimuli for each target behavior (Wolery, Werts, Holcombe, Billings, & Vassilaros, 1993).

Four investigations evaluated unique applications of instructive feedback. One used instructive feedback to study stimulus class formation (Werts, Wolery, Holcombe, & Neumont-Ament, 1992). Three studies focused on whether presenting instructive feedback stimuli would influence the efficiency of later instruction in which the previously used instructive feedback stimuli were taught directly (Holcombe, 1991; Holcombe, Wolery, Werts, & Hrenkevich, 1993; Wolery, Doyle, et al., 1991).

Demographic Variables

Demographic variables included the participants' ages, genders, and diagnoses. These data are presented in Table 1 for the 23 analyzed reports. A total of 113 students participated; 62% were males and 38% were females. The participants ranged from 3 to 21 years of age. Elementary-aged students were included in the largest number of studies (10 of the 23 reports), followed by secondary-aged students (7 reports), and preschool children (6 reports). Nearly all (94.6%) participants had an identified disability. The identified disabilities included mental retardation, autism, seizure disorders, developmental delays, learning disabilities, hearing impairments, speech and language delays, attention deficit disorder, behavior disorders, and social-emotional problems. One study (Werts et al., 1994) included children with typical development as well as children with disabilities. No studies focused exclusively on students without disabilities.

Procedural Parameters

The analyzed procedural parameters were: the type of target behavior, location of the instruction, type of instructor, instructional grouping, and type of instructional strategy used. Data on these variables are presented in Table 2. A variety of target behaviors were taught directly. Sight words (9 reports) and variations of them (recipe words, rebuses, etc.) were the most frequent target behaviors. Math concepts were taught in six reports, including identifying equivalent fractions, values of coin combinations, numerals, the number of objects in sets, and shapes. Other target behaviors were naming state capitals, stating facts related to social studies, and naming photographs.

The studies occurred in three settings: in special education classrooms in public schools (16 reports), specialized preschool classrooms (6 reports),

Table 1. Subject Demographics

Reference	Gender	Ages	Diagnosis	IQ
Carper, 1990	n=5 1m, 4f	16-4 to 21	mr/autism/ seizures	severe to 29-45
Doyle, Gast, et al., 1990	n=4 2m, 2f	16-7 to 18-2	mr	45-61
Doyle, Wolery, et al., 1990	n=3 2m, 1f	4-1 to 6-5	mr/dd seizures	—
Edwards, 1989	n=4 2m, 2f	16-3 to 17-11	ld/emr	—
Gast, Doyle, Wolery, Ault, & Baklarz, 1991	n=4 4m	7-10 to 8-8	mr/hi	52-73
Gast Doyle, Wolery, Ault, & Kolenda, 1994	n=4 4m	8-6 to 9-6	sp.lang/ mr/ld	50-75
Gast, Doyle, Wolery, Ault, & Farmer, 1991	n=4 2m, 2f	15-4 to 19-4	mr	<30-50
Gast et al., 1990	n=5 4m, 1f	8-8 to 12-10	mr	—
Harrell, 1990	n=8 6m, 2f	6-1 to 9-10	ld/emh	—
Holcombe, 1991	n=4 2m, 2f	3-8 to 4-10	dd/add/ seizures	—
Holcombe, et al., 1993	n=5 5m	3-6 to 5-0	dd	—
Keel & Gast, 1992	n=3 2m, 1f	11-6 to 12-1	ld/bd	71-105
Shelton et al., 1990	n=8 7m, 1f	9 to 12	emh	43-83
Stinson et al., 1991	n=4 1m, 3f	9-8 to 10-8	mr-moderate	41-51
Werts, Wolery, Holcombe Vassilaros, & Billings, 1992	n=3 3m	3-9 to 4-5	mr/hearing	—
Werts, Wolery, Holcombe, & Frederick, 1993	n=5 3m, 2f	9-3 to 10-7	sed	78-118
Werts, Wolery, Holcombe, & Neumont-Ament, 1992	n=5 4m, 1f	12-10 to 14-8	sed	83-111

Table 1. Continued

Reference	Gender	Ages	Diagnosis	IQ
Werts, Wolery, Venn, Demblowski, & Doren, 1994	n=9 2m, 1f 1m, 5f	5-5 to 6-1 not reported	mr/dd/ autistic typical	53-76 not reported
Wise, 1990	n=4 2m, 2f	13 to 15	ld/emr	61-75
Wolery, Cybriwsky, et al., 1991	n=4 2m, 2f	14-8 to 15-11	ld/bd	66 to average
Wolery, Doyle, et al., 1991	n=8 2m, 2f 2m, 2f	9-5 to 13-7 6-10 to 9-10	autism/mr mr	 45-51 42-51
Wolery, Holcombe, et al., 1993	n=5 3m, 2f	3-0 to 3-6	dd/mr	—
Wolery, Werts, et al., 1993	n=5 3m, 2f	4-7 to 5-1	speech/hearing	75-120

Notes: m = males, f = females, mr = mental retardation, dd = developmental delay, ld = learning disability, emh = educably mentally handicapped, sp.lang = speech and language delayed, add = attention deficit disorder, sed = social and emotional disorder.

and a general education classroom in a public school (1 report). The instructors in the studies included classroom teachers, program coordinators, and speech-language pathologists (16 reports); research and program staff (2 reports); research staff only (1 report); teaching assistants (1 report); and master's degree and doctoral students (3 reports). The majority of the studies (14 reports) were conducted in small group arrangements with 2 to 5 children in a group; three studies had multiple group arrangements. Five studies were conducted in 1:1 arrangements, and one study was conducted with the entire class. All studies used a response prompting strategy to teach the target behaviors. Constant time delay was used most frequently (16 reports) followed by progressive time delay (5 reports) and simultaneous prompting (1 report). One study compared the efficacy of progressive time delay and system of least prompts.

Instructive Feedback Variables

The factors involved with the presentation of instructive feedback stimuli and the results of that presentation are shown in Table 3. These include

Table 2. Procedural Parameters

Reference	Target Behavior	Strategy	Setting	Instructor	Grouping
Carper, 1990	sight words, pictures	PTD	special education-public	master's student	1:2
Doyle, Gast, et al., 1990	facts (govt. and medication)	CTD	special education-public	teacher	1:4
Doyle, Wolery, et al., 1990	sight words	CTD	preschool	staff coordinator	1:1
Edwards, 1989	spelling abbreviation	CTD-CAI	special education-public	doctoral student	1:1
Gast, Doyle, Wolery, Ault, & Baklarz, 1991	sight words	CTD	special education-public	teacher	1:4
Gast Doyle, Wolery, Ault, & Kolenda, 1994	labeling photos	CTD	special education-public	teacher	1:4
Gast, Doyle, Wolery, Ault, & Farmer, 1991	recipe words	PTD & SLP	special education-public	teacher	1:1
Gast et al., 1990	sight words	CTD	special education-public	teacher	1:5
Harrell, 1990	photos, antonyms	CTD	special education-public	teacher	1:4
Holcombe, 1991	numerals	CTD	preschool-segregated	teacher	1:2
Holcombe et al., 1993	number sets	CTD	preschool-segregated	teacher/investigator	1:2 & 1:3
Keel & Gast, 1992	sight words	CTD	special education-public	doctoral student	1:3
Shelton et al., 1990	sight words	PTD	special education-public	language therapist	1:4

Stinson et al., 1991	sight words	PTD	special education-public	teacher	1:4
Werts, Wolery, Holcombe, Vassilaros, & Billings, 1992	shapes	CTD-TBT	preschool-segregated	teacher/language therapist	1:1
Werts, Wolery, Holcombe, & Frederick, 1993	fractions state capitals	CTD	special education-public	teacher	1:5
Werts, Wolery, Holcombe, & Neumont-Ament, 1992	equivalent fractions	CTD	special education-public	teacher	1:5
Werts, Wolery, Venn, Demblowski, & Doren, 1994	values of coins	CTD-TBT	regular class-public	teaching assistant	1:18-24
Wise, 1990	multisyllable vocabulary	CTD	special education-public	teacher	1:4
Wolery, Cybriwsky, et al., 1991	social studies facts	CTD	special education-public	teacher	1:4
Wolery, Doyle, et al., 1991	identify photos	PTD	special education-public	teacher	1:1
Wolery, Holcombe, et al., 1993	identify rebuses	simultaneous prompting	preschool-segregated	researcher/coordinator	1:2 & 1:1
Wolery, Werts, et al., 1993	values of coins	CTD	preschool-segregated	researcher	1:3, 1:2, 1:1

Notes: CTD = constant time delay, PTD = progressive time delay, CAI = computer assisted instruction, SLP = system of least prompts, TBT = transition-based teaching.

Table 3. Instructive Feedback Parameters

Reference	Target Behavior	Instructive Feedback	Type	Presented	# of Stimuli	Exposures	% of Net Gain	% of Net Gain Observational
Carper, 1990	sight words picture identification	picture sign, word	parallel	visual	1 (1 had 2)	3	n/a	n/a
Doyle, Gast. et al., 1990	facts (government and medicine)	related fact	expansion	verbal	1	1,4	66.3	54.2
Doyle, Wolery, et al., 1990	sight words	function	expansion	verbal	1	n/a	88.9	
Edwards, 1989	spelling abbreviations	spelling word	expansion	visual	1	6	24.7	
Gast, Doyle, Wolery, Ault, & Baklarz, 1991	sight words	spelling	expansion	verbal	1 and 2	2	87.5	
Gast, Doyle, Wolery, Ault, & Kolenda, 1994	labelling photos	1. activities 2. addresses	expansion	verbal	1	2	71.4	
Gast, Doyle Wolery, Ault, & Farmer, 1991	recipe words	picture of action perform action	expansion	visual/verbal model/verbal	1	10	67.9	
Gast et al., 1990	sight words	definitions	expansion	verbal	1	3	29.2	31.9
Harrell, 1990	photos, antonyms	sight words definitions	parallel expansion	visual/verbal	1	3	55.7	35.6
Holcombe, 1991	numerals	number words	parallel	visual	1	6	44.9	60.0
Holcombe et al., 1993	number sets	numerals	parallel	visual/verbal	1	8	30.4	

Study	Target	Instructive feedback	Type	Modality				
Keel & Gast, 1992	sight words	definitions	expansion	verbal	1	5	48.0	43.0
Shelton et al., 1990	sight words	definitions	expansion	verbal	1	5	77.3	66.9
Stinson et al., 1991	sight words	definitions	expansion	verbal	1	3	84.4	76.6
Werts, Wolery, Holcombe, Vassilaros, & Billings, 1992	shapes	colors	novel	visual/verbal/signed (embedded)	1	1	22.2	
Werts, Wolery, Holcombe, & Frederick, 1993	fractions / state capitals	a. % b. states / a. states b. %	a. expansion b. novel	visual/verbal	1	2	77.7 / 71.1	
Werts, Wolery, Holcombe, & Neumont-Ament, 1992	equivalent fractions	equivalent fractions	parallel	visual	2 / 1 / 1	1 / 2 / 2	34.9 / -14.0 / 76.8	
Werts, Wolery, Venn, Demblowski, & Doren, 1994	values of coins	number words	parallel	visual/verbal	1	1	58.3	
Wise, 1990	multisyllable vocabulary words	definitions (verbatim)	expansion	verbal	1	2	18.3	
Wolery, Cybriwsky, et al., 1991	facts: social studies and health	related facts	expansion	visual/verbal	1	4	81.3	37.1
Wolery, Doyle, et al., 1991	identify photos	corresponding word	parallel	printed (no verbal)	1	6	64.3	
Wolery, Holcombe, et al., 1993	identify rebuses	classification	expansion	verbal	1	3	42.3	
Wolery, Werts, et al., 1993	values of coins	1. number word 2. array of pennies or numeral	parallel	visual/verbal	simultaneous:2 alternating:1	simultan:4 alternate:2	50.0	

the target and instructive feedback behaviors, type of instructive feedback, presentation method, number of instructive feedback stimuli for each target stimulus, number of presentations per session, and percent of net gain for participants' own instructive feedback stimuli and their peers' instructive feedback stimuli (observational learning).

Types of Instructive Feedback

The instructive feedback behaviors were varied and can be grouped in three categories: parallel, expansion, and novel. These types are defined in relation to the target behaviors. *Parallel instructive feedback stimuli* require the same responses as the target stimuli. This type was used in eight investigations. Examples included corresponding Arabic and Roman numerals and sets of objects (Holcombe et al., 1993); numerals and corresponding number words (Holcombe, 1991); coin values and related number words (Wolery, Werts, et al., 1993); equivalent fractions and percentages (Werts, Wolery, Holcombe, & Neumont-Ament, 1992). *Expansion instructive feedback stimuli* require responses different from the target stimuli and extend the concept being taught in the target stimuli. This type was used in 15 studies. Examples include sight words as the target stimuli and definitions of the words as instructive feedback (Gast et al., 1990; Shelton et al., 1991; Stinson et al., 1991) or spelling of the words as instructive feedback (Gast, Doyle, Wolery, Ault, & Baklarz, 1991). In other studies, students were taught to state specific facts about selected content as the target behavior, and related facts were presented as instructive feedback (Gast et al., 1994; Wolery, Cybriwsky, et al., 1991). *Novel instructive feedback stimuli* require responses different from the target behavior, are from a different curricular domain, and are unrelated conceptually to the target behavior. For example, Werts, Wolery, Holcombe, Vassilaros, and Billings (1992) taught preschoolers to name shapes when shown shapes of different colors; the instructive feedback stimuli were the colors of the shapes. Werts et al. (1993) taught children to state the answer to math equations and presented social study facts as instructive feedback.

Presentation Variables

In 10 studies, the instructor delivered the instructive feedback verbally; in 8 studies the instructive feedback stimuli were presented verbally *and* visually (e.g., with a flash card or a modeled sign). Five studies presented the instructive feedback stimuli only through visual means. One of these studies (Edwards, 1989) presented the instructive feedback on a computer

screen. In all studies, the instructive feedback was presented in a consistent manner across trials. In 20 of the reports, one instructive feedback stimulus was identified for each target behavior. In 3 studies (Gast et al., in press, Harrell, 1990; Wolery, Werts, et al., 1993), more than one instructive feedback stimulus was used with some of the target behaviors. The instructive feedback stimuli were presented immediately after the instructor delivered the reinforcers in 22 reports. In one study (Holcombe et al., 1993), the instructive feedback was delivered during the praise statement. In 17 studies, instructive feedback was presented only after students' correct responses on target behaviors; incorrect or no responses to the target behavior did not result in delivery of instructive feedback. In 5 studies, instructive feedback was delivered after both correct and incorrect responses. Each of those studies used an error correction procedure. In one study (Carper, 1990), the trials for which instructive feedback was delivered were not specified. The number of exposures to each instructive feedback stimulus within a session varied across studies, and no studies examined the number of exposures needed. The instructive feedback stimuli were presented from 1 to 10 times per session.

Measurement of Instructive Feedback

Single-subject designs were used in all studies. The multiple probe design was used most frequently (15 reports) followed by comparative designs including the adapted alternating treatments design (5 reports) and the parallel treatments design (3 reports). In all studies, students' responses to the instructive feedback stimuli were assessed in probe sessions prior to instruction. Subsequently, the target behaviors were taught directly with the instructive feedback stimuli presented on a consistent basis. After students acquired the target behaviors, their responses to the instructive feedback stimuli were again assessed in probe sessions.

All studies reported collecting interobserver agreement data for the instructive feedback probe sessions. In all studies, means above 97.9% were reported. In all studies, procedural fidelity data were collected and reported to document that the instructive feedback was used as planned. Some studies included the percentages for each subject, some for each session, and some for each step of the procedure. The mean percent of correct implementation was above 95% for 21 of the studies. Two studies reported that correct use was in the 90% to 100% range except for one step which occurred in the 87-89% range.

Effects of Instructive Feedback

All studies included data on the acquisition of the instructive feedback behaviors. The number of behaviors acquired varied across students, across conditions, and across stimuli. Four studies summed data across students. The net percentage gain on instructive feedback behaviors is presented in Table 3. Overall, 811 separate behaviors were taught to 113 students for a total net gain of 58.2%.

Eight reports contained data on maintenance of instructive feedback behaviors. Two of these reported group scores for all students involved (Gast, Doyle, Wolery, Ault, & Baklarz, 1991; Gast et al., 1994). Eight group scores indicated no loss in performance on maintenance probes and three showed increases in correct performance on later probe sessions. In the studies that reported individual maintenance data, 28 students had 60 assessments of maintenance. The results were mixed: correct performance remained stable in 23 assessments, was lower in 19, and was higher in 18.

In addition, 10 studies using small group instructional arrangements included data on students' performance of their peers' instructive feedback behaviors; this was termed, "observational instructive feedback." The percentage of net gain for observational instructive feedback also is shown in Table 3. Across the 10 studies, 45 students had scores for their own instructive feedback stimuli and the observational instructive feedback stimuli. Of these, 29 students had higher net gains on their own instructive feedback stimuli (range: 0.9-87.5%), 5 students performed equally well on both types, and 11 students had higher net gains on observational instructive feedback (range: 6.8-41.5%).

CONCLUSIONS

Several conclusions can be drawn from this research. To qualify the generality of these conclusions, the context in which the studies were conducted is noteworthy. Instructive feedback was studied when response prompting procedures were used during direct instruction to teach students multiple discrete target behaviors simultaneously. Students performance on instructive feedback stimuli was measured before instruction on target behaviors and after students met criterion on their target behaviors, but not during instruction. The instructive feedback was presented consistently after every correct response or after all responses regardless of correctness, and it was presented in the same way on each trial—the effects of other presentation schedules and of varied presentation have not been studied. Given these qualifications, the following conclusions are possible.

First, students acquire some, a majority, of their parallel (Holcombe et al., 1993), expansion (Stinson et al., 1991) and novel (Werts et al., 1993) instructive feedback behaviors. Second, students appear to maintain their performance on the instructive feedback behaviors. Third, when taught in small groups with the opportunity to observe the instructive feedback stimuli delivered to their peers, students often acquire those behaviors as well. Fourth, use of instructive feedback does not appear to interfere with the rapidity with which target behaviors are acquired or increase substantially (less than a minute) the length of instructional sessions (Holcombe, 1991; Holcombe et al., 1993; Wolery, Doyle, et al., 1991). Although the above qualifications exist, these findings have occurred across instructional arrangements including one-to-one instruction (Gast, Doyle, Wolery, Ault, & Farmer, 1991), small group instruction implemented in a variety of ways (Doyle, Gast, et al., 1990; Shelton et al., 1991), transition-based teaching delivered to individuals (Werts, Wolery, Holcombe, Vassilaros, & Billings, 1992) and groups (Werts et al., 1994), and computer-assisted instruction (Edwards, 1989). The findings are applicable across different means of presenting instructive feedback, including verbal, visual, and combinations of the two. Furthermore, the findings are applicable to preschoolers (Holcombe et al., 1993; Wolery, Holcombe, et al., 1993), elementary-aged students (Gast et al., 1990; Shelton et al., 1991), and secondary-aged students (Gast, Doyle, Wolery, Ault, & Farmer, 1991; Wolery, Cybriwsky, et al., 1991) with a variety of different disabilities. In most cases, the instruction in the studies was provided by program (teachers, speech-language pathologists, etc.) rather than research staff, and data were collected indicating that the practitioners delivered the instructive feedback with a high degree of procedural fidelity.

Besides these general conclusions, some specific conclusions are possible. First, students can acquire two instructive feedback stimuli for each target behavior when both instructive feedback are provided on each trial (Harrell, 1990; Gast et al., 1994; Wolery, Werts, et al., 1993) or they are presented separately on alternating trials (Wolery, Werts, et al., 1993). However, clear differences in performance on one set of instructive feedback over another may exist (Harrell, 1990; Gast et al., 1994). It is unclear whether this differential performance is related to the difficulty of the stimuli, students' interest in or preference for particular types of stimuli, the extent to which the stimuli are related to students' prior experience, or a combination of these possibilities.

Second, when students are presented with parallel instructive feedback and are later taught those stimuli directly, less instruction is needed to establish criterion-level responding than for similar stimuli that were not previously presented through instructive feedback (Holcombe, 1991; Holcombe

et al., 1993; Wolery, Doyle, et al., 1991). This finding suggests that even when students do not acquire all of the instructive feedback stimuli as shown on post-test assessments, the use of instructive feedback may "set them up" for more rapid learning when the behaviors are taught directly.

Third, some data indicate that instructive feedback can be used to promote the formation of stimulus classes (Werts, Wolery, Holcombe, Neumont-Ament, 1992; Wolery, Werts, et al., 1993). This appears to be particularly evident when the instructive feedback stimuli are less complex (less difficult) than target stimuli. Instructive feedback may be a means of teaching students that different stimuli are members of the same conceptual class.

Fourth, the acquisition of instructive feedback behaviors and particularly peers' instructive feedback behaviors appears to be promoted through the use of specific attentional cues provided at the beginning of instructional trials (Wolery, Cybriwsky, et al., 1991). For example, asking students to repeat a verbal task direction rather than only listening to it may increase the probability that their own and their peers' instructive feedback will be learned.

RECOMMENDATIONS

Based on the findings of this literature review, recommendations can be made for practitioners and for future research. These are discussed below.

Recommendations for Teaching

From these studies, no detrimental effects and several positive benefits have been identified from using instructive feedback. As a result, teachers should incorporate the use of instructive feedback into their instructional practices. This should be done when using response prompting procedures in direct instructional sessions with a variety of arrangements (i.e., transition-based teaching, one-to-one instruction, or small groups). In doing this, they should present at least one instructive feedback stimulus for each target behavior. The presentation should occur either after every correct response or after correct and incorrect responses if an error correction procedure is used. Finally, the presentation should occur in a consistent way within and across instructional sessions.

In selecting the instructive feedback stimuli, teachers can consider those that require the same response as the target behavior (parallel) or require different responses from the target behavior but are from the same

curricular domain (expansion) or different curricular domains (novel). These stimuli should be ones that are important for students to learn and probably should be those that are planned for instruction in the near future—particularly if they are of the parallel type. By including stimuli that will be taught in the future, two outcomes may occur. First, students may acquire them without direct instruction thereby eliminating the need for subsequent instruction. Second, if students do not acquire the behaviors through instructive feedback, they are likely to acquire them more rapidly when they are taught directly—particularly, if the instructive feedback stimuli require the same responses as the target stimuli.

In all studies, students' responses to the instructive feedback stimuli were assessed before the instructive feedback was used. Although this was done for experimental purposes (i.e., to document that students could not respond correctly to the stimuli), it may serve an additional function of cuing students that these stimuli are important. If such a function is operational (no data exists to support or refute it), then failure to conduct such assessments may result in different learning patterns. As a result, teachers should assess students' responses to the instructive feedback stimuli before using instructive feedback.

Issues for Future Research

The above recommendations can be made with confidence, but additional research would refine and expand the recommendations that are possible. This research should occur in several areas. First, instructive feedback studies should be extended to additional populations and new contexts. Although students with a variety of disabilities were included, none of the studies involved students who were blind or had severe visual impairments. Also, only one study included students without disabilities. With one exception (Werts et al., 1994), the studies occurred in special education classrooms. It is unclear how general education teachers who include children with disabilities would perceive the strategy or could use it. Recent studies have evaluated embedding instructional strategies into ongoing classroom activities (e.g., Venn et al., 1993); however, no studies were found beyond the transition-based teaching studies (Werts, Wolery, Holcombe, et al., 1992; Werts et al., 1994) in which instructive feedback was embedded within activities. Similarly, applications with entire classrooms (e.g., Werts et al., 1994) and with peer tutoring remain relatively unstudied. Instructive feedback has been used in the context of direct instruction with response prompting procedures in small groups and one-to-one arrangements. It has not been evaluated with milieu or naturalistic teaching strategies such as

incidental teaching and the mand-model procedure (Kaiser et al., 1992). Such application would be possible procedurally, but it is unclear what effects might accrue.

Second, investigations are needed on issues related to presenting instructive feedback. This research should focus on different schedules of presentation such as delivering instructive feedback on every other trial as compared to every trial and on methods of presentation (e.g., visual stimuli could be presented in different colors and sizes across trials). Additional research also is needed to examine the variables that control the amount of learning that occurs from various types of presentation, including presenting multiple instructive feedback stimuli for each target behavior. Few measures have been collected on the generalization of instructive feedback behaviors across stimuli and settings. The effects of various presentation schedules and methods should be evaluated on a range of generalization measures as well as on acquisition.

Third, three studies (Holcombe, 1991; Holcombe et al., 1993; Wolery, Doyle, et al., 1991) investigated the effects of presenting stimuli through instructive feedback and later teaching those stimuli directly. In all cases, these studies used parallel instructive feedback—the response required for the target stimulus was identical to that required for the instructive feedback stimulus. The savings of instructional time noted in such studies suggest that this line of research should address expansion and novel instructive feedback that require responses different from the target stimuli. Also, investigations that focus on directly teaching students the instructive feedback stimuli shown to their peers during small group instruction are warranted.

Fourth, the current research on the use of instructive feedback for stimulus class formation is quite exploratory (Werts, Wolery, Holcombe, Neumont-Ament, 1992; Wolery, Werts, et al., 1993). This area clearly calls for additional investigations because it may have practical implications for instruction and curriculum design as well as utility for understanding the process by which stimulus classes are formed.

SUMMARY

A total of 23 studies that used instructive feedback were reviewed. These studies included a variety of students with disabilities and were conducted primarily in special education classrooms. The results indicate that students have acquired and maintained a wide range of instructive feedback behaviors. Because the use of instructive feedback does not interfere with learning target behaviors and does not increase session length at detrimen-

tal levels, we recommend that teachers employ instructive feedback in their direct instructional activities with response prompting procedures. Areas for future research include expanding the studies to new populations and contexts. Future research also should focus on how instructive feedback is presented and used to influence future instruction and stimulus class formation.

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