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Effectiveness of Peer Delivered Simultaneous Prompting on Teaching Community Signs to Students with Developmental Disabilities

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Abstract: A multiple probe study across behaviors, replicated across participants, assessed effectiveness of peer delivered simultaneous prompting (SP) in teaching expressively identifying community signs to four students with developmental disabilities. The two purposes of the study were: (a) to find out if peer tutors use simultaneous prompting reliably for instructing their tutees with developmental disabilities, and (b) to examine effectiveness of simultaneous prompting on teaching expressively identifying community signs. The definition of community sign was presented as instructive feedback. Besides these aims, generalization and maintenance effects of simultaneous prompting were also investigated in the study. Generalization across persons was tested before introducing simultaneous prompting and after tutees met criteria. Maintenance data for targeted and non-targeted behaviors were collected one week after instruction. Results show that peer tutors deliver SP reliably, and tutees acquired expressively identifying community signs. Tutees also gained some instructive feedback. Furthermore, tutees maintained acquired skills at criterion level and generalized acquired skills to another person at criterion level. Based upon evaluation of findings and implications of the study future research needs are discussed.

As the number of students with disabilities in general education classrooms increases as a results of the inclusion policy, various instructional adaptations are getting attention from researchers and teachers in order to provide better educational experiences. On the other hand, however, with this increasing number of students with disabilities, in many cases, teachers of the mainstreamed classrooms do not have aides or other facilitators in their classrooms to receive instructional assistance. Peer mediated instruction and intervention would be one of the sources of assistance for making adaptations in these classrooms to serve as instructional resources. Peer mediated instruction and intervention is defined as using classroom peers to provide instruction and intervention to students who have difficulty in learning academic and/or social behaviors. Peer mediated instruction and intervention takes various forms in the literature such as cooperative learning, peer-directed behavior management interventions, peer modeling, peer initiation training, peer monitoring, peer tutoring, peer networking, and group oriented contingencies (Olson & Platt, 2000; Utley, Mortweet, & Greenwood, 1998; Ysseldyke & Algozzine, 1995). .

Peer tutoring is defined as assigning a student for transmitting some information to teach a classmate or a peer who is receiving the information under supervision of a teacher (Gearheart, Weishahn, & Gearheart, 1992; Greenwood, Carta, & Mahadey, 1991; Olson & Platt, 2000; Utley et al., 1998). In the peer tutoring procedure, peers provide individualized instruction to the tutees. Peer tu-

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toring has been used in both general and special education classrooms. Same age and cross age (older students) peer tutoring are the tutoring processes commonly used in classrooms. A normal developing student as well as a student with disabilities can serve as a tutor to his/her peers and/or classmates (Marchand-Martella et al., 1992; Utley et al.).

Advantages of peer tutoring are cited in literature as follows: (a) students can be successful and effective tutors, (b) tutors gain academically from teaching skills to their peers, (c) students meet their needs and pairs can be individualized according to these needs, (d) proportion of time students are engaged in academic instruction can be increased, (e) teachers gain time and engage more social and academic work in their classrooms, (f) a positive social interaction between peers can be developed (Greenwood, Delquadri, & Hall, 1989; McGee, Almedia, Sulzer-Azaroff, & Feldman, 1992; Passe & Beattie, 1994; Trapani & Gettinger, 1989; Utley et al., 1998).

Peer tutoring has been widely used with considerable success. Many studies investigated effects of peer tutoring on both academic and social behaviors of tutees. The following social behaviors were taught through peer tutoring: social skills such as providing specific praise statements, decreasing negative statements, giving appropriate commands (Martella, Marchand-Martella, Young, & Macfarlane, 1995); initiating and maintaining social interactions (McGee et al., 1992; Staub & Hunt, 1993); initiating conversation and play, and maintaining interaction (Pierce & Schreibman, 1995); and performing cafeteria skills (Kohl & Stettner-Eaton, 1985). Academic behaviors that were taught through peer tutoring were expressively naming words (Wolery, Werts, Snyder, & Caldwell, 1994); coin and value identification, verbally answering questions about classroom activities, oral reading and comprehension, and naming opposites (Kamps, Locke, Delquadri, & Hall, 1989); reading words (Collins, Branson, & Hall, 1995). Also, students with learning disabilities or mental retardation were found to deliver tutoring effectively and teach first aid skills (Marchand-Martella et al., 1992); sight words (Barbetta, Miller, Peters, Heron, & Cochran, 1991; Koury & Browder, 1986); and written spelling (Telecsan, Slaton, & Stevens, 1999).

The following conclusions can be drawn from findings of cited literature: (a) various discrete skills as well as chained skills can be taught through peer tutoring, (b) it is possible to utilize peer tutoring to teach both academic and social skills, (c) peers from various ages successfully implement peer tutoring and provide instruction, (d) peers with disabilities can be tutors to same aged or younger typical students and successfully implement instruction, (e) a positive interaction can be developed between parties.

Although peer tutoring can be used effectively for teaching various skills, a few of these studies were designed to utilize systematic response prompting procedures (Collins et al., 1995; Telecsan et al., 1999; Wolery et al., 1994). In many cases, constant time delay or progressive time delay were utilized during peer tutoring. One response prompting strategy is known as simultaneous prompting procedure (SP). SP is a relatively easy response prompting procedure. In SP the teacher delivers the target stimuli and controlling prompt simultaneously. Therefore, the student does not have an opportunity to respond independently during instruction and probe sessions are needed to test the transfer of stimulus control. Three types of student responses are possible with SP: (a) correct responses, (b) incorrect responses, and (c) no responses (Gibson & Schuster, 1992; MacFarland-Smith, Schuster, & Stevens, 1993; Parrott, Schuster, Collins, & Gassaway, 2000).

To date there is a limited number of studies examining effects of SP on teaching behaviors to people with various disabilities. Research has shown that SP is effective in teaching students with moderate and severe mental retardation (Fetko, Schuster, Harley, & Collins, 1999; Fickel, Schuster, & Collins, 1998; Maciag, Schuster, Collins, & Cooper, 2000; Parrott et al., 2000; Schuster & Griffen, 1993; Singleton, Schuster, & Ault, 1995); mild mental retardation and learning disabilities (Johnson, Schuster, & Bell, 1996), and developmental delays (Gibson & Schuster, 1992; MacFarland-Smith et al., 1993; Sewell, Collins, Hemmeter, & Schuster, 1998; Wolery, Holcombe, Werts, & Cipollone, 1993).

Studies examined effectiveness of SP on teaching discrete tasks such as object naming (MacFarland-Smith et al., 1993); science vocabulary words (Johnson et al., 1996); word

identification (Griffen, Schuster, & Morse, 1998); community signs (Singleton et al., 1995); rebus symbols (Wolery et al., 1993); sight words (Schuster, Griffen, & Wolery, 1992; Gibson & Schuster, 1992); identifying national flags, stating the sums of addition facts, identifying unlabelled outlines of the states from the US map, and demonstrating manual signs for communication picture symbols (Fickel et al., 1998); identifying animals (Tekin & Kircaali-Iftar, 2002). SP was also used for teaching chained tasks such as making juice from frozen concentrate (Schuster & Griffen, 1993); dressing skills (Sewell et al., 1998); vocational skills (Fetko et al., 1999); assembling shipping boxes (Maciag et al., 2000), and hand washing (Parrott et al., 2000).

One of the studies mentioned above was conducted with siblings (Tekin & Kircaali-Iftar, 2002). In this study sibling tutors delivered instruction with both constant time delay and SP to their younger siblings with mild to moderate mental retardation for teaching receptively identifying animals. Results showed that siblings delivered both procedures reliably and sibling tutees learned receptively identifying animals, maintained the acquired skills over 4 weeks, and generalized the acquired skills across materials. However, there is not such a study investigating whether or not peers would use SP reliably for instructing their peers with disabilities in inclusive school settings.

Instructive feedback is an instructional parameter that increases the number of behaviors learned during instructional trials. Werts, Wolery, Holcombe, and Gast (1995) defined instructive feedback as presenting extra, nontarget stimuli, during consequent events of instructional trials. Furthermore, students are not expected or reinforced to respond to these extra stimuli. Instructive feedback enhances efficiency of instruction by providing extra information during direct instruction. Werts et al. examined over 20 studies regarding presenting instructive feedback, and researchers reported that subjects gained some instructive feedback presented to them during instructional trials.

To date, there are only five studies examining acquisition of instructive feedback while using simultaneous prompting delivered by adult teachers (Griffen et al., 1998; Parrott et al., 2000; Schuster & Griffen, 1993; Singleton et al., 1995; Wolery et al., 1993). The majority of studies investigating effects of simultaneous prompting were conducted with preschool students. Among the five studies examining acquisition of instructive feedback during simultaneous prompting, four of them were conducted with elementary school students (Griffen et al.; Parrott et al.; Schuster & Griffen; Singleton et al.) and one of them was conducted with preschool students (Wolery et al.). These studies, only in one study instructive feedback was delivered when teaching chained task (i.e., Parrott et al.).

Findings of all above studies with SP showed that teachers implemented SP with high accuracy and most of these studies reported that SP is a relatively easy instructional procedure. However, there is no such study investigating whether or not peer tutors can deliver SP and present instructive feedback during consequent events reliably in inclusive settings while providing instruction to their peers with developmental disabilities.

The present study was conducted to examine whether or not peer tutors delivered SP reliably and peer tutees acquired the behaviors taught to them. Therefore, following research questions were addressed in this study: (a) Can peer tutors deliver SP reliably to teach expressively identifying community signs to their peers with developmental disabilities? (b) Is SP delivered by peer tutors effective on teaching expressive identification of community signs to peer tutees with developmental disabilities? (c) Can peer tutees acquire some non-target information (e.g., definition of the target stimuli) provided to them on consequent events after the correct responses during instructional trials? (d) Will peer tutees maintain acquired community signs and nontarget information over time? (e) Will peer tutees generalize acquired community signs across persons?

Method

Participants

Participants were four normally developing female peer tutors, and two female and two male peer tutees with developmental disabilities. Four peer dyads were formed. Peer tutors and tutees were at the same grade level, and

dyads were formed with peers from the same classrooms. Peers were selected by conducting interviews with the school counselor and classroom teachers. The purpose of the study was shared with the school counselor and classroom teachers. Peer tutors were selected according to classroom teacher and school counselor nominations based on regular attendance, having positive interactions with peers with disabilities, and success in academic subjects. None of the peers except Erdem had experience with any response prompting procedures. Erdem participated in a research study conducted with constant time delay on teaching chained skills. Only one peer served as tutor for each student with disability during the study. Specific participant information can be found in Table 1.

Prerequisite skills which peer tutors had to have were as follows: (a) reading and writing accuracy, (b) following written and verbal instructions, (c) agreeing to participate in a systematic teaching process, (d) volunteering to deliver SP procedure to their classmates with developmental disabilities, and (e) selecting possible reinforcers. Prerequisite skills for peer tutees were as follows: (a) ability to pay attention to audio and visual stimuli for at least 5 minutes, (b) ability to follow verbal instructions, and (c) ability to select reinforcers. All peers had the prerequisite skills for this study. There was no adaptive behavioral score for the tutees.

Figen was a ten-year old female with mild mental retardation. She attended a special class for two years and she was mainstreamed full time at third grade at a public school. She also attended 1:1 instruction for one hour once a week in a rehabilitation center for children with disabilities. Her physical growth was the same as her typical peers. Areas of strength included initiating and maintaining verbal and nonverbal communication, reading and writing skills. Areas of weakness included comprehension and attention skills. Kubra, Figen's tutor, was a 10-year old normally developing female student.

Erdem was an 11-year and one-month old male with Down syndrome. He had group support services for 5 years from a university unit. Erdem was a full time mainstreamed student at third grade at a public school. He knew reading and writing and some functional academic skills. His strengths included initiating and maintaining communication skills and some functional academic skills. Areas of weakness included communication skills and articulation. Selma was his tutor. Selma was 10-years and 5-months old and a normally developing female student.

Yaman was an 11-year old male with slow learning problems. He attended a special classroom for a year. Yaman was mainstreamed at a third grade for two years at a public school. His weaknesses included academic skills while his strengths included communication, social, and daily living skills. Esra was Yaman's tutor. She was an 11-year and two-month old normally developing female student.

Nihal was a 13-year old female student with mild mental retardation. She was a full time mainstreamed student at seventh grade at a public school. Areas of strengths included functional academic skills, self-care and daily living skills. Nihal's weaknesses included comprehension skills, attention skills, and communication skills. Although she had the necessary communication skills, she avoided initiating and maintaining communication with peers and adults around her. Canan was a 13-year and 5-month old normally developing female student. Canan was Nihal's tutor during this study.

TABLE 1

Names, Chronological Ages, Genders and Disability Labels of the Peers

Name (Tutor/Tutee)	*Chronological Age (Years, Month) (Tutor/Tutee)*	*Gender (Tutor/Tutee)*	*Label (Tutee)*
Kubra/Figen	10/10	Female/Female	Mild mental retardation
Selma/Erdem	11/10, 5	Female/Male	Down syndrome, mental retardation
Esra/Yaman	11/11, 2	Female/Male	Slow learner
Canan/Nihal	13/13, 5	Female/Female	Mild mental retardation

Settings

The tutor training part of this study was conducted in a small group teaching arrangement and the peer tutoring part was conducted in a 1:1 teaching arrangement at the counselor's office (4 m × 3 m) in the peers' school, which was a public school. There was a rectangular table (1.5 m × 0.7 m), a chair, a bookcase, a square table (1 m × 1 m) and two chairs, and a coffee table in this office. During the peer tutoring process, peers sat face to face at the square table. The researcher recorded each session via camcorder and no one else was available during the experimental sessions.

Materials

During tutor training, index cards (12 cm × 20 cm), notepads, and reinforcers were used to teach how to reliably use the instructional procedure. In the second part of the study, which included the peer tutoring sessions, a stopwatch, a camcoder, cards showing community signs (15 cm × 15 cm), and reinforcers were used. Reinforcers were selected by the peers and consisted of objects such as accessories, toys, stationery items, and edibles. There were twenty-five cards showing the community signs. Each card had a single community sign. Community signs were printed out from clipart files. They were glued on cards and then laminated. Name and definition of each sign was written on a separate sticker and stuck on the back of each card as visual cues for reminding the peer tutors about the target stimuli (e.g., "no smoking") and instructive feedback (e.g., "one should not smoke in the areas that have this sign") presented as a behavioral consequence after every correct response during instructional sessions. Sixteen point Times New Roman font was used to write name and function of target stimuli. Fifteen community signs were chosen to teach to three peer tutees and twelve community signs were chosen to teach to one peer tutee. Only twelve unknown community signs were available for this tutee. Three training sets of community signs were formed for each peer tutee. Community sign sets and instructive feedback presented to each community sign are presented in Table 2.

Screening Procedures

Prior to initial baseline conditions, 25 community signs were downloaded from clipart files and printed out by a graduate student. Peer tutors conducted screening sessions. There were twenty-five trials in each screening session and two screening sessions were conducted for each tutee. Screening trials were implemented as follows: Peer tutor secured tutee's attention, explained rules of the screening sessions, held a prospective target stimulus card, and asked the peer tutee, "Tell me. What is the name of this sign?" and waited 2 s for a response. The sequence of presenting prospective target stimuli was given to peer tutors by the researcher. Fifteen unknown community signs were determined for three peer tutees (i.e., Yaman, Erdem, Figen), and twelve unknown community signs were determined for a peer tutee (i.e., Nihal). Three training sets were prepared for each tutee. In order to equalize difficulty levels across training sets, the number of words in the signs was taken into consideration when forming the training sets.

General Procedures

Screening sessions were conducted to identify the target stimuli prior to the experimental procedures. Peer tutor training took 60 minutes. Peer tutors were trained in two sessions as to how to deliver SP reliably in a small group teaching arrangement. Using SP reliably was taught within (a) verbal description, (b) role modeling, (c) guided practice, and (d) performance feedback sequence. After peer tutors acquired necessary steps 100% correctly while using SP, the researcher let them start to deliver instruction with SP. Three community sign sets were taught to three peer tutees with a total of 15 community signs, and 12 community signs were taught to one peer tutee. Peer tutors collected the data during all experimental sessions. All sessions were recorded. During instructional trials, instructive feedback was delivered after each correct response as the definition of that specific target stimulus. Full and daily probe sessions were conducted. In addition, maintenance probe sessions for targeted community signs and instructive feedback and generalization probe sessions across persons were conducted. All

TABLE 2

Community Sign Sets and Instructive Feedback by Peer Dyads

Peer Dyads (Tutee-Tutor)	*Sets*	*Community Signs*	*Instructive Feedback*
		Swimming area	One can swim in this area.
		School road	Students may come across in this road.
	1	First-aid	There is a first-aid center near to this sign.
		No entrance	One cannot enter when sees this sign.
		Gas station	There is a gas station nearby.
		Railway passing	A train may come across suddenly.
		No horn	Horning is not allowed.
Figen-Kubra	2	No swimming	One cannot swim in this area.
		Bus stop	We take the bus near to this sign.
		No cellular phone	One should turn his/her cell phone off when sees this sign.
		Handicapped	This area is accessible to people with handicap.
	3	No bicycle	No bicycle is allowed in this area.
		Picnic area	There is a picnic area close to this sign.
		Attention	One should be careful due to danger.
		Restaurant	There is a restaurant nearby.
		Pedestrian crossing	Pedestrian can walk in this road.
		Handicapped	This area is accessible to people with handicap.
	1	Bicycle road	Bicycle can enter in this area.
		Fire danger	There is a fire danger in this area.
		No entrance	One cannot enter when sees this sign.
		Railway passing	A train may come across suddenly.
		No horn	Horning is not allowed.
Erdem-Selma	2	First-aid	There is a first-aid center near to this sign.
		Attention	One should be careful due to danger.
		Bus stop	We take the bus near to this sign.
		School road	Students may come across in this road.
		Camping area	There is a camping area nearby.
	3	No pets	Pets are not allowed in this area.
		Picnic area	There is a picnic area nearby.
		No smoking	Smoking is not allowed in this area.
		Recycling	There is a recycling can nearby.
		Fire danger	There is a fire danger in this area.
	1	Handicapped	This area is accessible to people with handicap.
		Swimming area	One can swim in this area.
		Public phone	There is a public phone nearby.
		No entrance	One cannot enter when sees this sign.
Yaman-Esra		Gas station	There is a gas station nearby.
	2	No horn	Horning is not allowed.
		No cellular phone	One should turn his/her cell phone off when sees this sign.
		Handyman	There is a handyman nearby.
		Restaurant	There is a restaurant nearby.
		Attention	One should be careful due to danger.
	3	Hotel	There is a hotel nearby.
		Camping area	There is a camping area nearby.
		Trash can	There is a trash can nearby.
		Fire danger	There is a fire danger in this area.
	1	No cellular phone	One should turn his/her cell phone off when sees this sign.
		Do not light	One should not light when sees this sign.
		Hotel	There is a hotel nearby.
		No entrance	One cannot enter when sees this sign.
Nihal-Canan		Restaurant	There is a restaurant nearby.
	2	Gas station	There is a gas station nearby.
		School road	Students may come across in this road.
		Attention	One should be careful due to danger.
		Trash can	There is a trash can nearby.
	3	Handyman	There is a handyman nearby.
		First aid	There is a first-aid center near to this sign.

experimental sessions were conducted in 1:1 teaching arrangement.

Peer Tutor Training

Peer tutors were trained through (a) verbal description, (b) role modeling, (c) guided practice, and (d) performance feedback sequence. A small group teaching arrangement was used during the peer tutor training. Prior to peer tutor training, the researcher asked peer tutors to deliver instruction with SP to determine their entry performance. None of the peer tutors knew how to deliver instruction with SP. Then, the researcher started to teach how to deliver the instruction with SP. First, instructional concepts (i.e., controlling prompt, target stimulus, response interval, inter-trial interval, reinforcement, instructive feedback, probe, data collection) were described. Peer tutors were given a verbal instruction about these concepts. Then, the peer tutors were asked to give a written answer to the questions about the description of each concept. They received a score for each correct response and exchanged their scores for reinforcers. Second, the researcher role-played and modeled SP, and provided negative examples of SP. Peer tutors were asked to give a written response about every single negative example that was performed by the researcher. Third, the researcher took the role of being a learner and let all peer tutors be her teacher and deliver SP. The researcher delivered feedback to each peer tutor until each of them delivered SP with 100% accuracy. In addition, during guided practice each peer tutor took the role of being a learner and the researcher let all peer tutors be the teacher of his/her partner. Fourth, the researcher delivered feedback to each peer tutor until each of them delivered the procedure with 100% accuracy.

Full Probe Conditions

Full probe sessions were conducted before introducing the intervention to the first training set and after criterion was met for each training set. All community sign sets were probed during full probe sessions until stable data were recorded for at least three consecutive sessions. Full probe sessions were implemented as follows: the peer tutor had training materials ready, secured the peer tutee's attention (e.g., "Are you ready? Today we will work on reading community signs. Shall we start?"), explained the rules during probe sessions, and then provided the target stimulus. After providing the target stimulus, the peer tutor waited for 2 s by counting "1001-1002" silently. Correct responses resulted in verbal praise; incorrect or no responses were ignored. Peer tutors received verbal reinforcement by the researcher at the end of each probe session that was implemented with at least 80% accuracy. Both peer tutors and peer tutees received verbal reinforcement for their attending and cooperation behaviors during sessions by the researcher.

In full and daily probe sessions, generalization and maintenance probe session responses were scored as correct if the peer tutee expressively identified the community sign within 2 s correctly, or incorrect, if the peer tutee did not respond or responded by expressively identifying another community sign.

Daily Probe Conditions

Since a controlling prompt is delivered on every training trial when using SP, the student does not have an opportunity to respond to the target stimulus independently. Therefore, daily probe sessions were conducted to test for transfer of stimulus control in SP. Daily probe sessions were conducted before every single daily training session. Community sign sets that were currently being taught were probed in these sessions. There was no daily probe session before the first training session. Correct responses during daily probe sessions were counted toward criterion. Criterion was 15/15 correct responding to community signs during daily probe sessions for three consecutive sessions for three tutees (i.e., Yaman, Erdem, Figen), and 12/12 correct responding to the community signs during daily probe sessions for three consecutive sessions for one tutee (i.e., Nihal). Daily probe sessions were implemented just like full probe sessions with two main differences. First, only the currently trained community sign set was assessed. Second, error correction was delivered for an incorrect or no response during daily probe sessions in order to decrease probe errors. Previous studies investigated that error rate

during daily probe sessions is significantly higher than error rate during training sessions. Therefore, to control error rate during daily probe, error correction was used. Each correct response resulted in a verbal praise whereas incorrect or no responses resulted in error correction by peer tutors. Verbal reinforcement was delivered to peer tutors who implemented the probe session with at least 80% accuracy. Both peer tutors and peer tutees received verbal reinforcement for their attending and cooperation behaviors during the sessions by the researcher.

Instructive Feedback Probe Sessions

Following the full probe condition, an instructive feedback probe session was conducted to assess the acquisition of instructive feedback. Fifteen trials occurred for three tutees and twelve trials occurred for one tutee in each instructive feedback session. This session was conducted in the same manner with full probe session. The peer tutor had materials ready, secured tutee's attention, explained rules, then presented the task direction, ". . . tell me, what does this sign mean?" and waited for 2 seconds for the tutee's response. There were correct responses, incorrect responses, and no responses during instructive feedback sessions. Correct responses were defined as verbally explaining the meanings of a particular sign correctly within 2 s. Incorrect responses and no responses were defined as verbally explaining the meaning of a particular sign incorrectly, verbally explaining the meaning of another community sign correctly or not responding within 2 s. Correct responses resulted in verbal descriptive praise, incorrect responses were ignored, and the next trial was presented. The inter-trial interval was 2 seconds. Both peer tutors and peer tutees received verbal reinforcement for their attending and cooperation behaviors during the sessions by the researcher.

Simultaneous Prompting Procedure

Simultaneous prompting and instructive feedback were delivered during instruction to read community signs from the cards. After getting stable data from the first full probe condition, the peer tutors started to teach the first training set. Training occurred in 1:1 teaching arrangement. One training session was delivered each school day or two training sessions were conducted with at least one hour remaining between the sessions when the previous school day was cancelled due to weather conditions. There were fifteen trials for three peer tutees (i.e., Yaman, Erdem, and Figen), and twelve trials for one tutee (i.e., Nihal). Each community sign in the training sets was presented three times randomly. Order of presenting the trials was determined and written to the data collection form by the researcher and given to the peer tutor before the session was started. Responses during instruction with SP were scored as correct, incorrect, and no response. They were defined the same as in probe sessions. Training sessions were conducted as follows. The peer tutor had materials ready, explained the rules, secured the tutee's attention and, after receiving an affirmative response to the question, ". . . ready for work?" the tutor held the community sign card and presented the task direction, ". . . tell me what is the name of the sign?" and then provided the controlling prompt, ". . . this is no smoking." immediately and waited for 2 s for a response. If the peer tutees imitated the controlling prompt and repeated it within 2 s, the peer tutor verbally praised the tutee's response and then provided the instructive feedback "Very good, Nihal. It is 'no smoking'. One should not smoke when sees this sign." Incorrect responses or no responses within 2 s resulted in error correction and the peer tutor presented the next trial. The inter-trial interval was 2 seconds. Both peers' attention and their cooperation behaviors were reinforced at the end of the sessions by the researcher.

Generalization and Maintenance Probes

Generalization across persons probe sessions were conducted in 1:1 teaching arrangement in a pretest-posttest manner. These sessions occurred before any training as a pretest, and at the end of teaching all community sign sets, final full probe session, as a posttest. Maintenance data were conducted one week after the final full probe session. Generalization and maintenance probe sessions were conducted just like full probe sessions. However, the researcher conducted generalization sessions and reinforcement was thinned (i.e., FR12,

FR15) during maintenance and generalization sessions.

Experimental Design

A multiple probe design across training sets and replicated across peer tutees was used to investigate effectiveness of SP delivered by peer tutors on teaching expressively identifying community signs to peer tutees with mild to moderate mental retardation. The dependent variable was number of correct responding on expressively identifying community signs and the independent variable of the study was SP. The independent variable was introduced to one community sign set at a time. Experimental control was built in when the subject was responding at or near to baseline levels during full probe conditions before the intervention had been introduced and the criterion was reached only after the intervention was introduced (Tekin & Kircaali-Iftar, 2001; Wolery, Bailey, & Sugai, 1988).

Interobserver and Procedural Reliability

Reliability data were collected at least 25% of all experimental sessions (50% of screening sessions; 25% of full probe sessions; 33% of daily probe and training sessions; 33% of maintenance of target behaviors and instructive feedback; and 50% of generalization sessions). Dependent variable reliability was calculated by using the point by point method with a formula of the number of agreements divided by the number of agreements plus disagreements multiplied by 100 (Tekin & Kircaali-Iftar, 2001; Tawney & Gast, 1984). Dependent variable reliability data collected during full probe sessions yielded a mean percentage of agreement of 99.7% (range = 99% - 100 %). Dependent variable reliability data collected during daily probe sessions yielded a mean percentage of agreement of 99.3% (range = 93% - 100 %), and 100% during training sessions. Dependent variable reliability data collected during screening sessions, instructive feedback, maintenance, and generalization probe sessions yielded a mean percentage of agreement of 100 %.

Procedural reliability data were collected to estimate whether or not peer tutors delivered simultaneous prompting reliably. Task analyses of experimental sessions were used to assess the occurrence and nonoccurrence of the planned steps of all experimental sessions. Planned steps that peer tutors were expected to demonstrate for simultaneous prompting were (a) having materials ready, (b) securing tutee's attention, (c) explaining rules, (d) presenting task direction, (d) providing controlling prompt immediately after the task direction, (e) delivering correct consequences, (f) delivering correct instructive feedback, and (g) providing appropriate inter-trial interval (2 s). Planned steps that peer tutors were expected to demonstrate for daily, full, generalization and maintenance probe sessions were (a) having materials ready, (b) securing tutee's attention, (c) explaining the rules, (d) presenting the task direction, (d) delivering correct consequences, and (e) providing the appropriate inter-trial interval (2 s). Independent variable reliability (procedural reliability) was calculated by dividing the number of observed peer tutor behaviors by the number of planned peer tutor behaviors, and multiplied by 100 (Billingsley, White & Munson, 1980; Tekin & Kircaali-Iftar, 2001).

Results

Reliability

Percentages of the peer tutors' compliance with the planned steps in SP were consistently high. Peer tutors delivered SP with an average of 99.8% (range = 99% - 100%) compliance with the planned steps of the procedure. Peer tutors delivered daily and full probe sessions with an average of 98.5% (range = 94.2% - 100%), and 100% compliance with the planned steps of the sessions respectively. Lastly, peer tutors delivered maintenance probe sessions with an average of 100% compliance with the planned steps of the session. Individual peer tutor reliability data during training, daily and full probe sessions were as follows: Kubra delivered SP with 99.8% accuracy across the sessions. Except delivering task direction (98.8% across sessions), she delivered the rest of the planned steps with 100% accuracy. Kubra delivered daily probe sessions with 99.8% (range = 98.6 – 100%) accuracy. Except delivering correct consequences (98.6% across sessions), she delivered the rest of the planned steps with 100% compliance. Kubra implemented the full probe sessions

with 100% compliance with the planned steps of the sessions. Selin delivered SP with 99.6% (range = 97.3% - 100%) accuracy across the sessions. Except delivering instructive feedback (97.3% across sessions), she delivered the rest of the planned steps with 100% compliance. Selin delivered daily probe sessions with 98.8% (range = 94.2% - 100%) accuracy. Except delivering error correction (94.2% across sessions), she delivered the rest of the planned steps of the sessions with 100% compliance. Selin implemented the full probe sessions with 100% compliance with the planned steps of the sessions. Esra and Canan delivered SP, daily probe and full probe sessions with an average of 100% compliance with the planned steps of the sessions.

Instructional Data

Probe and training data for Figen, Erdem, Yaman, and Nihal are shown in Figures 1 through 4, respectively. Closed circles represent number of correct responding during instructional trials and open triangles represent number of correct responding during daily, full, and maintenance probe sessions. As seen at Figures 1 through 4, all peer tutees met criteria after introduction of SP. Data indicate that SP delivered by peer tutors was effective on teaching expressively identifying community signs to the four students with developmental disabilities. Any procedural modification was not needed during the experimental sessions. Number of training sessions and trials, training and probe time, and training and probe errors are presented in Table 3.

Sessions and Trials through Criterion

Sixty-two training sessions and 675 training trials were required for the four peer tutees through criterion on all community sign sets. Figen and Erdem needed 17 training sessions and 255 training trials through criterion for all community sign sets. Yaman needed 15 training sessions and 225 training trials; and Nihal needed 13 training sessions and 195 training trials through criterion for all community sign sets.

Training and Probe Time through Criterion

Training time needed through criterion across four peer tutors was 2 hr, 30 min, 36 s. Figen, Erdem, Yaman, and Canan needed 40 min, 50 s, 46 min 6 s, 37 min 12 sec, and 26 min 28 s training time through criterion across all community sign sets respectively. The training time that the peer tutees needed through criterion was between 26 min 28 s and 46 min 6 s. The probe session time needed across peer tutees through criterion was 1 hr 37 min, 17 s. The individual probe time across community sign sets was between 15 min 58 s and 30 min 24 s.

Training and Probe Error through Criterion

SP instructional sessions were almost errorless for the peer tutees except Erdem through criterion across all community sign sets. No errors occurred during training sessions with Figen, Yaman, and Nihal. During training with Erdem 19 errors, ranging 1 to 17 occurred with an average of 4.7%. 104 errors occurred during probe sessions with an average of 2.2% across peer tutees. The probe session error rate ranged from 0.4% to 12.6%.

Maintenance and Generalization

Maintenance data collected one week after the final full probe session for the four tutees showed that peer tutees maintained the acquired community signs at criterion level (15/15 and 12/12). No other maintenance data were collected due to the end of school semester.

Generalization across person's data showed that all peer tutees generalized the acquired community signs at criterion level. Pretest generalization measures across all community sign sets for all tutees showed that peer tutees had no correct responding whereas posttest generalization measures across all community sign sets were 15/15 for the three tutees and 12/12 for one tutee.

Instructive Feedback Data

Data collected indicate that each peer tutee acquired some of his/her own instructive feedback stimuli. Mean percentage of correct

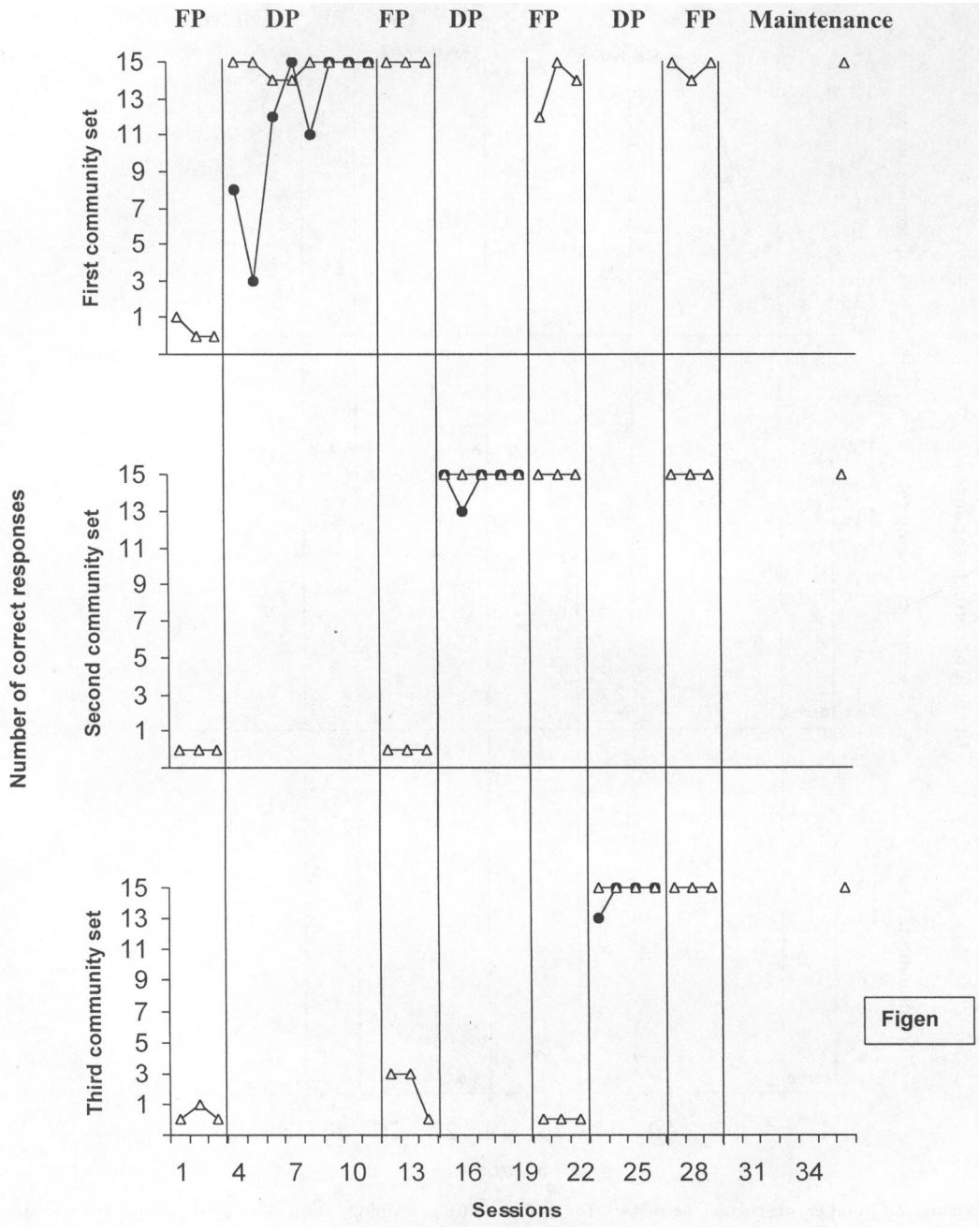

Figure 1. Number of correct responses for Figen during training, full, daily, and maintenance probe sessions. Open triangles represent daily probe, full probe, and maintenance probe data, and closed circles represent training data.

responding on instructive feedback stimuli for each training set for each subject during screening, full probe and maintenance sessions are presented in Table 4. During initial pretest all peer tutees' responses were at 0% correct responding. When experimental sessions were over (after the final probe session) the acquisition of the instructive feedback

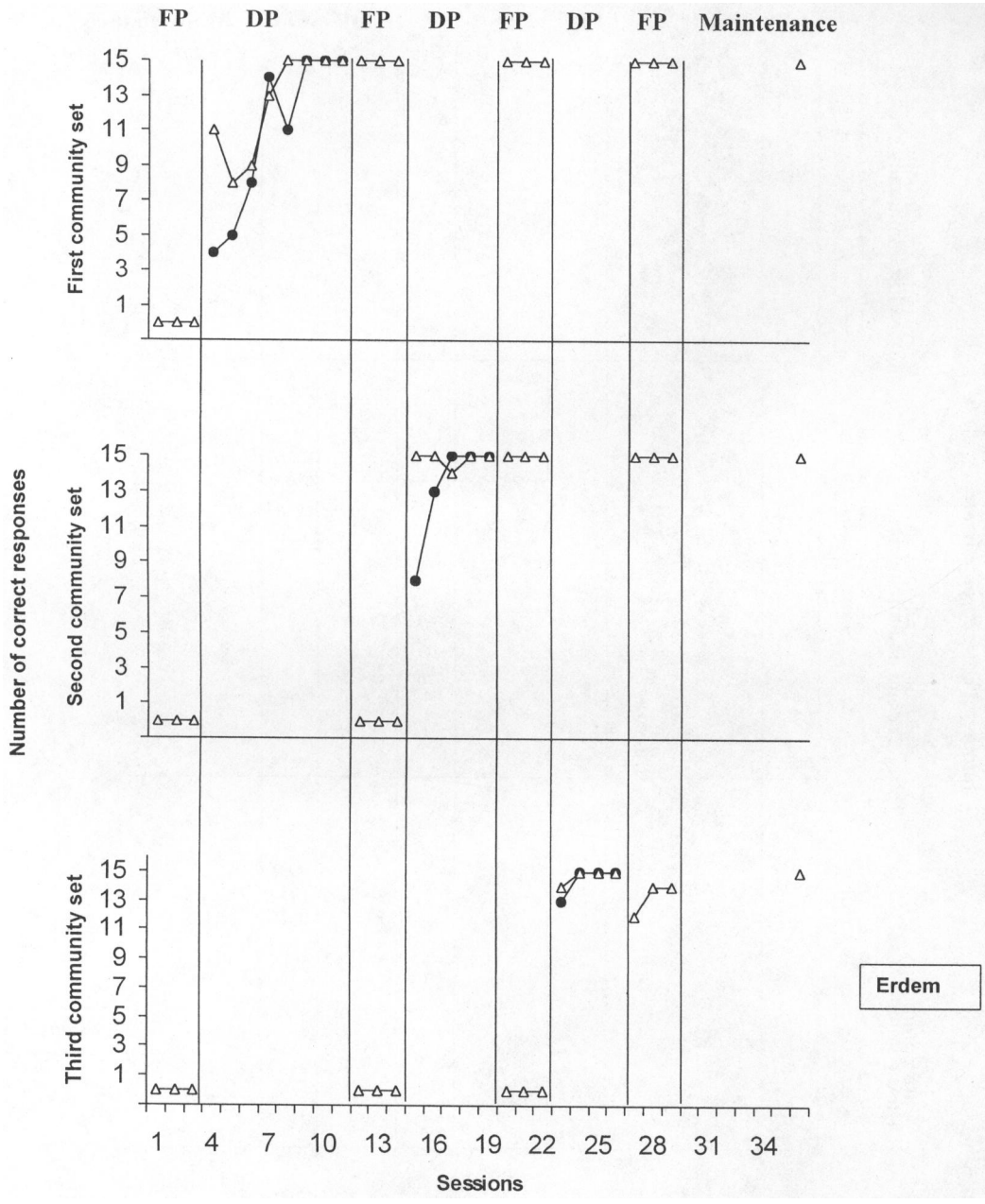

Figure 2. Number of correct responses for Erdem during training, full, daily, and maintenance probe sessions. Open triangles represent daily probe, full probe, and maintenance probe data, and closed circles represent training data.

across community sign sets were between 93% and 100%. Figen and Nihal acquired the instructive feedback stimuli presented to them with a mean of 93% (range = 80% - 100%) accuracy across the community sign sets; Erdem and Yaman acquired the instructive feedback stimuli presented to them with a mean of 100% accuracy across the community sign sets. Moreover, maintenance data showed that peer tutees maintained the instructive feedback that they acquired during the study with at least 86% accuracy.

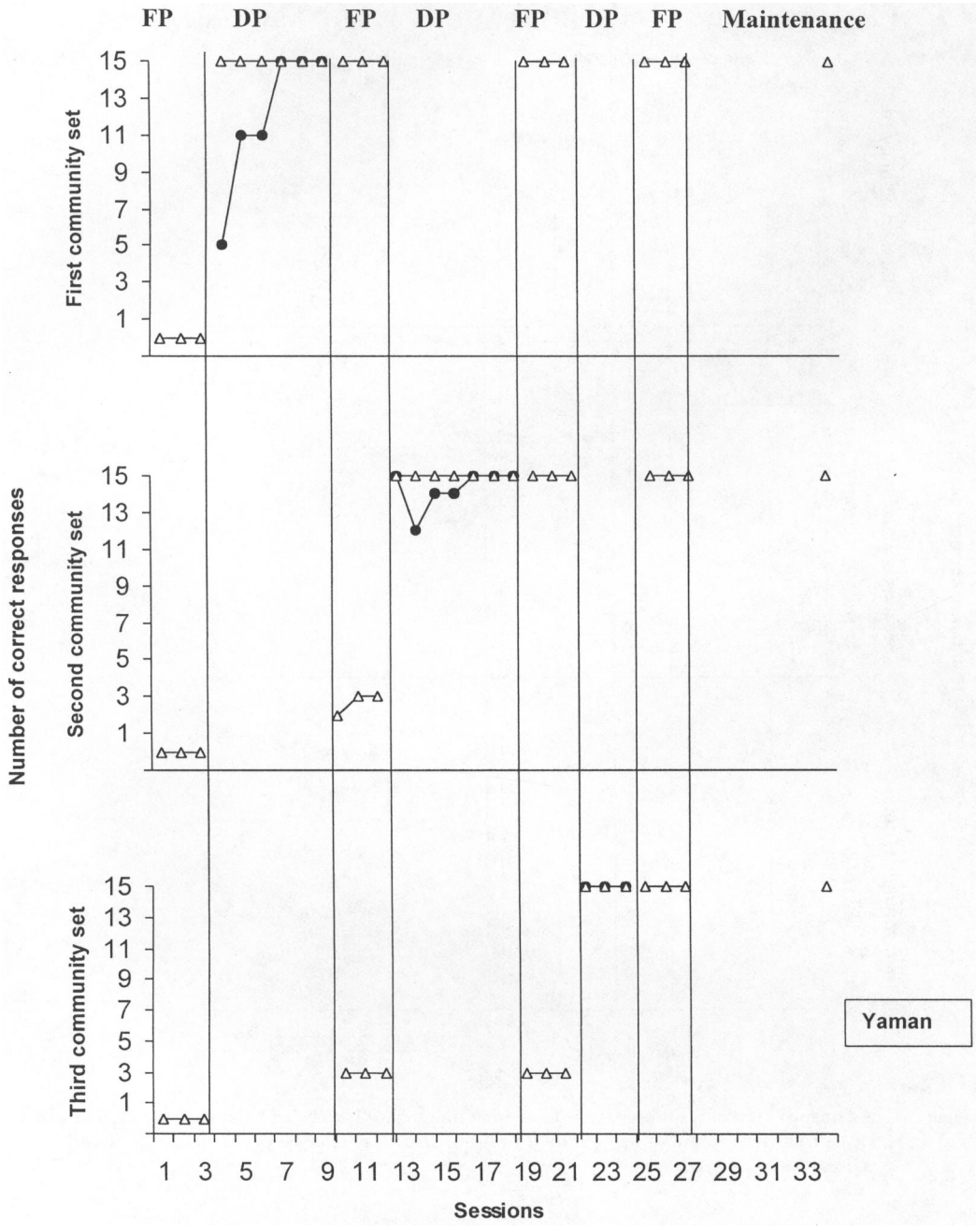

Figure 3. Number of correct responses for Yasin during training, full, daily, and maintenance probe sessions. Open triangles represent daily probe, full probe, and maintenance probe data, and closed circles represent training data.

Discussion

The purpose of this study was to evaluate the effects of SP implemented by normally developing students to their classmates with disabilities from general education classrooms. In addition, acquisition of instructive feedback stimuli, and maintenance and generalization effects of SP were also examined. Based on

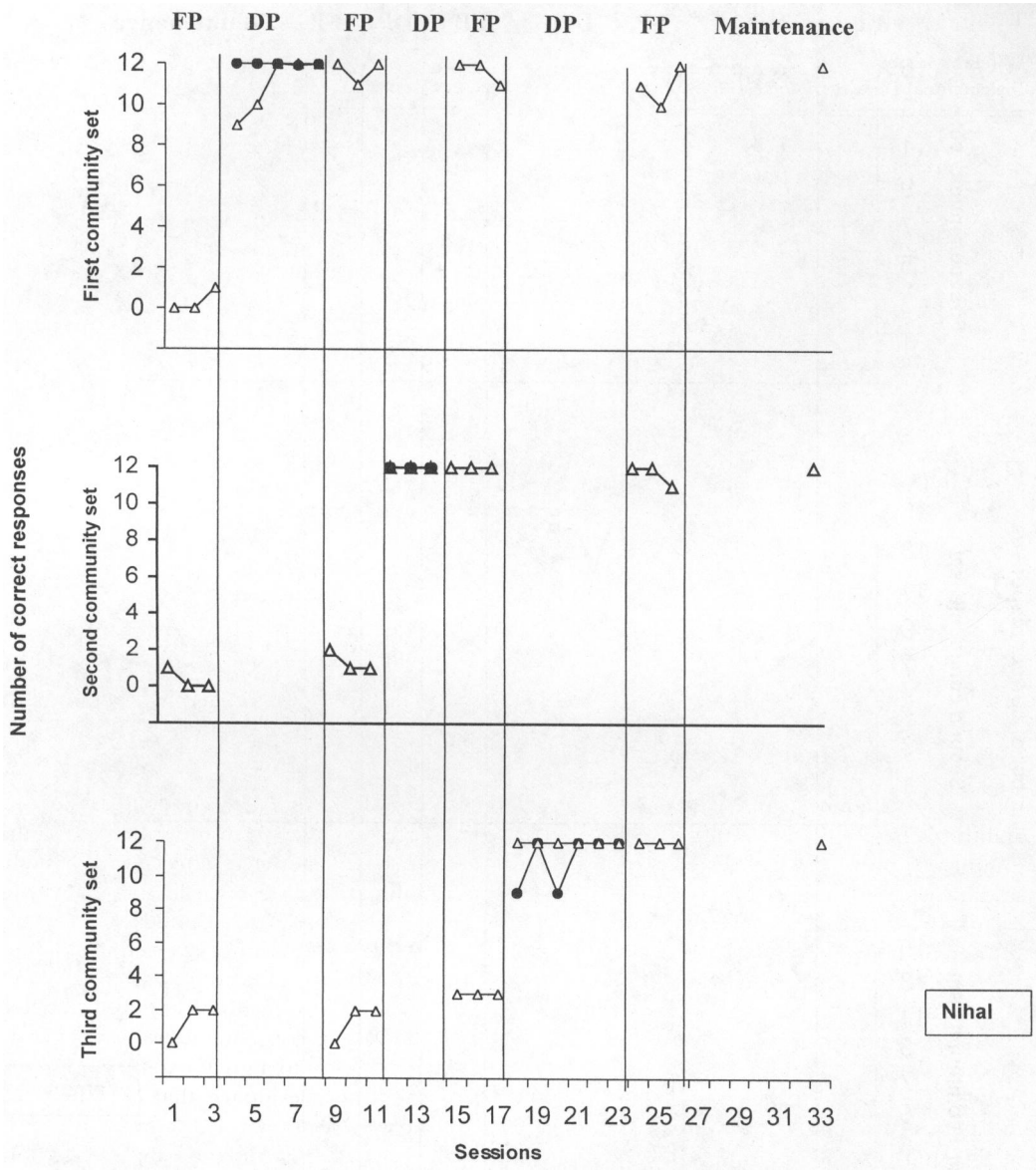

Figure 4. Number of correct responses for Nihal during training, full, daily, and maintenance probe sessions. Open triangles represent daily probe, full probe, and maintenance probe data, and closed circles represent training data.

data collected, several findings are worthy of discussion.

First, data indicate that peer tutors implemented SP with a high degree of procedural reliability. Data from previous adult teacher implemented SP studies showed that high levels of correct use were common (i.e., ranging from 95.5% to 99.2% across studies). Hence, tutors in this study delivered SP as reliable as adult teachers. Peer tutors in the study did not need any script or clue for implementing SP reliably. Teachers and other practitioners in inclusive educational settings may consider these findings as an advantage and use peers as instructional resource to deliver instruction with SP to their classmates.

Second, data indicate that SP was effective on teaching expressively identifying commu-

TABLE 3

Efficiency Data
Instructional Data for Each Student and Training Set Through Criterion

Tutees	*Set*	*No. Training Sessions*	*No. Training Trials*	*No. Training Errors*	*% Training Errors*	*Training Time*	*Daily Probe Time*	*No. Probe Errors*	*% Probe Errors*
Figen	1	8	120	0	0	19 min 39 s	14 min 31 s	26	22
	2	5	75	0	0	12 min	07 min 25 s	2	.02
	3	4	60	0	0	9 min 11 s	4 min 53 s	1	.01
Total		17	255	0	0	40 min 50 s	26 min 49 s	29	7.3
Erdem	1	8	120	17	14	23 min 25 s	16 min 2 s	32	26
	2	5	75	1	.01	13 min 26 s	8 min 41 s	9	12
	3	4	60	1	.01	9 min 15 s	5 min 37 s	2	.03
Total		17	255	19	4.7	46 min 06 s	30 min 24 s	43	12.6
Yaman	1	6	90	0	0	14 min 50 s	9 min 58 s	18	20
	2	6	90	0	0	15 min 20 s	9 min 20 s	4	.04
	3	3	45	0	0	7 min 2 s	4 min 48 s	0	0
Total		15	225	0	0	37 min 12 s	24 min 6 s	22	6.6
Nihal	1	5	75	0	0	9 min 52 s	6 min 4 s	5	.06
	2	3	45	0	0	5 min 28 s	3 min 19 s	0	0
	3	5	75	0	0	11 min 8 s	6 min 35 s	5	.06
		13	195	0	0	26 min 28 s	15 min 58 s	10	.04
Grand Total		62	675	19	1.1	2 h 30 min 36 s	1 h 37 min 17 s	104	2.21

nity signs to students with developmental disabilities. These findings are consistent with findings of previous studies. Most published studies with SP were designed to teach discrete behaviors such as object naming (MacFarland-Smith et al., 1993), science vocabulary words (Johnson et al., 1996) word identification (Griffen et al., 1998; Schuster et al., 1992), community signs (Singleton et al., 1995; Wolery et al., 1993); and animal identification (Tekin & Kircaali-Iftar, 2002). From this perspective it can be stated that findings of the study extend current literature about teaching discrete skills to students with special needs. Furthermore, it can be said that the study was a replication of the above studies in terms of teaching discrete skills. Last but not least, regarding effectiveness of SP, teachers and practitioners have gained the liberty of choosing the peer versus adult teacher to implement SP.

Third, data clearly indicate that SP was effective at maintaining acquired skills over time and generalizing the acquired skills across persons. These findings are also consistent with previous studies. Although peers maintained acquired skills over time, a maintenance probe session was conducted only one week after instruction in the study due to the end of school semester. This can be thought as a limited finding regarding maintenance effects. Future research should examine the effects of SP over a longer period of time.

Fourth, it was observed that peer tutors gained instructive feedback stimuli presented to them on the consequent events during instructional trials to a great extent. This observation provides evidence that SP is also an efficient instructional procedure that promotes broader learning during instruction. Peer tutees gained the instructive feedback stimuli between 80% and 100% accuracy in the study. The study contributed to the existing research literature about SP with instructive feedback.

Fifth, interobserver reliability was very high (i.e., ranging from 99% to 100%) in this study. Peer tutors collected data during all experimental sessions. This finding directs the researcher to think that the tutors collected the data in the study reliably. In the literature it is stated that while using peer tutoring the teacher needs to collect data to ensure the accuracy of teaching. Therefore, it is time con-

TABLE 4

Accuracy of Responding to Instructive Feedback During Full Probe Conditions

Tutees	*Sets*	*Screening*	*Probe I*	*Probe II*	*Probe III*	*Probe IV*	*Maintenance*
	1	0%	0%	20%	80%	100%	100%
Figen	2	0%	0%	0%	100%	80%	86%
	3	0%	0%	0%	0%	100%	100%
Total	Across Sets	0%	0%	20%	90%	93%	95%
	1	0%	0%	80%	100%	100%	100%
Erdem	2	0%	0%	0%	100%	100%	100%
	3	0%	0%	0%	0%	100%	100%
Total	Across Sets	0%	0%	80%	100%	100%	100%
	1	0%	0%	80%	100%	100%	100%
Yaman	2	0%	0%	0%	100%	100%	100%
	3	0%	0%	20%	20%	100%	100%
Total	Across Sets	0%	0%	80%	100%	100%	100%
	1	0%	0%	20%	80%	100%	100%
Nihal	2	0%	0%	0%	100%	80%	91%
	3	0%	0%	0%	0%	100%	100%
Total	Across Sets	0%	0%	20%	90%	93%	97%

suming for the teachers to train tutors to deliver instruction (Gerber & Kauffman, 1981). On the other hand, it was found out in the study that peers were able to monitor training reliably. Interobserver reliability findings of the study show that there was no need for a teacher to collect data during instruction since the peers in this study showed that they were able to collect the data reliably.

Sixth, there were mixed results regarding error rate and use of error correction in the study. Generally, error rate during daily probe sessions was consistently higher than the error rate during training sessions in previous studies. In order to decrease error rate during daily probe session's error correction was delivered for incorrect responses. However, there were mixed results in terms of decreasing error rate during daily probe sessions across tutees. It can be stated that error correction utilized during daily probe sessions was useful for three tutees but did not work well with one tutee (see Table 3). There were several reasons for these findings. Peers' characteristics such as history of learning and level of disability can be the source of these findings. Future research should examine the differential effects of student characteristics and error correction on error rate during daily probe sessions. Another way of controlling error rate during daily probe sessions can be conducting less frequent probe sessions such as intermittent probe sessions. Future research should also examine effects of different probe schedules.

Although not examined systematically, it was observed that both peer tutors and tutees were generally in favor of the use of peer tutoring. According to some anecdotal data gathered during individual interviews with the peer dyads, the tutees stated that their tutors would be good teachers (e.g., Nihal stated, "Canan will be a very good teacher. I learned the community signs easily from her."), they wanted themselves to be tutors to their classmates (e.g., Erdem said, "Let me teach Selma. It is my turn.") etc. All peers in this study indicated that they enjoyed and had fun during tutoring and that they would like to participate in tutoring again in the future.

Although findings of the study were very encouraging results should be interpreted cautiously. Since this is the first peer SP study the following limitations exist. First, this study was limited with four peer dyads and teaching discrete skills. Use of SP with a larger number of students from various disability areas is warranted. Second, although it was stated that SP was effective at maintenance level, only one maintenance probe session was conducted. Furthermore, the maintenance probe session was conducted just a week after training. Long term effects of SP should be examined in the future research.

In addition to above future research implications, the following research suggestions can be made when results of the study are taken into consideration. This study was conducted with pull-out teaching strategy. Future research should be conducted to examine similar effects in a pull-in teaching arrangement. Teaching chained skills with SP delivered by peer tutors can also be a goal in future research. Peer-delivered and teacher-delivered SP can be compared in terms of effectiveness, efficiency, and social validity variables. Since peer tutoring was found to be an effective means of delivering instruction with SP, future research might be designed to examine effects of peer delivered SP on practicing to master skills previously taught by teachers.

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