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Effectiveness of Simultaneous Prompting in Small Group: The Opportunity of Acquiring Non-target Skills through Observational Learning and Instructive Feedback

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Abstract: A multiple probe study across behaviors, replicated across students, assessed the effectiveness of simultaneous prompting (SP) in a small group teaching arrangement on teaching (a) to show the provinces, rivers, and border countries of Turkey on a map and (b) to expressively identify the names of the symbols which are usually used in math. Subjects of the study were five middle school age students with developmental disabilities. Maintenance and generalization effects of SP were investigated in the study as well. Moreover, acquisition of non-target skills was also assessed through instructive feedback and observational learning. Results show that SP was effective. Students generalized and maintained the acquired behaviors. Assessment of observational learning and instructive feedback data showed that students acquired non-target skills to certain extents. Implications and future research needs are discussed.

One of the most desired strategies for teaching skills to students with disabilities is group teaching arrangement. Group teaching arrangement has some advantages over traditional one to one teaching arrangement on both teacher and student sides such as (a) less personnel and instruction time is needed, (b) students are placed in their least restrictive environment, (c) students have a chance to interact with their peers appropriately, (d) teachers provide instruction to more than one student at a time, (e) students have the advantage of observing their peers in the group and the chance of learning more (Collins, Gast, Ault, & Wolery, 1991). Group teaching arrangement has been widely used with considerable success on teaching both discrete and chained skills to students with disabilities

(Alig-Cybriwsky, Wolery, & Gast, 1990; Doyle, Gast, Wolery, Ault, & Farmer, 1990; Parker & Schuster, 2002; Schoen & Sivil, 1989; Wolery, Cybriwsky, Gast, & Boyle-Gast, 1991).

One instructional procedure used to teach students with disabilities is known as simultaneous prompting (SP). In this procedure the teacher delivers the target stimuli and controlling prompt simultaneously. Therefore, the student does not have an opportunity to respond independently during training sessions and probe sessions are needed to test the transfer of stimulus control (Dogan & Tekin-Iftar, 2002; Gibson & Schuster, 1992; MacFarland-Smith, Schuster, & Stevens, 1993; Parrott, Schuster, Collins, & Gassaway, 2000; Tekin-Iftar, 2003; Tekin-Iftar, Acar, & Kurt, 2003).

To date there are 20 published studies examining the effects of SP on teaching either discrete or chained skills to people with various disabilities. Research has shown that SP is effective in teaching students with various disabilities such as moderate and severe mental retardation (Dogan & Tekin-Iftar, 2002; 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 (Palmer, Collins, & Schuster, 1999);

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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).

Evidence-based studies examined effectiveness of SP on teaching discrete tasks such as identifying occupations from picture cards (Dogan & Tekin-Iftar, 2002); 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; Tekin-Iftar, 2003); 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 USA map, and demonstrating manual signs for communication picture symbols (Fickel et al., 1998); identifying animals (Tekin & Kircaali-Iftar, 2002); reading grocery aisle headers and occupational words, defining prefixes, identifying elements from Periodic Table (Parker & Schuster, 2002); verbal identification of manual signs (Palmer et al., 1999); identifying first-aid materials (Tekin-Iftar et al., 2003). 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); construction of shipping boxes (Maciag et al., 2000), and hand washing (Parrott et al., 2000).

Small group instructional arrangement was used in only 35% of these 20 published studies. Homogeneous group format was used in the majority of studies. When delivering instruction with SP, using heterogeneous group is rare. According to Collins et al. (1991) conducting heterogeneous group may be more difficult as teacher will need to teach various skills in the group. However, students in this group have the chance of observing their peers in the group and may learn additional skills. Therefore, it can be said that conducting heterogeneous group may be more efficient than conducting homogeneous group or one to one teaching arrangement. Research has shown that students of various ages and ability levels can learn additional skills

during group instruction through observational learning (Farmer, Gast, Wolery, & Winterling, 1991; McCurdy, Cundari, & Lentz, 1990; Parker & Schuster, 2002).

Instructive feedback is another instructional parameter that increases the number of behaviors learned during instructional trials. Werts, Wolery, Holcombe, and Gast (1995) defined instructive feedback as presenting extra, non-target stimuli, during consequent events of instructional trials. 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 seven studies examining acquisition of instructive feedback while using SP delivered by either adults or peers (Griffen et al., 1998; Parrott et al., 2000; Schuster & Griffen, 1993; Singleton et al., 1995; Tekin-Iftar, 2003; Tekin-Iftar et al., 2003; Wolery et al., 1993). Among the seven studies examining the acquisition of instructive feedback during SP, four of them were conducted with elementary school students (Griffen et al.; Parrott et al.; Schuster & Griffen; Singleton et al.), one of them was conducted with preschool students (Wolery et al.), and one of them was conducted with middle school students (Tekin-Iftar 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 are only two studies investigating the effects of SP with middle school age students (Fickel et al., 1998; Tekin-Iftar et al., 2003). From these two, one study was conducted in a small group teaching arrangement and assessed the acquisition of observational learning (Fickel et al.). On the other hand there is no study investigating the effects of SP in small group on middle school age students and the acquisition of instructive feedback stimuli and observational learning stimuli in the group.

Therefore, the present study was conducted to examine effects of SP on teaching to show

the provinces, rivers, and border countries of Turkey on a map and to expressively identify the names of symbols that are frequently used in math. The following research questions were addressed in this study: (a) Is SP delivered in a heterogeneous small group effective on teaching to show the provinces, rivers, and border countries of Turkey on a map and expressively identify symbols which are frequently used in math to five students with developmental disabilities?, (b) Will students maintain the acquired behaviors over time (2 and 6 weeks after training)?, (c) Will students generalize the acquired behaviors across different persons and materials?, (d) Will students acquire instructive feedback stimuli provided to them on consequent events after the correct responses during instructional trials?, (e) Will students acquire the target behaviors of their pairs through observational learning?

Method

Participants

Participants were selected by conducting interviews with their classroom teacher and parents at a public special school for students with developmental disabilities. The purpose of the study was shared with them. After obtaining their permissions, five students with developmental disabilities, three girls—two boys, were included in the study. All attended the same class at the same special school. None of them had a history with SP.

Prerequisite skills which students had to have were as follows: (a) attending to audio and visual stimuli for at least 10 minutes, (b) having turn taking skill, (c) following verbal instruction, (d) selecting reinforcers. All students had the prerequisite skills for this study. There was no adaptive behavioral score for the participants.

Giray (11 years 7 months old) functioned at mild to moderate range of intellectual disabilities. Areas of strength included self-care skills, fine and gross motor skills, receptive and expressive language skills. He had basic functional academic skills such as reading and writing. He had color, shape, and location concepts. Areas of weakness included reading comprehension and social skills.

Hale (13 years 1 month old) had Down

syndrome. She functioned at moderate range of intellectual disabilities. She was receiving special education services since she was two and a half years old. Areas of strength included self-care skills, and fine and gross motor skills. She had knowledge of basic concepts such as color and shape concepts. Areas of weakness included functional academic skills and communication skills.

Sibel (14 years 3 months old) functioned at mild range of intellectual disabilities. Areas of strength included self-care skills, fine and gross motor skills, and receptive language skills. She could read and write, do addition and subtraction problems, and count exact change. She had knowledge of basic facts. Areas of weakness included communication, especially expressive language, and social skills.

Tarkan (12 years 2 months old) functioned at mild range of intellectual disabilities. Areas of strength included self-care skills, fine and gross motor skills, receptive and expressive language skills. He had basic functional academic skills such as reading and writing. He could do addition and subtraction problems with two digit numbers. Areas of weakness included social skills.

Irem (12 years 4 months old) functioned at mild range of intellectual disabilities as well. Areas of strength included self-care skills, fine and gross motor skills, receptive and expressive language skills. She had basic functional academic skills such as reading and writing. She could use phone and public transportation, and read a clock independently. She had color, shape, and location concepts. She could do addition and subtraction problems with two digit numbers. Areas of weakness included social skills.

Dyads were formed to assess acquisition of observational learning stimuli. Giray and Hale, Sibel and Tarkan, and Irem and Sibel were the first, second and third dyads respectively. Since five students participated in the study Sibel was paired with two different students. In the last dyad, acquisition of the observational learning was assessed only for Irem since Sibel's acquisition was tested in the second dyad. The third author conducted all experimental sessions. She had a master's degree in special education and four years experience in teaching students with intellectual

disabilities. Reliability data were collected by the first author who is faculty at the Department of Special Education at Anadolu University.

Setting

The study was conducted in the students' classroom (5 m x 3 m). There was a rectangular teacher table, chairs for the students, several tables for the students, and a board in the classroom. Students and researcher sat down face to face at a table in a semi circle. All experimental sessions were conducted in the same classroom. Intervention sessions were conducted in group teaching arrangement, and the rest of the experimental sessions were conducted in one to one teaching arrangement. Intervention and probe sessions were conducted Monday, Wednesday and Thursday at 10:00 to 10:30 am. The researcher recorded each session via camcorder. No one was available during the experimental sessions other than the researcher.

Materials

During training, index cards (5 cm × 5 cm), maps, reinforcers, a camcorder, and a stopwatch were used. Index cards were used to teach symbols used in math (e.g., min, gr, /). Reinforcers were selected by the students and consisted of objects such as stationery items and music tapes. Nine index cards were used when teaching the symbols. Each card had a single symbol. Sixteen point Times New Roman font was used in the cards. Nine symbols were chosen to teach one student. Three training sets of symbols were formed for the student. Reference map (45 × 60 cm) was used when teaching to show the provinces and border countries of Turkey, and environmental map (45 × 60 cm) was used when teaching to show the rivers in Turkey. Furthermore, as generalization items, different maps on different sizes and index cards in different sizes and colors were used.

Selection of Target Behaviors

Target behaviors were selected from IEP's of each student. They were selected from two curriculum areas: Social Sciences and Math.

The rivers, provinces and border countries of Turkey were taken from "Our Country and Our Regions" unit of Social Sciences class and symbols were taken from various units of Math class. Target behaviors were defined as "when asked student shows the border countries (rivers or provinces) of Turkey on a map" and "when shown student tells the name of the symbol on a card."

Screening Sessions

Screening sessions were conducted individually to identify the prospective target stimuli for each student. Prior to initial baseline conditions, 35 provinces, five provinces from seven regions in Turkey, were selected to form a pool. A pool for the rivers, 18 rivers, and a pool for the math symbols, 15 symbols, were formed. After that, to identify the unknown stimuli from these pools for each student, two consecutive screening sessions were conducted with a trial for each prospective target stimuli. The trials were presented in a random order. Instructive feedback stimuli were also screened in the same sessions.

Screening sessions were conducted as follows. The teacher had the materials ready, and secured the students attention (e.g., "Sibel, lets start to work with you. Are you ready?"). After receiving an affirmative response, the teacher presented the task direction, (e.g., "Sibel, please show Bursa on the map?"), and waited 4 s. After waiting 4 s, the teacher asked the instructive feedback stimuli, the region where that province is from, (e.g., "Sibel, tell me which region is Bursa from?"). Correct and incorrect responses for target behaviors as well as responses for instructive feedback were ignored during the screening sessions. The nine stimuli (provinces, rivers, border countries, and symbols) to which the students did not respond correctly were chosen as target behaviors. Three training sets were prepared for each student and each training set had three target behaviors. Target behaviors were randomly assigned to training sets. The target behaviors, and training sets for the dyads and the instructive feedback presented with each target behavior are in Table 1 and Table 2 respectively.

Screening sessions of observational learning stimuli were conducted after forming the

TABLE 1
Target Behaviors

Students	Target Behaviors
Giray	Showing border countries of Turkey on the map.
Hale	Showing provinces of Turkey on the map.
Sibel	Showing provinces of Turkey on the map where the provinces are not labelled.
Tarkan	Telling the name of given symbols which are used in math.
Irem	Showing the rivers of Turkey on the map.

training sets of each student. The students were tested in the same manner about the target behaviors of their pair in the dyad. The students' attention and cooperation were reinforced verbally at the end of each session (e.g., "Very good Sibel. You paid attention and were cooperative with me today.").

General Procedures

Screening sessions were conducted to identify target behaviors prior to the experimental procedures. Nine target behaviors were taught to each student in three training sets. All sessions were conducted and recorded by the third author. During instructional trials, instructive feedback was delivered after each correct response. Observational learning was encouraged and reinforced during instructional trials as well. Full and daily probe sessions were conducted. Also, maintenance probe sessions for targeted behaviors, instructive feedback and observational learning probe sessions, and generalization probe sessions across persons and materials were conducted. Instructional sessions were conducted in small group teaching arrangement and the rests of the other experimental sessions were conducted in one to one teaching arrangement. Individual criteria were used during training. Response intervals and intertrial intervals during all experimental sessions were 4 s. Students received verbal reinforcement

for their attending and cooperation behaviors at the end of all sessions by the teacher.

Full Probe Conditions

Full probe sessions were conducted in one to one teaching arrangement before introducing the intervention to the first training set and after criterion were met for each training set. All training sets were probed during full probe sessions until stable data were recorded for at least three consecutive sessions. Each stimulus in the training sets for each student was presented three times during the sessions. The teacher randomly sequenced the stimuli before the sessions. Full probe sessions were implemented as follows: the teacher had training materials ready, secured the student's attention (e.g., "Are you ready?"), and then provided the target stimulus and waited 4 s for the student to respond. The teacher recorded the student's responses and correct responses resulted in verbal praise; incorrect or no responses were ignored.

Daily Probe Conditions

Since a controlling prompt was delivered on every training trial, the student did 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. Training sets that were currently being taught were probed in these sessions. No daily probe session was conducted before the first training session. Correct responses during daily probe sessions were counted toward criterion. Criterion was 100% correct responding for three consecutive daily probe sessions. Daily probe sessions were implemented just like full probe sessions with one exception. Only the currently trained set was assessed in the daily probe session. Same consequences were provided in daily probe sessions.

Instructive Feedback and Observational Learning Probe Sessions

Following every single full probe condition, instructive feedback and observational learn-

TABLE 2

Training Sets and Instructive Feedback Stimuli

<i>Dyads Participants First Dyad (Giray-Hale)</i>	<i>Training Sets</i>	<i>Instructive Feedback Stimuli</i>
Giray	1 Georgia Bulgaria Syria 2 Armenia Northern Cyprus Iran 3 Azerbaijan Greece Iraq	Tbilisi is the capital of Georgia. Sofia is the capital of Bulgaria. Damascus is the capital of Syria. Yerevan is the capital of Armenia. Lefkose is the capital of Northern Cyprus. Teheran is the capital of Iran. Baku is the capital of Azerbaijan. Athens is the capital of Greece. Baghdad is the capital of Iraq.
Hale	1 Bursa Mugla Antalya 2 Batman Aydin Samsun 3 Corum Mersin Gaziantep	Bursa is in the Marmara region in Turkey. Mugla is in the Aegen region in Turkey. Antalya is in the Mediterranean region in Turkey. Batman is in the Eastern Anatolian region in Turkey. Aydin is in the Aegen region in Turkey. Samsun is in the Black Sea region in Turkey. Corum is in the Black Sea region in Turkey. Mersin is in the Mediterranean region in Turkey. Gaziantep is in the Southeastern Anatolia region in Turkey.
Second Dyad (Sibel-Tarkan)		
Sibel	1 Izmir Siirt Aydin 2 Maras Erzurum Diyarbakir 3 Istanbul Adapazari Adiyaman	Izmir is in the Aegen region in Turkey. Siirt is in the Southeastern region in Turkey. Aydin is in the Aegen region in Turkey. Maras is in the Mediterranean region in Turkey. Erzurum is in the Eastern Anatolia region in Turkey. Diyarbakir is in the Southeastern Anatolia region in Turkey. Istanbul is in the Marmara region in Turkey. Adapazari is in the Marmara region in Turkey. Adiyaman is in the Southeastern Anatolia region in Turkey.
Tarkan	1 S > Kg 2 Cm - ≠ 3 Min Gr /	It is used when telling time. It is used when talking about greater than. It is used when measuring weight. It is used for when measuring height and length. It is used in the subtraction problems. It is used when talking about unequal sets. It is used when telling time. It is used when measuring weight. It is used in division problems.
Third dyad (Irem-Sibel)		
Irem	1 Sakarya Ceyhan Gediz 2 Kizilirmak B. Menderes Goksu 3 Yesilirmak Seyhan Coruh	Sakarya flows into Black Sea. Ceyhan flows into Mediterranean Sea. Gediz flows into Aegen Sea. Kizilirmak flows into Black Sea. B. Menderes flows into Aegen Sea. Goksu flows into Aegen Sea. Yesilirmak flows into Black Sea. Seyhan flows into Mediterranean Sea. Coruh flows into Black Sea.

ing probe sessions occurred in order to assess the acquisition of the stimuli introduced in the instructive feedback and observational learning trials. Nine trials occurred for each student during these sessions. These sessions were conducted in the same format with full probe sessions.

The teacher had the materials ready, secured the student's attention, and presented the task direction, ". . . tell me, which region is Bursa from?" and waited for 4 s. There were correct responses, incorrect responses, and no responses during instructive feedback probe sessions. Correct responses were defined as telling the region of the asked province correctly within 4 s. Incorrect responses and no responses were defined as telling a different region or not responding within 4 s. Correct responses resulted in verbal descriptive praise, incorrect responses and no responses were ignored, and the next trial was presented. Students received verbal reinforcement for their attending and cooperation behaviors during the sessions.

Acquisition of the observational learning stimuli was assessed in the dyad by testing the target stimuli of the student's pair on the other student in the study (e.g., Hale was tested about Giray's target stimuli and Giray was tested about Hale's target stimuli). The teacher conducted observational learning probe sessions as follows: The teacher had materials ready, secured the student's attention and presented the task direction, "Hale, please show Syria on the map." The possible responses of the students and their consequences were the same as instructive feedback probe sessions.

Simultaneous Prompting Procedure

After obtaining consistent data during baseline sessions, the teacher started to use SP to teach target behaviors to students in small group arrangement. Simultaneous prompting and instructive feedback were delivered during instruction to show the provinces, rivers, and border countries of Turkey on the map, and to expressively identify the symbols that are usually used in math. Training was delivered three days a week with one training session each day. There were nine trials for each student. Each target behavior in the training

sets was presented three times randomly. A total of 45 trials were delivered with nine trials for each student in the group. Prior to each training session, the teacher determined the order of presenting the trials and of starting with the student. Responses during instruction with SP were scored as correct, incorrect, and no response. Responses were defined the same as in the probe sessions. Different controlling prompts were used in the study for the students.

Training sessions were conducted as follows. The teacher had the materials ready, and secured the students' attention in the group by delivering attention cue for the group. After receiving an affirmative response to the question, "Students, are you ready for work?", the teacher explained the group that she was going to work with one of them and everybody in the group needed to listen carefully especially his/her pair in the group (i.e., "I'm going to start with Giray today. All of you should observe us carefully, especially his pair Hale."). After that the teacher presented the task direction, "Giray, Please show Bulgaria on the map", and then provided the controlling prompt immediately, "teacher showed Bulgaria on the map", and waited 4 s for a response. If the students imitated the controlling prompt and repeated it within 4 s, the teacher provided a verbal reinforcement "Very good, Giray. You show Bulgaria on the map." and then provided the instructive feedback "The capital of Bulgaria is Sofia." Incorrect responses or no responses within 4 s resulted in reproviding the controlling prompt and the teacher presented the next trial. Students' attention and their cooperation behaviors were reinforced at the end of the sessions by the teacher.

Since acquisition of the observational learning stimuli was one of the parameters in the study, observational learning was encouraged during the training. The teacher secured the other students' attention while working with one of the students in the group. The teacher verbally reinforced their observing behaviors during the session (e.g., "Good job. You all observe Giray very good."). Continuous reinforcement schedule was used until criterion was met, then reinforcements were delivered on a VR5 basis.

Generalization and Maintenance Probes

Generalization across persons and materials probe sessions was conducted in one to one teaching arrangement in a pretest-posttest manner. These sessions occurred before any training as a pretest, and at the end of teaching all training sets, final full probe session, as a posttest. Maintenance probe sessions were conducted two and six weeks after training, following the final full probe session. Generalization and maintenance probe sessions were conducted just like full probe sessions. However, generalization sessions were conducted by the first author and different maps and index cards were used during the sessions. Reinforcement was thinned (i. e., VR3 for the first probe session, FR9 for the consecutive session) during maintenance and generalization sessions.

Experimental Design

A multiple probe design across training sets and replicated across students was used to investigate effectiveness of SP delivered in small group teaching arrangement on teaching to show the provinces, rivers, and border countries of Turkey and to expressively identify the name of a given symbol used in math frequently to students with developmental disabilities. The dependent measure was percentage of correct responses on showing the provinces, rivers, and border countries of Turkey and expressively identifying the given symbols which are used in math frequently, and the independent variable of the study was SP. The independent variable was introduced to one training set at a time. Experimental control was built in when the student 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-Iftar & Kircaali-Iftar, 2004; Wolery, Bailey, & Sugai, 1988).

Interobserver and Procedural Reliability

Reliability data were collected at least 20% of all experimental sessions (20% of full probe and daily probe sessions, 20% of training sessions; 33% of maintenance ses-

sions and instructive feedback; and 50% of generalization sessions). A point by point method with a formula of the number of agreements divided by the number of agreements plus disagreements multiplied by 100 was used to calculate interobserver reliability (Tawney & Gast, 1984; Tekin-Iftar & Kircaali-Iftar, 2004). Interobserver reliability data collected during the full probe sessions yielded a percentage of agreement of 100% across all students. Dependent measure reliability data collected during daily probe sessions yielded a mean percentage of agreement of 99.3% (range = 89 – 100), and 100% during training sessions across all students. Dependent variable reliability data collected during instructive feedback, observational learning, maintenance, and generalization probe sessions yielded a mean percentage of agreement of 98.9% (range = 92 – 100), 99.5% (range = 95 – 100), 95% (range = 84 – 100), 98.2% (range = 78 – 100) respectively across all students.

Procedural reliability data were collected to estimate whether the teacher delivered SP and other experimental sessions (e.g., full and daily probe sessions, generalization and maintenance sessions, instructive feedback and observational learning probe sessions etc.) as they were planned in the study. Planned steps that the teacher was expected to demonstrate during simultaneous prompting sessions were (a) having materials ready, (b) securing the student's attention, (c) encouraging observational learning, (d) presenting task direction, (e) providing controlling prompt immediately after the task direction, (f) delivering correct consequences, (g) delivering correct instructive feedback, and (h) providing appropriate inter-trial interval (4 s). Planned steps that the teacher was expected to demonstrate for daily, full, instructive feedback and observational learning, and generalization and maintenance probe sessions were (a) having materials ready, (b) securing the student's attention, (c) presenting the task direction, (d) delivering correct consequences, and (e) providing the appropriate inter-trial interval (4 s). Procedural reliability was calculated by dividing the number of observed teacher behaviors by the number of planned teacher behaviors, and multiplied by 100 (Billingsley, White, & Munson, 1980; Tekin-Iftar & Kircaali-Iftar,

2004). Independent variable reliability data indicated that the teacher performed all behaviors with 100% accuracy during all probe sessions. During training sessions, the teacher implemented all behaviors with 100% accuracy with the exception of delivering instructive feedback stimuli. She delivered instructive feedback stimuli with a mean of 83% accuracy (range = 67 – 100) across all students.

Results

Instructional Data

Figures 1–5 display the percentage of correct responses during full probe, daily probe and maintenance probe sessions for Giray, Hale, Sibel, Tarkan, and Irem respectively. As seen in the figures, using SP to teach a heterogeneous group of students with developmental disabilities was effective. Any procedural modification was not needed during the experimental sessions. Hale did not attend school during training with her third training set. 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

Seventy-eight training sessions and 702 training trials were needed for the students to meet criterion on all training sets. Giray needed 21 training sessions and 189 training trials, Hale needed 14 training sessions and 126 training trials, Sibel needed 12 training sessions and 108 training trials, Tarkan needed 15 training sessions and 135 training trials, and Irem needed 16 training sessions and 144 training trials. Giray needed the highest number of training sessions through criterion and Sibel needed the lowest in the group.

Training and Probe Time Through Criterion

Two hr, 32 min, 23 s training time was needed through criterion across students. Giray, Sibel, Tarkan, Irem needed 45 min, 8 s, 22 min 13 s, 25 min 42 sec, and 35 min 2 s training time through criterion across all training sets respectively. Hale needed 24 min 18 s training time though criterion across first two training

sets. The training time that the students needed through criterion was between 22 min 13 s and 45 min 8 s. 1 hr 11 min, 6 s probe session time was needed across five students through criterion. The individual probe time across training sets were between 9 min 25 s and 17 min 39 s.

Training and Probe Error Through Criterion

SP instructional sessions were almost errorless for the students. One error occurred during training sessions with Sibel, 2 with Irem, 3 with Hale, 4 with Giray, and 5 with Tarkan. Fifteen errors occurred during training with 2.14%. There were 172 errors during probe sessions with an average of 6.57% across students. Probe session error rate ranged from 0% to 57.7%.

Maintenance and Generalization

Maintenance probe sessions were conducted two and six weeks after the final full probe sessions. Maintenance data for the students showed that students maintained the acquired skills of showing the provinces, rivers, and border countries of Turkey on a map and expressively identifying the names of the symbols which are frequently used in math at criterion level (see Figures 1-5).

Generalization across persons and materials data showed that except Irem all students generalized the acquired skills at criterion level. Irem generalized the acquired skill at 56% across persons and materials. Pretest generalization measures across sets were 0% for Giray, Tarkan, Hale, and Irem whereas posttest generalization measures across all sets were 85% for Giray, and 100% for Sibel, Tarkan, and Hale.

Instructive Feedback Data

Data collected indicated that each student in the group acquired some of his/her own instructive feedback stimuli. Mean percentage of correct responding on instructive feedback stimuli for the training set for each student during screening, full probe and maintenance sessions are presented in Table 4. During baseline all students' responses were at 0%

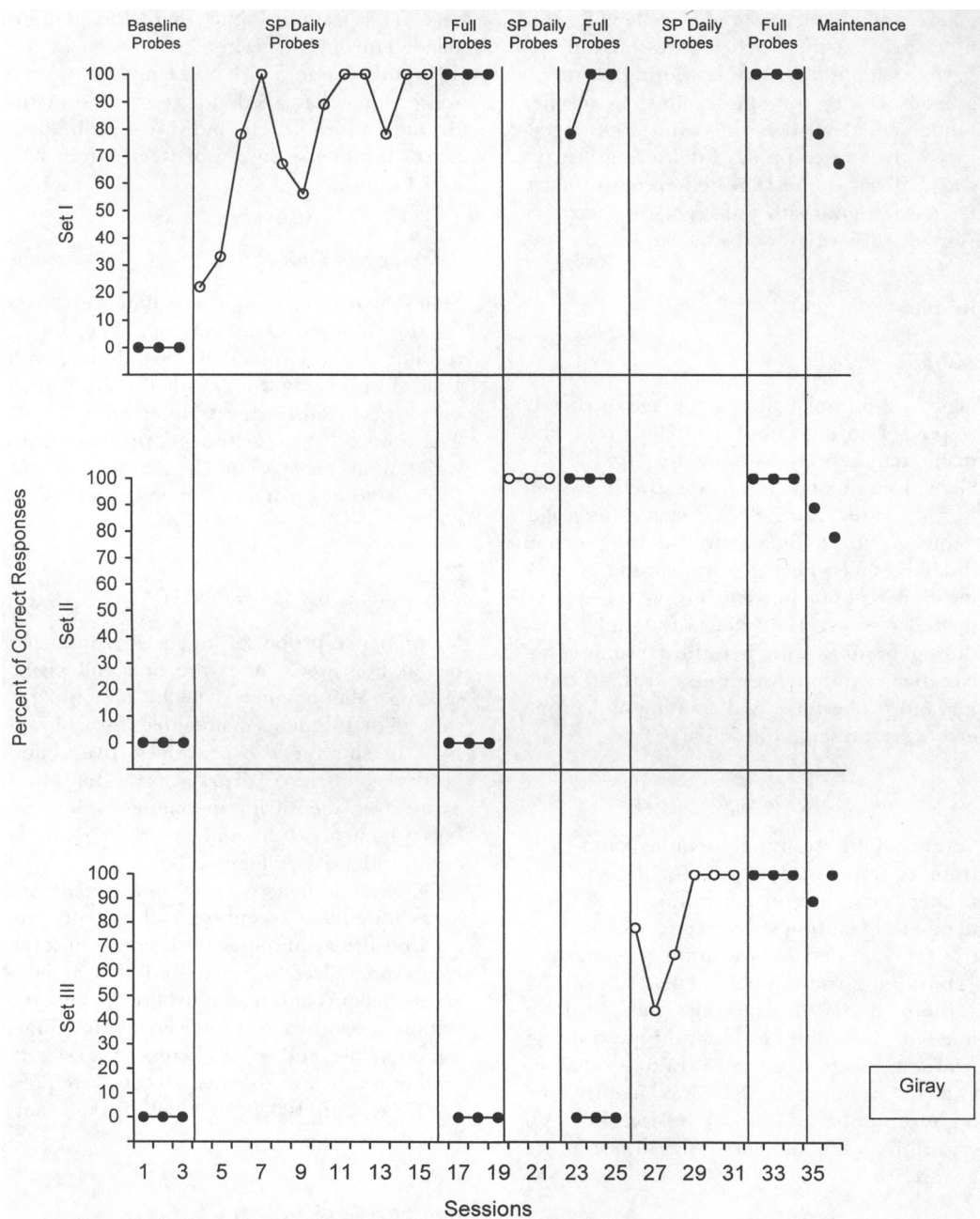


Figure 1. Percent of correct responses during full, daily and maintenance probe sessions for Giray.

correct responding. When experimental sessions were over (after the final probe session) the acquisition of the instructive feedback across training sets was between 33% and 100%.

Observational Learning Data

Data collected for the acquisition of observational learning indicated that students acquired some of the target behaviors of their

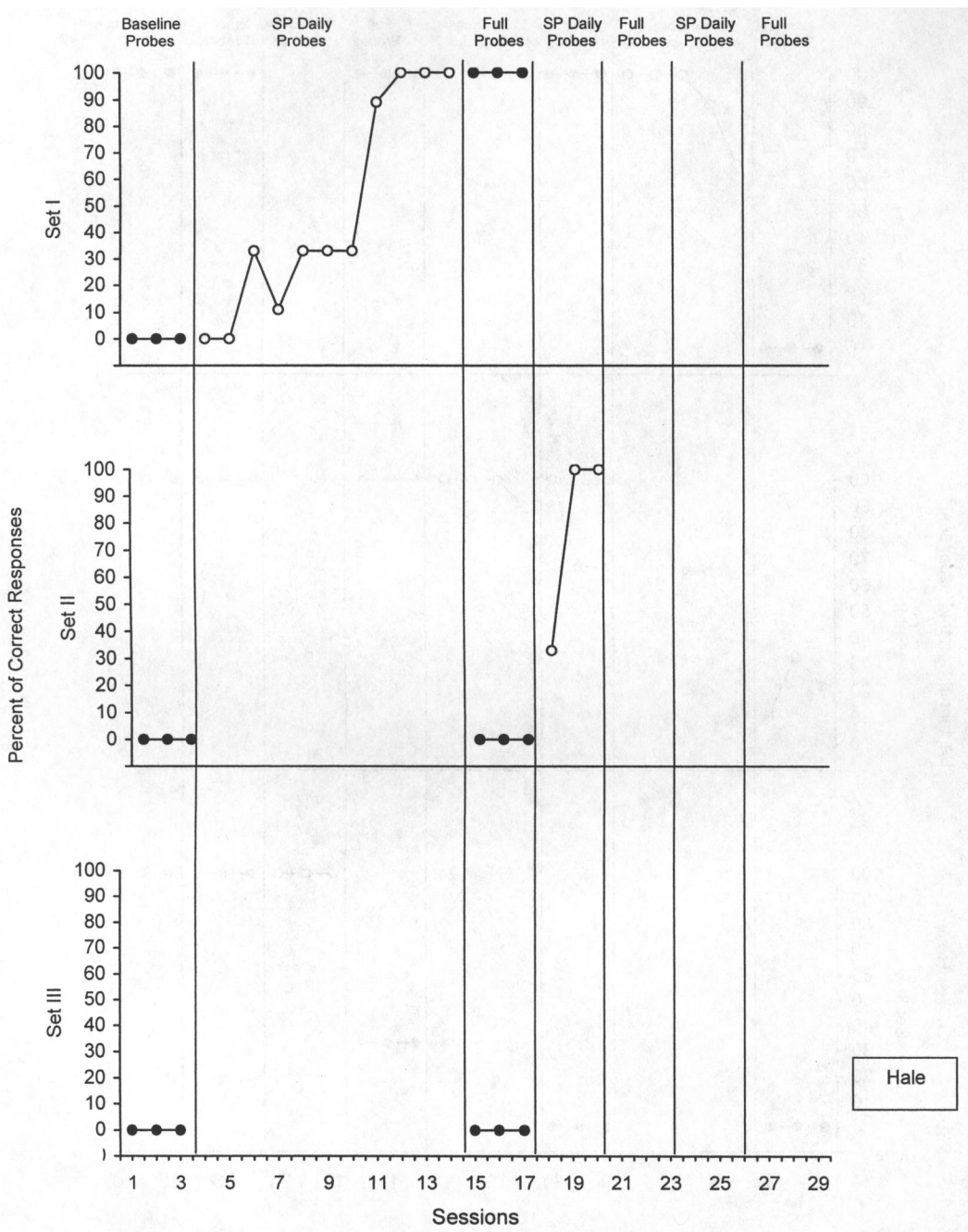


Figure 2. Percent of correct responses during full, daily and maintenance probe sessions for Hale.

pairs to a certain extent by observational learning. Mean percentage of correct responding on observational learning stimuli for the training set for each student during

screening, full probe and maintenance sessions are presented in Table 5. During baseline students' responses were between 0%–33% correct responding. When experimental

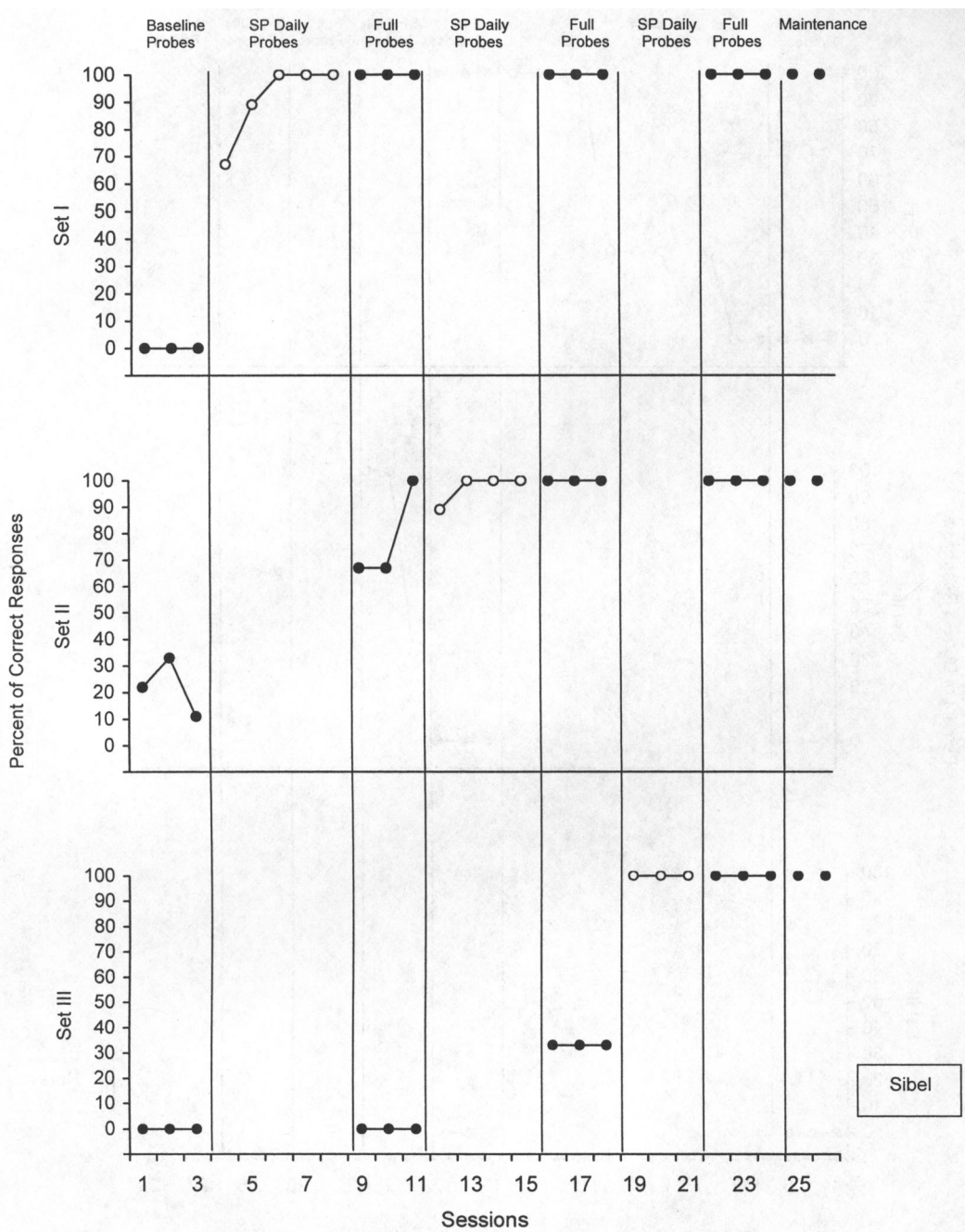


Figure 3. Percent of correct responses during full, daily and maintenance probe sessions for Sibel.

sessions were over (after the final probe session) the acquisition of the observational learning stimuli across training sets was between 33% and 100%.

Discussion

The purpose of this study was to evaluate the effects of SP delivered in a small group on

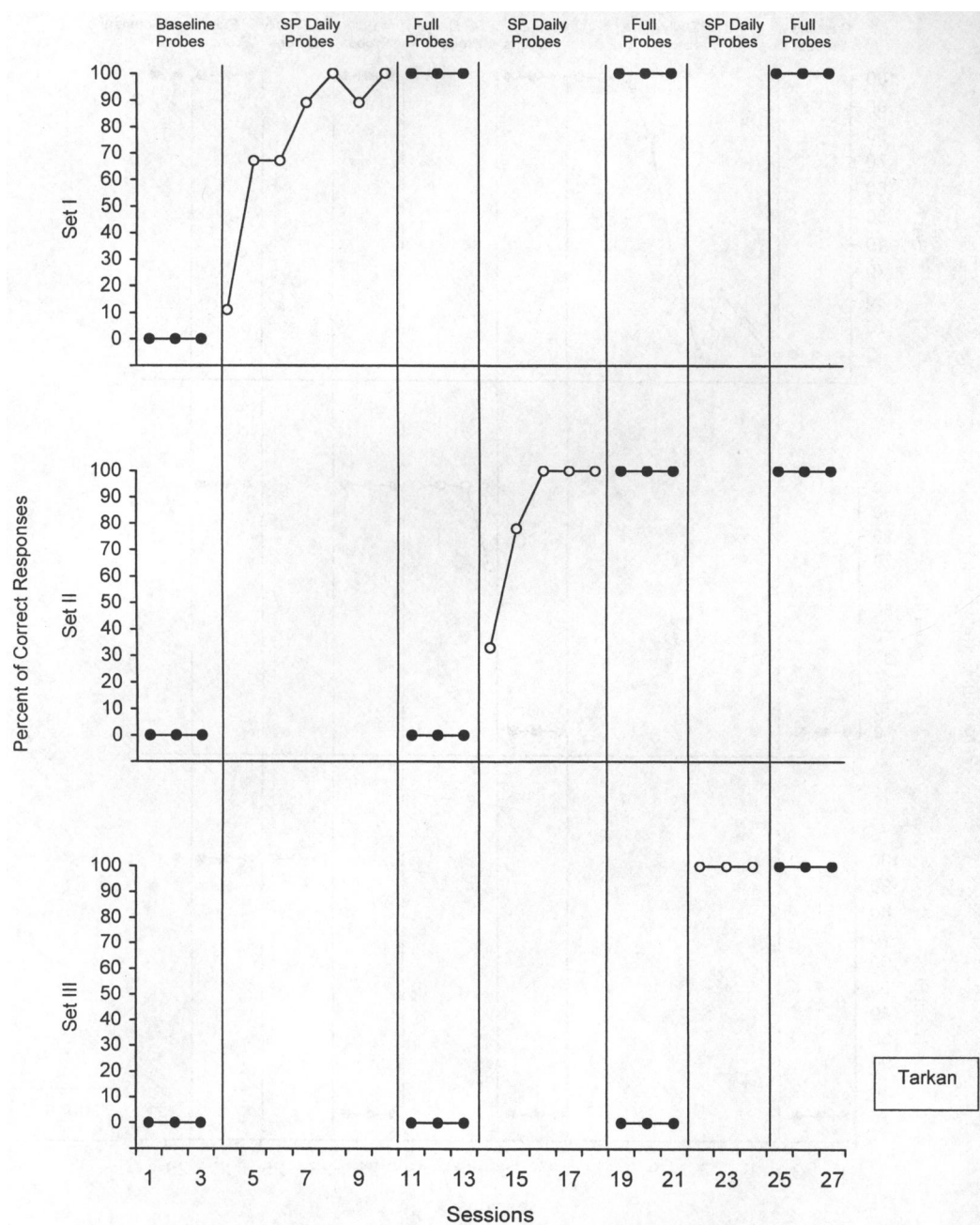


Figure 4. Percent of correct responses during full, daily and maintenance probe sessions for Tarkan.

teaching to show the provinces, rivers and border countries of Turkey on a map and to expressively identify the names of the symbols, which are frequently used in math to five students with developmental disabilities.

Generalization and maintenance effects of SP were examined as well. In addition, acquisition of instructive feedback stimuli and observational learning stimuli were investigated in the study. Based on the data col-

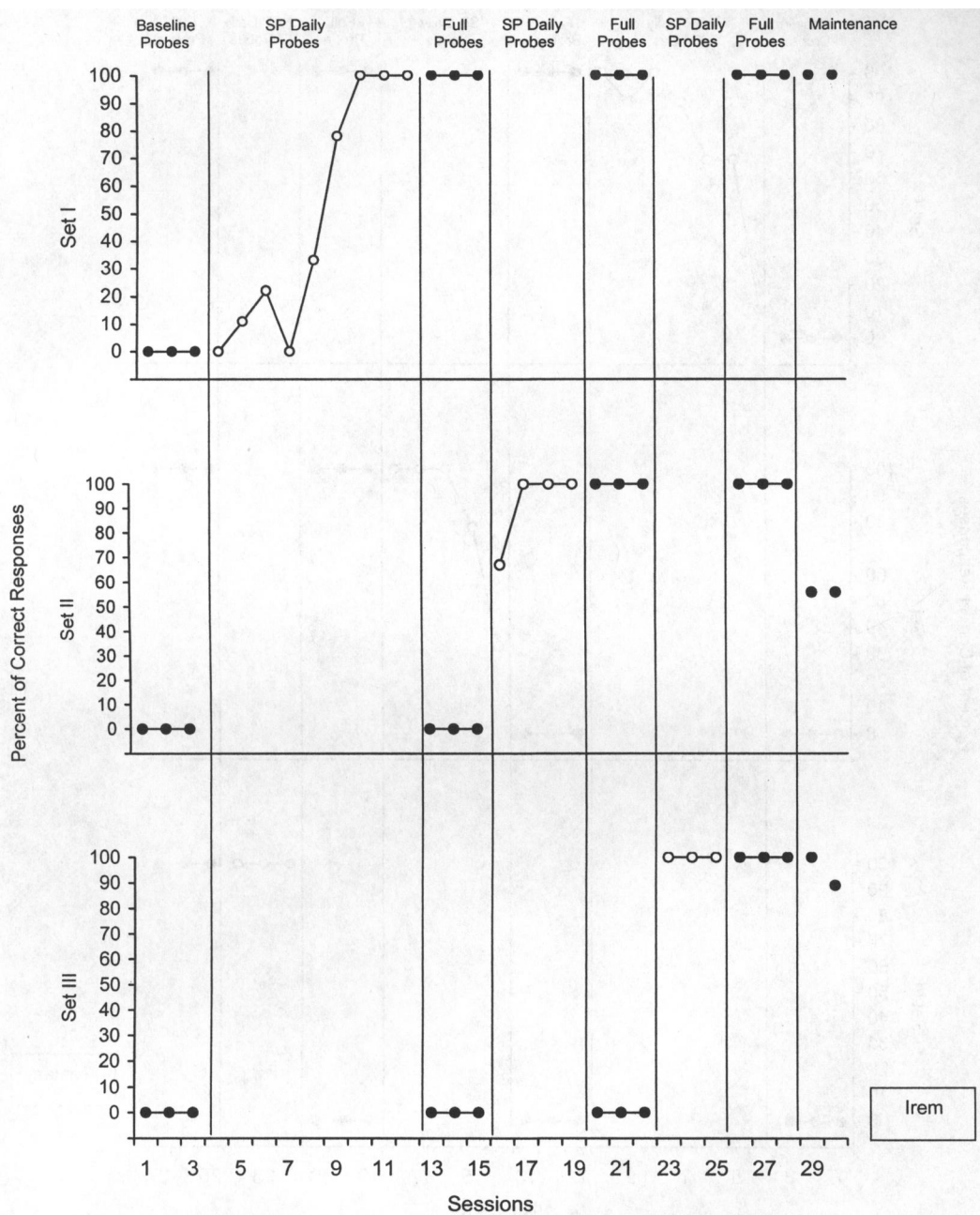


Figure 5. Percent of correct responses during full, daily and maintenance probe sessions for Irem.

lected, several findings and implications are worth to discuss.

First, the data indicated that SP delivered in small group was effective on teaching to show the provinces, rivers, and border countries of Turkey on a map and to expressively identify

the name of the symbols which are frequently used in math to five students with developmental disabilities. Findings of the study are consistent with the findings of the previous studies. As mentioned before most published studies with SP were designed to teach dis-

TABLE 3

Instructional Data for Each Student and Training Set Through Criterion

<i>Student/Set</i>		<i>No. training sessions</i>	<i>No. training trials</i>	<i>No. training errors</i>	<i>% training errors</i>	<i>Training time</i>	<i>Daily probe time</i>	<i>No. probe errors</i>	<i>% probe errors</i>
Gökhan	1	12	108	3	2.7	24 min 16 s	10 min	25	23
	2	3	27	0	0	8 min 4 s	2 min 39 s	0	0
	3	6	54	1	1.85	12 min 48 s	5 min	10	18.5
Total		21	189	4	1.5	45 min 8 s	17 min 39 s	35	13.8
Hale	1	11	99	2	2.02	18 min 13 s	11 min 55 sn	57	57.5
	2	3	27	1	3.70	6 min 5 sn	3 min	6	22.2
	3	—	—	—	—	—	—	—	—
Total		14	126	3	2.86	24 min 18 s	14 min 55 s	63	39.9
Sibel	1	5	45	1	2.2	8 min 32 s	3 min 55 s	4	8.8
	2	4	36	0	0	6 min 21 s	3 min	1	2.7
	3	3	27	0	0	7 min 30 s	2 min 30 s	0	0
Total		12	108	1	.73	22 min 23 s	9 min 25 s	5	3.8
Tarkan	1	7	63	4	6.34	10 min 30 s	5 min 15 s	16	25.3
	2	5	45	1	2.2	9 min 27 s	6 min 10 s	9	20
	3	3	27	0	0	5 min 45 s	2 min 24 s	0	0
Total		15	135	5	2.85	24 min 42 s	13 min 49 s	25	15.1
Irem	1	9	81	2	2.46	18 min 39 s	8 min 24 s	41	50
	2	4	36	0	0	9 min 16 s	4 min	3	8.3
	3	3	27	0	0	7 min 7 s	2 min 54 s	0	0
Total		16	144	2	.83	35 min 2 s	15 min 18 s	44	19.4
Grand Total		78	702	15		2 h 30 m 23 s	1 h 11 min 6 s	172	6.57

crete behaviors such as science vocabulary words (Johnson et al., 1996), object naming (MacFarland-Smith et al., 1993; Tekin-Iftar et al., 2003), word identification (Griffen et al., 1998; Schuster et al., 1992), community signs (Singleton et al., 1995; Tekin-Iftar, 2003; Wolery et al., 1993); and animal identification (Tekin & Kircaali-Iftar, 2002), 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). Very few of them were conducted in group teaching format (Fickel et al; Palmer et al., 1999; Parker & Schuster, 2002). The findings of the present study are consistent with the findings of these studies. Therefore, it can be claimed that the present study extends current literature about the effectiveness of SP when delivered in small group.

Second, data indicated that students were able to maintain the acquired behaviors over time (i.e., 2 and 6 weeks after training). These

findings are also consistent with the findings of the previous studies. However, maintenance data were collected for only three students. Student attrition (i.e. Hale) and starting of the summer holiday (i.e., Tarkan) were the main reasons for this limited findings. Third, it was observed that students generalized the acquired behaviors across persons and materials to a certain extent. The generalization range for students was between 56% and 100% for the students. Therefore, it can be argued that generalization effects of SP were positive in general. These findings are also consistent with the previous studies.

Fourth, data showed that students in the group gained some of the instructive feedback stimuli presented to them on the consequent events during instructional trials. As mentioned earlier an efficient instructional procedure allows students learn extra stimuli during training. In other words an efficient instructional procedure increases the number of behaviors learned during instructional trials. From this perspective, efficacy of SP can be

TABLE 4
Accuracy of Responding to Instructive Feedback During Full Probe Conditions

<i>Tutees</i>	<i>Sets</i>	<i>Screening</i>	<i>Probe I</i>	<i>Probe II</i>	<i>Probe III</i>	<i>Probe IV</i>
Giray	1	0%	0%	0%	33%	33%
	2	0%	0%	0%	33%	0%
	3	0%	0%	0%	0%	0%
Total	Across Sets	0%	0%	0%	33%	33%
Hale	1	0%	0%	0%	0%	—
	2	0%	0%	0%	0%	—
	3	0%	0%	0%	0%	—
Total	Across Sets	0%	0%	0%	0%	—
Sibel	1	0%	0%	33%	33%	33%
	2	0%	0%	0%	0%	0%
	3	0%	0%	0%	0%	33%
Total	Across Sets	0%	0%	33%	33%	33%
Tarkan	1	0%	0%	67%	100%	67%
	2	0%	0%	0%	67%	33%
	3	0%	0%	0%	0%	100%
Total	Across Sets	0%	0%	67%	84%	67%
Irem	1	0%	0%	100%	67%	100%
	2	0%	0%	0%	100%	100%
	3	0%	0%	0%	0%	100%
Total	Across Sets	0%	0%	100%	84%	100%

TABLE 5
Accuracy of Responding to Observational Learning During Full Probe Conditions

<i>Tutees</i>	<i>Sets</i>	<i>Screening</i>	<i>Probe I</i>	<i>Probe II</i>	<i>Probe III</i>	<i>Probe IV</i>
Giray	1	0%	0%	44%	56%	-%
	2	0%	11%	44%	100%	-%
	3	0%	11%	67%	100%	-%
Total	Across Sets	0%	11%	32%	85%	-%
Hale	1	0%	0%	0%	0%	0%
	2	0%	0%	0%	33%	44%
	3	0%	0%	0%	0%	11%
Total	Across Sets	0%	0%	0%	33%	28%
Sibel	1	0%	33%	100%	100%	100%
	2	0%	0%	0%	89%	100%
	3	0%	33%	33%	33%	100%
Total	Across Sets	0%	33%	67%	74%	100%
Tarkan	1	0%	0%	11%	0%	33%
	2	0%	0%	0%	0%	33%
	3	0%	0%	0%	0%	22%
Total	Across Sets	0%	0%	11%	0%	29%
Irem	1	0%	0%	100%	78%	100%
	2	0%	0%	0%	0%	100%
	3	0%	0%	0%	0%	67%
Total	Across Sets	0%	0%	100%	78%	89%

seen clearly. To date, there are only seven studies examining the acquisition of instructive feedback during SP delivered by either adults or peers (Griffen et al., 1998; Parrott et al., 2000; Schuster & Griffen, 1993; Singleton et al., 1995; Tekin-Iftar, 2003; Tekin-Iftar et al., 2003; Wolery et al., 1993). The findings of the present study are consistent with these studies. Majority of the studies investigating the effects of SP were conducted with preschool and elementary school students, and one of them was conducted with middle school students (Tekin-Iftar et al.). In the present study students acquired the instructive feedback with 33% to 100% accuracy. This study contributes and enhances the current literature on delivering instructive feedback during SP trials to middle school age students with developmental disabilities.

Fifth, data collected for the acquisition of observational learning indicated that students acquired some of the target behaviors of their pairs to a certain extend by observational learning. The highest correct responding during baseline was 33% whereas, when experimental sessions were over, the acquisition of the observational learning stimuli across training sets was between 33% and 100%. These findings are consistent with the findings of the previous studies (Farmer et al., 1991; Fickel et al., 1998; McCurdy et al., 1990; Parker & Schuster, 2002).

Besides these findings several points observed during study are important to discuss. First, both observations of the records of training and procedural reliability data showed that although it was her first experience with SP in the group, the teacher implemented the SP in the group with high accuracy. This finding encourages us for advising professionals to use SP either in group or one to one teaching arrangement. Second, error rate during probe sessions was high like in previous studies. The error rate during daily probe sessions was consistently higher than the error rate during training sessions in the previous studies as well. On the other hand conducting daily probe sessions for five students was cumbersome for both students and the teacher. Therefore, several strategies can be advised to decrease the error rate during probe sessions and to deal with the effects of being continuously measured. Conducting intermittent

probe sessions and delivering error correction during probe sessions can be taken into consideration as strategies for decreasing the error rate. Conducting intermittent probe sessions can also be helpful for dealing with the effects of being continuously measured. Future research should examine the effects of conducting different probe schedules and delivering error correction during probe sessions to deal with the above problems.

Although findings of the study were very encouraging the results should be interpreted cautiously for the following reasons. First, this study was limited with five students and teaching discrete skills. Use of SP with a larger group of students from various disability areas is warranted. Second, experimental control with Sibel could not be demonstrated in the study. Sibel was living in the orphanage and her sisters provided exercises to her about the target behaviors of the second training set of the study upon her request. Therefore, source of the progress of Sibel during second training set can not be solely explained by the effects of SP. The effects may be due to SP alone, or practice at home or both. Third, although different stimuli and different tasks were used in the study during training some of the students had the common stimuli and tasks (i.e., Hale and Sibel-showing provinces of Turkey on the map). Each student may have different stimuli and different tasks in the future studies. Fourth, the diagnoses of the students were mild and moderate intellectual disabilities. Also, the ages of the students were close to each other. Therefore, the results are limited with these features. While forming the groups, more heterogeneous groups, students who are diagnosed with different labels and vary in ages can be included in future research studies.

In addition to the above mentioned future research implications, the following research suggestions can be made when results of the study are taken into consideration. Future research should be conducted to examine similar effects when teaching chained skills with SP delivered in the small group. Massed trial presentation format was used in the study. The effects of other trial presentation formats such as, distributed and spaced, can be investigated in the future studies. Individual responding was utilized in the study. Future re-

searchers may design a study to investigate the effects of choral responding and/or compare both regarding the effectiveness and efficiency when delivering instruction with SP. Individual criterion was used in the study. However, group criterion is an alternative approach. The effects of using group criterion can be examined in the future studies. Also, comparison studies can be designed to investigate the differences between them, if any. Independent group contingency, each student received reinforcement based on his/her own behaviors, was used in the study. Interdependent and dependent contingencies can be taken as alternative parameters to investigate in the future research. Literature shows that peer tutor can deliver training with SP reliably in one to one teaching arrangement (Tekin-Iftar, 2003). Conducting training with SP in small group by the peers can be examined in the future research. Furthermore, future research might be designed to compare the effects of peer-delivered and teacher-delivered SP in terms of effectiveness, efficiency, and social validity variables in small groups.

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