A COMPARISON OF ONE-TO-ONE AND GROUP TEACHING

INSTRUCTIONAL METHODS ACROSS CLASSROOMS SERVING STUDENTS

WITH AUTISM AND OTHER DEVELOPMENTAL DISABILITIES

by

DALE WALKER

B.A., SCRIPPS COLLEGE, CLAREMONT, CA   1982

M.A., UNIVERSITY OF KANSAS, LAWRENCE, KS   1985

Submitted to the department of Human Development and Family Life
and the faculty of the graduate school of the University of Kansas
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy.

Diss
1988
W151
c. 2

Redacted Signature

Redacted Signature

Redacted Signature

Redacted Signature

Redacted Signature

Redacted Signature

Redacted Signature

Dissertation Defended:

Table of Contents

List of Tables

List of Figures

Abstract

Research on the effectiveness of small group instructional
formats with children who have autism and developmental disabilities
has received mixed results in the research literature (e.g., Reid
& Favell, 1984). The purpose of this study was to address the
inconsistencies in this literature by comparing small group
instruction with one-to-one instruction for a variety of teachers,
students, and settings. Forty-one students in six classrooms
ranging in age from 5-20 years old participated in the study, with
27 serving as experimental group participants and 14 as control group
participants. Specifically, the study investigated academic gains
using pre and postest measures of task acquisition, on-task and
self-stimulatory behavior levels, correct responding, and frequencies
of teacher behaviors during one-to-one and small group formats.

Results from the non-equivalent control group design with
repeated measures indicated that students taught in small groups
learned more material than those receiving only one-to-one instruction.
No significant differences were found for levels of on-task or
self-stimulatory behaviors between the two formats. Teacher
behavior did not differ significantly across the teaching formats.
These results indicate that small group formats are a viable,
effective teaching format across curriculum areas. The successful
application for this number of students and teachers in natural
learning environments provides important documentation for the
utility and practicality of small group instruction.

Introduction

Early applied research efforts with students who have autism or other developmental disabilities concentrated upon documenting the effectiveness of operant conditioning techniques (e.g., Ferster & DeMyer, 1962; Hewett, 1965; Lovaas, Schaeffer, & Simmons, 1965; Metz, 1965; Wolf, Risley, & Mees, 1964). Most of these early studies utilized an intensive one-to-one instructional format. The one-to-one format refers to the individual instruction of one student by a teacher. The use of one-to-one instruction was an effective instructional context in which to document the efficacy of operant techniques. In fact, the one-to-one format was so effective that many have considered it to be the optimal training paradigm for instructing students with autism (e.g., Lovaas, Koegel, Simmons, & Long, 1973; Rotholz, 1987; Russo & Koegel, 1977; Rutter, 1970). One of the reasons for the preferred use of one-to-one instruction is that it provides students with individualized teacher attention, which is believed to facilitate greater control over student performance and behavior (e.g., Koegel & Covert, 1972; Koegel & Schreibman, 1982).

In spite of its documented effectiveness, several problems arise out of the exclusive use of one-to-one instruction. For example, most public educational settings have neither the staff-to-student ratios nor the resources required to use one-to-one instruction as the primary teaching format. Another concern with

the exclusive use of one-to-one instruction with disabled populations is that skills acquired during one-to-one teaching may not always generalize to group instructional situations, or to persons other than the original trainer (Koegel & Rincover, 1974). In fact, exclusive reliance upon one-to-one, teacher-student instructional arrangements may, in the long run, exacerbate the problems persons with autism have in generalizing skills to different persons, settings, and stimuli (Brown, Nietupski, & Hamre-Nietupski, 1976; Rincover & Koegel, 1977). Further, one-to-one instruction does not provide students with the skills for functioning in group situations, nor does it promote interaction between students (Bates, Renzaglia, & Wehman, 1981; Brown et al., 1976; Favell, Favell, & McGimsey, 1978). While the one-to-one paradigm has been documented to be effective in teaching various skills to students, its cost-efficiency and practicality as the exclusive educational format used with severe populations are limited (Brown et al., 1976; Lovaas, Schreibman, & Koegel, 1974).

Based upon the need for alternative instructional strategies to the one-to-one teaching paradigm for students with severe disabilities, researchers have investigated the use of small group instruction, the instruction of 2 to 8 students seated in close proximity to each other. Although only a few empirical studies have investigated alternatives to one-to-one instruction with students who have autism or other developmental disabilities

(e.g., Alberto, Jobes, Sizemore, & Doran, 1980; Favell et al., 1978; Koegel & Rincover, 1974; Martin, England, Kaprowy, Kilgour, & Pilek, 1968; Rotholz, McGrale, Helm, & Hall, 1985; Peck, 1985; Whorton, Walker, Locke, Delquadri, & Hall, 1987), these reports have suggested that group instruction and peer tutoring may be effective alternatives to one-on-one instruction.

Definitions of Instructional Arrangements

One-to-One instruction. One-to-one instruction refers to the instruction of one student by a teacher. This method of instruction has been the model most commonly used for teaching students with autism and other developmental disabilities.

Individual instruction in a group. This format, also referred to as the sequential model (Reid & Favell, 1984) is a group teaching procedure in which a teacher instructs a student using the one-to-one format while concurrently supervising other students in a group seating arrangement (e.g., 2 to 8 students). The teacher may intermittently reinforce students for working independently, and deliver behavior management contingencies as necessary. Students may also be required to observe other students receiving instruction, and may also interact with other students. While using this model, the teacher keeps all students actively engaged while rotating direct instructional sequences among students.

Collective instruction in a group. This format requires that the teacher maintain active engagement with a group of students (e.g., 2 to 8). In this model, all students are

instructed simultaneously. Following the delivery of the discriminative stimulus by the teacher all students are expected to make a response.

Combined individual and collective instruction. This format, also referred to as the combination concurrent/sequential approach (Reid & Favell, 1984) combines both individual and collective group instruction. In this model, the teacher alternates trials to individual students and intersperses trials in which all students are expected to respond collectively. Instructions may be delivered simultaneously, while reinforcement may be delivered on an individual basis. This procedure enables the individualization of tasks (trials) allowing heterogeneous groups of students to be instructed simultaneously. This model also allows for modeling of skills by peers who have previously mastered the material.

Investigations Comparing Group Versus One-to-One Instruction

Studies comparing one-to-one instruction with group instruction have been conducted to determine whether students' task acquisition rates and behaviors were similar when instructed in one-to-one and group formats. Studies have also compared the teacher time required when using one-to-one versus group training. To date, most of these studies have been conducted with persons who have retardation (e.g., Alberto et al., 1980; Favell, et al., 1978; Oliver & Scott, 1981; Storm & Willis, 1978). Only a few studies have compared individual versus group training formats with students

who have autism (e.g., Martin et al. 1968; Rotholz, McGrale, Helm, & Hall, 1985; Whorton, Walker, Locke, Delquadri, & Hall, 1986).

Several studies comparing instruction delivered either in one-to-one or group formats with clients residing in institutions serving the mentally retarded have found one-to-one and group training to be equally effective for training a variety of tasks including, social skills (Morris & Dolker, 1974), imitation tasks (Storm & Willis, 1978), language concepts (Alberto et al., 1980; Oliver & Scott, 1981), and sorting skills (Frankosky & Sulzer-Azaroff, 1978). For example, Favell et al. (1978) found no differences between students' acquisition rates on word recognition tasks during one-to-one versus group training formats with sixteen students who had severe retardation. Students required the same number of trials and sessions to reach criterion on the word task in both training formats with two different teachers conducting one-to-one sessions or groups with four participants. Less teacher time was required to conduct the group training sessions, however, compared to the one-to-one sessions.

Oliver and Scott (1981) found that when teaching receptive language skills to individuals with severe retardation, fewer trials to criterion were required when subjects were instructed in group versus individual sessions. Although there was no significant difference between language acquisition in either format, the generalization of skills to novel stimuli was approximately 50% greater when they were trained using a group format.

Fink and Sandall (1980) reported similar results with preschoolers who were developmentally disabled. Children in this study were trained on a verbal labeling task using one-to-one and small group formats. Students performed similarly in both one-to-one and small group formats. Conversely, the average teacher time required to conduct the one-to-one sessions was approximately three times that required to teach the same material using a group format. Rotholz, Baker, Hill, and Hall (1985) demonstrated that the group teaching model was as effective as one-to-one in terms of academic performance on readiness tasks, and more efficient in terms of teacher time than either one-to-one or independent work formats used in public classrooms serving children with autism.

Several studies that have compared one-to-one versus group instruction have reported that group training was more effective than one-to-one formats for training social skills (e.g., Peck, 1985), and academic tasks (e.g., Biberdorf & Pear, 1977; Frankel & Graham, 1976; Oliver, 1983; Smith & Meyers, 1979; Rotholz, McGrale, et al., 1985; Whorton et al.,1987). For example, in a program designed to train social skills to elementary aged students with autism, Peck (1985) compared acquisition of social skills during one-to-one and small group training sessions. Student acquisition of social skills during group training was greater than acquisition during one-to-one sessions. Increased performance during the group arrangement may have been the result of more opportunities during the group for the occurrence of

interactions between students, thus facilitating social behavior.

Frankel and Graham (1976) measured the performance of preschool children with retardation and autism on imitation and direction following skills. The children in this study performed better in the group condition compared to the one-to-one condition. The authors reported however, that students with lower mental ages benefited more from individual training than group instruction. Biberdorf and Pear (1977) compared small group and one-to-one instruction for training picture naming tasks to children with retardation. The small group instruction was conducted using individual instruction within a group format. The group was more effective than one-to-one in terms of correct responses, fewer number of trials to criterion, and the occurrence of incidental learning.

Besides being a more efficient use of teacher time, group instruction has also been found to provide students with higher rates of actual instruction time than either one-to-one or independent work formats (e.g., Rotholz, Baker et al., 1985; Rotholz, McGrale et al., 1985; Snell, 1983; Storm & Willis, 1978; Westling, Ferrell, & Swenson, 1982; Whorton, Walker, Locke, et al., 1987). Whorton, Walker, Locke, et al. (1987) compared the effects of one-to-one and small group instruction, as well as variations in the instructional agents (e.g., peer, teacher, classroom aide) to teach word recognition skills to three students with autism. Their results indicated that when conducted

by the teacher, small group instruction was more effective than one-to-one in terms of student acquisition; however, when the classroom aide conducted the group student behavior and acquisition rates lowered. The small group format also produced the presentation of more student trials than during one-to-one sessions, more reinforcing statements delivered by the teacher, increased opportunities for student interactions, and incidental learning from peers by two of the three subjects. Similarly, the results of a comparison study conducted by Rotholz and McGrale et al. (1985) with four youths with autism indicated that individualized instruction in a group and collective instruction in a small group produced greater amounts of completed and correct trials, and attending behaviors than when students received one-to-one training during baseline conditions. Further, the group instruction condition resulted in a more efficient use of teacher time in terms of providing more opportunities for academic responding by students and allowing for a closer physical proximity that may have promoted more continuous teacher-student interactions.

Studies comparing one-to-one instruction with group instruction have been conducted to determine whether task acquisition rates were similar or different, if students behaved differently in either training format, and whether trial delivery was different. Several studies found one-to-one and group training to be comparable in terms of students' task acquisition rates and behavior (e.g., Alberto, et al., 1980; Favell, et al., 1978; Morris

& Dolker, 1974). In some instances, group instruction has been found to be more effective than one-to-one instruction in terms of student acquisition rates, more efficient in terms of instruction time, and may provide students with more opportunities to respond (e.g., Biberdorf & Pear, 1979; Frankel & Graham, 1976; Rotholz, & McGrale, et al., 1985; Whorton, Walker, Locke, et al., 1986). In addition, group instruction has been found to provide students with more opportunities to interact with their peer than one-to-one formats (e.g., Peck, 1985).

Conflicting Reports Regarding the Use of Group Instruction

Although the studies discussed provided empirical evidence supporting group instruction as an effective alternative to one-to-one training for students with developmental disabilities, conflicting reports regarding one-to-one versus group instruction also exist. For instance, Fink and Sandall (1978) found posttest performance to be slightly higher when students were taught a reading task using a one-to-one format rather than when an integrated small group training arrangement was employed. Math performance however, decreased slightly when instructed in individual sessions rather than in small group sessions. In a later study conducted with developmentally disabled preschool students Fink and Sandall (1980) found group training to be superior to one-to-one training. Similar results were reported by Westling, et al. (1982) with children who had profound retardation. The children in this study were all nonverbal and had limited

receptive skills. These researchers measured children's acquisition of behavioral objectives in one-to-one and small group formats, the number of objectives completed, and the teacher time required in each format. The six subjects all had superior acquisition when instructed in one-to-one sessions compared to the group training format in which students were instructed individually and performed maintenance tasks while waiting for their turns. Observations of teacher behavior indicated more "looking away" from students when conducting the group sessions. Oliver (1983) found acquisition of individualized language tasks was slightly faster when a one-to-one instructional format was implemented with adults who were severely retarded. Performance in the one-to-one and group sessions, however, was comparable when the same task items were taught to all group participants.

The conflicting results obtained in these comparison studies suggest a need for additional research with more stringent empirical control over methodology, procedures, subject populations studied, and outcome measures employed. These investigations pose further research questions and issues to be studied before conclusions may be drawn regarding the effectiveness of one-to-one versus group instructional formats.

Studies and Programs Utilizing Group Instructional Formats

Several reports exist in which group instruction has been investigated but not compared with other instructional methods.

For example, students have been taught daily living or social skills (e.g., Kazdin & Erickson, 1975; Spellman, DeBriere, Jarboe, Campbell, & Harris, 1978; Strain, 1975; Morris & Dolker, 1974), have learned prevocational tasks (e.g., Gola, Holmes, & Holmes, 1982; Egan, Fredericks & Hendrickson, 1985), and have been taught academic tasks (e.g., McCarty, Griffin, Apolloni, & Shores, 1977; Faw, Reid, Scheipis, Fitzgerald, & Welty, 1981) in group instructional formats. Similarly, Strain (1975) reported a program designed to increase the social play of preschoolers with severe retardation. During a story reading period that preceded free-play, the teacher would individually prompt the children in the reading group to assume the role of a character in the story. As a result of this group activity, social play during free-time increased.

Vocational tasks have been taught to students with autism and retardation using a group instructional format (e.g., Brown & Holvoet, 1982; Gola et al., 1982; Egan et al., 1985; Hendrickson, et al., 1985; Schepis, Reid, & Fitzgerald, 1987; Whorton, 1983). For example, Brown and Holvoet (1982) measured the incidental learning (e.g., learning a task not directly instructed to the student) of two students with severe retardation who were individually instructed on prevocational sorting tasks in a small group. The results demonstrated that one student learned the tasks instructed to his peer while the other student displayed no incidental learning. Along with the experimenter, the students in

this study delivered reinforcement to their peer for correct responding. It was hypothesized that the interaction resulting from delivering reinforcement may have served to cue the students to attend when their peers received instruction. Egan et al. (1985) measured the vocational training of five adolescents with severe handicaps. The target behavior selected for each student were behaviors such as reducing inappropriate responses to co-workers and being able to work in a group situation with minimal distractions. Although it was not clear what instructional formats were used to teach the target behaviors, it is assumed that students were instructed using an individualized instruction format within the group since the students were reported to be in close proximity to their peers, and that the work performance approximated actual industrial demands. The authors reported that students were successfully taught work skills that were necessary for employment in vocational environments. Whorton (1983) compared several levels of group instruction on vocational tasks (e.g., clothing recycling, pen assembly, and weighing), and generalization of skills in a work activities setting with six adolescents with autism. Baseline probes were conducted to determine student's pre-training skills, and the intervention consisted of 1:6 collective instruction in a group. Generalization of skills was measured in simulated conditions with 12 participants. The group training procedure was successful in teaching vocational skills to five of the six subjects and skills

generalized to the simulated work environment.

Group instructional formats have also been used to teach arithmetic skills (McCarty, et al., 1977), vocabulary (Cavallaro & Poulson, 1985; Orelove, 1982), and sign language (Faw et al., 1981) to students with retardation. For example, in a study with 12 adults who had severe handicaps, Orelove (1982) measured acquisition and incidental learning of words instructed using an individual instruction within a small group format. The findings indicated that almost all of the adults were successfully instructed within a small group format, and that most of the participants displayed incidental learning. Similarly, Cavallaro and Poulson (1985) measured the language acquisition and incidental learning of four preschool aged children with retardation. Language acquisition was measured during lunch and free-play sessions following the delivery of reinforcement for language use. All four children learned their vocabulary words in addition to the incidental learning of words taught to their peers.

Studies have also assessed the use of group training on performance of interdependent tasks (e.g., tasks requiring the participation of several persons for completion) (e.g., Liberman, 1968; Mithaug & Wolfe, 1976). In an early study Liberman (1968) described programs initiated in seven different mental health facilities in California that were developed because decreases in funding sources prohibited individual programming. These pioneer

programs included structured group dance therapy and athletic
programs, as well as work projects that required cooperation among
members to complete tasks (e.g., maintenance of client's living
areas). Mithaug and Wolfe (1976) evaluated the effects of
arranging task events for interdependence with persons who had
mental retardation. Group members were required to obtain puzzle
pieces from their partners using verbal requests in order to
complete puzzles. The task interdependence made task completion
contingent upon verbalizations and cooperation with a partner.
Verbalizations directed toward partners increased as a result of
the group format.

Several studies have investigated the effects of teaching
social skills, academic tasks, and vocational tasks using group
instructional formats. These studies concluded that group
instruction was an effective format for teaching a variety of
skills to persons with autism and other developmental disabilities,
who are being served in institutional settings, clinics, and
public schools. Further, studies were analyzed that reported the
effectiveness of using interdependent tasks in group instruction
formats. The interdependent tasks required that group
participants work cooperatively to complete the specified tasks.

Considerations When Instructing Students in Groups

Perhaps one of the major concerns with using group instruction
compared to one-to-one teaching strategies is the potential loss of
control over student academic responding, on-task, and

appropriate behavior(s) (e.g., Charlop, Schreibman, Mason, & Vesey, 1983; Dunlap & Johnson, 1985; Harris & Handleman, 1980; Koegel & Covert, 1972; Koegel & Rincover, 1974; Stabler et al., 1974). Although this concern has been repeatedly discussed as one of the major drawbacks to group teaching, very few studies have actually compared student behavior in one-to-one and group formats (e.g., Charlop et al., 1983; Frankosky & Sulzer-Azaroff, 1978; Koegel & Rincover, 1974; Rotholz, McGrale, et al., 1985; Sainato, Strain, & Lyon, 1987; Whorton, Walker, Locke et al., 1987). For example, Frankosky and Sulzer-Azaroff (1978) found that appropriate social behaviors (i.e., positive discussions with peers, helping peers during activities) of adults with retardation occurred more frequently under group consequences than under individual training. Conversely, inappropriate social behaviors (i.e., negative statements to peers, physical aggression) were exhibited at a lower frequency in group compared to individual training. These results generalized to a subsequent snack period.

In one of the first studies that systematically investigated group teaching with students who had autism, Koegel and Rincover (1974) found that although students learned attending skills, speech, and imitation skills within a one-to-one format, students' performances of previously learned skills decreased when they were instructed in groups of 1:2 and 1:8 teacher-to-student ratios. Following the implementation of a comprehensive program to facilitate the transfer of skill performance from one-to-one

sessions to a classroom arrangement, students performed as well in groups as they had during one-to-one training. In a naturalistic observation study, Charlop et al. (1983) observed the behavior of 19 students with autism to assess the instructional environments in which out-of-seat, self-stimulatory behavior, echolalia, tantrums, verbal behavior, work, play, and social behaviors occurred. Group instructional arrangements resulted in lower work rates and fewer appropriate verbal behaviors than did independent or one-to-one arrangements. The authors report however, that no specific instructional protocol was followed during group training, and praise and feedback were not always delivered contingently. The description of "group instruction" in this study differed from descriptions of groups in other studies and therefore, the inclusion and analysis of these results with other comparative studies is questionable.

In contrast to the findings of Charlop et al. (1983), Fredericks, Anderson, and Baldwin (1979) examined programs for the severely disabled including students with autism and mental retardation, and found that a combination of one-to-one and group instruction provided the least amount of unoccupied time in which students could engage in off-task behaviors. Similarly, in a study with youngsters who had autism, Whorton, Walker, et al. (1987) found student rates of on-task and self-stimulatory behavior to be comparable in one-to-one and small group conditions. However, the authors noted variance within individual

student's rates of behavior during group instruction. In another comparison study with students who had autism, Rotholz, McGrale, et al. (1985) found group training conditions to be superior to a one-to-one baseline condition in terms of increased academic engagement and decreased levels of self-stimulatory behavior. Academic engagement averaged 50% during baseline conditions, 68% during individualized instruction in a group, and 78% during collective group instruction.

The heterogeneous skill levels of students has also been presented as a potential difficulty when training students in groups (e.g., Everard, 1976; Koegel, Egel, & Dunlap, 1980; Oliver, 1983; Rincover & Koegel, 1977; Stabler, et al., 1974; Storm & Willis, 1978). Everard (1976) asserts that because "Autistic children rarely possess abilities at the same overall level...it is rarely possible to teach successfully a group of children together as a class" (p. 57-58). Researchers have suggested that students with varying skill levels, may not benefit from group instruction. They contend that when the content is beyond the students' skill levels they may become inattentive and engage in off task and/or self-stimulatory behavior(s) (e.g., Everard, 1976).

A number of studies investigating the feasibility of educating students with autism in group formats have stressed the need for gradual fading in of students from one-to-one to small group sessions to maintain control over academic performance and

inappropriate behavior (Fowler, 1982; Halpern, 1970; Harris & Handleman, 1980; Koegel & Rincover, 1974; Martin et al., 1968; Rincover & Koegel, 1977; Stabler et al., 1974; Storm & Willis, 1978). Koegel and Rincover (1974) successfully integrated seven students with autism into a classroom group only after students received intensive one-to-one training, and were gradually faded into a group. A previous program (Koegel & Rincover, 1974) consisting of combined one-to-one treatment and repeated exposure to a classroom for a period of six months produced very little change in student behavior. The transfer program required that the teacher instruct two students with two classroom aides present to provide individual prompting and reinforcement to the students. When criterion was met on basic skills (i.e., receptive and expressive language and low rates of off-task and self-stimulatory behaviors), two additional students were added to make a group of four students, one teacher, and two aides. The two new students had previously received the same pretraining program as their peers. The program was repeated until the teachers' aides were faded out, leaving a group of seven students and one teacher.

In response to the problem of heterogeneous skill levels, Rincover and Koegel (1977) developed a procedure to increase individual student responding in a group. The unsupervised responding and amount of academic progress was measured for four students with autism who had previously participated in the programming transfer study (Koegel & Rincover, 1974). In the

absence of teacher supervision, students would cease working on tasks. Following treatment consisting of teacher prompts and a gradual decrease of teacher supervision, longer chains of student behavior were built in response to one instruction. Gola, et al. (1982) also gradually faded students two at a time into small group formats in which prevocational skills were developed. Students' prevocational skills and on task behavior increased when a group contingency for correct responding and on-task behavior was implemented.

In a study comparing small group and individual programming with persons who had profound retardation, Storm and Willis (1978) found a slight initial increase in imitation behavior with students who had participated in individual programming prior to the group format compared to the behavior of students who were placed directly in group training. Following a short duration of involvement in group instruction, the behavior of the students who had received only group training became comparable to the students who had received pretraining.

Several programs serving students with developmental disabilities have described the use of individual programming prior to instruction in group formats (e.g., Fredericks, Buckley, Baldwin, Moore, & Stremel-Campbell, 1983; Harris & Handleman, 1980; Stabler, et al., 1974; Watson, 1985). These programs all utilized individual training to increase attending behaviors, establish basic skills, and decrease unwanted behaviors (i.e.,

self-injurious and aggressive behaviors) before transferring students to group training settings. For example, in a program outlined by Stabler et al. (1974), intensive short-term training was delivered until participant behavior stabilized. Students were then gradually faded into groups of 3 to 6 students, and then gradually more students were added to approximate regular classroom conditions. In descriptions of Project TEACCH in North Carolina, Watson (1985) outlined programming that began in highly structured individualized sessions in which student's self-stimulatory behavior, and over-selectivity were decreased and basic academic skills were developed before students were placed in group settings. They suggested that after students learn a skill in a one-to-one format it can be generalized to a group setting.

Unfortunately, the additional time required to provide individual programming for heterogeneous groups of students, and gradual shaping of teacher-student ratios may discourage educators from training students using group formats. Brown et al. (1980) proposed that tasks be individualized within group training sessions. They recommended utilizing different modes for presenting tasks (i.e., speech, signing, and motor responses), refining steps of programs (i.e., breaking tasks into smaller steps), requiring different responses from students based upon skill levels, and varying materials when training to ensure that all students benefit from group training.

Group training without requiring pre-programming has been successfully conducted with students who have severe retardation (Favell, et al., 1978), and autism (e.g., Rotholz & McGrale, et al., 1985; Whorton, Walker, et al., 1987). Whorton, Walker, Locke et al. (1987) reported the use of group training to teach sight word recognition to students with autism. Although task presentation was occasionally individualized for students, the teacher in this study accounted for individual skill levels by allowing students who had mastered the material to model correct responses for their peers. Although some students exhibited more off-task and self-stimulatory behaviors in group training than in one-to-one situations, overall student performance was not adversely affected.

Throughout this review, several issues were discussed that are addressed in the literature concerning the use of group formats as an alternative instructional strategies to one-to-one instruction. These issues include: limited school resources for teaching students in exclusively one-to-one formats; limitations of one-to-one instruction for the generalization of skills to other teachers, settings, and methods of instruction delivery; opportunities during group instruction for interactions with other students; opportunities for learning material delivered to other students in group format; conflicting results regarding the potential loss of control over student's behavior in group training compared to one-to-one instruction; the heterogeneous skill levels of students as a

barrier to using group instruction; and whether pre-training in individual sessions is required to successfully integrate students into group situations.

<u>Purpose</u> <u>of</u> <u>the</u> <u>Present</u> <u>Study</u>

The literature reviewed on the use of group instruction with persons who have developmental disabilities presents a relatively convincing case for the use of group training formats. Several issues remain, however, that warrant further investigation to substantiate whether group instruction is at least as effective as one-to-one instruction. Although studies investigating the efficacy and effects of group instruction have been conducted with a range of subjects with disabilities, not all studies have been methodologically sound, and a good deal of variability exists in the methodology employed, settings, behavior(s) targeted, and interpretation of results. Further, the inconsistent findings of studies comparing one-to-one and group instruction and the reported disadvantages of group instruction, suggest that further investigation is warranted.

The purpose of this study was to compare the effectiveness of one-to-one and small group instruction with a large group of students with autism and other developmental disabilities. The study addressed the concerns expressed in the literature regarding the viability of instructing students with disabilities in group formats, and the effects on students' on-task, acquisition, and classroom behavior. This study differed from those reported in

that they report results for small groups of students (e.g., 4 to 8), while this study investigated the effects of training 41 students with autism and developmental disabilities in one-to-one and group formats. Further, this study measured several behaviors while simultaneously comparing the effects of one-to-one instruction versus group instruction on task acquisition. Specifically, the research questions addressed in this study were as follows: (a) Was small group instruction an acceptable teaching format for a variety of teachers in several different settings? (b) Were students' performance levels on academic tasks similar in the one-to-one and small group formats? (c) Was small group instruction an appropriate format for teaching a variety of academic tasks to students of various ages with differential ability? (d) Did students exhibit similar levels of attending and behavioral skills in one-to-one and small group instructional formats? and (e) Were teachers' rate of task presentation, delivery of assistance, or reinforcement similar across the two instructional formats?

<div align="center">METHOD</div>

Subjects

Forty-one students ranging in age from 5 to 21 years old participated from 6 classrooms in the metropolitan Kansas City area to participate in the study. Twenty-seven students with a mean chronological age of 11.0 years (range=5 to 21 years) comprised the experimental group. The control group consisted of

14 students with a mean age of 11.4 (range= 5 to 19 years).
Table 1 presents descriptive information for the 41 students. To
form the experimental groupings teachers were asked to identify
5-8 students including both high and low functioning students.
Three to five students were included as experimentals and 2-4
students matched as closely as possible were selected for the
control group. Due to the necessity of matching the experimental
and control groups, random selection of groups was not possible.
Eighteen students had previously received a diagnosis of autism
and 23 were diagnosed as having mental retardation with a
functioning level of trainably mentally handicapped. All
participants were diagnosed by agencies not associated with the
study (e.g., child psychiatrists at public or private facilities,
school psychologists, etc.). Participants' diagnoses met either
federal and state guidelines and criteria for educational
placement (Missouri State Plan for Part B Funds, 1987-88; Kansas
State Plan for Special Education, 1986) or the DSM-III
classification guidelines.

Formal intelligence scores from the Stanford Binet or the
Weschler were obtained for 29 of the 41 students from their
school/medical records. The average IQ for the experimental group
was 46 with a range of 32-64. The average IQ for the control
group was 40 with a range of 30-52. Teachers also completed the
Autism Behavior Checklist from the Autism Screening Instrument for
Educational Planning - ASIEP (Krug, Arick, & Almond, 1978)

(Appendix A). Higher scores indicated a greater degree of autistic behaviors. The average score for the experimentals was 38 with a range of 0-92. The average score for the control group was 42 with a range of 10-107. These measures indicate comparable groups for experimental and control subjects in terms of intellectual functioning and behavioral performance.

Settings

This study was conducted in six special education classrooms, (i.e., three public school classrooms, a work activity center, and two classrooms located in a private day school serving students with autism and other developmental disabilities). The six classrooms were all self-contained classrooms serving students with special needs.

Classroom A was a self-contained classroom serving children with mental retardation (trainable level) located in the Kansas City, Kansas Public School District. Students in Classroom A were 5 to 10 years old with IQ scores ranging from 34-52. Five students served as experimentals and 3 students were in the control group. Their academic skills included, elementary word and number identification, beginning counting skills, following one and two-step instructions, and some independent seat-work skills (e.g., tracing letters and spelling their names). The eight participants in this class had well developed expressive skills, and exhibited some spontaneous language. The subjects all engaged in some social behavior with classmates and adults. All

Table 1

Age, Diagnosis, IQ, and ASIEP Behavior Checklist Data for Subjects

Experimental Group

Student#	Classroom	Age	Sex	Diagnosis	IQ/MA	ASIEP
1	A	7.11	M	Mentally Retarded	48	4
2		8.7	M	Mentally Retarded	52	0
3		7.4	M	Mentally Retarded	40	13
4		7.11	M	Mentally Retarded	34	4
5		10.0	F	Mentally Retarded	52	13
6	B	8.0	M	Mentally Retarded	40	61
7		5.6	F	Mentally Retarded	40	8
8		6.10	M	Mentally Retarded	--	18
9		5.8	M	Mentally Retarded	20 Mos	37
10	C	10.0	M	Autistic	60	34
11		11.11	M	Autistic	39	82
12		9.0	M	Autistic	50	53
13		11.1	M	Autistic	50	90
14		9.10	M	Autistic	53	55
15		12.3	M	Mentally Retarded/BD	50	25
16	D	21.10	M	Autistic	32	76
17		16.3	M	Autistic	--	61
18		17.2	M	Autistic	64	60
19		20.5	F	Mentally Retarded	32	9
20	E	10.0	M	Autistic	33	40
21		6.5	M	Autistic	50	31
22		9.4	M	Mentally Retarded	--	13
23		6.4	M	Autistic	--	4
24	F	18.8	M	Autistic	35	92
25		12.2	M	Mentally Retarded/BD	59	10
26		10.6	M	Autistic	54	--
27		16.2	M	Autistic	37	87

N = 27   M̄ CA = 11.0   M̄ IQ = 45.6   M̄ ASIEP = 38

Control Group

Student#	Classroom	Age	Sex	Diagnosis	IQ/MA	ASIEP
28	A	8.2	M	Mentally Retarded	3 yrs	11
29		5.8	F	Mentally Retarded	52	11
30		8.10	F	Mentally Retarded	40	10
31	B	7.10	F	Mentally Retarded	2.4 yrs	34
32		6.3	M	Mentally Retarded	1.6 yrs	66
33		6.6	M	Mentally Retarded	35	50
34		6.8	F	Mentally Retarded	2.0 yrs	12
35	D	15.6	M	Autistic	30	76
36		19.4	M	Mentally Retarded	47	10
37		18.0	M	Mentally Retarded	1.9 yrs	66
38	E	11.8	M	Mentally Retarded	32	--
39		11.9	M	Autistic	1.4 yrs	--
40	F	17.3	F	Autistic	42	55
41		17.2	M	Autistic	--	107

N = 14   M̄ CA = 11.4   M̄ IQ = 40   M̄ ASIEP = 42

eight students demonstrated moderate levels of on-task behavior. They engaged in some self-stimulatory behaviors and some off-task behaviors (e.g., crying, aggression, and destruction of materials).

Students in Classroom B were 5 to 8 years of age with IQ scores ranging from 35-40. These students were the lowest functioning group in the study with several having a mental age in the 1 1/2 to 2 year level. Four students served as experimentals and 4 as control subjects. The academic skills of these students were limited to performing pre-academic tasks (e.g., object discrimination, sorting and matching skills, and gross motor tasks). They could follow one-step directions with some prompting. Six out of the eight students exhibited limited expressive language and some receptive skills. They primarily used sentence fragments (e.g., "Want cookie"), and usually responded to questions with single-word answers. The students in classroom B exhibited spontaneous social behavior toward classmates and adults. Their behavior was characterized by frequent off-task behavior (e.g., fidgeting, non-compliance), and occasional tantrums (e.g., aggression, crying, and destruction of materials).

Classroom C was a self-contained classroom serving students with autism located in the Kansas City, Missouri Public School District. Students ranged in age from 9 to 12 years of age with IQ scores from 39-60. All six students served as part of the experimental group (the classroom teacher wanted all students to

receive treatment). The academic skills of these students included: elementary arithmetic skills, sight words, some reading, and age-appropriate fine and gross motor skills. The six students in this class had some expressive skills, and well developed receptive skills. However, their language included some deviant speech patterns (e.g., pronoun reversal, echolalia, and misplaced intonation). Most of the students engaged in occasional spontaneous speech with their peers and adults. They exhibited behavioral characteristics commonly associated with autism. These included: self-stimulatory behaviors (e.g., hand waving, and repetitive body movements), variable attention spans, occasional non-compliant behavior (e.g., avoiding situations, and yelling), and tantrum behaviors (e.g., crying and aggression).

Classroom D was a school-based work activities center located in the Kansas City, Kansas Public School District. In this program, students received vocational training in preparation for entry into community vocational settings. Students ranged in age from 15 to 21 years of age with IQ scores from 30-64. Four students served as experimentals and 3 as controls. All students served in this class could perform various sorting and matching tasks, and some counting tasks. They all had the prerequisite skills for performing the job contracts secured by the center (e.g., sorting and collating paper items by color and type, assembling folders and shipping containers). Four of the seven participants in this study had some expressive skills, and all had

well developed receptive skills. Their behavioral characteristics included some off-task behaviors, self-stimulation, and occasional tantrum behaviors (e.g., screaming, aggression), and one student experienced frequent seizures.

Classroom E was a self-contained classrooms serving youngsters with autism, retardation, and severe behavior disorders located in a private day school setting in Kansas City, Missouri. Four students with autism and 2 with retardation ranging in age from 6 to 11 years participated from Classroom E. Their IQs ranged from 32 to 50 with four students serving as experimentals and 2 as controls. These students received instruction in preacademic tasks (e.g., tracing numbers and letters, compliance training and beginning language tasks). Most of the students in this class had beginning verbal expressive and receptive skills. They exhibited deviant language behavior such as, echolalia, pronoun reversal, and nonsense speech. Their behavioral characteristics included some social behavior with peers and adults, self-stimulatory behavior (e.g., body rocking, inappropriate noises), low levels of on-task behavior, and tantrum behavior (e.g., aggression, self-injurious behavior, and destruction of property).

Six students from Classroom F participated, their ages ranging from 10 to 18 years and IQs from 35 to 59. Four students served as experimentals with 2 controls. All students were identified as having autism except for 1 of the experimentals who was diagnosed as having mental retardation with behavioral

problems. These students were higher functioning than most of the other participants in the study. They received instruction on academic tasks such as, two and three digit arithmetic, beginning reading, and tasks involving the use of computers. Their verbal expressive skills and receptive skills were well developed. They were usually required to speak in full sentences, and use appropriate grammar. While these students engaged in some spontaneous social behavior with peers and adults, they were deficient in their levels of social skills. All engaged in low rates of self-stimulatory behavior (e.g., some inappropriate speech, gazing at lights).

Seven special education classroom teachers participated as the instructors for the experimental and control group students. In addition, each of the six classrooms were staffed with at least one teacher's aide. Classroom F had two teachers who participated in the study. Aides in all the classrooms assisted with the instruction and monitoring of students not involved in the study, and occasionally assisted the teachers with the one-to-one instructional sessions.

Tasks

The instructional tasks for the students were selected by classroom teachers in accordance with general individual educational plan goals for students in their classes. The task for Classroom A was money skills which included coin identification, coin value, and coin usage. Students in Classroom B were taught readiness or

pre-academic skills which included identification of objects, functional use of objects, following directions, and identifying body parts. Classroom C students were taught a language task which focused on who, what, where, when, why and how questions. Stimulus pictures included those from the Peabody Language Development Kit, community helpers posters, magazine cutouts, and photographs. Students in Classroom D were taught shopping skills which included identification of food items, use of shopping lists for item selection, and money skills for purchasing items and receiving change. The task in Classroom E combined language and preacademic skills which included vocal imitation, picture identification, color recognition, and beginning counting. Students in Classroom F were taught expressive language skills including correct pronoun usage, use of complete sentences, plurals, and adjectives.

Behavior Definitions and Measurement

Measures were collected for both students' and teachers' performance during all experimental phases. Student measures consisted of pre and post acquisition data, on-task and self-stimulatory behaviors during instructional sessions, and percent of correct responding during sessions. Teacher measures consisted of frequencies of the number of trials, models, prompts, and reinforcements delivered to students during instructional sessions.

Student Measures. The primary dependent measure was the increase in percentage of correct items as indicated by criterion-

referenced pre- and posttests. Test items corresponded to the
tasks described for each classroom (e.g., language, money, shopping
skills). Students in each classroom were administered the
same test on a pre and post basis for the task instructed in their
classroom. Table 2 presents sample test items from each of the
six classrooms. (Sample Pre/posttests for all 6 classes are
presented in Appendix B).

The second student measure consisted of recording on-task and
self-stimulatory behaviors exhibited during 5-minute probes during
instructional sessions. Observational data were collected using a
15-second momentary time sampling procedure in which both on-task
and self-stimulatory behaviors were scored simultaneously using the
following definitions. Behavior was scored as on-task if the
student was observed looking at the teacher; looking at a peer
responding or at materials; working on the task; or responding to
teacher prompts. Self-stimulation was scored if the student
exhibited any self-stimulation (e.g., body rocking, repetitive
gestures, perseverative vocalizations or laughing, inappropriate
smelling or touching of persons/objects). On-task and self-
stimulatory measures were collected during 33% (6 samples) of the
instructional sessions. A sample data sheet for on-task and self-
stimulatory behavior is presented in Appendix C.

The final student measure consisted of the percent of correct
responses during 5-minute probes of instructional sessions.
Student responses to each teacher directive/instruction were

Table 2

Sample Criterion Referenced Test Items

Classroom	Task	Sample Items
A	Money skills	1. Teacher points to coins, one at a time and asks student to name to coin. Penny, nickel, dime, quarter
		2. Teacher points to coins, one at a time, and asks student "How much is this worth."
		3. Teacher places 2-10 pennies in a group and asks students "How much is this worth."
		4. Teacher places dime plus 1-5 pennies in group and asks student "How much is this worth."
		5. Flashcards are made with coin combinations. Student matches to corresponding number value cards.
B	Language/ Readiness	1. Put the bean bag under the chair.
		2. Stand up and touch your head.
		3. Find the dog in the picture.
		4. Hand me the hat.
		5. Put the circle in the box.
C	Language	1. Who is in the picture?
		2. When do you have a party?
		3. Why do you go to the store?
		4. Where are the animals?
		5. How do you make a sandwich?
D	Shopping	1. Match word/picture cards to 5 food items.
		2. Give me 25¢, 50¢ $2.
		3. Sort food pictures into 50¢ $1 boxes.
		4. Tell me 5 things you can buy at the grocery store.
		5. Give student 5 items word/picture list. Have student retrieve items from shelf.
E	Language/ Readiness	1. Identify colors from color cards. Red, blue, yellow, green, black, brown, white, orange.
		2. Identify body parts. Eyes, ears, nose, mouth, hair, hands, feet, stomach.
		3. Identify numbers 1-15.
		4. Give 1-5 objects to teacher.
		5. Identify items from pictures. Pants, watch, shoe, chair, duck, hat, shirt, candy, car, gloves.
F	Language	1. Teacher holds up picture and says "Tell me about this."
		2. Where are they?
		3. What is the train next to?
		4. Where are the lights?
		5. What is the cow doing?

scored as correct, incorrect, or no response. To compute percent correct, the number of correct responses were divided by the total number of responses and multiplied by 100. A sample performance data sheet is presented in Appendix D.

Teacher Measures. Teacher behaviors consisted of the number of trials, models, prompts, and reinforcements delivered to students during instructional sessions. Trials were defined as the presentation of a clear instruction to student(s), the trial ending with the student response and teacher feedback. Models were scored when the teacher modeled the correct verbal or physical response for the student to imitate, these usually followed an incorrect or no response by the student (e.g., "This is 3; count 1, 2, 3."). Prompts were defined as any other assistance or cues (except models) given to the student(s) following the initial instruction. Prompts could be verbal or physical assistance (e.g., "Look at the picture again."; teacher pointing to picture). Reinforcements were scored when the teacher delivered praise, tokens, stickers, food, physical strokes, smiles etc., following correct responding by students. Teacher behavior measures were collected during 5-minute observations for 33% (6 samples) of the instructional sessions. These measures were collected simultaneously with student performance data. A sample performance data sheet is presented in Appendix D.

Finally, teachers' ratings of group instruction as a teaching format were measured. Teachers' responses to six questions

concerning the preparation time for arranging groups, benefits to students, behavior of students, and whether or not they would use group instruction again were measured on a five-point Likert scale ranging from 1-strongly agree to 5-strongly disagree. A sample of the teacher satisfaction survey is presented in Appendix E.

Reliability. Reliability checks were conducted for 50% of the 5-minute probes collected for student and teacher measures. Percentages were calculated using the formula of number of agreements divided by the number of agreements plus disagreements multiplied by 100. Reliability for on-task behavior ranged from 75-100%, with an overall mean of 94%. The reliability for the nonoccurrence of on-task behavior was 73%. Off-task behavior occurred for only 23% of all sessions across all students. Table 3 presents the reliability for on-task and self-stimulatory behavior across students. The reliability percent for on-task and self-stimulation separated by classroom is presented in Table 4. Reliability for self-stimulatory behavior ranged from 70-100% with a mean of 93%.

Reliability for teacher observations was computed for each teaching behavior. Reliability for the number of trials ranged from 67-100% with a mean of 95%. Reliability for percent of correct responses by students ranged from 57-100% with a mean of 91%. These data are presented in Table 5. Reliability for specific teacher behaviors was slightly lower with means of 89% (R=50-100%), 81% (R=0-100%), and 83% (R=0-100%) respectively for models, prompts, and reinforcements. These data are presented in Table 6.

Table 3

Reliability Percentages for On Task and Self-Stimulatory Behavior Across Students

On Task						Self-Stimulation					
Overall (Trial-by-Trial)		Nonoccurrence		Frequency Off Task		Overall (Trial-by-Trial)		Occurrence		Frequency Self-Stim	
Exp	Con	Exp	Con	Exp	Con	Exp	Con	Exp	Con	Exp	Con
93%	95%	66%	79%	20.5%	26%	94%	93%	61%	66%	20%	20%

Totals - Experimental and Control Groups

94%		73%	23%	94%	64%	20%

Table 4

Reliability Percentages for Students On Task and Self-Stimulatory Behavior by Classroom

Classroom	On Task					Self-Stimulation				
	X Total (Trial-by Trial)	Range	X Nonoccur	Range	Frequency Off Task	X Total (Trial-by Trial)	Range	X Occur	Range	Frequency Self-Stim
A	97%	90-100	76%	0-100	15%	95%	85-100	76%	0-100	24%
B	95%	85-100	66%	0-100	19%	92%	70-100	73%	0-100	36%
C	97%	80-100	88%	43-100	13%	86%	70-100	58%	0-100	39%
D	97%	80-100	67%	0-100	10%	96%	80-100	65%	0-100	16%
E	84%	75-100	64%	18-100	57%	93%	75-100	61%	0-100	12%
F	94%	75-100	75%	0-100	21%	97%	85-100	24%	0- 75	3%
Totals	94%	75-100	73%	0-100	23%	93%	70-100	60%	0-100	21%

Number of Students = 41

Reliability Assessed for 50% of Observations

Table 5

Reliability Percentages for Teacher Observation Form - Trial Delivery

Teacher	# Trials X	# Trials Range	Correct Trials X	Correct Trials Range	Collective Trials X	Collective Trials Range
A	96%	67-100	93%	77-100	97%	50-100
B	98%	67-100	97%	67-100	100%	100
C	96%	85-100	86%	57-100	96%	77-100
D	98%	87-100	97%	71-100	100%	99-100
E	96%	86-100	93%	57-100	---	------
F	88%	60-100	82%	60-100	---	------
Overall Means	95%		91%		98%	

Number of Students Observed = 41

Reliability Assessed for 50% of observations.

Table 6

Reliability Percentages for Teacher Observation Form

Teacher	Models X	Models Range	Prompts X	Prompts Range	Reinforcements X	Reinforcements Range
A	94%	71-100	83%	0-100	81%	0-100
B	95%	80-100	81%	33-100	85%	40-100
C	93%	79-100	82%	30-100	78%	57- 92
D	90%	50-100	85%	60-100	85%	43-100
E	80%	50-100	76%	46-100	87%	60-100
F	83%	62-100	79%	54-100	82%	46-100
Overall Means	89%		81%		83%	

Number of Students Observed = 41

Reliability Assessed for 50% of Observations

Procedures

Experimental Design. A quasi-experimental non-equivalent control group design (Campbell & Stanley, 1963) was used to evaluate the effects of one-to-one and group instruction. Primary measures were the criterion-referenced acquisition tests previously described. An analysis of covariance, with the pretest serving as covariate, was used to analyze the results (Systat, 1985). In addition, repeated measures were collected weekly for on-task, self-stimulation, and correct responding within one-to-one and small group sessions. Weekly measures were also collected for teacher behaviors (i.e., number of trials, models, prompts, and reinforcements).

Teacher Training Protocol. Prior to the initiation of the experimental phases, the experimenters met with each of the teachers from the six schools to discuss the rationale for the study and to provide an overview of the timeline of the experiment. Consecutive informal meetings were then arranged to assist teachers in the selection of the content areas and to provide suggestions for how curricula might be modified to fit a group structure. During teacher/experimenter meetings, teachers were provided with information about using a discrete trial presentation format, pacing and varying instructions, alternating order a sequence of instruction, promote incidental/observational learning, and error correction procedures. Information concerning behavior management strategies was also discussed. Some of the

information covering behavior management included: delivery of reinforcement, gaining and maintaining students' attention, reviewing session rules, and attending to appropriate behaviors. Finally, the physical arrangement of the classroom best suited for instruction in small groups was discussed. These training sessions included information concerning the seating arrangement, access to materials, and differential student functioning levels. This information is detailed in a published manual for conducting alternative instructional formats for use with students with developmental disabilities (Whorton, Walker, McGrale, Rotholz, & Locke, 1987).

Baseline. During the baseline phase, teachers conducted one-to-one instruction (e.g., one teacher to one student) on the tasks previously described. All experimental and control students received 5 minutes of one-to-one instruction on the tasks for their class three times per week. Teachers were asked to use a discrete trial format for presentation of materials with modeling and prompting procedures as needed, reinforcement for correct responses, and correction procedures for errors. Specific frequency of trials or delivery of prompts, models, etc. was not controlled during sessions. This was viewed as an important issue in verifying a naturalistic implementation of small group arrangements, as opposed to focusing on teacher behavior. Hence, the variables controlled across groups were time, materials, and instructional arrangement (i.e., one-to-one versus small group).

During the one-to-one sessions, experimenters collected on-task, self-stimulation, and response data for students once per week (one-third of sessions). Experimenters also conducted teacher observations to record the number of trials, models, prompts, and reinforcements provided by teachers. These data were collected once per week for each student (one-third of sessions). Baseline conditions were conducted for approximately two weeks for a total of six one-to-one sessions for all 41 subjects.

Small group instruction. During the intervention phase, 27 of the students (approximately two-thirds) were placed in a small group instruction format. Three to five students were taught in a small group within each classroom. A combined individual and collective instruction model of group training was used in which some procedures, trials, materials, were implemented concurrently for all group members and some were presented for each student in a sequential fashion. Teacher discretion dictated collective versus individual presentations based on task items, student functioning levels, and entry level skills. Small groups were conducted with the same tasks and materials used during the one-to-one baseline condition. Groups were conducted three times per week for 15-20 minute periods or 5 minutes per number of students. For example, a group with 3 students lasted 15 minutes; 4 students 20 minutes, etc. Teachers were instructed to continue with the same procedures (e.g., discrete trial format, modeling, prompting, reinforcement) as used during baseline.

Hence, the only change from the baseline condition was provision of instruction in a small group format.

The remaining 14 control students continued baseline conditions (i.e., one-to-one instruction three times per week). Data collection continued on a weekly basis (one-third of sessions) for on-task, self-stimulation, correct responding, and teacher behavior. This second experimental phase lasted for approximately four weeks for a total of 12 sessions. At the completion of the experimental phases, students were posttested to determine task acquisition.

RESULTS

Student Measures

Criterion-Referenced Tests. The primary dependent measure was pre and posttest scores on criterion-referenced tests. Table 7 presents individual scores and class means for experimental and control groups. Pretest scores for the experimentals (N=27) ranged from 7 to 57% with a mean of 29.8%. Posttest scores ranged from 29 to 92% with a mean of 61.0%. This reflected gains ranging from 16 to 47% (X = 32%) from pre to posttest for the experimentals. Pretests for the control group ranged from 7 to 74% with a mean of 27.6%. Posttests ranged from 16 to 94% with a mean of 49.1%. One control subject scored 10 percentage points lower on the posttest than on the pretest. With the exception of this student, gain scores for the control students were less than experimentals ranging from 9 to 37% with a mean gain of 21.5

percentage points. These data indicate approximately 10% higher gains for the experimental group who received small group instruction than for the control group who received one-to-one instruction.

Table 8 displays the results of the analysis of covariance. A significant difference was found ($\underline{F}(1,38)=6.18$, p=.017) between groups after statistically equating students on pretest scores. Students in the experimental group produced significantly higher adjusted posttest means (61.46) than the students in the control group (53.05).

On-task behavior. Additional student measures were collected for the on-task and self-stimulatory behavior of students. Table 9 presents a summary of these data which shows a decrease in on-task behavior for both experimental and control students. The average on-task behavior during baseline for experimental students was 89%, decreasing to 81%, a loss of 8% during small group instruction (see Table 9). The mean level of on-task behavior for the control students during baseline (pre) was 83%, with a decrease to 77% (-6%) during the second baseline phase (post). An analysis of covariance with baseline percentages serving as the covariate indicated no significant differences between the experimental and control groups. While this indicated that on-task levels remained acceptable when students moved from one-to-one to small groups, there was a great deal of variability for individual students. Individual students' on-task scores for the experimental and control groups are

Table 7

Pre and Posttest Percentage Correct for Experimental and Control Groups

	Student#	Pre	Post	Gain		Student#	Pre	Post	Gain
	1	26	63	37		28	23	56	33
	2	33	72	39		29	28	40	12
Money	3	19	42	23		30	26	56	30
	4	42	58	16					
	5	30	51	21					
	6	45	86	41		31	7	35	28
	7	48	91	43		32	12	37	25
Readiness	8	7	30	23		33	57	85	28
	9	45	77	32		34	74	94	20
	10	43	90	47					
	11	10	43	33					
Language	12	30	73	43					
	13	50	86	36					
	14	33	73	40					
	15	57	90	33					
	16	48	72	24		35	49	80	31
Shopping	17	26	49	23		36	31	67	36
	18	52	92	40		37	12	39	27
	19	32	50	18					
	20	8	36	28		38	26	16	-10
Language	21	11	39	28		39	19	28	9
	22	11	29	18					
	23	20	42	22					
	24	23	54	31		40	28	65	37
Language	25	27	65	38		41	15	31	16
	26	24	65	41					
	27	20	55	35					
n = 27		—	—	—	n = 14		—	—	—
		Pre 30%		Post 62%			Pre 29%		Post 52%
			% Gain = 32%					% Gain = 23%	

Table 6

<u>ANCOVA</u> <u>Summary</u> <u>Table</u> <u>for</u> <u>Experimental</u> <u>and</u> <u>Control</u> <u>Group</u> <u>Pre</u> <u>to</u> <u>Posttest</u>
<u>Differences</u>

		<u>Prettest</u>	<u>Posttest</u>	<u>Post</u> <u>Adjusted</u>
Experimental	$\bar{x}$	30.37	61.96	61.46
(N = 27)	sd	14.71	19.79	
				*
Control	$\bar{x}$	29.07	52.07	53.05
(N = 14)	sd	18.87	23.54	

* $p = .017$

Table 9

On Task and Self-Stimulatory Behaviors for Students During Experimental
Conditions

		Mean % On Task			Mean % Self-Stimulation		
		Base	Small Group Instruction	Difference	Base	Small Group Instruction	Difference
Experimental	M̄ =	89.0%	81.0%	-8%	15.0%	15.0%	0%
	SD =	11.6%	13.0%		20.5%	19.7%	
(N = 27)							
		Base 1	Base 2	Difference	Base 1	Base 2	Difference
Control	M̄ =	83.0%	77.0%	-6%	19.0%	20.0%	1.0%
	SD =	17.7%	17.9%		15.9%	21.3%	
(N = 14)							

presented in Table 10. Difference scores for experimental students ranged from -30% on-task behavior to +16%. Differences for the controls ranged from -25% to +23% on-task behavior.

Self-stimulatory behavior. Self-stimulatory behavior was analyzed using an analysis of covariance with no significant differences between the experimental and control groups. Self-stimulation levels were 15% for the experimental group during baseline one-to-one sessions and small group instruction. Baseline levels for the control students averaged 19% with an increase to 20% during the second phase. As with on-task behavior, these analyses indicate no change in problem behavior when advancing to small groups, however, individual data again reflected high levels of variability across subjects. The individual scores for self-stimulation behavior for experimental and control groups are presented in Table 11. Difference scores for experimental students ranged from a decrease of 25% in self-stimulation to an increase of 36%. Differences for the control group ranged from a decrease of 21% to an increase of 25%. Individual data from two representative experimental group students and two control group students are presented in Figures 1 through 4. These data illustrate the variance across students and sessions for on-task and self-stimulatory behavior.

Figure 5 displays an overall summary of student task acquisition data, on-task data, and self-stimulatory behavior. These data are presented for baseline (pre) and experimental

Table 10

Pre and Post On-Task Percentages for Experimental and Control Groups

	Experimental				Control		
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Money	1	85	81	- 4	28	100	95	- 5
	2	100	84	-16	29	75	79	+ 4
	3	95	96	+ 1	30	83	73	-10
	4	80	96	+16				
	5	100	90	-10				
Readiness	6	60	64	+ 4	31	88	78	-10
	7	95	97	+ 2	32	90	75	-15
	8	88	83	- 5	33	55	78	+23
	9	90	94	+ 4	34	100	95	- 5
Language	10	100	93	- 7				
	11	100	76	-24				
	12	100	74	-26				
	13	100	83	-17				
	14	95	88	- 7				
	15	100	76	-24				
Shopping	16	100	96	- 4	35	100	86	-14
	17	88	74	-14	36	100	88	-12
	18	100	98	- 2	37	90	65	-25
	19	100	91	- 9				
Language	20	70	81	+11	38	55	40	-15
	21	73	54	-19	39	50	41	- 9
	22	75	75	0				
	23	73	73	0				
Language	24	80	54	-26	40	90	97	+ 7
	25	82	73	- 9	41	85	87	+ 2
	26	90	60	-30				
	27	83	70	-13				
	—	—	—		—	—	—	

Pre = x = 89%   Post = 81% | Pre 83%   Post 77%

Difference = - 8% | Difference = - 6%

Reliability: Mean = 94%
              Range = 45 to 100%

Table 11

Pre and Post Self-Stimulatory Percentages for Experimental and Control Groups

		Experimental				Control		
	Student#	Pre	Post	Dif	Student#	Pre	Post	Dif
Money	1	3	13	+10	28	0	9	+ 9
	2	10	46	+36	29	25	20	- 5
	3	0	1	+ 1	30	15	17	+ 2
	4	0	5	+ 5				
	5	30	16	-14				
Readiness	6	68	49	-19	31	50	70	+20
	7	20	15	- 5	32	35	60	+25
	8	0	1	+ 1	33	45	24	-21
	9	5	0	- 5	34	10	12	+ 2
Language	10	28	3	-25				
	11	5	4	- 1				
	12	35	50	+15				
	13	3	14	+11				
	14	45	54	+ 9				
	15	30	29	- 1				
Shopping	16	18	5	-13	35	28	28	0
	17	75	66	- 9	36	18	1	-17
	18	10	8	- 2	37	18	5	-13
	19	8	4	- 4				
Language	20	0	5	+ 5	38	18	8	-10
	21	10	15	+ 5	39	5	20	+15
	22	0	1	+ 1				
	23	5	3	- 2				
Language	24	0	1	+ 1	40	0	0	0
	25	8	3	- 5	41	3	0	- 3
	26	0	3	+ 3				
	27	0	0	0				
		—	—	—		—	—	—

n = 27

Experimental: Pre 15% Post 15%   Control: Pre 19% Post 20%

Difference = 0%   Difference = + 1%

Reliability: Mean = 94%
              Range = 50 to 100%

Subject 2 (Experimental)

● On-task
○ Self-Stim
✦ Pre, posttest
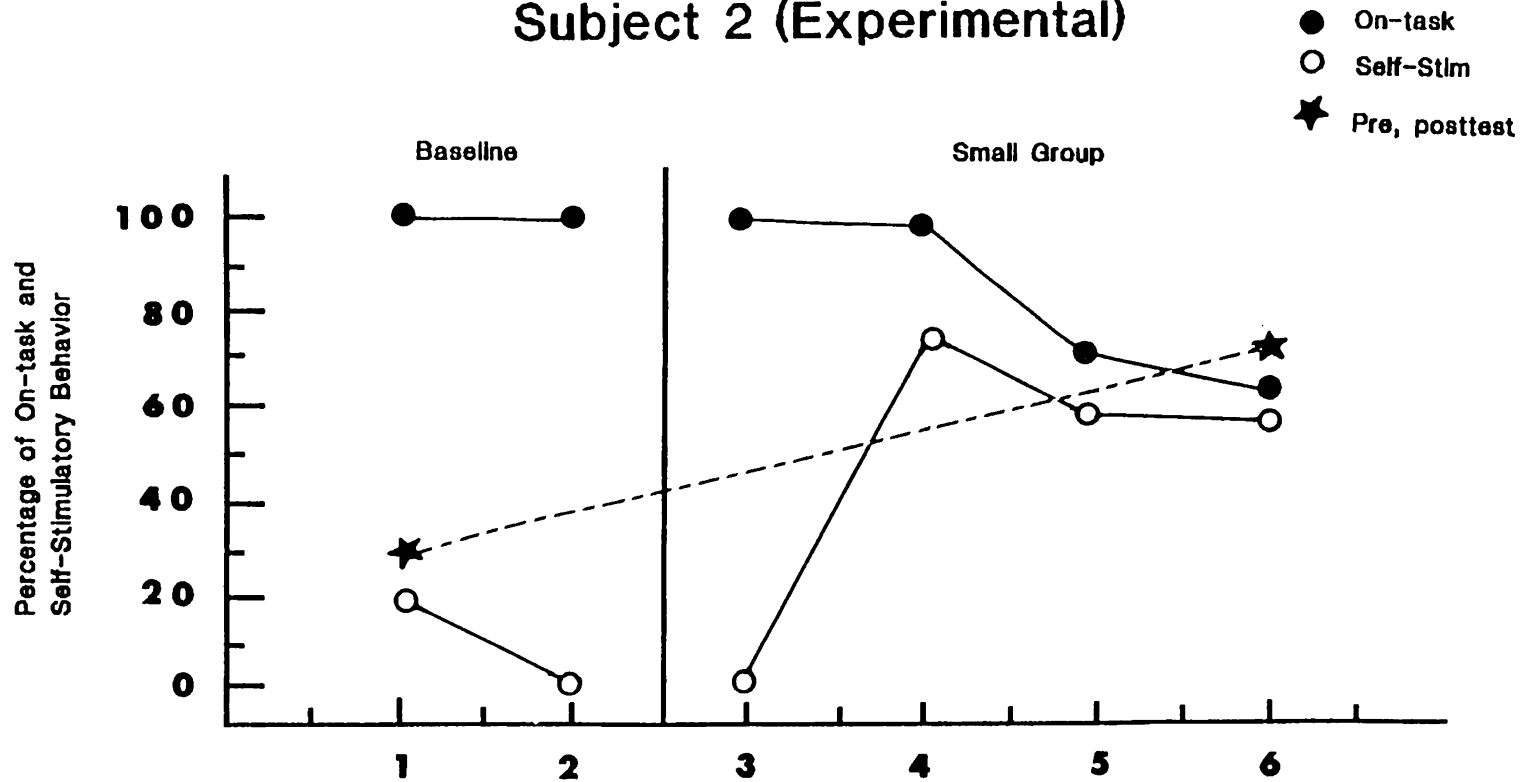
Figure 1. Percent of on-task and self-stimulatory behavior across
instructional phases. Percent gain from pre to posttest
acquisition was 39%
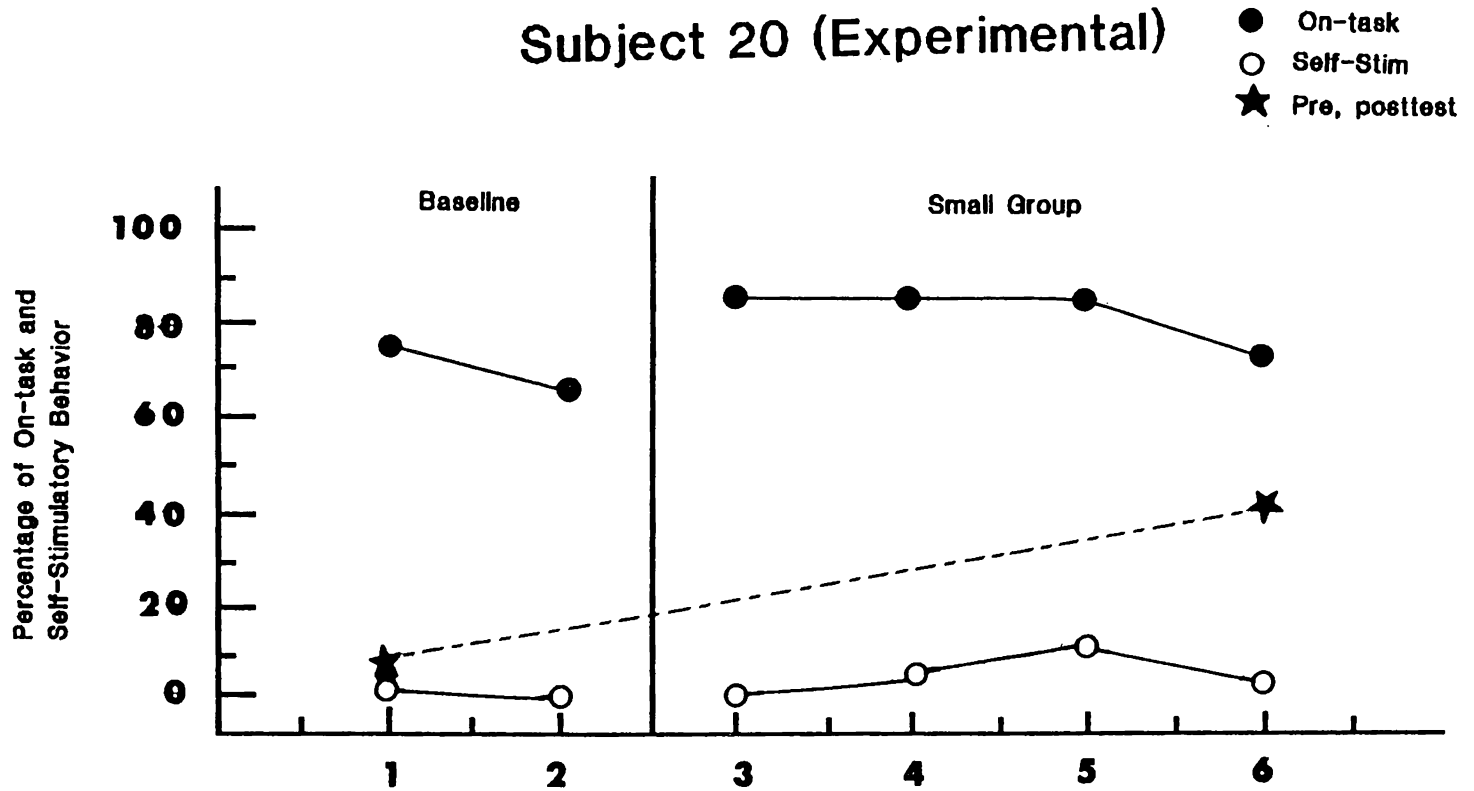
Figure 2. Percent of on-task and self-stimulatory behavior across instructional phases. Percent gain from pre to posttest acquisition was 28%.

Subject 31 (Control)
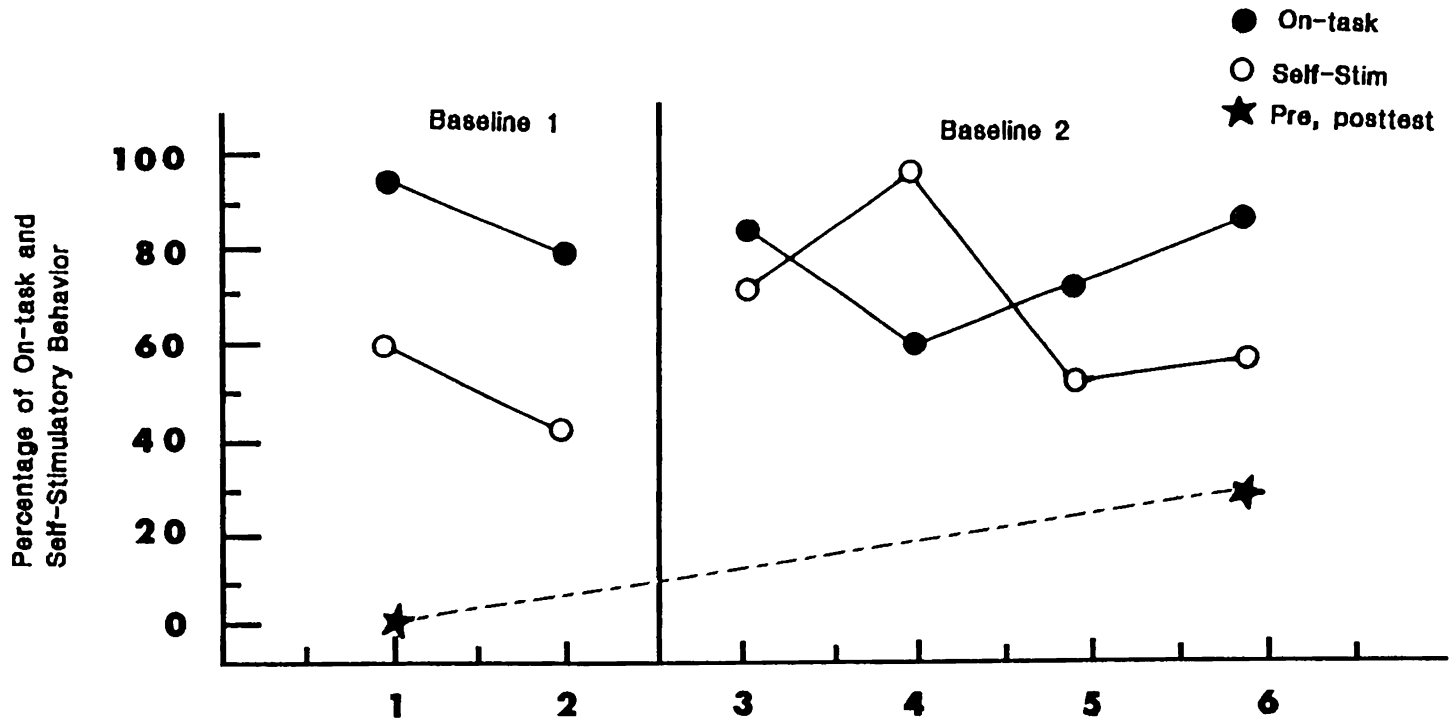
Figure 3. Percent of on-task and self-stimulatory behavior across instructional phases. Percent gain from pre to posttest acquisition was 28%.
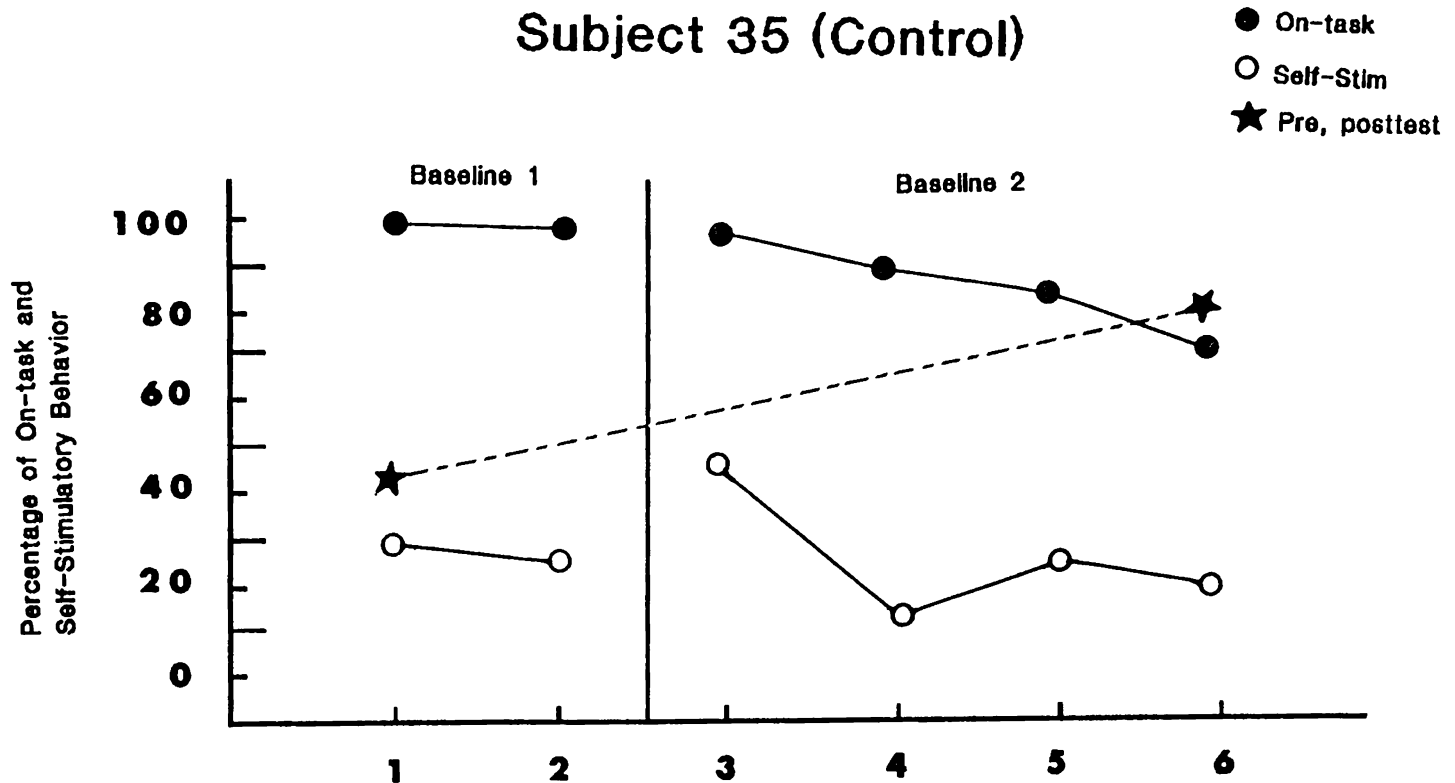
Figure 4. Percent of on-task and self-stimulatory behavior across instructional phases. Percent gain from pre to posttest acquisition was 31%.

GROUP TEACHING STUDY

TASK ACQUISITION

	Pre	Post	Gain
Exp	30%	62%	32%
Control	29%	52%	23%

PRE   POST

ON TASK

	Pre	Post	Difference
Exp	89%	81%	-8%
Control	83%	77%	-6%

PERCENT

PRE   POST

SELF-STIMULATORY BEHAVIOR

	Pre	Post	Difference
Exp	15%	15%	0%
Control	19%	20%	1%

KEY
EXP.
CON.

PRE   POST
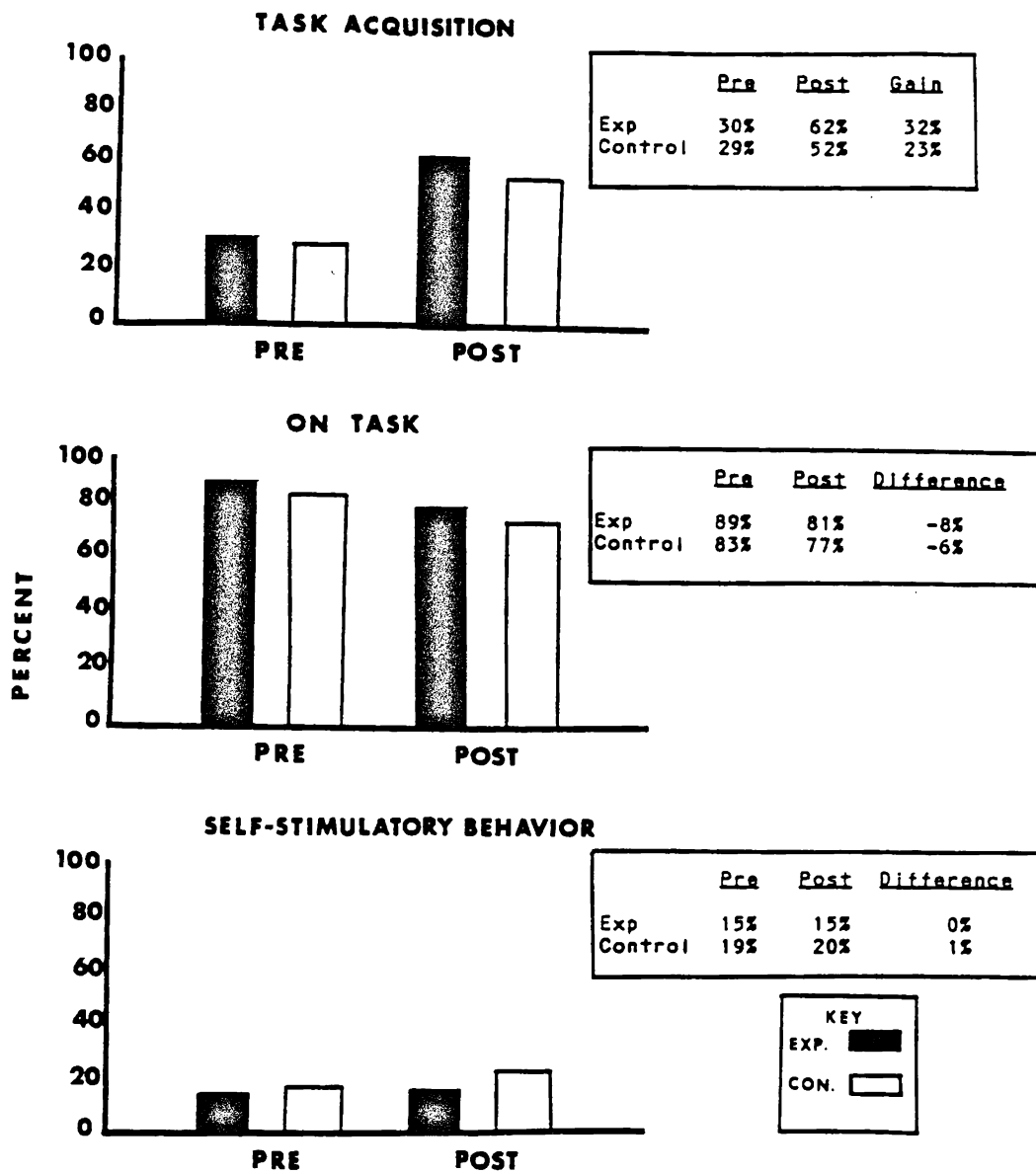
Figure 5 - Overall task acquisition, on-task, and self-
stimulatory behavior for experimental and
control group students during baseline(pre) and
experimental(post) conditions.

conditions for the experimental group, and baseline (pre) and the
conditions for the experimental group, and baseline (pre) and the
continued baseline (post) for the control group students.

Correct responses. A final student measure was the percent of
correct responses by students during instructional sessions.
Similar to on-task and self-stimulatory behavior, no significant
differences were seen between the experimental and control groups.
The percent correct responding for experimental students averaged
62.2% during baseline and 63% during small group sessions,
indicating no debilitating effects for small group placement.
However, individual differences were noted across classrooms. The
average percent correct responding during instructional sessions
decreased for classrooms A, B, and C and increased for D, E, and F.
The percent correct responding for control students averaged 52.2%
during baseline and increased slightly to 58.6% during the second
phase. Classroom A showed a decrease in correct responding for
the control subjects. These data are presented in Figure 6 for
experimental group students and control group students in each
class.

Teacher Measures

Teacher measures consisted of the number of trials, models,
prompts, and reinforcements delivered across experimental phases.
Table 12 presents the average frequency of teacher behavior for
experimental and control students.

Table 12

Mean Percent of Teacher Behaviors for Experimental
and Control Groups

Behavior		Baseline	Experimentals Small Group (5 Min.)	Small Group (entire)	Controls Baseline 1	Baseline 2
Trials	M̄ =	17.4	7.7	22.2	14.6	13.8
	R =	8-24	5-12	19-23	7-22	11-22
Models	M̄ =	8.0	3.0	8.0	10.1	7.7
	R =	2-15	2-4	2-21	3-21	4-18
Prompts	M̄ =	18.6	7.0	25.0	22.6	22.4
	R =	19-27	4-11	1-55	16-24	17-30
Reinf.	M̄ =	16.9	6.0	17.0	14.6	12.0
	R =	10-23	4-8	8-26	7-22	7-17

Experimental Group

**Mean Percentage for Correct Response
During Instructional Sessions Across
Experimental Conditions**

CLASSROOM

Base 1:1

Small Group

Control Group

**Mean Percentage for Correct Response
During Instructional Sessions Across
Experimental Conditions**

CLASSROOM
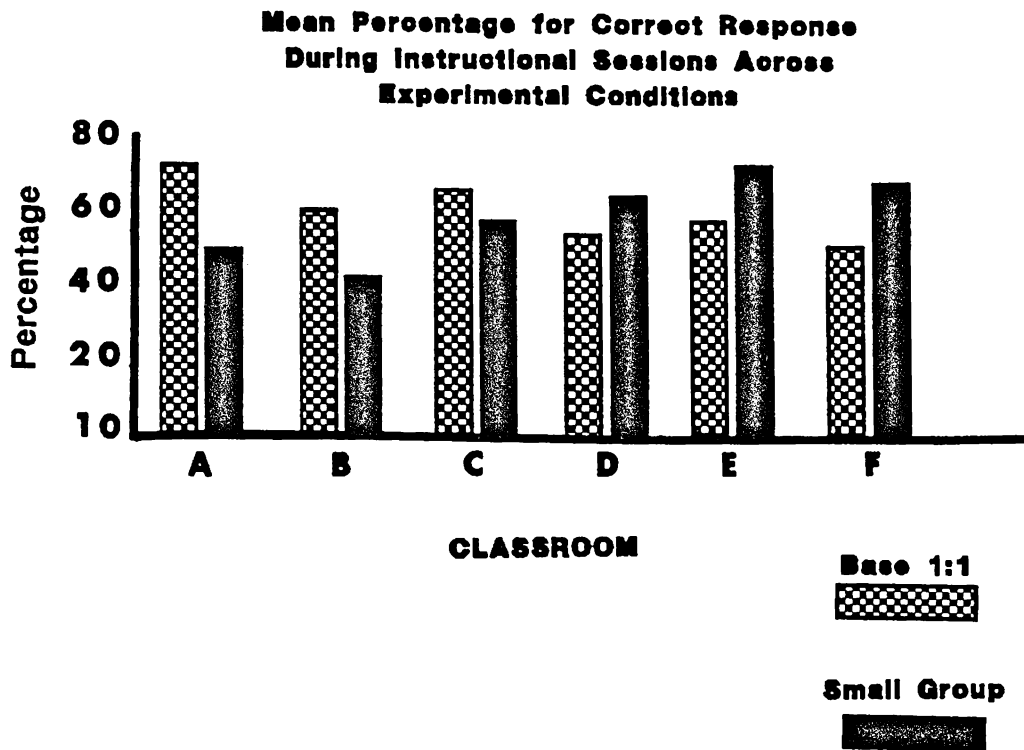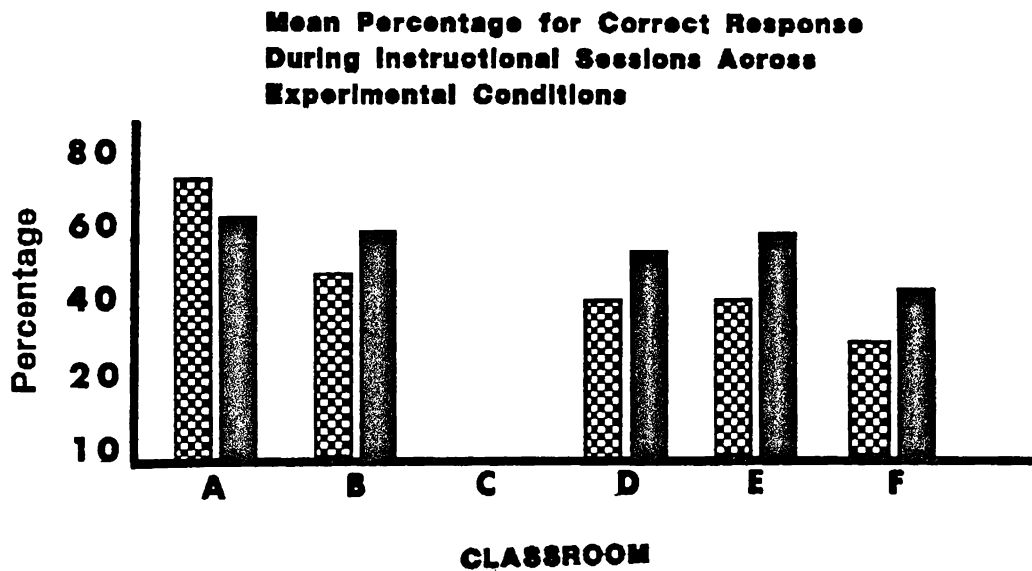
Figure 6. Mean Percentage for Correct Response During Instructional
Sessions Across Experimental Conditions

These data reflect a great deal of variance in teacher behavior. The average number of trials presented to the experimental students was 17.4 during the 5-minute baseline and 7.7 during 5-minute probes in small groups. A note of caution in viewing the low frequency of trials delivered during group is that the data represents only a 5-minute segment of the entire session. All session data (e.g., entire 15-25 min.) were collected for 24 of the 27 experimental students which averaged 22.2 trials during small group sessions. Control students averaged 14.6 trials during baseline 1 and 13.8 during baseline 2.

The mean number of models was 8.0 during baseline, 3.0 during small groups, and 8.0 during the entire group sessions for the experimentals. The control group showed a decrease from 10.1 to 7.7 from baseline 1 to baseline 2. The number of prompts delivered by teachers decreased from 18.6 during baseline to 7.0 in the small groups but averaged 25.0 for the entire group for experimentals. The number of prompts remained consistent across phases for the control students (i.e., 22.6, 22.4).

The final teacher behavior measured was reinforcement delivered following correct responses. The baseline mean was 16.9 with 6.0 during 5-minute probes in the small groups for experimentals. All session levels of reinforcement averaged 17.0. A slight decrease was seen for the controls, from 14.6 to 12.0.

As reflected across all teacher behaviors (i.e., number of trials, models, prompts, and reinforcements) levels of

presentation were quite variable from session to session. As expected, students received much higher levels of presentation during 5 minutes of one-to-one instruction than during 5-minutes was 17.4 during the 5-minute baseline and 7.7 during 5-minute of small group with 3-5 students. However, equitable levels of teacher interaction were indicated when the entire small group sessions were observed. A further consideration in interpretation of teacher behavior is that students have the opportunity to observe all teacher trials, models, etc., even when directed to other students in the small group arrangement. While the benefits of indirect exposure were not measured in this study (e.g. incidental learning, socialization, observation of peer reinforcement, etc.), spillover effects are certainly a possibility.

Teacher satisfaction with group instruction was measured using a satisfaction survey distributed to teachers randomly. Teachers were asked to respond to six questions about group instruction. Only three teachers out from the six classrooms responded to the survey. All three respondents agreed that preparation time for group instruction was similar to preparation time for one-to-one sessions. All respondents also agreed that the students who participated in the group teaching situation benefited academically. Two teachers agreed that levels of maladaptive behavior were similar in both one-to-one and group formats, and one disagreed but did not clarify whether students

engaged in more or less maladaptive behavior in group formats. All respondents agreed or strongly agreed that they would use a group teaching format in the future with their students.

Discussion

Several reasons have been discussed for investigating small group formats as an alternative instructional strategies to one-to-one formats. For instance, educational settings rarely have the staff-to-student ratios or the resources required when using one-to-one formats. Another concern with the exclusive use of one-to-one instruction is that skills acquired during the one-to-one instruction may not generalize to group instructional situations (e.g., Koegel & Rincover, 1974). Further, one-to-one instruction does not provide students with some of the skills needed for functioning in group situations (e.g., Brown et al., 1976; Favell et al., 1978; Nickelsburg, 1983). Brown et al. (1980) points out that if people learn through the observation of others as reported by some authors (e.g., Biberdorf & Pear, 1977; Brown & Holvoet, 1982; Whorton et al., 1986) then disabled persons are at a disadvantage because they are predominantly instructed in one-to-one formats without opportunities to observe other students.

The purpose of this investigation was to compare one-to-one and small group instruction with students who have autism and other developmental disabilities. Results indicated that small group formats were a viable instructional methodology with these populations. These results were demonstrated through pre and

posttest gains across curriculum tasks in six classrooms. Further, the small group format showed no ill effects for on-task or self-stimulatory behaviors for the majority of students.

These findings support previous studies which have demonstrated the use of small group formats for youngsters with autism and retardation (e.g., Favell et al., 1978; Koegel & Rincover, 1974; Rincover & Koegel, 1977; Schepis et al., 1987). A significant difference in this current study was the number of students participating as part of an experimental-control group design. Previous research has focused on demonstrations of small group instruction using single-subject designs and a small number of target students, typically 4-8 (Walker, 1986). Thus, this study allows for further validation and replication of the positive effects of small group instruction within natural learning environments for this unique population. The study provides further relevance to the current literature in that small group instruction was demonstrated effective for a variety of curriculum tasks (e.g. language, money skills, shopping, readiness skills) and in a variety of placement settings (e.g. primary, intermediate, and secondary classes for students with autism and developmental disabilities in two public school districts and a private day school).

Given the favorable results of the study acquisition across tasks and settings, the continued use of small group instructional formats with students who have autism and developmental

disabilities is warranted. In addition, other positive effects
of the small group format are noteworthy. First, group arrangements
increase the opportunities for teacher-student interactions. Given
defined time periods within classroom schedules, teachers spent
more time with each student in a collective format than if the time
is used to alternate one-to-one instruction among students.
Further, group formats offer the advantage of monitoring student
acquisition and progress in comparison to other students in an
immediate fashion when several students are taught simultaneously.
In addition to increased teacher-student interactions, small groups
provide a means for increasing student-to-student interaction time
(Frankosky & Sulzer-Azaroff, 1978; Peck, 1985). Consequently, the
opportunities for observational or incidental learning are enhanced
through peer modeling and reinforcement (Alberto et al., 1980;
Brown & Holvoet, 1982; Oliver & Scott, 1981; Orelove, 1982;
Whorton, Walker, Locke, Delquadri, & Hall, 1987).

A final benefit to the use of small groups is that this model
more closely approximates regular classroom settings. In a
proposal describing the characteristics of appropriate educational
programs for disabled persons, Bates, Renzaglia, and Wehman (1981)
recommended the use of age appropriate curriculum, functional
objectives, regular assessment of progress, opportunities to
interact with nondisabled students and the use of small group
instruction. Similarly, Anderson-Inman et al., (1984) included
group instruction as one of the relevant variables when for

successful educational or work placement of individuals with disabilities. Group instruction has been reported to be an integral part of learning to function in different environments, as it requires that students learn to tolerate the close proximity of peers, to take turns, to cooperate, and to attend to others (Brown et al., 1976). Therefore, functioning in groups may be viewed as a necessary prerequisite behavior for mainstreaming to regular classrooms, transitioning to work sites, and participation in community environment activities. More research is necessary, however, to document the generalized effects of group teaching strategies compared to one-to-one teaching (e.g., Reid & Favell, 1984).

In response to the concerns expressed by researchers regarding the possible loss of control over students behavior in group teaching some researchers have recommended that groups including appropriate peer models be included in groups in order to facilitate observational learning of desired behaviors (Brown & Holvoet, 1982). Foxx (1982) also suggested that if specific behaviors are being remediated in one-to-one instruction, remediation should also take place in group formats for generalization to occur. The results of the present study indicated no significant differences in students' on-task behavior in the one-to-one sessions or the small group sessions. For individual students however, there were some differences. One interesting point is that while for some individual students

the rate of self-stimulation increased in the group condition, on-task or task acquisition did not decrease. This will be an interesting area for further research into the relationship between self-stimulation and on-task behavior and effects on task acquisition.

While the present study provides verification of small group formats for acquisition of tasks, other benefits and issues require further investigation. In conclusion, further research is needed to (a) document the most efficient ways to train educators to implement group instruction; (b) assess the skills students should have prior to inclusion in group training; (c) outline curricula that lends itself best to group instruction; (d) identify programming considerations that promote maintenance and generalization of skills learned in group formats; (e) analyze the teaching procedures best used in group formats; and (f) validate the acceptance of group training programs by educators. Furthermore, it is important that the proposed benefits of group training (i.e., observational learning, generalization, and preparation for future environments in which group participation may be required) be empirically validated as such outcomes may significantly affect the selection of instructional strategies and the future placement of students with autism and other developmental disabilities.

References

Alberto, P., Jobes, N., Sizemore, A., & Doran, D. (1980). A comparison of individual group instruction across response tasks. <u>Journal of the Association for the Severely Handicapped</u>, <u>5</u>, 285-293.

Bates, P., Renzaglia, A., Wehman, P. (1981). Classroom techniques: Characteristics of an appropriate education for severely and profoundly handicapped students. <u>Education and Training of the Mentally Retarded</u>, <u>16</u>, 142-166.

Biberdorf, J., & Pear, J. (1977). Two-to-one versus one-to-one student-teacher ratios in the operant verbal training of retarded children. <u>Journal of Applied Behavior Analysis</u>, <u>10</u>, 506.

Brown, F., & Holvoet, J. (1982). Effects of systematic peer interaction on the incidental learning of two severely handicapped students. <u>Journal of the Association for the Severely Handicapped</u>, <u>7</u>, 19-28.

Brown, L., Nietupski, J., & Hamre-Nietupski, S. (1976). Criterion of ultimate functioning. In M. A. Thomas (Ed.), <u>Hey don't forget about me</u> (pp. 1-15). Reston, VA: Council for Exceptional Children.

Cavallaro, C. C., & Poulson, C. L. (1985). Teaching language to handicapped children in natural settings. <u>Education and Training of Children</u>, <u>8</u>, 1-24.

Charlop, M. H., Schreibman, L., Mason, J., & Vesey, W. (1983).

Behavior-setting interactions of autistic children: A

behavioral mapping approach to assessing classroom behaviors.

Analysis and Intervention in Developmental Disabilities, 3,

359-373.

Dunlap, G., & Johnson, J. (1985). Increasing the independent

responding of autistic children with unpredictable supervision.

Journal of Applied Behavior Analysis, 18, 227-236.

Egan, I., Fredericks, B., Hendrickson, K. (1985). Teaching

associated work skills to adolescents with severe handicaps.

Education and Treatment of Children, 8, 239-250.

Everard, M. P. (1976). An approach to teaching autistic children.

New York: Pergamon Press.

Favell, J. E., Favell, J. E., & McGimsey, J. F. (1978). Relative

effectiveness and efficiency of group versus individual

training of severely retarded persons. American Journal of

Mental Deficiency, 83, 104-109.

Faw, G. D., Reid, D. H., Scheipis, M. M., Fitzgerald, J. R., &

Welty, P.A. (1981). Involving institutional staff in the

development and maintenance of sign language skills with

profoundly retarded persons. Journal of Applied Behavior

Analysis, 14, 411-423.

Ferster, C. B., & DeMeyer, M. K. (1962). A method for the

experimental analysis of the behavior of autistic children.

American Journal of Orthopsychiatry, 32, 89-98.

Fink, E., & Sandall, S. (1980). A comparison of one-to-one and small group instructional strategies with developmentally disabled preschoolers. Mental Retardation, 18, 34-35.

Fowler, S. A. (1982). Transition from preshool to kindergarten for children with special needs. In K. E. Allen & E. M. Goetz, Early childhood education: Special problems, special solutions (pp. 309-334). Rockville, MD: Aspen.

Foxx, R. M. (1982). Decreasing behaviors of severely retarded and autistic persons. Champaign IL: Research Press.

Frankel, F., & Graham, V. (1976). Systematic observation of classroom behavior of retarded and autistic preschool children. American Journal of Mental Deficiency, 81, 73-74.

Frankosky, R. J., & Sulzer-Azaroff, B. (1978). Individual and group contingencies and collateral social behaviors. Behavior Therapy, 9, 313-327.

Fredericks, H. D., Anderson, R., & Baldwin, V. (1979). The indentification of competency indicators of teachers of the severely handicapped. AASPH Review, 4, 81-95.

Gola, T. J., Holmes, P. A., & Holmes, N. K. (1982). Effectiveness of a group contingency procedure for increasing prevocational behavior of profoundly mentally retarded residents. Mental Retardation, 20, 26-29.

Halpern, W. I. (1970). The schooling of autistic children: Preliminary findings. American Journal of Orthopsychiatry, 40, 665-671.

Harris, S. L., & Handleman, J. S. (1980). Programming for generalization: Educating autistic children and their parents. Education and Treatment of Children, 3, 51-63.

Hewett, F. M. (1965). Teaching speech to an autistic child through operant conditioning. American Journal of Orthopsychiatry, 34, 927-936.

Kazdin, A. E., & Erickson, L. M. (1975). Developing responsiveness to instructions in severely and profoundly retarded residents. Journal of Behavior Therapy and Experimental Psychiatry, 6, 17-21.

Koegel, R. L., & Covert, A. (1972). The relationship of self-stimulation to learning in autistic children. Journal of Applied Behavior Analysis, 5, 381-387.

Koegel, R. L., & Rincover, A. (1974). Treatment of psychotic children in a classroom environment: I. Learning in a large group. Journal of Applied Behavior Analysis, 7, 45-59.

Koegel, R. L., & Schreibman, L. (1982). How to integrate autistic and other severely handicapped children into a classroom. Lawrence, KS: H & H Enterprises.

Liberman, R. (1968). A view of behavior modification projects in California. Behavior Research and Therapy, 6, 331-341.

Lovaas, O. I., Koegel, R. L., Simmons, J. Q., & Long, J. S. (1973). Some generalization and follow-up measures of autistic children in behavior therapy. Journal of Applied Behavior Analysis, 6, 131-166.

Lovaas, O. I., Schaeffer, B., & Simmons, J. Q. (1965). Building social behavior in autistic children by use of electric shock. Journal of Experimental Research in Personality, 1, 99-109.

Lovaas, O. I., Schreibman, L., & Koegel, R. L. (1974). A behavior modification approach to the treatment of autistic children. Journal of Autism and Childhood Schizophrenia, 4, 111-129.

Martin, G. L., England, G., Kaprowy, E., Kilgour, K., & Pilek, V. (1968). Operant conditioning of kindergarten classroom behavior in autistic children. Behavior Research and Therapy, 6, 281-294.

McCarty, T., T., Griffin, S., Apolloni, T., & Shores, R. E. (1977). Increased peer-teaching with group-oriented contingencies for arithmetic performance in behavior-disordered adolescents. Journal of Applied Behavior Analysis, 10, 313.

Metz, J. R. (1965). Conditioning generalized imitation in autistic children. Journal of Experimental Child Psychology, 2, 389-399.

Mitaug, D. E., & Wolfe, M. A. (1976). Employing task arrangements and verbal contingencies to promote verbalizations between retarded persons. Journal of Applied Behavior Analysis, 9, 301-314.

Morris, R. J., & Dolker, M. (1974). Developing cooperative play in socially withdrawn retarded children. Mental Retardation, 12, 24-27.

Nickelsburg, R. T. (1973). Time sampling of work behavior of
mentally retarded trainees. Mental Retardation, 11, 29-32.

Oliver, P. R. (1983). Effects of teaching different tasks in
group versus individual training formats with severely
handicapped individuals. Journal of the Association of the
Severely Handicapped, 8, 79-91.

Oliver, P., & Scott, T. (1981). Group vs. individual training
in establishing generalization of language skills with
severely handicapped individuals. Mental Retardation, 19,
285-289.

Orelove, F. P. (1982). Acquisition of incidental learning in
moderately and severely handicapped adults. Education and
Training of the Mentally Retarded, 17, 131-136.

Peck, C. A. (1985). Increasing opportunities for social
control by children with autism and severe handicaps:
Effects on student behavior and perceived classroom
climate. Journal of the Association for the Severely
Handicapped, 10, 183-193.

Reid, D. H., & Favell, J. E. (1984). Group instruction with
persons who have severe disabilities: A critical review.
Journal of the Association for the Severely Handicapped, 9,
167-177.

Rincover, A., & Koegel, R. L. (1977). Classroom treatment of
autistic children: II. Individualized instruction in a group.
Journal of Abnormal Child Psychology, 5, 113-126.

Rotholz, D. A. (1987). Current considerations on the use of one-to-one instruction with autistic students: Review and recommendations. Education and Treatment of Children, 10, 271-278.

Rotholz, D. A., Baker, M., Hill, C., & Hall, R. V. (1985, May). A comparison of teaching methods with autistic children in a public school classroom. In D. A. Rotholz (Chair), Research with autistic students in public school settings. Symposium presented at the Annual Convention of the Association for Behavior Analysis, Columbus, OH.

Rotholz, D. A., McGrale, J. E., Helm, E., & Hall, R. V. (1985). A comparison of individual and group instructional formats with autistic children. Unpublished manuscript.

Russo, D. C., & Koegel, R. L. (1977). A method for integrating an autistic child into a normal public school classroom. Journal of Applied Behavior Analysis, 10, 579-590.

Rutter, M. (1970). Autism: Educational issues in special education, 59, 6-10.

Sainato, D. M., Strain, P. S., & Lyon, S. R. (1987). Increasing academic responding of handicapped preschool children during group instruction. Journal of the Division for Early Childhood, 12, 23-30.

Schepis, M. M., Reid, D. H., & Fitzgerald, J. R. (1987). Group instruction with profoundly retarded persons: Acquisition, generalization, & maintenance of a

renumerative work skill. <u>Journal</u> <u>of</u> <u>Applied</u> <u>Behavior</u>
<u>Analysis</u> <u>20</u>, 97-105.

Smith, M., & Meyers, A. (1979). Telephone-skills training for
retarded adults: Group and individual demonstrations with
and without verbal instructions. <u>American</u> <u>Journal</u> <u>of</u>
<u>Mental</u> <u>Deficiency</u>, <u>83</u>, 581-587.

Snell, M. E. (1980). Implementing and monitoring the IEP:
Intervention strategies. In M. E. Snell (Ed.), <u>Systematic</u>
<u>instruction</u> <u>of</u> <u>the</u> <u>moderately</u> <u>and</u> <u>severely</u> <u>handicapped</u>
(pp. 391-411). Columbus, OH: Merrill.

Spellman, C., DeBriere, T., Jarboe, D., Campbell, S., &
Harris, C. (1978). Pictorial instruction: Training daily
living skills. In M. E. Snell (Ed.), <u>Systematic</u> <u>instruction</u>
<u>of</u> <u>the</u> <u>moderately</u> <u>and</u> <u>severely</u> <u>handicapped</u> (pp. 391-411).
Columbus, OH: Merrill.

Stabler, B., Gibson, F. W., Cutting, D. S., & Lawrence, P. S.
(1974). Zone planning for accelerating adaptive behavior
in the retarded. <u>Exceptional</u> <u>Children</u>, <u>40</u>, 252-257.

Storm, R., & Willis, J. (1978). Small group training as an
alternative to individual programs for profoundly retarded
persons. <u>American</u> <u>Journal</u> <u>of</u> <u>Mental</u> <u>Deficiency</u>, <u>83</u>, 283-288.

Strain, P. (1975). Increasing social play of severely
retarded preschoolers with socio-dramatic activities.
<u>Mental</u> <u>Retardation</u>, <u>13</u>, 7-9.

Systat, Inc. (1985). System Statistics: SYSTAT (Version 2.0).
    Evanston, IL: Systat, Inc.

Walker, D. (1986). A review of the literature on the use of
    group instruction with students who have autism and other
    developmental disabilities. Unpublished manuscript.
    Juniper Gardens Children's Project, University of Kansas.

Watson, L. R. (1985). The TEACCH communication curriculum.
    In E. Schopler & G. B. Mesibov (Eds.), Communication
    problems in autism (pp. 187-206). New York: Plenum.

Westling, D. L., Ferrell, K., & Swenson, K. (1982).
    Intraclassroom comparison of two arrangements for teaching
    profoundly mentally retarded children. American Journal of
    Mental Deficiency, 86, 601-608.

Whorton, D. (1983). The effects of vocational training on
    work production rates, attention to task, worker rating
    evaluations, and enthusiasm scores for autistic and
    autistic-like adolescents. Unpublished doctoral
    dissertation, University of Kansas.

Whorton, D., Walker, D., Locke, P., Delquadri, J., & Hall, R. V.
    (1987). A comparison of one-to-one instruction by peers,
    one-to-one instruction by adults, and small group
    instruction with children with autism. Unpublished
    manuscript. Juniper Gardens Children's Project, University
    of Kansas.

Whorton, D. M., Walker, D., McGrale, J., Rotholz, D., & Locke,
    P. (1987). Alternative instructional strategies for
    students with autism and other developmental disabilities:
    Peer tutoring and group teaching procedures. Austin, TX: Pro Ed.

Wolf, M. M., Risley, T. R., & Mees, H. (1964). Application of
    operant conditioning procedures to the behavior problems of an
    autistic child. Behavior Research and Therapy, 1, 305-312.

APPENDIX A

ASIEP TEST

AUTISM BEHAVIOR CHECKLIST

Student's Name_____

Date _____

Examiner_____

INSTRUCTIONS: Circle the number to indicate the items that most accurately describe the child.

Item	Sensory 1	Relating 2	Body and Object Use 3	Language 4	Social and Self-Help 5
Whirls self for long periods of time.			4		
Learns a simple task but "forgets" quickly.					2
Child frequently does not attend to social/environmental stimuli.		4			
Does not follow simple commands which are given once (sit down, come here, stand up)				1	
Does not use toys appropriately (spins tires, etc.)			2		
Poor use of visual discrimination when learning (fixates on one characteristic such as size, color or position)	2				
Has no social smile.		2			
Has pronoun reversal (you for I, etc.)				3	
Insists on keeping certain objects with him/her			3		
Seems not to hear, so that a hearing loss is suspected	3				
Speech is atonal and arhythmic.				4	
Rocks self for long periods of time.				4	
Does not (or did not as a baby) reach out when reached for.		2			
Strong reactions to changes in routine/environment					3
Does not respond to own name when called out among two others (Joe, Bill, Mary).				2	
Does a lot of lunging and darting about, interrupting with spinning, toe walking, flapping, etc.			4		
Not responsive to other people's facial expressions/feelings		3			
Seldom uses "yes" or "I"				2	
Has "special abilities" in one area of development, which seems to rule out mental retardation					4
Does not follow simple commands involving prepositions ("put the ball on the box" or "put the ball in the box")				1	
Sometimes shows no "startle response" to a loud noise (may have thought child was deaf).	3				
Flaps hands.			4		
Severe temper tantrums and/or frequent minor tantrums					3
Actively avoids eye contact.		4			
Resists being touched or held		4			
Sometimes painful stimuli such as bruises, cuts and injections evoke no reaction	3				
Is (or was as a baby) stiff and hard to hold		3			
Is flaccid (doesn't cling) when held in arms		2			
Gets desired objects by gesturing				2	
Walks on toes			2		
Hurts others by biting, hitting, kicking, etc.					2
Repeats phrases over and over				3	
Does not imitate other children at play		3			
Often will not blink when a bright light is directed toward eyes.	1				
Hurts self by banging head, biting hand, etc.			2		
Does not wait for needs to be met (wants things immediately).					2
Cannot point to more than five named objects				1	
Has not developed any friendships.		4			
Covers ears at many sounds.	4				
Twirls, spins and bangs objects a lot.			4		
Difficulties with toilet training.					1
Uses 0-5 spontaneous words per day to communicate wants and needs				2	
Often frightened or very anxious.		3			
Squints, frowns or covers eyes when in the presence of natural light	3				
Does not dress self without frequent help					1
Repeats sounds or words over and over				3	
"Looks through" people		4			
Echoes questions or statements made by others				4	
Frequently unaware of surroundings, and may be oblivious to dangerous situations.					2
Prefers to manipulate and be occupied with inanimate things.					4
Will feel, smell and/or taste objects in the environment.			3		
Frequently has no visual reaction to a "new" person.	3				
Gets involved in complicated "rituals" such as lining things up, etc.			4		
Is very destructive (toys and household items are soon broken)			2		
A developmental delay was identified at or before 30 months of age.					1
Uses at least 15 but less than 30 spontaneous phrases daily to communicate.				3	
Stares into space for long periods of time	4				
TOTALS	1	+ 2	+ 3	+ 4	+ 5 =

APPENDIX B

SAMPLE TESTS FOR EACH CLASS

Money Tasks

1. Teacher points to coins, one at a time, and asks student to name the coin. Penny, nickel, dime, quarter.

2. Teacher points to coins, one at a time, and asks students "How much is this worth?".

3. Student matches number to correct coin--5:nickel, 1:penny, 10:dime, 25:quarter.

4. Coins are on table, teacher asks student to give her penny/nickel/ dime/quarter.

5. Worksheet with coin stamps down one side and number value on other side is given to student to match.

6. Worksheet with coin stamps down one side and number word on other side is given to student to match.

7. Pictures from magazines of food items are put on flashcards with prices 1¢, 5¢, 10¢, 25¢. Student matches correct coins to pictures.

8. Student has two sets of flashcards, one set has coin stamp, one set has number value. Student matches card.

9. Teacher lines up coins (2 of each) one of each coin is face up, one is face down--student matches.

10. Teacher places 2-10 pennies in a group and asks student "How much is this worth?".

11. Teacher places nickel plus 1-5 pennies in group and asks student "How much is this worth?".

12. Teacher places dime plus 1-5 pennies in group and asks student "How much is this worth?".

13. Teacher places quarter plus 1-5 pennies in group and asks student "How much is this worth?".

14. Flashcards are made with the above coin combination. Student matches to corresponding number cards.

15. Worksheet with coin combinations (money stamps) down one side and number values down other side are given to students to match.

16. Pictures with price 4, 5, 12, 14, 26, and 29¢ etc., are given to student. He matches with coin combination cards or counts out money.

17. Teacher has change on table. Ask student to give you 2¢, 3¢, 5¢, 6¢...28¢, 29¢,

1. Who is in the picture
2. What are they (he/she) doing
3. Where are they
4. When do you eat
5. How do you get to school
6. Why do you go to the store
7. Who is your teacher
8. What is in the picture
9. Where do you play
10. When do you sleep
11. How do you make a sandwich
12. Why do you laugh
13. What do you do at Crown Center
14. Where do you go after school
15. How does the boy/girl feel
16. Why do you go to Burger King
17. When do you have a party
18. Who is this
19. What is happening in the book
20. When is your birthday
21. Who do you live with
22. How do you build a house
23. Where are the animals
24. Why do you go to the zoo
25. What do you do at Christmas
26. Where do boats go
27. When do you brush your teeth
28. How do you make a picture
29. Why do you wear a coat
30. Who likes candy

1. Shake the bell
2. Stand up and touch your head
3. Open the book
4. Shake the can
5. Put the bean bag under the chair
6. Hold up number 1
7. Put the circle in the box
8. Hold up the color blue
9. Clap your hands
10. Shake your head
11. Put the comb in the box
12. Put the keys in the purse
13. Put the hat on
14. Open the box
15. Stand up and push in your chair
16. Where is the ball in the picture
17. Where is the boy in the picture
18. Where is the girl in the picture
19. Where is the dog in the picture
20. Find the shoe in the picture
21. Find the pants in the picture
22. Find the shirt in the picture
23. Hand me the comb
24. Hand me the shoe
25. Hand me the sock
26. Hand me the hat
27. Hand me the cup
28. Hand me the plate
29. Stand up and touch your head
30. Hold up number 3

Shopping Skills Pre/Post Test

1. Label 5 food items.   5 points

2. Match word/picture cards to 5 items.   5 points

3. Identify quarter. How much: 1, 2 quarters.   3 points

4. Identify $1, $1.25, $1.50.   3 points

5. Identify $2, $2.25, $2.50.   3 points

6. Give me 25¢, 50¢, $1, $2.   4 points

7. Sort pictures into 50¢, $1 box. 3 each, 6 points

8. Give student 5 item word list or picture card,
   ask to get items from shelf.   5 points

9. Where do you buy food?   1 point

10. What can you buy at the grocery store?
    Tell me 5 things.   5 points

11. What do you use to buy food?   1 point

12. Who do you pay?   1 point

    Total: 42 points

APPENDIX C

ON-TASK / SELF-STIMULATION DATA SHEETS

Date:_____ School:_____ Observer:_____ Task:_____

Name   Group

	On-task	
	Self-stim	
	On-task	
	Self-stim	
	On-task	
	Self-stim	

Name   1:1

	On-task	
	Self-stim	
	On-task	
	Self-stim	
	On-task	
	Self-stim	

Name   Tutor

	On-task	
	Self-stim	
	On-task	
	Self-stim	
	On-task	
	Self-stim	

/ = On-task   X = Off-task   + = Self-stim Occurs   - = Self-stim doesn't occur

APPENDIX D

STUDENT AND TEACHER PERFORMANCE DATA SHEETS

Date:_____
Class:_____
Task:_____

Trial Observation Sheet

Format		Model	Prompt	Rein
I	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	-			

Format		Model	Prompt	Rein
I	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			
	C			

APPENDIX E

TEACHER SATISFACTION SURVEY

SATISFACTION SURVEY

KEY

1 - Strongly Agree
2 - Agree
3 - Neutral
4 - Disagree
5 - Strongly Disagree

1. Preparation time for the group teaching   1   2   3   4   5
    format was similar to preparation time
    for 1:1 sessions.

2. The students who participated in the   1   2   3   4   5
    group teaching situation benefited
    academically.

3. Academic benefits were similar in the   1   2   3   4   5
    group teaching and 1:1 sessions.

4. Students who participated in the group   1   2   3   4   5
    teaching situation behaved appropriately.

5. Levels of maladaptive student behavior   1   2   3   4   5
    were similar in both 1:1 and group
    teaching sessions.

6. I would use a group teaching format   1   2   3   4   5
    again with my students.

Comments

1. What skill areas would you use in a group teaching format in the future?

2. Suggestions (i.e., is there anything you would delete, include, or change
    with future groups)?