Increasing the Problem-Solving Skills of Students with Developmental Disabilities Participating in General Education

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ABSTRACT

Although skill in problem solving is critical to success In school and the community, as well as to promoting student self-determination, problem solving remains a neglected curriculum area for students with developmental disabilities. Using the self-determined learning model, 4 students with mental retardation or developmental disabilities were taught problem-solving skills to achieve self-set goals. A multiple-baseline-across-participants design was used, and the instruction was provided in general education content classes. Target behaviors included Increasing appropriate touching, increasing contributions to class discussion, and increasing direction following. Data revealed immediate and dramatic changes for all participants, with performance levels maintained at 10096. Anecdotal social validation data supported the findings. The implications of these findings in respect to promoting self-determination and inclusive practice are discussed.

CRITICAL TO A STUDENT'S SUCCESS IN GENERAL education is his or her ability to problem solve. As we endeavor to fully include students with severe disabilities in general education and to raise our expectations about educational outcomes for them, it is crucial that we teach students to be more adept at problem solving. Peterson (1996) noted that an increased focus on teaching critical thinking and problem solving has been central to restructuring school curriculum reform because such skills provide the basis for all learning. Indeed the ability to retrieve and process information and, in turn, propose a solution to a discernable problem represents a skill that will greatly advance a student's competence and independence (Agran & Wehmeyer, 1999; Stainback & Stainback, 1996). Problem solving involves using available information to identify and design solutions to problems. It is not guess work, but a systematic information processing strategy in which the student is taught to define and analyze a situation to identify potential problems and then identify and execute a solution to those problems (Mithaug, 1993). Unfortunately, many persons with mental retardation or developmental disabilities lack the skills to solve problems in their lives (Wehmeyer & Kelchner, 1995). There are relatively few studies examining the social and functional problem-solving skills of individuals with mental retardation or other cognitive disabilities (Agran & Wehmeyer, 1999). This circumstance most likely exists because of the expectation that students with intellectual or developmental disabilities will not benefit from instruction to promote problem solving (Agran & Wehmeyer, 1999). In a recent study of the degree to which teachers working with adolescents with disabilities knew about and taught the skills leading to self-determination, there was general agreement among the 1,200 respondents that teaching skills like problem solving was important for successful school and community outcomes. When asked, however, if they taught skills like problem solving, teachers of students with mental retardation and other developmental disabilities indicated they did so significantly less frequently than did teachers of students

with learning disabilities because they felt their students would not benefit from such instruction (Wehmeyer, Agran, & Hughes, 2000). What results is that many individuals have a limited set of response options and may rely on previously employed responses, even though they may have been ineffective (Agran & Wehmeyer, 1999).

The lack of instructional opportunities may have negative consequences for students with cognitive disabilities. As mentioned previously, problem solving has also been identified as a key component in promoting and enhancing self-determination. It stands to reason that limited experience in solving problems may greatly compromise an individual's opportunity to achieve a higher quality of life. In effect, all of the strategies associated with promoting self-regulation and self-determination serve in part to help individuals solve problems (Agran & Hughes, 1997). For example, the goal setting and attainment process has a problem-solving process at its core. Mithaug (1996) noted that problem solving reduces the discrepancy between what we have achieved (i.e., our current or actual state) and what we want (i.e., our goal state). This goal discrepancy analysis allows us to identify the problem (i.e., the difference between our actual state and our goal state) and to identify solutions to solve that problem (i.e., narrow the gap between current and goals states). By becoming more effective problem solvers, students are better able to set and attain goals, identify potential response alternatives in the decision-making process, and self-regulate learning (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000).

As previously mentioned, it has been traditionally assumed that individuals with mental retardation or developmental disabilities could not benefit from instruction in problem solving-an assumption that is both potentially erroneous and debilitating (Agran & Wehmeyer, 1999). There is, in fact, an emerging body of research to demonstrate that persons with mental retardation can learn to solve problems across a variety of situations (see Agran & Hughes, 1997; Agran & Wehmeyer, 1999). For example, Hughes and Rusch (1989) taught two individuals with severe mental retardation to solve a series of work-related problems (e.g., obtaining materials put in an incorrect location, responding to a puddle of soap on a work table). The participants were taught to use verbal self-instructions, which included a statement of the problem, a statement of the correct response, a reporting of the response, and a self-reinforcement or praise statement. Both individuals increased the frequency of their correct responses and were able to generalize their responding to untrained situations. Also, nine individuals with mental retardation were taught to use a problem-solving strategy to prevent work-related injuries (Agran, Madison, & Bown, 1995). When presented with 24 different problem situations (e.g., frayed wire, broken glass on floor), the participants were taught to ask and respond to the following questions: How could an accident happen? When could an accident be prevented? Who would you talk to? and What would you do or say? The participants' problem-solving skills increased markedly, and their newly acquired skills generalized to untrained situations. Last, Agran, Blanchard, and Wehmeyer (2000) taught 19 students with mild to severe mental retardation to solve a variety of problems relating to their transition programs (e.g., arranging for transportation to job training site, following directions). Seventeen of the 19 students made substantial progress.

Although there is evidence that individuals with mental retardation and other disabilities can learn to systematically problem solve, most of these studies have been conducted with adults in work or community settings, not with students and certainly not in general education settings. Given the current interest in ensuring access to the general curriculum for all students with disabilities, it is critical that studies be conducted in natural school settings. Indeed, the application of problem-solving strategies to classroom behaviors has received very little attention (Copeland, Hughes, Wehmeyer, Agran, & Fowler, in press; Snyder & Bambara, 1997). The purpose of the present study was to investigate the effects of self-regulated problem-solving instruction on specified classroom behaviors of four middle school students with cognitive or developmental disabilities.

METHOD

Participants

Four students, labeled as having autism, intellectual disabilities, or multiple disabilities, under the state of Utah's classification guidelines, participated in the study. These students were served in a neighborhood middle school and participated in general education to address one or more of their IEP objectives. All students were verbal. Of the four participating students, three were girls and one was a boy. Two students were in the seventh grade, and two were in the eighth grade. See Table I for a summary of the characteristics of each student. Both the students and their parents expressed an interest in problem-solving instruction and gave consent to participate.

Andy was very social by nature, as evidenced by his strong desire to talk to classmates and touch them. Several peers had commented to their teacher that they enjoyed interacting with Andy; however, he did not appear to understand the notion of "personal space. Jane seemed withdrawn during class and was reported to have spent much of her class time daydreaming rather than listening and following directions. Joan also seemed withdrawn from the class. Her teacher indicated that she would like to get her more involved in the class activities, Last, Natalie's general education teacher reported that she often let Natalie do whatever she wanted to (e.g., come to class late,

TABLE 1. Participant Characteristics

Student	Grade	Age	Classification[a] and other characteristics	IQ score	Grade level performance	Target behavior
Andy	8	14	Autism, socially outgoing	FS 64[b]	About grade level	Increase appropriate touching.
Jane	8	15	Intellectual disabilities	FS 73[b]	Two grade levels below	Follow directions
Joan	7	14	Intellectual disabilities, quiet, rarely initiates social interactions	FS 46[b]	About third grade	Contribute to class
Natalie		12	Multiple disabilities, rarely initiates social interaction, wanders through the halls during classes	FS 41[c]	Significantly below third grade	Contribute to class

[a]Based on *Utah Classification Guidelines* (Utah State Office of Education, n.d.). [b] *Weschler Intellgence Scale for Children-Ill* (Wechsler, 1991). [c] *Slosson Intelligence Test* (Slosson, Nicholson, &,Hibpshman, 1991).

leave early, not participate in class activities. Her special education teacher was concerned about this.

Settings

This investigation was conducted at separate locations across students, although all students were enrolled at the same neighborhood middle school. Andy was in a general education science class. Jane participated in a general education life skills class, and Joan and Natalie were enrolled in the same general education English class. Class sizes ranged from 22 to 35 students, with equal numbers of boys and girls. Andy's class (N = 30) and Joan and Natalie's class (N = 25) each had two team teachers, and Jane's class (N = 22) had one teacher. Instructional grouping arrangement across all classes involved small-group instruction and one-to-one instruction, with a limited amount of large-group instruction. There was no peer support.

Dependent Measures

The participating students, along with their special education and general education teachers, identified target behaviors related to their IEP goals. Each student identified a target behavior he or she particularly wanted to improve. Three of the students were aware of their instructional needs and required little support in considering target behavior options. One student, Natalie, required a higher level of teacher assistance. First, the teacher discussed with Natalie several behaviors she thought she might want to change, then asked Natalie if she agreed with her selection. Of those behaviors in which Natalie and the teacher agreed on the need to change, Natalie was asked to select the three behaviors most in need of change, Natalie was asked to select the behavior she wanted to change the most. This became the target behavior.

Andy's chosen goal for improving his social skills in science class was to refrain from inappropriately touching others and only appropriately touching others during the class hour. His target goal was to achieve 80% mastery in appropriate touching. Appropriate touching involved behaviors such as shaking hands, giving a "hi five," and performing other various greetings. Jane identified following directions as her goal. After being directed, she was expected to put her books away, hand in homework, perform tasks as directed, and ask for help when needed. She established a personal goal of correctly performing the target behavior during 90% of opportunities. Joan and Natalie both selected the goal of contributing more in their English class. Specifically, this was to be done by responding to a teacher's or a classmate's question. Both of these students set a personal goal of correctly performing the target behavior during at least 80% of opportunities.

To achieve their target goals, students were expected to follow the problem-solving program taught (see the Training sections). Teachers created from three to five opportunities each day for the students to perform their target behaviors and practice the problem-solving steps daily. That is, specific situations were set up to promote the occurrence of the target behavior. The data reported were based on the students' responses to these opportunities. Although there may have been naturally occurring situations throughout the day that involved student performance of the target behavior, data were restricted to students' responses after the specified stimulus was presented. For example, Andy would grab someone when he transitioned from seatwork to a collaborative learning group or when he entered the

classroom. Likewise, when he worked with a peer tutor or in a group activity, he often would touch another person. During training, Andy was taught to respond appropriately to these situations. Likewise, Jane was given from three to five directions each day in her life skills class. As previously noted, there were three to five opportunities for Joan and Natalie to perform their target behaviors (i.e., responding to questions). The teacher or a designated student was requested to ask Joan or Natalie three to five questions during an observation session.

Observation and Recording Procedures

A special education teacher participated in the study by identifying students and their respective general education teachers. In one case, the teacher identified a paraprofessional as the data collector. The teacher provided input about potential target behaviors, the data collection forms, and the recording procedures. Three general education teachers and the paraprofessional collected data on a daily basis throughout the baseline, training, and maintenance conditions of the study. A pool of potential problems that students might encounter each day was given to the observers to determine the student's use of the strategy. If a situation not listed was observed, it was not counted. The observers gave students 1 point for a correct response and 0 points for no response (or an incorrect response). The observer marked "NA" (not available) if a task was listed but not required on *a* given day.

Observer Training. The teachers and paraprofessional participated in two training sessions prior to baseline data collection. In the first training session, the students were introduced to a self-regulated problem-solving strategy through the self-determined learning model of instruction (Mithaug, Wehmeyer, Agran, Martin, & Palmer, 1998; Wehmeyer, Palmer, et al., 2000; see the Self-Determined Learning Model of Instruction section). In the second training session, the observers were taught to identify the target behaviors and how to record their observations. In each case, an individual form was developed for each student based on the input of the special and general educators. On-site training observations were conducted until observers met an 80% reliability criterion for two consecutive observation sessions. A total of nine observations were completed over a 3-day period with 98% reliability.

Interobserver Agreement. Agreement data across observers were calculated across approximately 28% of the total number of sessions per participant per condition. A point-by-point procedure was used to calculate interobserver agreement throughout the investigation. The percentage of agreement was computed by dividing the total number of agreement by the total number of agreements plus disagreements and multiplying by 100. The range of interobserver agreement across baseline sessions was 93% to 100%, with a mean of 98%. During training and posttraining, the interobserver agreement mean was 100%. It should be noted that because of time constraints, end-of-year school activities, and student absences, agreement data were not available for several students in the maintenance condition, which occurred at the end of the school year.

Goal Attainment Scale

During the baseline condition, teachers were asked to complete the *Goal Attainment Scale* (GAS) for each student. Students also completed the *Goal Attainment Scale* prior to the training condition. The GAS has been used to measure goal attainment and program effectiveness (Kiresuk & Lund, 1976). The GAS involves establishing goals and specifying a range of outcomes or behaviors that indicate progress in achieving these goals (Can, 1979). Based on the student's current level of performance, the teacher was asked to project the student's posttraining performance outcome. Teachers provided educated guesses about five levels of performance. Teachers first identified what would indicate expected or adequate progress toward achieving the goal. Based on that estimate, they identified a "less favorable" outcome and a "least favorable" outcome, followed in turn by "more favorable" and "most favorable" outcomes.

Social Validation

At the conclusion of the study, teachers were asked to report on their perceptions of the effects of the problem-solving process on student performance. Specifically, they were asked to detail students' progress and changes made by students. Additional data from students were obtained based on their responses to Phase 3 of the model of teaching (see the following section). The students responded to the following six questions: "What have I learned? What barriers have been removed? What has changed about what I didn't know? Do I know what I want to know? Did I finish my goal? and How do I feel about the results?" The questions were restated or modified if the students had difficulty comprehending them.

Self-Determined Learning Model of Instruction

The self-determined learning model of instruction is designed to enable teachers to teach students a self-regulated problem-solving process in which students set their own goals and select and use one or more student-directed learning strategies (e.g., self-monitoring, self-instruction) to achieve them. The model is based on the premise that self-determined students persistently regulate their problem solving to achieve their goals. As a self-regulated problem-solving strategy, the process involves a means-ends sequence (Mithaug et al., 1998). That is, solving a problem identified by one question (e.g., "What is my goal?") is the means of solving the problem represented by another question in the sequence (e.g., "What can I do to make this happen?). This means-ends sequence connects needs and interests to actions and results via goals and plans. The questions in the sequence help guide students' problem

solving toward development of this means-ends chain between what the student has (actual or present situation) and what he or she desires (a goal state or expected situation). As such, problem solving serves to allow the student to achieve what he or she wants. As suggested by Mithaug et al., self-determination goes beyond goal setting or choice making by involving a strategy designed to construct a means-end chain to move people from where they are to where they want to be. The model includes three instructional phases. Each phase presents a problem to be solved by the student. To address the problem, there are several questions the student needs to solve. The first phase ("set a goal") involves goal setting in which the student is instructed to identify what he or she desires, what must be done or learned to achieve the goal, and what barriers exist that may counter such efforts. In the second phase ("take action"), the student is taught to develop an action plan to achieve the self-selected goal and to develop. a schedule for implementation of the plan. After the plan is developed, it is implemented. These two phases are conducted prior to the beginning of the baseline condition. Last, in the third phase ("adjust goal or plan"), the student is taught to self-evaluate progress toward the goal. Specifically, the student is asked to determine what he or she has achieved; what barriers, if any, were removed; and what has changed for him or her. With this information, the student can decide if progress has been adequate. If not, the student can keep working on the goal set, change the goal, or revise the action plan (e.g., select a new learning strategy). In each phase, the student is engaging in self-regulated learning and acts as the causal agent for choices, decisions, and actions.

Experimental Design and Conditions

The effects of the problem-solving strategy were evaluated in a multiple-baseline-across-participants design. The design was employed to assess the staggered effect of the intervention over time. The experimental conditions included baseline, training, and posttraining.

The training involved teaching students to set a goal, create an action plan, and evaluate the outcome. In this study, students focused their Phase I goal-setting activities on generating a goal to resolve a "problem" related to their participation in general education and then in Phase 2 were taught a problem-solving strategy to employ as part of the action plan to achieve the goal. Each student completed two worksheets leading him or her through the first two phases of the instructional model. In the course of completing the worksheets, students responded to such questions as, "What do you have to do *or* change to reach your goal?" and "What can you do to overcome or do away with obstacles?" While guiding students through the phase worksheets, the facilitator instructed them on how to use the problem-solving strategy.

Baseline. Throughout baseline, student performance of target behavior was observed. No feedback or reinforcement was provided. Advancement into the next experimental condition was predicated on the stability of mean performance.

Training. Training began by teaching students the sequence of steps in problem solving. First, the student was taught to verbalize, "What is the problem?" and to say out loud what it was. Second, the student was taught to ask, "What can I do about it?" and to verbalize the proposed solution. Third, the student was taught to implement the proposed solution. Last, the student was taught to ask, "Did that fix the problem?" For example, Natalie was taught to ask herself, "What is the problem?" and to respond by saying, "I need to say at least one sentence during class." After responding to teacher or student questions, she would ask, "Did that fix the problem?" Following, she would count the number of verbal comments she had made. Next, she would ask, "Did I meet my goal?" Similarly, Jane, using the same strategy, would identify her problem (not following directions), cue herself to follow directions, then determine if she fixed the problem and met her goal. Cue cards were developed to teach students the steps and their sequence in the process, and students were instructed to refer to the cards if they forgot the steps in the strategy. Students were expected to repeat the questions out loud until the trainer was assured that they understood and could recall the steps and their sequence. Students were not expected to ask the questions out loud in the general education classroom setting but were expected to use the steps and (when necessary, use a cue card) to work through each daily challenge. Praise and corrective feedback were provided throughout the training condition. When a student began the training condition, the teacher provided opportunities for practicing the problem-solving steps in the classroom. Instruction was provided at the beginning of the class, and students were encouraged to use the strategy whenever necessary during the class.

Once students knew the problem-solving questions in. sequence, they were expected to use the strategy to achieve their target goal. For instance, Andy asked, "What is the problem?" and responded with, "Kids don't want me always touching them." Andy would then ask, "What can I do about it?" He might respond, "I can keep my hands to myself and only touch them appropriately." Next, he would implement his solution by refraining from touching other students in *his* science class except when appropriate (e.g., greeting, completion of a group task). Finally, at the conclusion of the class hour, he would ask, "Did that work?" and he might respond, "Yes, it did." The problem-solving strategy provided students with a means of problem solving in the classroom setting by making them responsible for working out solutions for challenges they identified as important to themselves.

Maintenance. Mastery was 80% correct performance per opportunity across 8 days. Once mastery was assured, no further praise or feedback was given. The teacher or paraprofessional observing the student continued to observe and record data on the target behavior. Due to

cord data on the target behavior. Due to time constraints with the ending of the school year, the maintenance condition was 2 weeks for Andy, 5 days for Jane, and 2 days each for Joan and Natalie.

RESULTS

Baseline

All students consistently performed the target behaviors at low frequency levels (see Figure 1). Andy had a performance baseline mean of 9% with a range of 0% to 20%. Jane performed consistently at a baseline mean of 20%. The baseline mean for both Joan and Natalie was 0%.

Training

During the training condition, there was a marked increase in student target performance for all participating students. The mean number of training sessions to achieve 80% mastery was 2.3 sessions. The three students who maintained a mean of 100% throughout the training condition were Andy (in training for 8 days), Jane (in training for 9 days), and Natalie (in training condition for 5 days). The mean for Joan in the 8 days of her training condition was 88% with a range of 40% to 100%. The limited length of Natalie's training condition was due to the closing of school for the summer break.

Maintenance

As mentioned earlier, when a student's daily mean score reached at least 80% for 8 consecutive training days, the student was placed in maintenance. In this condition, Andy, Jane and Joan all maintained a mean of 100%. Andy remained in maintenance for 8 days, Jane for 5 days, and Joan for 2 days. No maintenance data are available for Natalie, as she was still in training at the close of school.

Goal Attainment Scale

Based on the GAS pretests completed by the students, all of the participating students achieved above what teachers expected they would achieve. Natalie, Andy, and Joan all established personal goals of achieving 80% correct responses, but each achieved 100% and thus exceeded their goals by 20%. Jane established a personal goal of 90% and achieved 100%, exceeding her goal by 10%.

Social Validation

All four of the participating students provided feedback on the value of using and verbalizing the problem-solving strategy at the conclusion of the study. In response to the question, "What have I learned?" three students said they learned the target skill, and one said she learned the problem-solving steps. Specifically, Andy said he learned to keep an arm's length away from the kids in his class and only touch them when it was appropriate. Jane said she was following directions and doing her work better. Both Joan and Natalie said they talked more to their friends in class.

To the question, "What barriers have been removed?" students responded that they now solve problems, are more comfortable in their general education class, have more fun, or have more friends. When asked, "What has changed about what I didn't know?" students answered that their social lives have improved and they work better in class. All four students reported that they learned what they wanted to know. Further, they indicated that they finished their goals. Three reported feeling "great" or "good" about their achievements, and two reported feeling "proud of myself."

Although formal social validation data were not obtained, the students' teachers provided some anecdotes. Andy's general education teacher said that his classroom behavior improved considerably. She said that she knew he liked to talk and get attention, so when they put together skits, she asked if he would be the lead player. She noted that he began to express himself and to engage with others in socially appropriate ways. Also, she noted that she tried to come up with problematic situations in her classroom so he would use the problem-solving strategy.

Jane's teacher indicated that the intervention was helpful in keeping Jane engaged. She indicated that Jane was never a disturbance in class, but that she was frequently unengaged. The strategy appeared to produce positive results. Also, she noted an improvement in Jane's social interactions.

Joan's teacher said that she noticed an increased level of comfort for Joan in the class. Not only did Joan initiate more in class discussion, but her peers appeared to respond in kind. Last, Natalie's teacher said she appreciated the improvements she observed in her, but didn't clarify specifically what those improvements were.

DISCUSSION

The findings of the present study suggest that students with varying levels of mental retardation and other disabilities can learn to use a self-regulated problem-solving strategy to achieve self-selected goals. Although baseline levels for all participating students ranged between 0% and 20%, their performance levels after receiving instruction increased to 100% and maintained that level. Furthermore, the gains achieved by these students exceeded teacher-selected expectations based on the GAS. Last, social validation data indicated that all the students had positive feelings about the strategy and their ability to problem solve.

We believe that the present study contributes to the research literature in several ways. First, because students with intellectual disabilities often have great difficulty with problem solving, problem solving represents a critical

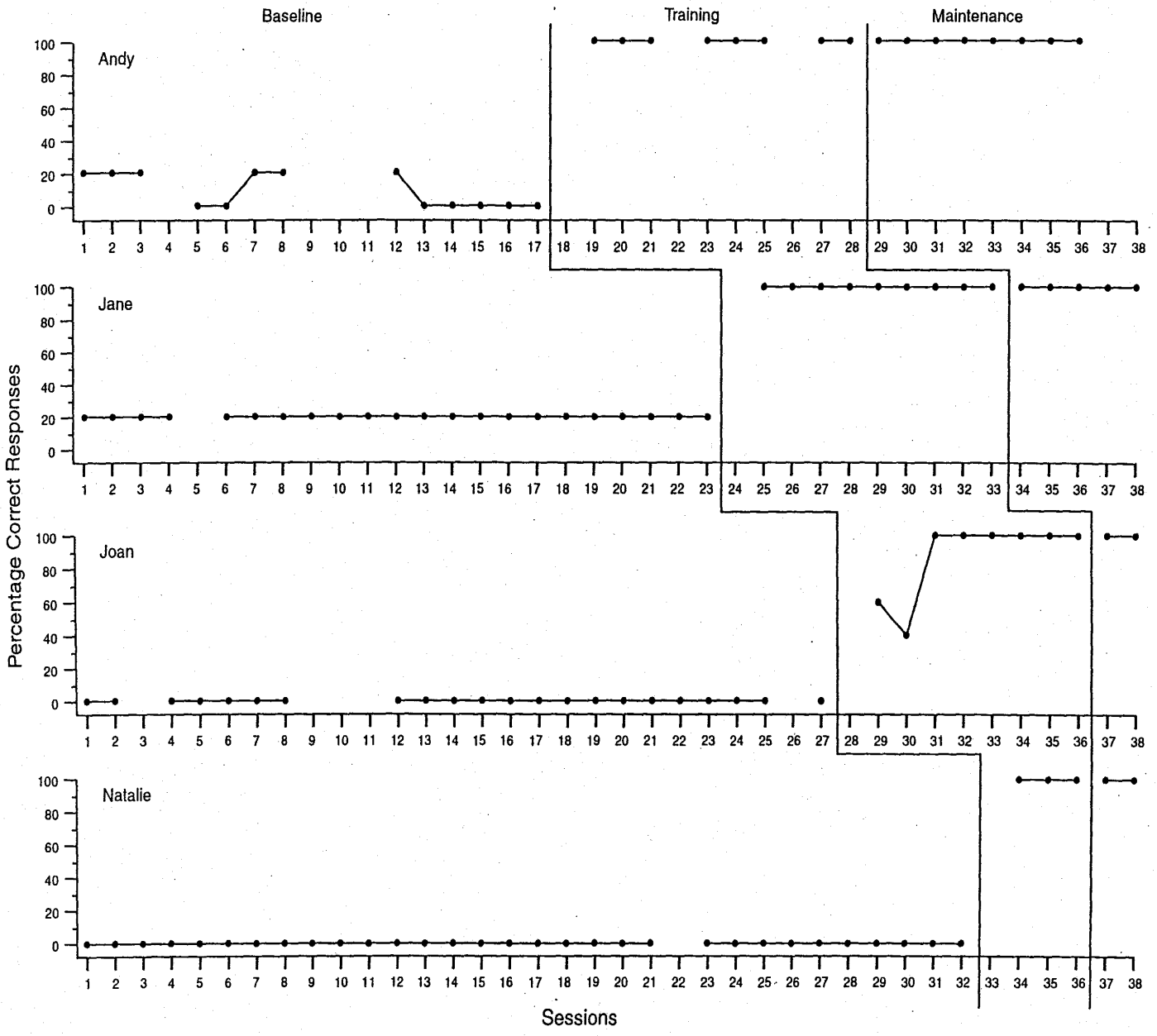

FIGURE 1. Percentage of correct responses of students across baseline, training, and maintenance conditions.

need for inclusive education (Stainback & Stainback, 1992). However, there are few applied studies that have investigated the effects of a problem-solving strategy with students with mental retardation; of those reported in the literature (see Agran & Wehmeyer, 1999), few have been conducted in classroom settings. In the present study, all instruction was provided in general education content classes.

Graden and Bauer (1992) suggested that problem solving needs to be unobtrusive and fit into the natural context of the classroom. In the present study an *embedded functional skills* approach was used, in which problem solving was embedded or integrated into the existing instructional programming conducted at that time (Ford et al., 1989).

Second, the effects of the problem-solving strategy were examined across a number of social skills (e.g., contributing to class, following directions) and academic skills. As noted previously, applications of problem-solving strategies for students with mental retardation and developmental disabilities have been largely restricted to work behaviors. The findings suggest that a self-regulated problem-solving strategy can potentially be used to address different instructional needs. In recent surveys of samples of both general and special educators on the curriculum domains and skills they value for students with mild to severe disabilities in inclusive settings, the highest ranked skills area was problem solving (4.6 on a scale of 1 to 5; Agran & Alper, 2000). The teachers in this survey indicated that problem solving was their students' greatest skill deficit. Furthermore, although problem solving was ranked as the second most important self-determination instruction area or student-directed learning strategy (choice making was first), the data revealed that few teachers systematically teach these skills. The present study suggested that teachers can instruct students with mental retardation to use a systematic problem-solving strategy. Indeed, the dramatic and immediate behavior changes reported for all participants suggests a strong functional relationship between the independent and dependent variables. The fact that performance levels for all students increased to and maintained at 100% relatively quickly suggests that the target behavior may have been already acquired by the students but was infrequently and inconsistently performed. Nevertheless, the fact that the behavior positively changed only after the intervention was implemented suggests that the experiment was controlled and that the program assisted in establishing stimulus control. As Watson and Tharp (1989) indicated, stimulus control may represent an important goal for a self-directed plan. In the present study, the problem-solving questions may have served to cue the desired response and establish stimulus control, with the verbal solutions acting as reinforcers.

Third, the three phases of the self-determined learning model of instruction (i.e., set a goal, take action, adjust goal or plan) provide continuous opportunities for participants to be involved in all aspects of self-directed change. Each student was involved in identifying what he or she wanted to change or learn. Then, the student was taught to develop a plan, follow it, and determine if he or she achieved the stated goal. As suggested by Agran and Wehmeyer (1999), problem solving involves several overlapping strategies, including goal setting, self-monitoring, and self-evaluation. Although the students learned a specific problem-solving strategy, functionally they were employing several strategies. No doubt, the greater their level of involvement in their self-directed behavior change, the greater the positive effect on their self-determination. In many other investigations on the effects of strategies to promote self-determination, students have used one specific strategy. As in the present study, the collateral use of several strategies to produce a desired change is encouraged.

Although desired behavior changes were reported for all students, a number of limitations warrant attention. First, the findings are specific to the target behaviors investigated. Needless to say, future research on the effects of this strategy on other behaviors is needed. Second, because of time constraints (end of school year), we were only able to collect limited maintenance data. However, the maintenance data obtained do suggest strong findings. Clearly, there are insufficient data to demonstrate durable behavior change. Nevertheless, the fact that all students continued to perform at 100% after training was withdrawn suggests that reinforcers were present to maintain the target behaviors. With the continued presence of these reinforcers, the behaviors may continue to be performed at desired levels, but this remains unknown. Additionally, no data on generalized effects were obtained, but we suggest this is not a major threat. First; because the study was conducted in the natural performance setting, generalization across settings was not warranted. Second, as stated previously, the students were asked to identify one target behavior they wanted to improve. We believed that asking students to identify multiple behaviors would have been too demanding, and having us identify additional behaviors would have compromised the intent of the investigations-to discover the effects of self-regulated problem solving. Needless to say, further research on programming to facilitate generalization on collateral behaviors is warranted. Also, data on the procedural integrity of the intervention were not collected. Although instruction involved following a formal script, as described in the Method section, we were unable to collect data on this aspect of its implementation. Because of the strong level change in performance observed for all participants and the high level of interobserver agreement, we suggest that this lack of procedural reliability does not represent a serious threat. Nevertheless, the omission of these data does represent a limitation. Last, data were not obtained on the students' responses to naturally occurring antecedent events that warranted problem solving. Given the dramatic level changes reported for all students, it is likely that they used the strategy at times other than the formal observations, but no data were collected to support this contention. In future investigations of the effects of problem solving strategies, such observations are warranted.

Practical Implications

Despite the limitations discussed in the previous section, we suggest that the findings reported provide clear evidence that students with mental retardation and developmental disabilities can learn to use a problem-solving strategy to modify a variety of social and communication skills in an inclusive setting. It is strikingly clear that student-directed learning strategies are at best underutilized and given low instructional priority (Agran, Snow, & Swaner, 1999; Martin & Huber Marshall, 1995; Wehmeyer, Agran, & Hughes, 2000). Although problem solving represents a major deficit for many students with disabilities (Schuler & Perez, 1987; Smith, 1989), it is rarely included in educational programs for students with mental retardation (Agran & Wehmeyer, 1999). Given the ongoing need to solve problems on a daily basis, we find it disheartening that students are leaving schools without these skills. The findings of the present study contribute to the emerging self-determination literature and demonstrate that students can indeed have an active, problem-solving role in their own learning and development. More specifically, in the present study, all participants learned to use the strategies in a relatively brief period (i.e., from three to nine instructional sessions). These findings contribute to the emerging knowledge base that students with developmental disabilities or mental retardation can learn to problem solve and regulate their own behavior.

Knowlton (1998) suggested three levels of curricular modification to enhance student success within the general curriculum. These include *curriculum adaptation,* which involves modifying the presentation and representation of content; *curricular augmentation,* which involves teaching students to use one or more self-regulation or student-directed learning strategies to promote their learning; and *curriculum alteration,* which involves changing the curriculum to address specific student needs. Of these three levels of curriculum modification, curricular augmentation has been advanced because it changes neither the curriculum nor the way it is presented but instead provides the student with one or more learning strategies that will allow him or her to become "active learners" and learn to regulate his or her own behavior (Agran, 1997). Goal-setting and problem-solving skills represent important and effective augmentative skills. There is no question that students who have difficulty problem solving will have difficulty with every aspect of school life, including their acquisition and performance of academic and functional skills, the development of positive social relationships, daily management of activities, decision making, and personal future and IEP planning. Many instructional activities, including cooperative learning groups, peer instruction, and independent seatwork, involve problem solving. The problem-solving approach described in the present study represents a validated, student-friendly strategy that provides students with an opportunity to exercise choice and control over self-selected instructional and learning supports.

Mithaug, Mithaug, Agran, Martin, and Wehmeyer (in press) suggest that learning functions as an adaptation to a new circumstance. As such, students regulate their expectations, choices, and actions to adapt to those circumstances so they can learn as much from them in order to achieve self-selected goals. Successful adjustments involve self-regulated problem solving to assist students in discovering what they do not know and allowing them to engage in actions that can maximize learning by reducing the discrepancy between what they want or need and how they are to meet their goals. We believe the problem-solving strategy employed in the present study has great utility for maximizing learning and promoting inclusive practice as it provides a strategic approach that allows students to set their own goals, develop and execute action plans, and adjust their goals and/or plans as needed. By engaging in these three operations, the problem or challenge is mitigated by the fact that the solution (learning) is self-directed and therefore will enhance student motivation and engagement. ■

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AUTHORS' NOTE

The study was supported in part by Department of Education Grant No. H023D9790502-98 awarded to Drs. Agran, Hughes, and Wehmeyer, and does not necessarily reflect the opinions of the Office of Special Education Programs.

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Received March 2001
Revision received July 2001
Initial acceptance September 2001
Final acceptance December 2001