Increasing Skill Performances of Problem Solving in Students with Intellectual Disabilities

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Abstract: Problem-solving instruction facilitates children in becoming successful real-world problem solvers. Research that incorporates problem-solving instruction has been limited for students with mild and moderate intellectual disabilities. However, this population of students needs increased opportunities to learn the skills of problem solving. Using a problem-solving strategy, four students with mild and moderate intellectual disabilities were taught to identify problems and possible solutions, identify best solutions, and self-evaluate. A multiple-probe design was used to increase students’ skill performances of problem solving. Data suggested that all students learned to identify problems and possible solutions. In addition, students generalized and applied their problem-solving skills during role-play sessions.

Self-determination has been defined as both a civil right and civic responsibility for persons with disabilities (Skouge, Kelly, Roberts, Leake, & Stodden, 2007). The development of self-determination is a best practice for children with disabilities, according to the 2003 President’s Commission on Excellence in Special Education Report (Wehmeyer, Gragoudas, & Shogren, 2006). Teachers need to be aware of the importance of self-determination instruction, and how to guide instruction to meet individual needs of students with disabilities, while relating skills to state standards (Fiedler & Danneker, 2007; Wehmeyer et al., 2006). Agran, Blanchard, and Wehmeyer (2000) indentified nine component elements of self-determined behavior as: (a) choice-making, (b) decision-making, (c) problem solving, (d) goal-setting, (e) independence, (f) self-evaluation, (g) self-instruction, (h) self-advocacy, (i) internal locus of control, (j) positive outcomes of efficacy, (k) self-awareness, and (l) self-knowledge. Students with disabilities need to develop self-determination for autonomy and quality of life (Agran & Hughes, 2005), and teachers need to utilize strategies that facilitate students in developing self-determination (Thoma, Nathanson, Baker, & Tamura, 2002; Thoma, Ragan, & Baker, 2001). Palmer and Wehmeyer noted that self-determination provides the construct for students with disabilities to pursue their interests, make decisions, and solve problems (2002).

Schools, teachers, and parents must work together to help students with disabilities learn the skills that lead to self-determination and problem-solving (Glago, 2005). One skill component of self-determination is problem solving (Wehmeyer et al., 2006). Problem solving is needed in everyday life. Glago, Mastropieri, and Scruuggs (2009) stressed the importance of teaching students with disabilities the skills of problem solving in order to prepare them for inclusive environments. Problem-solving instruction encourages student acquisition of personal efficacy and self-awareness. When students learn to find answers to their own questions they become less dependent, more independent, and self-reliant (Scruuggs, & Mastropieri, 1997). Particularly, when presented with problem situations, students with intellectual disabilities have difficulty generating various courses of actions or choosing a course of action (Agran & Wehmeyer, 2005; Cole &
Barrett, 1997; Crites & Dunn, 2004, Wehmeyer, Agran, & Hughes, 2000). Instead, these students often choose the easier or familiar course of action (Agran & Wehmeyer).

The literature indicated that the use of self-regulated problem-solving instruction increased self-determination skills in students with intellectual disabilities (Palmer & Wehmeyer, 2003; Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). McGlashing-Johnson, Agran, Sitlington, Cavin, and Wehmeyer, (2003) noted that students with intellectual disabilities had the aptitudes to learn problem-solving skills that ultimately led to self-determination and successful life outcomes. Problem-solving instruction can be useful in helping students with intellectual disabilities achieve their IEP goals while accessing the general education curriculum (Wehmeyer, 2006). However, without a systematic method of instruction, these students often lack the necessary skills to identify problems, devise a plan, and self-evaluate. Self-regulated problem-solving instruction should utilize strategies that allow for practice of problem-solving skills and involve the use of real-world or interest-based problems (Edeh, 2006; Palmer & Wehmeyer, 2003). Edeh noted that problem-solving skill deficits in students with intellectual disabilities could be explained by the methods and materials used in instruction. The practice of problem-solving steps, and the use of scenarios and role-play, are effective methods to help students learn the skills of problem solving (Glago, 2005).

This study’s methodology partially replicated research conducted by Glago (2005). Glago’s study incorporated the teaching of problem-solving skills to students with learning and emotional disabilities, whereas, this study incorporated the teaching of problem-solving skills to students with intellectual disabilities. Additionally, the study added to the existing problem-solving research by incorporating a longer generalization and maintenance phase (Agran et al., 2000, 2002; Glago; Glago et al., 2009). Researchers recommended incorporating research-based strategies for individuals with intellectual disabilities that taught problem solving, application, maintenance, and the generalization of skills (Crites & Dunn, 2004). Yet, researchers noted that a longer generalization condition was needed across settings to demonstrate the efficacy of instruction (Crites & Dunn; Palmer, Wehmeyer, Gipson, & Agran 2004).

This study examined the effects of problem-solving instruction to increase skill performances of problem solving in middle school students with intellectual disabilities. The purpose of this study was to develop a systematic problem-solving intervention designed to teach middle school age students with intellectual disabilities, to identify problems and possible solutions, identify best solutions, and self-evaluate. This problem-solving study analyzed the following five research questions: (a) What were the effects of problem-solving instruction on the skill performances of problem solving in students with intellectual disabilities? (b) To what degree were students with intellectual disabilities able to identify the steps of problem solving? (c) To what degree did students with intellectual disabilities generalize their skill performances of problem solving? (d) To what degree did students with intellectual disabilities maintain their skill performances of problem solving? (e) What effect did problem-solving instruction have on students’ with intellectual disabilities perceptions of their skill performances of problem solving? (f) What were teacher perceptions about implementing the problem-solving strategy to increase skill performances of problem solving in students with intellectual disabilities?

**Method**

**Setting**

This study was conducted in an urban middle school setting located in a southwestern state. The school was a designated professional development model, and part of a district that served approximately 310,000 students. The school served 929 students, who were 47.1% female and 42.9% male. The school’s student demographics included 130 special education students and 328 English Language Learners. The school’s student demographics included the following ethnicities: 73.6% Hispanic, 9.5% African American, 1.2% Asian/Pacific Islanders, 8.7% Caucasian, and 1.2% American Alaskan/Native American.

Students received instruction in a self-con-
tained classroom for students with intellectual disabilities. The special education teacher utilized a small learning center (i.e., small round table with three chairs) for instruction. Instruction occurred at the same time of the day, every day of the week, and during the same period. The teacher directed students to a large round table in the middle of the classroom. The designated area promoted teacher-student direct-instruction, individualized instruction, and discussion.

Participants

School administrators and teachers identified students receiving special education services under the primary category of mental retardation. Students included one male and three females, ages 11 to 12. The mean age of the students was 11.7. Each student received special education services in a self-contained classroom for students with mental retardation. Student A was a seventh grade Asian male, age 12. Student B was a sixth grade Caucasian female, age 12. Student C was a sixth grade African American female, age 11. Student D was a sixth grade Hispanic female, age 12. Student A was identified as a student with moderate mental retardation and multiple impairments, (b) Student B was identified as a student with mild mental retardation, (c) Student C was identified as a student with moderate mental retardation and orthopedic impairments, and (d) Student D was identified as a student with mild mental retardation.

One special education teacher participated in the study. The teacher was a special education teacher with 23 years teaching experience. The teacher held a master’s degree in education with an endorsement in mental retardation. The teacher had been employed by the current school district for 23 years and had taught at both the elementary and middle school level. Her current assignment was a self-contained “mentally challenged classroom.”

Definition and Measurement of Dependent Variable

Two dependent variables were measured in this study: identifying the problem and generating a possible solution. The investigator and doctoral student collected dependent variable data during pre-study, treatment, generalization, maintenance, and retention. Identifying the problem was defined as possessing the skill to express what the problem was (e.g., There is no more chocolate milk to go with Billy’s pizza). Generating a possible solution was defined as possessing the skills to consider optional answers to the problem (e.g., Billy could drink strawberry milk with his pizza).

Definition of Independent Variable

The independent variable used during this study was defined as a problem-solving strategy. Students were taught three problem-solving steps: (a) “What’s the problem?” (b) “How can you fix it?” and (c) “Why would it work?” The teacher was instructed to follow the sequential steps outlined in a daily script for problem-solving instruction. The script described the order to be followed (i.e., goals, materials, advance organizer, describe and model, guided practice, role-play practice, problem-solving practice, feedback) when introducing students to the problem-solving instruction.

Procedural Fidelity Checklist

A procedural fidelity checklist was used to ensure the teacher’s adherence to the steps outlined in the daily script (see Table 1). The investigator and doctoral student collected procedural fidelity data during the treatment phase.

Research Design

This study used a multiple-probe design (Horner & Baer, 1978) with pre-study (i.e., baseline), treatment, and maintenance phases. During Phase One, the investigator and doctoral student collected baseline data on students’ problem-solving skills, when presented with a problem situation baseline measure. During Phase Two, students received comprehensive problem-solving training (e.g., direct instruction, modeling, role-play). During Phase Three, students’ self-evaluated problem-solving skills, post-test measures were conducted, and generalization, maintenance, and retention data were gathered. This study was conducted over a 16-week period.
Data Collectors

The investigator was the primary person responsible for: (a) teacher/interrater training, (b) implementation of the intervention, and (c) collecting pre- and post-data. One doctoral student (i.e., fifth-year doctoral student) assisted the investigator with data collection, as well as interobserver reliability and procedural fidelity checks.

Phase One: Pre-Study

The purpose of Phase One: (pre-study) was to gather: (a) teacher, (b) student, and (c) parent consent. A professional translator translated the informed consent and demographic survey (i.e., English to Spanish) to facilitate understanding for Spanish speaking parents. Parents were given a copy of Palmer and Wehmeyer’s, A Parent’s Guide to the Self-Determined Learning Model for Early Elementary Students (2002), and were informed that modifications would be made to the model. Parents were encouraged to ask questions and were assured that their child’s participation was voluntary and identities were kept strictly confidential. Parents signed an informed consent in order for their child to participate in the study. Students were asked to sign a student assent form to participate in the study. In addition, during this phase, the investigator conducted teacher training.

Teacher Training

The teacher received one-on-one training, conducted by the investigator. Training consisted of 30-minute sessions over a 5-day time period. Training consisted of introducing the teacher to the three phases of the Self-Determined Learning Model of Instruction (Wehmeyer et al., 2006): (a) setting a goal, (b) developing an action plan, and (c) evaluating progress. The teacher was informed that the problem-solving intervention incorporated a modified version of the model. In addition, the teacher was given the daily script for problem-solving instruction. Following the daily script, and with the assistance of a student aide (i.e., after parental consent was given), the investigator modeled problem-solving instruction for the teacher. At least one hour was used for investigator to student aide mod-

<table>
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<th>Table 1</th>
<th>Procedural Fidelity Checklist</th>
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<tr>
<td>Teacher:</td>
<td>Session #</td>
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<td>Observer:</td>
<td>Date:</td>
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<td>Condition: Treatment</td>
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1. Pushes record button on Digital Voice Recorder
2. Tells the student what he or she will be doing and why
3. Teaches or reviews three problem-solving steps
4. Utilizes cues (e.g., 3 x 5 cards, worksheet)
5. Utilizes problem-solving books when appropriate
6. Introduces problem situations
7. Facilitates student in defining the problem
8. Facilitates student in identifying possible solution(s)
9. Provides feedback (e.g., high fives, smiles)
10. Utilizes role-play or discussion during problem-solving instruction
11. Models how to ask a question

Increasing Skill Performances of Problem Solving / 515
eling. Teacher concerns and questions were addressed, during and after modeling.

Materials

The instructional materials were modified from A Parent’s Guide to the Self-Determined Learning Model for Early Students and Glago’s study (Palmer & Wehmeyer, 2002; Glago, 2005). Palmer and Wehmeyer’s questions were modified to support students’ comprehension of the problem-solving instruction. The questions used in the study were: (a) “What’s the problem?”; (b) “How can you fix it?”; and (c) “Why would it work?” Glago’s measures and questionnaires were modified to support student understanding and ability levels. For example, students in Glago’s study learned five problem-solving steps, whereas students in this study learned three problem-solving steps. A problem-solving step worksheet was created to assist students with remembering the three modified steps (see Figure 1). The worksheet (adapted from Glago, 2005) was used to create student-made 3 × 5 flash cards.

Problem situation measures presented 10 problem situations (adapted from Glago, 2005). The problem situations were similar to those that might be encountered in the student’s school or home environment. The measures gave students an opportunity to brainstorm possible solutions. A Parent’s Guide to the Self-Determined Learning Model for Early Elementary Students (Palmer & Wehmeyer, 2002), provided the teacher and parents with a strategy for teaching students problem-solving skills. The model was modified for students with intellectual disabilities (Palmer & Wehmeyer, 2003). Palmer and Wehmeyer (2002) identified problem-solving books to be shared with students. The problem-solving storybook titles used in this study included: (a) An Evening at Alfie’s (Hughes, 1984), (b) Princess Smartypants (Cole, 1986), (c) No Peas for Nellie (Demarest, 1991) and (d) Sweet Clara and the Freedom Quilt (Hopkinson, 1993). The teacher read and discussed the books with the students, during treatment. In addition, the teacher used an Olympus Digital Voice Recorder to record students’ responses. Recordings were made throughout the problem-solving intervention and served as documentation.

Procedure

Baseline. Baseline criterion performance was set at a minimum of three data points with more than 20% variability, with stability in trends and levels before introducing treatment (Horner & Baer, 1978; Horner et al., 2005; Tawney & Gast, 1984). Problem situation baseline measures were used for baseline assessment. Student A and Student B were included in the first level of the design. Student A and Student B received four baseline measurements. Student C received four baseline measurements and three probes. Student D received four baseline measurements and five probes. A problem-solving step measure (adapted from Glago, 2005) was administered pretreatment to measure students’ pre-treatment knowledge of the problem-solving steps used in this study. All students were assisted in completing the measures (i.e., teacher scribed student responses). Students were asked to name the three steps of problem solving. During pretreatment, all students were unable to identify any steps.

Next, a problem-solving questionnaire (adapted from Glago, 2005) was administered to measure students’ knowledge of problem solving. Students were assisted in completing the questionnaires (i.e., teacher read the question; teacher circled the answer). The questionnaire asked eight problem solving related questions such as “What is a problem?” or “Can you name a problem you have had?” Responses ranged from positively not sure to very sure. A 5-point Likert-type scale was used in scoring.

Phase Two: Treatment condition. During treatment, the teacher instructed students in problem solving, following a daily script. Training consisted of one 15-minute session per day, five days a week. The teacher supported students in learning three problem-solving steps and in developing 3 × 5 flash cards. A problem-solving step worksheet contained pictures that corresponded to the three steps (i.e., detective symbolized What’s the problem, doctor symbolized How can you fix it, happy girl symbolized Why would it work). The flash cards were used to prompt students’
recall of the problem-solving questions. The teacher made use of problem-solving storybooks. Questions were asked to start discussions. Using the 10 problem situation measures, students were afforded opportunities to learn the problem-solving steps. The problem situation measures were similar to the problem situation baseline measures in setting and character (i.e., school; peers). The teacher read the problem situation to the students. The problem situations contained real-world problems. For example, one problem situation contained the following scenario: "Ann’s teacher wants Ann to practice reading sight words everyday. After school, Ann goes to her grandma’s house. When Ann’s mother picks her up, Ann is too tired to practice, and goes to bed." The teacher facilitated the students in defining the problem and in identifying at least two possible solutions per situation. Students were then asked to choose the best possible solutions and then to justify or defend why they thought their solutions would work. Treatment always included the teacher assisting students in selecting the solutions that they felt were best. Additionally, the teacher verbally reinforced students for sharing solutions to the problems such as: *You solved the problem, found a solution, and it worked.* A rubric was used for data collection. In addition, the teacher role-played how to approach a teacher or an adult when presented with a problem. The teacher described and modeled how to ask a question to facilitate students’ skills of asking for assistance (e.g., *I do not know what to do. Can you help me? What do I do now?*) Students were given sufficient practice of asking for assistance when presented with a problem. Practice was given during the problem situation sessions.

Student A and Student B were included in the first level of the design (see Figure 2). Since Student A and Student B showed similar stability in baseline performances (i.e., four days with more than 20% variability) a determination was made to simultaneously introduce treatment. Student C and Student D continued in the baseline phase until Student A and Student B demonstrated 80% criterion (i.e., answered at least four out of five questions correctly) on three consecutive attempts using the problem situation measure. Lastly, Student D began the treatment condition. Treatment continued until Student D demonstrated 80% criterion (i.e., answered at least four out of five questions correctly) on three consecutive attempts using the problem situation measure (Tawney & Gast, 1984).

**Interobserver Reliability**

Interobserver agreement reliability checks were conducted equally across baseline, treatment, generalization, maintenance, and retention probes. In addition to direct observations, one digital voice recorder was used to record student responses throughout treatment. The investigator and doctoral student collected practice data and reviewed recordings to establish interobserver agreement on the number of recorded correct and incorrect student responses. After interobserver agreement was established (i.e., 100% agreement on three successive occasions), data collectors reviewed recordings and records weekly. Both observers set an agreed upon review time and date, at the beginning of each week. The point-by-point method was used to score the data (Kazdin, 1982). Agreement data were calculated by 

\[
\text{Interobserver Agreement} = \frac{\text{agreements}}{\left(\frac{\text{agreements}}{\text{disagreements}}\right) + 1} \times 100 \%
\]

The interobserver agreement was 98.7% during 20% of random sessions.

**Procedural Reliability of Treatment**

Both the investigator and doctoral student observed the teacher’s methods during treatment. A “+” or “−” was recorded if the teacher complied with the methods. The procedural fidelity or interobserver agreement data were calculated by dividing the number of steps implemented correctly by the number of correct plus incorrect number of steps multiplied by 100 (Kazdin, 1982). The procedural fidelity interobserver agreement data were 97%.
Figure 1. Problem-Solving Step Worksheet.

Step 1

What's the Problem?

Step 2

How can you fix it?

Step 3

Why would it work?
**Phase Three**

During Phase Three, students completed the problem-solving questionnaire and problem-solving step measure. The teacher assisted students with evaluations of their existing skills. The teacher read the questions and students answered orally. The teacher facilitated students in writing their answers to the questions or circling the corresponding number. Three weeks post-treatment, three generalization measure probes were conducted over a two-week period. Students were assessed during a role-play of a problem situation. For example, the teacher presented Student A with an assignment. The student was asked to leave his desk. The teacher then removed Student A’s pencil. Student A was directed to return to his desk and to complete the assignment. When Student A noted the absence of his pencil, the teacher asked Student A to: (a) identify the problem, (b) identify two possible solutions, (c) identify a best possible solution, and (d) identify why the best solution would work. A rubric was used to assess each student on the following: (a) if he or she identified the problem, (b) if he or she identified two possible solutions, (c) if he or she identified a best possible solution, and (d) if he or she identified why the best possible solution would work.

Seven and nine week’s post-treatment, students were given a problem situation maintenance measure and problem situation retention measure. Students were re-assessed on their skill performances of problem solving when presented with problem situations. The measures assessed if students maintained and retained their problem-solving skills post-treatment. The measures were scored using a rubric.

**Results**

**Pre-Study and Treatment**

Baseline (i.e., Pre-Study) and overall treatment mean percentages were compared for efficacy of problem-solving instruction. During treatment, each student met the established criterion for the study (i.e., 80% on three successive occasions). Baseline and treatment mean percentages represented the total number of baseline and treatment sessions, for Student A, Student B, Student C, and Student D, divided by the averaged baseline and treatment session score. Baseline data for, Student A, showed no variability (M = 0; range, 0). A visual inspection of baseline data, for Student B, showed a stable trend (M = 20; range, 0–40). The visual inspection, of baseline data for Student C, showed much variability with a stable accelerating trend during the last three probes (M = 29; 0–60). A visual inspection of baseline data, for Student D, showed more variability in trend (M = 45; range, 20–60).

Student A’s treatment data showed a gradual progression of accelerating trend (M = 43.6; range, 0–100). Student B’s treatment data, showed a gradual progression of accelerating trend (M = 65.7; range, 40–100). Student C’s treatment data, did not show immediate changes with the introduction of instruction, however, showed variability. Continued visual inspection of data revealed a steep change in slope between sessions three and four (M = 63.3; range, 40–80). Student D’s treatment data, showed immediate changes with the introduction of problem-solving instruction, thereby preventing a visual inspection of trend (M = 100; range, 100). The number of problem-solving treatment sessions required for each student to reach criterion differed (i.e., three days at 80% criterion). The numbers of sessions were: Student A, 11, Student B, 7, Student C, 6 and Student D, 3. Pre- and post-treatment data suggested the effectiveness of the problem-solving instruction to increase students’ skill performances of problem solving. Data suggested that participants identified problems and possible solutions as a result of the systematic problem-solving instruction.

**Generalization, Maintenance and Retention**

Generalization and treatment (i.e., overall) mean percentages were compared to assess mastery and generalization of skill performances of problem solving. All students maintained and demonstrated skill performances of problem solving at the mastery level during the role-play of classroom problem situations (i.e., Student A, M = 80; range, 80; Student B, M = 93; range, 80–100; Student C, M = 93;
range, 80–100; Student D, M = 93; range, 80–100). Maintenance and retention measures were administered seven and nine weeks post-treatment.

Maintenance and retention measures were administered during the same week to Student A and Student B, due to a winter school break. Student A, did not reach criteria on the maintenance measure, however, did reach criteria on the retention measure. Student B maintained criteria on both measures. Student C maintained criteria on the maintenance measure, however, did not reach criteria on the retention measure. Student D maintained criteria on both measures. See Table 2.

**Problem-Solving Steps and Questionnaire**

Pre-treatment all students were unable to identify any of the problem-solving steps. Post-treatment, Student A did not identify any problem-solving steps. Post-treatment (i.e., 9 weeks), Student B, Student C, and Student D were unable to repeat the problem-solving steps verbatim, but, interestingly, responses indicated that students remembered the steps and their order. For example, Student B identified the first two steps (i.e., *eye glass looking for a problem; feeling better; finding a solution*), however, she did not identify the final step (i.e., *feeling better*). Student C identified the first two steps (i.e., *a problem; a solution*), on the other hand, did not identify the last step (i.e., *be happy, he found his backpack*). Student D identified the first two steps (i.e., *the problem, what’s the problem; the doctor, the solution*), yet, she did not identify the last step (i.e., *happy, we found a solution*). This could be due in part to the time period between treatment and the administration of the measure (i.e., nine weeks post-treatment). Student A, Student B, Student C, and Student D may have recalled the problem-solving steps if the measures were administered shortly after treatment (i.e., two weeks), as indicated in Glago’s research (2005).

There was a continuum of student responses comparing pre- and post-questionnaires. Post-treatment, Student A indicated that he was very sure he could remember the last time he had a problem, compared to his pre-treatment response that he was not very sure he could remember the last time he had a problem. Post-treatment, Student B indicated that she was somewhat sure about whom to go to with a problem compared to her pre-treatment response of definitely not sure. Post-treatment, Student C was very sure she could identify a problem, find a solution, and ask for help. Pre-treatment, Student D indicated she was definitely not sure about identifying a problem, finding a solution, and asking for help. The responses of Student D varied the most between pre- and post-treatment. Post-treatment, Student D indicated that she was very sure that she could name and fix a problem, find a solution, and ask for help. Pre-treatment, Student D indicated that she was definitely not sure when it came to naming a problem, fixing a problem, finding a solution, and asking for help. The analysis of post-treatment student responses suggested that students were more assured of their abilities to: (a) identify problems and possible solutions, (b) fix problems, and (c) seek needed help.

**Overview of Change in Student Problem-Solving Skills**

Baseline, treatment, generalization, maintenance, and retention mean percentages were
analyzed to suggest the efficacy of the problem-solving intervention. Student A, Student B, Student C, and Student D met criterion during the last three days of treatment (i.e., 80% on three successive occasions). Generalization data points indicated that students applied their problem-solving skills to problem situations during role-play (i.e., Student A, 80%; Student B, 93%; Student C, 93%; Student D, 93%). However, the data did not suggest that students were equal in their maintenance and retention of problem-solving skills. Maintenance and retention data points suggested that Student B and Student D (i.e., students with mild intellectual disabilities) maintained and retained their skill performances of problem solving (i.e., Student B, treatment, 65.7%, maintenance, 80%, retention, 100%; Student D, treatment, 100%, maintenance, 100%, retention, 100%). Student A, a student with moderate intellectual disabilities, did not evidence maintenance of problem-solving skills, at the criterion level, on the first measure, but, did evidence maintenance at the criterion level on the second measure (i.e., treatment 43.6%, maintenance, 40%, retention, 100%). When the teacher presented the first measure, the student focused on the word *backpack* (e.g., incorporated the word *backpack* in all responses). Consequently, the student was unable to identify a second solution, best solution, or to express why the solution would work. Student C, a student with moderate intellectual disabilities did evidence maintenance of problem-solving skills at the criterion level, on the first measure, but did not evidence maintenance of problem-solving skills at the criterion level on the second measure (i.e., treatment 63.3%, maintenance, 80%, retention, 60%). When presented with the second measure, Student C did not identify a second solution and did not convey why a best solution would work. Although Student A and Student C did not maintain mastery level on both measures (i.e., maintenance, retention), neither Student A nor Student C, returned to their baseline mean percentages (i.e., Student A, baseline, 0%, maintenance, 40%, retention, 100%; Student C, baseline, 29%, maintenance, 80%, retention, 60%). An analysis of the data suggested that students with more moderate intellectual disabilities (i.e., Student A and Student C) needed increased opportunities to practice problem-solving skills (i.e., longer session) for maintenance. See Figure 2 for a visual of baseline, treatment, generalization, maintenance, and retention problem-solving data.

**Social Validity Measure**

One week into treatment, the teacher expressed that the problem-solving instruction was too difficult for student ability levels, and she suggested questions be modified to facilitate students’ grasp of the concept. In spite of her concerns, the teacher diligently followed procedures utilizing the daily script. During week 16, the teacher completed a social validity measure. Teacher data indicated the problem-solving instruction: (a) was fairly easy to implement, (b) facilitated students in seeking assistance, (c) was effective in teaching problem solving, (d) was feasible in the amount of time to teach it, (e) was appropriate for students’ ability levels, (f) facilitated students in identifying solutions, (g) was useful in teaching self-determination, and (h) would be continued post-study. During casual conversations, the teacher indicated that she was surprised that students were able to identify problems, possible solutions, best possible solutions, and self-evaluate.

**Discussion**

The purpose of this study was to develop a systematic problem-solving intervention designed to teach middle school age students with intellectual disabilities, to identify problems and possible solutions, identify best solutions, and self-evaluate. The data suggested that students with intellectual disabilities had not been exposed to problem-solving instruction, however, as a result of the study students learned the skills of problem solving. Overall findings indicated that students increased in their skill performances of problem solving. The data suggested that all students learned to identify problems and possible solutions. Further, they learned to identify best possible solutions and to self-evaluate. In addition, students generalized their problem-solving skills, and they applied problem-solving skills during role-play sessions.
Figure 2. Student Accuracy Using the Problem-Solving Strategy.
This study extends previous work on the significance of teaching problem-solving skills to students with disabilities (Agran, Blanchard, Wehmeyer, & Hughes, 2002; Agran & Wehmeyer, 2005; Palmer & Wehmeyer, 2003). Limited research has incorporated the teaching of problem-solving skills to students with mild disabilities (e.g., learning), however, this study incorporated the teaching of problem-solving skills to students with intellectual disabilities. In addition, few problem-solving research studies have included students with both mild and moderate intellectual disabilities (Agran et al.; Glago et al., 2009; Palmer & Wehmeyer). Researchers have suggested the importance of studies that include a longer period of time to assess for maintenance and generalization of students’ problem-solving skills (Crites & Dunn, 2004; Glago et al.; Palmer et al., 2004; Wehmeyer et al., 2000). As a result, this study further extends the existing knowledge base on problem-solving instruction by incorporating a longer generalization and maintenance phase.

The authors would like to note there are a few limitations to this study. First, the participants in this study attended the same middle school, therefore, the effects of the problem-solving instruction may be problematic when trying to generalize across school settings. Second, the number of participants included in the sample size was small (i.e., four), therefore, the effects of the problem-solving instruction may be difficult to generalize across large groups of students. Lastly, the participants included in the sample size were students with mild and moderate intellectual disabilities; therefore, the effects of the problem-solving instruction may be problematic when generalizing to students with more severe disabilities.

Despite the limitations, the results suggest that the systematic problem-solving intervention is a viable strategy that teachers of students with mild and moderate intellectual disabilities can incorporate into the curriculum and provide students with opportunities to practice, generalize, and maintain problem-solving skills. Second, this study suggests that teachers of students with intellectual disabilities will find that students increase in skill performances of problem solving as a result of a systematic problem-solving intervention. Third, this study suggests that the problem-solving intervention is easy, effective, and useful to teachers in increasing skill performances of problem solving in students with both mild and moderate intellectual disabilities. Due to the importance of teaching problem-solving skills to students with mild and moderate intellectual disabilities, future research is warranted, to expand upon the limited research for this population of students. The authors would like to see further problem-solving research conducted with students with intellectual disabilities in inclusive settings to assess the generalization of students’ problem-solving skills with general education teachers. Additionally, the authors would like to include elementary-age students, with mild and moderate intellectual disabilities, in further problem-solving research.

References


