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## Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

Lindsay Ann Diamond  
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PROBLEM SOLVING INTERVENTIONS: IMPACT ON YOUNG  
CHILDREN WITH DEVELOPMENTAL DISABILITIES

By

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A dissertation submitted in partial fulfillment  
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Doctor of Philosophy in Special Education

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## THE GRADUATE COLLEGE

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**Lindsay Lile Diamond**

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## ABSTRACT

### **Problem Solving Interventions: Impact on Young Children with Developmental Disabilities**

by

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Problem-solving skills are imperative to a child's growth and success across multiple environments, including general and special education. Problem solving is comprised of: (a) attention to the critical aspects of a problem, (b) generation of solution(s) to solve the problem, (c) application of a solution(s) to the identified problem, and (d) evaluation of the consequences of the solution. Children with developmental disabilities may experience difficulty with the problem-solving process.

The purpose of this study was to determine an effective method to teach young children with developmental disabilities to problem solve. Specifically, this study compared two types of problem-solving instruction. The two interventions compared for this study were, Literacy-Based Structured Problem-Solving instruction followed by embedded problem solving opportunities and Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction.

Results of this study support the use of problem-solving instruction among young children with developmental disabilities. Both interventions were effective for improving the ability of young children with developmental disabilities to learn and apply the steps within the problem-solving process. Significant gains were made at posttest for both instructional groups on the acquisition of identifying a problem, identifying a solution,

and evaluating a problem solution. Although both interventions were significant over time, further comparison indicated that children who received the combined method of instruction (Literacy-Based Structured Problem-Solving and Center-Based Direct Instruction) were more capable of applying problem-solving strategies.

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## CHAPTER 1

### INTRODUCTION

The ability to solve problems is a complex process that is necessary to function successfully in life (Greenwood, Walker, Carta, & Higgins, 2006; Newman, 1977). Successful problem solving increases the development of a healthy personality, self-confidence, independence, interpersonal and social relationships as well as self-determination (Agran, Blanchard, Wehmeyer & Hughes, 2002; Dincer & Guneyusu, 1997; Greenwood et al., 2006; Palmer & Wehmeyer, 2003). Problem solving is comprised of: (a) attention to the critical aspects of a problem, (b) generation of a solution(s) to solve the problem, (c) application of a solution(s) to the identified problem, and (d) evaluation of the consequences of the solution (Greenwood et al., 2006; Palmer & Wehmeyer, 2003; Rubin & Rose-Krasnor, 1992).

Although typically developing children are capable of solving problems, children diagnosed with developmental delays may experience difficulty with the problem-solving process across a variety of situations (Stevens, 2009). This inability to successfully solve problems may decrease social opportunities and increase the likelihood of peer rejection (Pettit, Dodge, & Brown, 1988). It also may increase aggressive behavior and result in a variety of behavior problems (Baker-Henningham, Walker, Powell, & Gardner, 2009; Gouze, 1987). Because of the strong relationship between the ability to solve problems and the development of self-esteem, instruction in the area of problem solving is imperative for children with developmental disabilities in order to promote future success and independence (Karnes, Johnson, & Beauchamp, 2005; Shure & Healey, 1993).

Self-determination research focusing on children and adults with disabilities illustrates the need for proficiency in problem solving (Wehmeyer & Palmer, 2000). Self-determination is described as the ability to be in control of daily life decisions (Field, Martin, Miller, Ward, & Wehmeyer, 1998). When people with disabilities are capable of making daily decisions, solving problems, and assuming responsibility they are considered to be self determined. This component of problem solving is critical for independence because it allows the person to function without relying on others to solve daily problems (Agran et al., 2002). While most research has focused on self-determination and problem solving as adolescent skills, they have their roots in early childhood (Wehmeyer & Palmer, 2000). Unfortunately, few researchers have investigated problem-solving instruction in the early childhood environment (Joseph & Strain, 2010).

### **Problem Solving Defined**

The ability to function seamlessly through daily life activities (e.g., driving, using public transportation, grocery shopping, interacting with others, making routine life decisions) requires the ability to solve problems. Being able to solve simple problems with ease increases the likelihood that a person will solve crucial problems as they occur (D’Zurilla & Goldfried, 1971). Developmentally, problem solving requires the ability to process, alter, or change plans based on the problem encountered (Stevens, 2009). In order to support the development of problem solving skills, it is important to understand the definitions of problem solving represented in the literature.

The ability to solve problems involves the use of cognitive skills (e.g., strategic planning, organization) to make decisions and implement them seamlessly (Agran et al.,

2002). This involves a self-directed, cognitive-behavioral process in which the individual attempts to identify or discover effective solutions for problems encountered in everyday life (D’Zurilla, Nezu, & Maydeu-Olivares, 2004). This has been interpreted as the ability to transition from one cognitive thought to another without difficulty (Stevens, 2009). Current research describes this as a natural progression that occurs in a step-by-step process and results in the identification of solutions for a situation, activity, or task (Joseph & Strain, 2010; Palmer & Wehmeyer, 2002). The problem-solving process typically occurs within the natural environment and includes: (a) recognition of the problem, (b) identification of a solution, and (c) evaluation of the solution. The goal of this process is to function independently across multiple environments (D’Zurilla et al., 2004).

As a cognitive skill, effective problem solving requires the use of multiple steps to effectively execute a solution to a problem. The ability to apply this set of skills is one of the most complex skills learned in life (Newman, 1977). Thus, to effectively apply these skills, the individual must recognize when a problem arises and determine that problem solving skills are necessary. Some children and adults do not have the innate ability to recognize a problem or automatically generate a solution to it, indicating a need for problem-solving instruction (Verma & Verma, 1994). Research indicates that the process of problem solving is imperative when a task or activity occurs for which a solution is not readily identified (Agran et al., 2002). For the purposes of this study, problem solving is defined as the ability: (a) to recognize a task, activity, or a problem, (b) generate a solution(s) to the identified problem, and (c) evaluate the identified solution(s) in terms of

its effectiveness to solve the identified problem (Greenwood et al., 2006; Palmer & Wehmeyer, 2003; Rubin & Rose-Krasnor, 1992).

### **Problem Solving Instruction**

Some researchers maintain that problem solving is a skill developed within the constructs of the home environment (Pettit, Dodge, & Brown, 1988). While others argue that problem solving continuously develops across multiple environments and through a variety of social interactions (Verma & Verma, 1994; Vygotsky, 1978). Routine and planned activities across environments promote the development of problem-solving skills for children with and without disabilities. Because problem solving is an important life skill, strategies to promote its development should be incorporated in the school environment beginning in the early elementary years (Hess & Copeland, 2001).

### **Problem Solving with Students Who are Typical Learners**

Various forms of instruction can be used to teach a fundamental set of sequential steps needed to effectively solve a problem. The common steps involved in teaching problem solving are: (a) defining the problem, (b) generating a solution(s), (c) applying the identified solution, and (d) determining if the solution worked (Britz, 1993; Joseph & Strain, 2010; Shure, 1992a; Webster-Stratton & Reid, 2003; Wehmeyer & Palmer, 2000). Proficiency in applying the sequential problem-solving steps allows children to become independent members of society. Furthermore, research indicates that problem-solving skills are tied to social and academic achievement (Benard, 1995; Youngstrom et al., 2000). Thus, children who consistently and independently apply problem-solving strategies demonstrate higher academic achievement and decreased rates of behavior



problems (Benard, 1995). Therefore, when children function as independent problem solvers they are more likely to have positive social interactions and maintain friendly relationships with their peers (Dincer & Guneyusu, 1997; Greenwood et al., 2006).

Problem solving is a skill that develops naturally for most typically developing children. Through daily social interactions and hands-on manipulation of objects within the environment, young children learn to become self-sufficient problem solvers (Poole, Miller, & Church, 2004). Children who demonstrate proficiency in problem solving are more likely to demonstrate self determination and self reliance in future life activities (Agran et al., 2002; Hess & Copeland, 2001; Palmer & Wehmeyer, 2003). In addition to independence, children who display strong problem-solving skills have a higher rate of high school completion (Hess & Copeland, 2001). Research indicates that independent problem solvers cope better with adversity and daily stressors that occur throughout various life events (Hess & Copeland, 2001).

It appears that problem-solving skills develop naturally over time among children who are typically developing (Gross, 2005; Poole, Miller, & Church, 2004). Although problem solving is considered a naturally developing skill, general education teachers provide a variety of instructional supports for it on a daily basis. These supports occur through direct and specially designed instructional lessons (Angell, Stoner, & Fulk, 2010). While some instructional programs focus on the use of direct instruction for children who struggle with problem solving, most early childhood programs incorporate the use of naturally-embedded instruction that supports the development of these skills (Shure, 1992a; Webster-Stratton & Reid, 2003).

Embedded problem-solving lessons occur throughout a variety of routine instructional activities (e.g., dramatic play center, manipulative center, snack time, recess). This may involve different explorations of solving problems as well as positive and corrective feedback when problem-solving situations arise (Poole, Miller, & Church, 2004). During these problem-solving situations, teachers act as a catalyst to facilitate learning by assisting children in defining the actual problem that is occurring and helping children generate a solution (Gross, 2005). This type of instruction allows teachers to facilitate problem-solving instruction on a daily basis and indirectly teach children the specific steps needed to problem solve (Youngstrom et al., 2000).

While providing embedded instruction, general educators use a variety of questions to assist in the development of effective problem-solving skills. During spontaneous situations, teachers use varying levels of questioning from low-to-high levels to help children assess problem situations that arise on a daily basis (Gauvain & Rogoff, 1989; Poole, Miller, & Church, 2004; Turner & Durrett, 1975). Through the use of specific questions, children become more aware of the situation that is occurring and how to think about it. The use of open-ended questions allows multiple opportunities for teachers to provide: (a) feedback for appropriate problem identification, (b) reinforcement for appropriate solutions, and (c) support to carry out the resolution to a problem (Poole, Miller, & Church, 2004).

Often, with typical learners, this instruction may occur through the use of peer support (e.g., collaborative problem solving) (Tudge & Hogan, 1997). This typically occurs in the form of planned activities (Salisbury, Evans, & Palombaro, 1997). Planned activities provide multiple and varied opportunities for children to practice the problem-

solving process with their peers (Salisbury, Evans, & Palombaro, 1997). Teaching problem solving through peer collaboration is an effective method to teach children to work with their peers to solve problems that may arise throughout the school or home environments (Holmes, 1997).

Although collaborative problem solving and embedded instruction are commonly used in early childhood programs, there are typical learners who require more assistance. These students benefit from a direct-instruction program (Joseph & Strain, 2003). The direct instruction commonly occurs through the use of problem-solving instruction or bibliotherapy (Forgan, 2002; Shure, 1992a; Webster-Stratton & Reid, 2004).

Bibliotherapy incorporates the use of children's literature to provide instruction in recognizing a variety of problem situations and applying the steps needed to effectively maneuver through the situations (e.g., identify the problem, generate solutions, apply the solutions, and evaluate) (Forgan, 2002). This method of instruction provides children with the opportunity to become proficient problem solvers through group practice and discussion of why problems occur and how to fix them.

Other problem-solving programs used to teach young children without disabilities incorporate the use of literature along with more direct methods of instruction. Shure (1992a) designed an instructional program for young children, the *I Can Problem Solve* (ICPS). The *ICPS* program focuses on the development of interpersonal problem-solving skills. Through the use of specifically designed lessons, children are taught to recognize the steps associated with problem solving and when to apply the steps through the use of guided lessons, story books, role play, and dialogue (Dincer & Guneyusu, 1997, 2001;

Shure & Spivack, 1982). Children are taught to recognize problems and act out sequential actions to resolve the problem (Shure & Spivack, 1982).

Another problem-solving program used with typical learners focuses on direct skill teaching during classroom or clinical-based instruction (Baker-Henningham, Walker, Powell, & Gardner, 2009; Webster-Stratton, Reid, & Hammond, 2001). The *Dina Dinosaurs Social Skills and Problem-Solving Curriculum* (Webster-Stratton, 1990a) incorporates daily lessons based on individual student needs (Webster-Stratton, & Reid, 2004). Each lesson focuses on prosocial solutions to problems and evaluation of solutions based on the impact of the solution on the problem (Webster-Stratton, & Reid, 2003). *Dina Dinosaurs* (Webster-Stratton, 1990a) uses puppets, video models, role play, and free play. Children are taught to identify how they feel, the problem, a solution to the problem, and how to implement the solution effectively to solve the problem (Webster-Stratton, & Reid, 2003).

Even though problem-solving skills usually develop naturally among typically developing children, the research supports the use of instruction in this area (Dincer & Guneyusu, 2001; Palmer & Wehmeyer, 2003; Richards & Siegler, 1981; Shure & Healey, 1993; Webster-Stratton, Reid, & Hammond, 2001). The development of problem-solving skills for typically developing children is supported through the use of peer collaboration, embedded lessons, direct instruction, as well as routine and planned activities (Joseph & Strain, 2010).

### **Problem Solving with Students with Developmental Disabilities**

Although problem solving has been identified as a critical component in the development of self-determination and self-reliance, it often is not taught to young

children with developmental disabilities (Agran et al., 2002; Hess & Copeland, 2001; Wehmeyer, 1999). The concern has been that cognitive delays experienced by some children with disabilities may impair their ability to apply the skills needed to recognize a problem situation, generate appropriate solutions, and apply the solutions without adult guidance (Verma & Verma, 1994). Thus, problem-solving instruction is not implemented in school until middle school or high school with students with disabilities. While the instruction of problem solving for adolescents has occurred through the use of direct instruction for many years (Wehmeyer & Palmer, 2000), it was not until recently that effective methods to teach younger children with developmental disabilities problem solving were identified (Cote et al., 2010; Galgo, 2005; Wehmeyer & Palmer, 2002).

Systematic instruction in the form of direct instruction has been found to be effective in teaching young children with developmental disabilities to problem solve (Cote et al., 2010; Galgo, 2005; and Wehmeyer & Palmer, 2002). Through direct instruction, using child-based scenarios, children are taught to identify potential problems, generate solutions for those problems, apply the solutions, and evaluate the solutions' effectiveness to solve the identified problem (Cote et al., 2010; Galgo, 2005). Other methods of instruction such as the use of storybooks, role play, and practice situations also have been used for teaching problem solving (Cote et al., 2010). These methods of instruction focus on providing children with teacher assistance in identifying and selecting appropriate problems and solutions (Cote et al., 2010).

In addition to direct instruction, informational modeling has been used to teach problem solving to students with developmental disabilities (Palmer & Wehmeyer, 2003). *The Teacher's Guide to Implementing the Self-Determined Learning Model of Instruction*

(Palmer & Wehmeyer, 2002) is used to teach children a three-phase process to solve problems (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). This instructional program focuses on teaching the problem-solving sequence in three phases through direct instruction. Instruction is implemented across a variety of academic and social situations throughout the instructional day and focuses on helping the child to identify problems, solutions, barriers, and consequences associated with the solutions (Palmer & Wehmeyer, 2003).

While problem-solving research with young children with developmental delays is just beginning, it appears that instruction should be implemented through scaffolding, direct teaching, and using collaborative problem-solving techniques. Continued research in this area will provide information concerning a learning skill that is crucial for young children with developmental disabilities as they move through school and into adulthood (Wehmeyer & Palmer, 2000).

### **Statement of the Problem**

Adults with cognitive and physical disabilities report that problem-solving skills are imperative to their sense of self-determination in today's society (Angell, Stoner, & Fulk, 2010). The ability to use problem-solving strategies to make critical decisions regarding everyday problems is necessary to ensure a high quality of life (Agran et al., 2002). Typically, problem-solving skills are not taught to young children with developmental disabilities due to few research-based interventions designed for this population (Palmer & Wehmeyer, 2003). Thus, it is critical to investigate possible instructional options. Recent research supports the need for problem-solving

interventions for young children with disabilities and calls for the identification of specific instructional routines for teachers to use (Gross, 2005).

The purpose of this study is to investigate problem-solving instruction, specifically with young children with developmental disabilities. The goal is to ascertain the impact of structured problem-solving instruction on this population of students. Through a comparison of two types of problem-solving instruction (whole group, Literacy-Based Structured Problem-Solving instruction and small group Center-Based Direct Instruction using problem-solving picture cards) specific questions regarding problem-solving instruction will be addressed. The specific research questions in this study are:

Research Question 1: Does the ability of preschool-aged children with developmental disabilities to *identify a problem* increase with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 2: Does the ability of preschool-aged children with developmental disabilities to *identify a problem solution* increase with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 3: Does the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* increase with the use of Literacy-Based Structured Problem Solving combined with Center-

Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 4: Is the ability of preschool-aged children with developmental disabilities to *identify a problem* better maintained with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 5: Is the ability of preschool-aged children with developmental disabilities to *identify a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 6: Is the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

Research Question 7: Does the ability of preschool-aged children with developmental disabilities to name the three steps needed to solve a problem (e.g., what is the problem, what is the solution, and evaluate the solution) differ with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?



### **Significance of the Study**

Although typically developing children are capable of problem solving in a variety of situations, young children with developmental disabilities often are not natural problem solvers (Forgan, 2002). However, problem solving typically is not taught in early childhood special education. Thus, addressing the need for instruction in the area of problem solving with young children with developmental disabilities is imperative. Because it is a critical component to self-determination, as well as a skill necessary for overall school success, problem-solving instruction should not be delayed until secondary school (Karnes, Johnson, & Beauchamp, 2005; Wehmeyer & Palmer, 2000; Wehmeyer & Palmer, 2003).

Children with and without developmental delays can be taught the problem-solving process (Poole, Miller, & Church, 2004). Through the use of strategic problem-solving instruction children can be taught how to solve basic problems across a variety of environments (Abdellatif, Cummings, & Maddux, 2004). Thus, determining an effective intervention to teach problem-solving skills to young children with developmental disabilities may have a positive impact on school success as well as self-determination across the life span. Children must be able to recognize a problem, identify possible solutions, and apply solutions independently. Research indicates that the preschool years may be the most productive for providing problem-solving instruction (Dincer & Guneyusu, 1997).

Currently, problem-solving instruction is suggested, but may not occur on a consistent or structured basis in early childhood education (Joseph & Strain, 2010). Because children are capable of learning how to problem solve, using step-by-step

strategies appears to be the most effective method to teach problem-solving skills to young children with developmental delays (Britz, 1993; Joseph & Strain, 2010). However, further research is needed concerning systematic methods to teach problem solving to this population. This study compared Literacy-Based Structured Problem-Solving instruction with Literacy-Based Structured Problem-Solving coupled with Center-Based Direct Instruction problem-solving lessons to determine an effective method to teach young children with developmental disabilities problem solving. Gaining an understanding of the most effective means of instruction in the area of problem solving for young children with developmental disabilities may increase the success of these children throughout their school years and beyond.

### **Definitions**

The following list is representative of terms used in this study. It is important to understand the use of these terms within the field of early childhood special education to clearly understand their meaning within the context of this study.

**Center-based, direct instruction.** Center-based, direct instruction consists of small group instruction (e.g., 2-5 children) for a period of 10 minutes. Activities during this time are teacher led and typically introduce new or review previously learned skills. For the purposes of this study, Center-Based Direct Instruction occurred four days a week following circle time. During this time, teachers used scripted problem-solving picture cards to reinforce the problem-solving process.

**Child with developmental disability (delay).** A child who is under the age of six, and demonstrates a delay of at least two standard deviations in one, or at least one

standard deviation in two or more, of the following areas: receptive or expressive language, cognitive abilities, gross or fine motor function, self-help, and social emotional condition (NAC 388.430, 2008).

**Child without a developmental disability (delay).** A child who is under the age of six, and does not demonstrate cognitive delays in one or more of the following areas: receptive or expressive language, cognitive abilities, gross or fine motor function, self help, and social emotional conditions.

**Circle time.** Circle time is a structured time of the day in the early childhood classroom, typically lasting 15 minutes. Instruction during this time is provided through teacher-led planned activities that introduce and review skills promoting student interaction.

**Direct instruction.** Direct instruction is a teaching method used by teachers to directly teach concepts in the form of whole group or small group instruction (Cooper, Heron, & Heward, 2007).

**Early childhood education special education classroom.** The primary focus of the early childhood special education program is to provide a high quality learning environment that is conducive to promoting development of skills (e.g. fine motor, gross motor, cognitive, self-help, and social emotional) among children with a variety of disabilities (NAEYC, 2009). Teacher-directed, child-initiated, and center-based activities are the primary instructional strategies used in the early childhood programs. Each program consists of two groups of children, one in the morning and one in the afternoon.

**Early childhood special education teacher.** An early childhood teacher is a person who holds a degree in teaching young children and currently meets the licensure requirements to teach within the state.

**Literature-based structured problem solving.** Structured literature-based problem-solving instruction was delivered through the use of children's literature. The books provided problem-solving situations and were used during whole group instruction. The instruction introduced common problem solving vocabulary (e.g., problem, solution, evaluate) and the steps needed to problem solve independently.

**Preschool-aged children.** A preschool-aged child is between the ages of three-and-five years of age and is not eligible to attend kindergarten (More, 2010).

**Problem solving.** Problem solving is the ability to recognize a task, activity, or a problem, generate a solution(s) to the identified problem, and evaluate the effectiveness of the identified solution(s) to solve the identified problem (Greenwood et al., 2006).

**Problem identification.** Problem identification is the ability to identify a given problem that may require a solution(s) to continue functioning within the environment (D'Zurilla & Goldfried, 1971).

**Problem solution.** A solution is a cognitive-behavioral response to a problem that provides an effective resolution to the identified problem (D'Zurilla & Goldfried, 1971).

**Problem evaluation.** The process that an individual or group uses to evaluate the effectiveness of a proposed solution(s) to a particular problem (D'Zurilla & Goldfried, 1971). The purpose of the evaluation is to determine whether or not the proposed solution(s) would be effective in solving the problem (Palmer & Wehmeyer, 2003).

**Problem-solving picture cards.** Problem-solving picture cards are illustrated cards designed for this study. Each picture card was paired with a teacher script that depicted a problem scenario (e.g., an untied shoe, gum stuck on the bottom of a shoe).

**Self-determination.** Self-determination is the ability of an individual to act responsibly across a variety of environments. It is the ability to recognize a need or a want and take the appropriate steps to fulfill those needs to improve quality of life (Agran et al., 2002).

**Self-reliance.** Self-reliance is the ability to function independently within society by applying problem-solving skills across a variety of environments (Hess & Copeland, 2001).

### **Limitations**

The limitations of this study are:

1. Classrooms were selected for this study based on convenience sampling. Thus, the population represented may not be a true reflection of the community.
2. The use of instructional interventions was implemented four days a week for five weeks. An intervention implemented over a longer time period may yield different results.
3. The total time allotted for embedded problem solving following Literacy-Based Direct Instruction for Group 1 was not reported.
4. The instructional interventions were implemented with young children who have developmental disabilities. Thus, the results cannot be generalized to other disability groups.

5. Data were collected from 4- and 5- year old children. Thus, the results cannot be generalized to older or younger children.

### **Summary**

While problem solving has long been recognized as a critical component of self-determination for older students, it is only recently that researchers have begun to explore problem solving in the early elementary years (Wehmeyer & Palmer, 2000).

Understanding the importance of problem solving as a predictor of self-determination later in life encourages the instruction of problem-solving skills at a younger age (Agran et al., 2002; Palmer & Wehmeyer, 2003). Thus, it is critical to begin problem-solving instruction with young children with developmental disabilities (Wehmeyer & Palmer, 2000). By identifying an effective instructional strategy to teach this population problem solving, practitioners will have access to an intervention that can be incorporated into the early childhood special education environment. The ultimate goal is the acquisition of critical skills needed to become successful and independent problem solvers. This skill will ultimately impact the ability of children with disabilities to become self-determined and self-reliant members of society in the years to come.

## CHAPTER TWO

### REVIEW OF THE LITERATURE

Problem solving is a cognitive and behavioral skill that begins to develop in the early years of life and continues throughout adolescence and into adulthood (Keen, 2011; Smith, 2003). The ability to successfully recognize and solve problems is a skill impacted by cognitive, intellectual, and verbal ability (Gagne', 1980). As children learn and grow, problem-solving skills evolve through natural interactions within the environment (Britz, 1993; Smith, 2003). Throughout the day, young children encounter situations in which they must solve a variety of problems to learn, play, and interact with their peers.

Problem solving is defined as a process that occurs when an unfamiliar situation is present and in which an individual does not have an immediate response (D'Zurilla & Goldfried, 1971; Gagne', 1959). This process incorporates the application of a set of skills to resolve the situation encountered. Throughout the problem-solving process, a sequential set of rules are followed to solve the problem. This includes the ability to: (a) recognize the problem, (b) generate possible solutions to the problem, (c) apply the best solution, and (d) evaluate the effectiveness of the solution (D'Zurilla & Goldfried, 1971).

Efficient problem solving skills can impact a person's independence, cooperation, academics, and quality of life (Agran et al., 2002; Angell, Stoner, & Fulk, 2010, Goffin & Tull, 1985). When children demonstrate a deficit in the development of problem solving early in their education, it is prudent to address this skill (Burns, Haywood, Delclos, & Siewert, 1985). Research concerning the instruction of problem solving has focused on elementary-aged children and adolescents without disabilities. Instructional programs for these age groups focus on the use of scripted programs designed to correct at-risk behavior (Webster-Stratton, Reid, & Stoolmiller, 2008). This instruction can occur

through teacher-facilitated instruction, comprised of embedded and direct-learning opportunities to practice the cognitive components of problem solving (D’Zurilla & Goldfried, 1971; Joseph & Strain, 2010). This reinforces the correct use of problem-solving strategies and results in enhanced self confidence for solving problems independently (Brotherson, Cook, Erwin, & Weigel, 2008). Although research has been conducted to demonstrate the learning of problem-solving skills in elementary and secondary settings, there is limited research with young children with developmental disabilities (Joseph & Strain, 2010). However, because problem solving is a skill that impacts reading, writing, and math, as well as social behaviors, it should be a critical instructional component in the early childhood environment (Keen, 2011).

### **Problem-Solving Instruction for Typical Learners**

Problem-solving interventions have been discussed in the literature since the 1960s (Shure, 2001). These interventions primarily have focused on reducing problem behaviors among children while promoting more proficient interpersonal skills (Joseph & Strain, 2003). The focus has been to promote student thinking about problem situations using a means-end-thinking model and guided instruction (Shure & Spivack, 1972). Teaching children to use a means-end-thinking process promotes the use of a step-by-step protocol to solve problems (Shure, 2001; Shure & Spivack, 1972). Researchers agree on the need for step-by-step strategies to complete the problem-solving process in novel situations; however, the defined steps of problem solving vary among interventions (Gagne', 1959; Joseph & Strain, 2010).



## Early Childhood Education

Problem-solving research for young children has focused on the use of specific curricula designed for children who are typically developing. Interventions such as *I Can Problem Solve (ICPS)* (Shure, 2001) and *Incredible Years Dina Dinosaurs Classroom Curriculum* (Webster-Stratton, 1990a) provide instruction to preschool children through elementary school who demonstrate a need for instruction in this area. These children do not display proficient problem-solving skills, have not been exposed to natural instruction, or are at-risk for developing problem behaviors.

In a study designed to ascertain the impact of a set curriculum on problem-solving skills in the preschool setting, Baker-Henningham, Walker, Powell, and Gardner (2009) used the *Incredible Years Teacher Training Program (IYTTP)* (Webster-Stratton, 2000) paired with modules from the *Incredible Years Dina Dinosaurs Classroom Curriculum (IYDDCC)* (Webster-Stratton, 1990a). The goal of the study was to evaluate the use of the curriculum on the classroom environment, the behaviors of the children and teachers, and the acceptance of the program by the teachers. Five preschools that provided services to children participated in the study. Three of the schools were comprised of families living in an inner-city setting while two schools consisted from families of lower and lower middle income groups. The control group was comprised of 12 classrooms and 15 classrooms made up the experimental group. Each classroom had one teacher and an average of 21 students.

The teachers in the control group were provided teaching materials and bi-monthly observation visits while the experimental teachers received seven trainings on the implementation of the teaching materials and monthly consultation meetings. An experimental design was used in which all classrooms (experimental and control)

participated in a pre-observation phase prior to the implementation of the training and curriculum in the experimental classrooms. The pre-observation phase consisted of four, 15-minute observations of each classroom (two observations during teaching and two observations of child-directed play). The purpose of the pre-observations was to record the teacher behaviors (positive and negative), teacher commands, and teacher promotion of positive social interactions among the children.

After the pre-observation, the experimental teachers were trained using the *IYTTP* (Webster-Stratton, 2000), every month over the seven months of its implementation. This training focused on the use of the emotional components of the *IYDDCC* (Webster-Stratton, 1990a). The teachers also received a one-hour monthly consultation focusing on the development of specific curricular skills in the programs. During the consultation, specific behaviors and situations were discussed. While the control group teachers did not receive the training in implementation of the program, they did receive bi-monthly unstructured visits. These visits did not provide support of curricula implementation.

The instructional phase of the study involved the experimental teachers implementing the skills learned during the *IYTTP* (Webster-Stratton, 2000) training. The teachers taught specific lessons from the *IYDDCC* (Webster-Stratton, 1990a) twice a month during 30-40 minute lessons. The monthly instruction focused on how to: (a) follow rules, (b) understand feelings, and (c) develop problem-solving skills (Baker-Henningham et al., 2009). Conversely, the control teachers were provided a copy of the *IYDDCC* (Webster-Stratton, 1990a), but were not trained in the implementation of the curriculum. Following the implementation of the *IYDDCC* (Webster-Stratton, 1990a) in the experimental classrooms, post-observations were conducted in the experimental and

control classrooms. Data were collected concerning teacher behaviors (positive and negative), teacher commands, and teacher promotion of positive social interactions among the children.

The data were analyzed using a multilevel, multiple regression analysis. The results indicated that at pre-observation there was no significant difference between experimental and control groups on teacher and children behaviors. The pre-observations for both groups showed high levels of negative teacher behaviors with a low number of positive behaviors for both teachers and children. At post-observation, the negative teacher behaviors in the control classroom increased, indicating high levels of teacher demands. In the experimental classrooms, negative teacher behaviors decreased by 50% and teachers showed an increase in positive behaviors. Significant results were noted for increasing teacher behaviors (positive praise and incentives), decreasing negative behaviors (negative commands and critical comments), and promotion of positive child behaviors in the experimental classrooms (talking about feelings). Although there was not a significant reduction in teacher commands in the experimental classrooms, the type of commands given differed significantly from pre- to post-observation. The commands changed from a high number of negative commands to more positive comments that promoted positive social emotional skills (talking about interactions). Children in the experimental classrooms exhibited more appropriate behaviors than those in the control classrooms at post-observation.

Baker-Henningham et al. (2009) maintained that the results indicate that the students in the experimental classrooms exhibited more positive behaviors, participated in more positive social interactions while the teachers gave fewer negative commands.

The teachers in the experimental classrooms rated the *IYTTP* (Webster-Stratton, 2000) and the *IYDDCC* (Webster-Stratton, 1990a) as useful and suggested training for other teachers.

Baker-Henningham et al. (2009) concluded that professional development using the *IYTTP* (Webster-Stratton, 2000) paired with the *IYDDCC* (Webster-Stratton, 1990a) was effective in creating a more positive classroom environment that promoted positive social interaction among children and teachers. When compared to the experimental classrooms, the control classrooms demonstrated a significant decrease in the quality of the classroom environment over a one-year period. The researchers maintained that because negative behaviors in the classroom environment can affect all children, it is critical to implement a curriculum designed to promote positive environments. They recommended implementation of a curriculum paired with guided support in the form of monthly consultations.

Dincer and Guneyusu (1997) conducted a study designed to explore the impact of Shure's (1992a) *I Can Problem Solve* (ICPS) training curriculum on the development of interpersonal problem-solving skills of preschool children. The study was conducted in a child care center. Two classrooms participated in the study. One classroom of 38, 5-year old children made up the experimental group while another classroom of 36, 5-year olds served as the control group.

An experimental design was used in which a pre-test, training, posttest was conducted over a six-month period. Both classrooms (experimental and control) participated in the pre- and posttests while training only occurred with the experimental group. All children completed the *Pre-school Interpersonal Problem Solving Test* (PIPS)

(Shure, 1992b), to measure their ability to recognize a peer problem and generate a solution to the problem presented. Each response was assigned points, depending on the nature of the response (negative or positive). After the pretest was completed, the training phase began for the experimental group. During this time, the control group did not implement a specific problem-solving intervention.

The training phase of the study used the *ICPS* (Shure, 1992a). The training was implemented to teach the children to understand the idea of problem-solving, recognize the feelings of others, see different points of view, and to develop problem-solving skills (Dincer & Guneyusu, 1997). The training consisted of 83 lessons that were 20-30 minutes in length. The problem-solving instruction was comprised of socio-dramatic games (Dincer & Guneyusu, 1997). The use of socio-dramatic games allowed the children to learn and apply the problem-solving rules in a comfortable and fun environment. Following the training, posttests were given, using the *PIPS* (Shure, 1992b), to both the experimental and control groups in the same manner as the pretest.

The data were analyzed using the non-parametric significance test and a chi-squared test of significance. Results of the data analysis indicated a significant increase in the ability of the experimental group to generate more solutions on the posttest when compared to the pretest (Dincer & Guneyusu, 1997). A comparison between the two groups (experimental and control) indicated there was a significant difference between posttest scores of the children, the experimental group generated more positive solutions to solve the problems presented than did the children in the control group. The use of the *ICPS* (Shure, 1992a) was effective in teaching young children to analyze situations,

produce multiple solutions, and to apply the most appropriate solution in the context of a problem.

Dincer and Guneyusu (1997) concluded that the use of a long-term problem-solving training program was effective in creating active problem solvers in interpersonal situations. They maintained that training, using socio-dramatic games, provides children with the necessary skills to appropriately identify a problem situation and identify multiple solutions to the problems presented. Dincer and Guneyusu (1997) suggested that the preschool years are a critical time period in which children can learn to problem solve. They recommend the use of problem-solving training programs to promote positive social relationships with peers and adults in school and across other environments.

In a follow-up study, Dincer and Guneyusu (2001) conducted a one-year study to ascertain the long-term impact of the *I Can Problem Solve* (ICPS) training curriculum (Shure, 1992a) on preschool-aged students. The goal of the study was to determine whether there was a difference in the problem-solving abilities of students who previously received training using *ICPS* (Shure, 1992a) after one year of no instruction. The results of the earlier study conducted by Dincer and Guneyusu (1997) determined that after receiving training using the *ICPS* (Shure, 1992a) curriculum, children in the experimental group produced significantly more solutions to problems when tested using the *Pre-school Interpersonal Problem Solving Test* (PIPS) (Shure, 1992b), when compared to children in the control group. The follow-up study used a sample of 30 children from the original experimental group and 28 children who originally served as the control group (Dincer & Guneyusu, 2001).

An experimental method of data collection was used. Children in both the experimental and control group completed the identical assessment used in the previous study. The *PIPS* (Shure, 1992b) test measured the child's ability to recognize a peer problem and generate a solution to the problem. Each response was assigned points, depending on the nature of the response (negative or positive). During one-on-one sessions, each child, across both groups (experimental and control), was given the *PIPS* (Shure, 1992b).

The data collected were compared to the posttest results from the previous study conducted by Dincer and Guneyusu (1997). The data were first analyzed using a *t* test to test for a significance difference between the two posttests. The results indicated that the experimental and control group did not show significant differences between the number of solutions presented at posttest when compared to the previous study (where significance was noted after training). A significance test for the difference between two equals was used to analyze the current study results compared to the previous study in regard to the number of solutions and categories presented (pro-social vs. negative). The difference between the average scores of the follow-up test compared to the original posttest for the experimental group indicated a significant increase among solutions presented, while the control group showed no significant increase. In addition to number of solutions presented, specific questions measuring the number of solutions produced in situations involving authority figures were analyzed. This analysis indicated a significant difference in the number of solutions produced in the control group at the follow-up assessment when compared to the original posttest results, while the experimental group showed no difference in this category.

Dincer and Guneyasu (2001) attributed the increase in the production of solutions in the control group to typical development over time. Thus, the lack of significant difference between the experimental and control group in the follow-up study was attributed to typical development. They concluded that even though the experimental group received training during the original study and showed significant success with the development of problem-solving skills, continuous instruction and reinforcement of the skills must be provided to further develop and maintain problem-solving skills (Dincer & Guneyasu, 2001). They recommended that teachers receive continuous training to facilitate the development of problem-solving skills with young children.

Vestal and Jones (2004) designed a study to determine the impact of teacher training on the development and use of pro-social interpersonal problem-solving skills among children. The goal of the study was to determine if teachers, trained in the use of a problem-solving curriculum, would have more impact on the development of interpersonal problem-solving skills when compared to untrained teachers. The study was conducted across 11 Head Start preschool classrooms. Six classroom teachers, providing services to 37 students, comprised the experimental group. Five teachers, providing services to 27 children, served as the control group. The children in the experimental and control group were three-to-five years old and from similar socioeconomic backgrounds.

An experimental design utilizing a pretest, training, posttest design was used. Pretests were administered to both the experimental and the control group prior to teacher training. All children were assessed using *the Preschool Interpersonal Problem Solving* (PIPS) test (Shure, 1990). Teachers across both groups (experimental and control) were interviewed concerning conflict resolution skills. Following the pretest, teachers in the



experimental group and control group were given problem-solving materials. Teachers in the control group were not trained on the implementation of the materials, while the experimental group attended a 40-hour conflict resolution training using the *I Can Problem Solve* (ICPS) program (Shure, 1992a). During this training, teachers were instructed on how to implement the *ICPS* (Shure, 1992a) program using the specific dialogue supported by the program. After the training session, experimental teachers were expected to implement the program for a period of two months (Vestal & Jones, 2004).

The program implementation focused on teaching children the vocabulary necessary to problem solve, problem identification, generation of solutions, and determining the consequences of the solutions (Vestal & Jones, 2004). While the experimental group implemented the *ICPS* (Shure, 1992a) program, the control group could use the curriculum; however, they were not trained to implement the curriculum. Following the intervention phase (at posttest), both the experimental and control group teachers were interviewed concerning conflict resolution skills and the experimental and control children were given the *PIPS* test (Shure, 1990) (Vestal & Jones, 2004).

Data from the pre- and posttest teacher interviews reflected adjustments in teacher attitudes and perceptions regarding conflict resolution training using the *ICPS* (Shure, 1992a) program. Posttest results for the *PIPS* test (Shure, 1990) were analyzed using an ANOVA (Vestal & Jones, 2004). Results indicated that children in the experimental group demonstrated a higher level of relevant solutions, indicating that they generated more relevant solutions to solve problems, while the control group did not show a significant increase in relevant solutions. A multivariate ANOVA was used to measure

the force and relevancy of the responses generated by the children. The experimental group demonstrated an increased amount of relevant solutions generated and showed a decrease in the amount of forceful solutions (Vestal & Jones, 2004). Results indicated that the children in the control group did not demonstrate a decrease in the production of forceful solutions when solving problems.

Vestal and Jones (2004) concluded that the teacher training was effective in promoting the acquisition of pro-social, problem-solving skills among children in the experimental classrooms when compared to the control group. The knowledge and understanding of the teachers regarding problem solving promoted a positive classroom environment in which the children felt supported, confident, and motivated to apply problem-solving skills in novel situations. Vestal and Jones (2004) maintained that teachers who are knowledgeable about problem solving have better attitudes toward conflict resolution and, thus, have a positive impact on the classroom environment and student behavior in the preschool classroom. While some research exists surrounding the use of teacher training and the impact it has on the ability of children to problem solve, Vestal and Jones (2004) suggested that empirical studies are still lacking. These researchers were effective in demonstrating that teacher training in problem solving creates a positive environment impacting the overall development of a child's ability to efficiently problem solve. Vestal and Jones (2004) suggest further study to determine the effect of teacher training on the development of problem-solving behaviors over time.

Domitrovich, Cortes, and Greenberg (2007) were concerned with the efficacy of a preschool curriculum designed to decrease problem behaviors while increasing emotional knowledge, problem solving, attention, and control. The curriculum used in this study

was a version of the *Promoting Alternative Thinking Strategies (PATHS)* curriculum (Kushe & Greenberg, 1994). In this study, the curriculum was adapted to be developmentally appropriate for preschool-aged students. The study was conducted across two Head Start campuses that provided services to families living in poverty. A total of 246 children participated in the study, across 20 classrooms. Ten of the classrooms were assigned to the experimental condition while the remaining 10 classrooms served as the control group. In each classroom there were 7 to 16 children and one teacher.

A multi-method strategy assessment was used to pretest both the experimental and control groups prior to intervention (Domitrovich et al., 2007). The series of assessments focused on measuring student ability to understand and express emotions, communicate verbally, exhibit attention, and show visual and spatial memory. Problem-solving ability was measured using a portion of the *Challenging Situations Task (CST)* (Denham, Bouril, & Belouad, 1994). The *CST* measures behavioral responses to common problems that occur in preschool settings. Using pictures, paired with scenarios, children choose the correct response from a series of pictures representing solutions to the posed problem. In addition to these assessments, parents were interviewed during a home visit and teachers completed questionnaires on each child in their classroom (Domitrovich et al., 2007). During the intervention, teachers in the control group continued to implement the already adopted curriculum used by the school while teachers in the experimental group were trained to implement the *PATHS* curriculum (Kushe & Greenberg, 1994) once a week during circle time. Each lesson focused on learning to differentiate feelings, self-control, and problem-solving. Following circle-time lessons, each experimental

teacher implemented extension activities using literature, art, and centers. Following the implementation of the 30 lessons, posttesting was conducted across both the experimental and control groups.

Preliminary data analysis tested for gender and verbal ability differences between the two groups (experimental and control). Few differences were noted between the two groups. Data were then analyzed using an analysis of covariance (ANCOVA). Results of the data analysis indicated that the experimental group, taught with the *PATHS* curriculum (Kushe & Greenberg, 1994), showed significantly higher receptive emotional vocabulary and were more accurate in identifying their feelings. The experimental group showed significantly lower levels of anger when compared to the control group. However, no significant correlation between the implementation of the *PATHS* curriculum (Kushe & Greenberg, 1994) and problem-solving ability, attention, or self-control was noted at posttest. Parents of the experimental group rated their children as significantly more socially and emotionally competent when compared to the control group, but no difference in externalizing behaviors was reported. Teachers in the experimental classrooms rated the social competence of the children in their classrooms significantly higher than did the control group teachers.

Domitrovich, Cortes, and Greenberg (2007) concluded that the use of the preschool *PATHS* curriculum (Kushe & Greenberg, 1994) was effective in improving the emotional knowledge, self regulation, and social skills of young children. They also maintained that teachers can appropriately implement a social-emotional curriculum within the preschool environment. While no impact was found on the problem-solving ability of the children, the researchers believed it was due to the limited number of

problem-solving lessons introduced (only 3 out of 30). Children who are provided direct instruction in problem-solving skills are likely to show some increase in problem solving ability (Domitrovich et al., 2007). Assessments of problem-solving skills typically allow for young children to generate responses based on open-ended questions, however the assessment used in this study provided the children little time or picture choices to answer the questions dealing with problem-solving skills. Domitrovich et al. (2007) concluded that early childhood is a time to foster the development of many skills and teachers should focus on implementing a curriculum designed to foster the development of social-emotional skills and problem solving.

Current research supports the use of problem-solving interventions through the use of teacher-facilitated instruction among typically developing children (Domitrovich et al., 2007). Teacher trainings, paired with instruction, provide teachers with the knowledge base and understanding of how to accurately implement problem-solving programs within the preschool environment (Vestal & Jones, 2004). It appears that implementation of a problem-solving curricula supports the development of positive teacher attitudes and creates an environment that promotes student directed problem solving (Baker-Henningham et al., 2009). Therefore, it behooves researchers to continue to explore the implementation of problem-solving instructional programs to promote the development of pro-social, problem-solving skills among typically developing preschool-aged children.

### **Elementary School**

Scripted programs were originally developed to provide instruction to children at the elementary level who were at-risk for demonstrating deficits in problem-solving skills (Anliak & Sahin, 2010). The programs were designed for use in the clinical setting and

often included a parent component in conjunction with one-on-one child training (Webster-Stratton, Reid, & Stoolmiller, 2008). Recent adaptations of various interventions have been studied within the school environment to determine the impact on the development of problem-solving skills among young children outside of the clinical setting (Anliak & Sahin, 2010; Webster-Stratton et al., 2008). The use of the programs has been successful in decreasing at-risk behaviors (e.g., lack of emotional control, poor self-regulation skills, aggression, withdrawal) seen in the home and school environments.

In a study designed to ascertain the impact of a problem-solving curriculum on the behavior of elementary-aged children, Anliak and Sahin (2010) used the *I Can Problem Solve* (ICPS) curriculum (Shure, 2001). The goal was to evaluate the impact of the *ICPS* curriculum on changing aggressive behavior to pro-social behavior among young children. Children (ages 5 and 6) attending a public school were selected to participate in the study. The control group consisted of 43 children and 40 children comprised the experimental group. In this study, the control group only participated in pretests and posttests while the experimental group participated in pretest, training, and posttest.

A non-participant observational method was used to complete the pretest and posttest for both groups (experimental and control). During pretest, children were observed in two separate small group-play sessions, each lasting for approximately 15 minutes. During this time, two observers rated the behavior patterns of the children, using the *Drexel Early Childhood Behavior* (DECB) rating scale (Shure, 2005). The *DECB*

consists of a 12-item questionnaire used to rate the pro-social behaviors, aggressive behaviors, and introvert behaviors displayed in a social setting (Anliak & Sahin, 2010).

Following the pretesting phase of the study, the experimental group implemented the *ICPS* curriculum (Shure, 2001) in their classrooms. Over the course of four months, the teachers taught 83 daily lessons using the *ICPS* programed lessons. Each lesson was teacher directed and lasted 20-30 minutes, depending on the attitudes and attention of the children. The lessons used puppets, drama, role-play, and pictures. The teachers in the control group did not implement the *ICPS* curriculum. Posttests were conducted following the intervention phase for both groups (experimental and control). Using the identical method as pretesting, the children were observed during two 15-minute play sessions and rated using the *DECB* rating scale (Shure, 2005).

Data were analyzed using a multivariate criterion of Wilks Lambda (Anliak & Sahin, 2010). Results indicated an effect between pretest and posttest scores of both groups, suggesting behavior change. In order to evaluate the effect of the *ICPS* program (Shure, 2001) on the behavior change among the children, an ANVOA was used. When compared to the control group, the experimental group demonstrated a significant decrease in introvert behaviors and a significant increase in pro-social behaviors. The results of this study indicate that the *ICPS* training was effective in teaching typically developing children how to effectively solve problems during play situations (Anliak & Sahin, 2010).

Anliak and Sahin (2010) concluded that the use of the *ICPS* program (Shure, 2001) promotes positive social interactions and the ability to recognize and solve problem situations. Although significant decreases in aggressive behavior were not seen using the

*ICPS* training, they suggested that some adjustment in aggressive behavior was observed. Anliak and Sahin (2010) maintained that instruction should focus on the development of the child as a whole using programs that promote the development of pro-social, problem-solving skills and to involve multiple opportunities to practice problem solving. Anliak and Sahin (2010) recommended that further study be done to ascertain the effect of problem-solving instruction on behavior change.

Green, Cillessen, Rechis, Patterson, and Hughes (2008) conducted a study designed to pinpoint the type of social problem-solving strategies first-grade children use in a variety of social situations. The purpose of the study was to determine if the type and number of problem-solving strategies used (pro-social-assertive, passive, or coercive) correlated with the gender of the children and to the teacher ratings of antisocial behaviors of the children. The study was conducted in 36 classrooms, across 15 schools. An average of 13 children from each classroom participated, with a total of 257 children participating. To begin the study, all teachers were required to complete a behavior-rating scale for each child in their classroom. The 26-item teacher rating scale was created by the researchers and used a variety of existing behavior-rating scales (Green et al., 2008). Teachers rated the frequency of the behaviors displayed by the children on a 5-point Likert-type scale.

The children were assessed using a social cognitive interview created for the study based on the *Preschool Interpersonal Problem-Solving Test* (Shure, 1992b) and the *Social Problem Solving Test* (Rubin, Daniel-Beirness, & Hayvren, 1982). The interview was designed to determine the amount and type of strategies the children used when presented with a problem scenario. The assessment consisted of four scenarios depicting



the situations of joining: (a) a friend in a play activity, (b) an unfamiliar peer in play, (c) a familiar group of peers in a game, and (d) an unfamiliar group of peers playing a game (Green et al., 2008). An interview was conducted with each child during a 15-minute, one-on-one session. During the interview, the children were asked two questions concerning each scenario: (1) what would you do in the situation, and (2) if that does not work, what else can you do?

Data were coded using the teacher-rating scales and child social cognitive interviews (Green et al., 2008). All responses from the social cognitive interviews were narrowed down to 13 categories. From the 13 categories, analyses of the data were conducted. A Chi-squared test of association indicated that the number of strategies used, comparing boys to girls, was insignificant (Green et al., 2008). The data were then analyzed using a multivariate ANOVA. Results of the analysis indicated no significant difference between boys and girls concerning the type of strategy used to solve problem-based scenarios (Green et al., 2008). However, the girls demonstrated the use of more pro-social-assertive responses.

Data from the teacher rating scales were analyzed using a Pearson  $r$  to determine the correlation between the rating and type of strategy used by the child. Results indicated that girls showed a positive correlation between the use of pro-social-assertive strategies and teacher-rated antisocial behaviors. Girls rated high on social competence as demonstrated by a positive relationship with amount of pro-social strategies used to solve problems. Boys rated by teachers as antisocial used coercive strategies when solving problems. Even though most children used pro-social or requesting strategies on the

scenario assessment, the boys did not demonstrate any significant relationships in the three categories (pro-social-assertive, passive, and coercive) (Green et al., 2008).

Green, Cillessen, Rechis, Patterson, and Hughes (2008) concluded that children rated as competent by teachers are more likely to display positive problem-solving behaviors in peer-related situations. The researchers support the use of problem-based scenarios that incorporate open-ended responses to evaluate strategies used by young children presented with problem situations. They maintained that scenarios, representing a broad range of problems, are an effective means to measure the acquisition of problem-solving skills. Green et al (2008) recommended that further study include the use of a control group, intervention, and other measures of social competence.

Bushman and Peacock (2010) studied the effectiveness of parent training paired with a *Problem-Solving Skills Training* (PSST) (Kendall & Braswell, 1985) compared to a parent training paired with a Nondirective Therapy (NT). The goal of the study was to determine which training resulted in increased social skills (in problem situations), reduced oppositional behaviors, and reduced family stress. Parents of children between the ages of 7 and 12 who displayed at-risk signs of oppositional defiant disorder were included. A total of 26 families were selected to participate in the study. Prior to the study, parents of all children were required to attend six sessions of parent training. During these sessions, mothers were taught how to address problem situations using hands-on role play and video-modeling.

An experimental design using pretest, training, and posttest was used for the study. Immediately following the parent training, pretests were given to the parents and the child. In the pretest phase, parents were responsible for completing a behavior

checklist, a parent stress measure, and a parent questionnaire design to rate the behavior of their child, while the children completed a self-report of social skills (Bushman & Peacock, 2010). During intervention, children in the experimental group attended a 50-minute problem-solving skills training session, once a week for six weeks. While the control group attended a non-directive therapy session (Bushman & Peacock, 2010). Problem-solving skills training focused on practicing the steps to problem solve during hands-on games and social role-play situations. Throughout the training session, mothers of both groups of children completed daily behavior ratings of their child. Following the training phase, mothers in both groups (PSST and nondirective) completed posttests which consisted of a behavior checklist, a parent stress measure, and a parent questionnaire, while the children completed a self-report of social skills (Bushman & Peacock, 2010).

Pretest measures completed by the parents and self-reports completed by the children were analyzed using a between groups ANOVA. The results of the data analysis indicated no difference at baseline between groups. Pretest and posttest measures for both groups (PSST and nondirective) were analyzed using a repeated measure ANOVA to test for significance in the improvement of social skills, reduction in negative behaviors, and decrease in parental stress. Results of the analysis indicated significant effect on social skills over time for the *PSST* (Kendall & Braswell, 1985) group and no significant increase for the nondirective therapy group control. The results of the child behavior checklist completed by the parents did not demonstrate statically significant results for either group, but did indicate small improvements for the experimental group. Children in the *PSST* group were rated by their parents as demonstrating a decrease in the amount of

negative behaviors exhibited over time, while the parents of the nondirective group indicated a non-meaningful increase in negative behavior. Data collected through the daily behavior reports completed by the parents showed improvements in social skills for both groups (Bushman & Peacock, 2010). Parents of all children in the study (PSST and nondirective) reported a decrease in their stress levels and rated the training as effective in decreasing problem behaviors of their children.

Bushman and Peacock (2010) concluded that the use of the comprehensive training program was effective in increasing social skills and reducing parental stress. It appears that a structured program is effective in supporting families and providing lessons in a clinical setting. The researchers maintained that while all results were not significant, the training was helpful in decreasing externalizing behaviors, increasing social competence, reducing parental stress, and increasing social skills of the children. Bushman and Peacock (2010) recommend further research to determine which components of problem-solving treatments are most effective when working with a variety of children and families.

Webster-Stratton, Reid, and Stoolmiller (2008) conducted a study that investigated the impact of an adapted version of a clinical-based program used in a public school setting. The goal of the study was to determine if teachers trained in the *Incredible Years Child Training Curriculum (Dinosaur School)* (Webster-Stratton, 1990a) would demonstrate more positive behavior management strategies and focus on the development of social-emotional skills of the children. Over a four-year period, a total of 1,746 students participated in the study. The students were selected from diverse groups and children living in poverty. Students were nested within 160 classrooms consisting of

Head Start, kindergarten and first grade. The average age of the students was 5.5 years old.

In this study, the control group implemented the usual school curriculum while, the teachers in the experimental group used the *Dinosaur School* curriculum (Webster-Stratton, 1990a). An experimental design was used in which all classrooms (experimental and control) participated in pretesting prior to the implementation of the curriculum in the experimental rooms. The pretest consisted of teacher observations, parent observations, and classroom observations. Classroom observations were recorded using an adapted version of the *Multiple Option Observation System for Experimental Studies (MOOSES)* created by Tapp, Wehby, and Ellis (1995). These observations were conducted during two separate 30-minute sessions and focused on rating the amount of positive and negative teacher and child interaction, peer interactions, and child involvement in various activities.

Classroom management styles of the teachers were measured using the *Teacher Coder Impressions Inventory (TCI)* (Webster-Stratton, Reid & Stoolmiller, 2008). This is a 71-point likert-type scale designed to measure the frequency and degree of critical comments, inconsistency, affection, and promotion of social and emotional skills used by the teachers. During the pretesting phase, a subset of the experimental population (216 children) was selected, based on teacher behavior report, to participate in additional assessment. Children in the subset population were given the *Wally's Problem Solving Test* (Webster-Stratton, 1990b). The assessment is designed to measure the problem-solving skills of children when presented with hypothetical situations.

After the pretesting phase, the experimental teachers were trained to implement the *Dinosaur School* curriculum (Webster-Stratton, 1990a). The teachers implemented the curriculum two days a week, during 20-30 minute large group sessions, followed by a 20-minute small group lesson for six months. The control group continued to implement the traditional curriculum during this time.

Following the implementation of the curriculum with the experimental group, post assessments were administered to both groups (control and intervention). Post assessments consisted of two 30-minute observations of the children and teachers using the *MOOSES* (Tapp, Wehby, & Ellis 1995) and *TCI* (Webster-Stratton, Reid & Stoolmiller, 2008) observation forms. In addition to the observations the subset population of the experimental group was tested using the *Wally's Problem Solving Test* (Webster-Stratton, 1990b).

The data were analyzed using a multi-level random intercept and slope model within a pre-post ANCOVA. A 4-level modeling method consisting of repeated measures within students, classrooms within teachers, students within classrooms, and teachers was conducted.

Using the analysis results of the *MOOSES* (Tapp, Wehby, & Ellis 1995) the number of critical responses by teachers showed a significant effect. The correlation was negative and significant indicating that after training the experimental teachers demonstrated less critical or harsh behaviors toward student behaviors. No other teacher behaviors showed a significant effect in the control or experimental group. Child conduct behaviors showed significant correlations on the intervention slope. Thus, children in the experimental group improved significantly in their behaviors in comparison to the control

group. The experimental students also demonstrated greater improvement in overall classroom atmosphere when compared to the control group.

A series of nested Chi-square tests were conducted to analyze the *TCI* (Webster-Stratton, Reid & Stoolmiller, 2008). These results indicated significant effects for the teacher behaviors in the experimental group. The teachers in this group demonstrated less harsh behaviors, more affection toward their students, and placed more emphasis on the social and emotional development of the students.

A mixed-design, ANOVA was used to analyze the results of the *Wally's Problem Solving Test* (Webster-Stratton, 1990b). Children in the experimental group showed significant improvements in their ability to generate positive solutions to problems when compared to the control group. Children in the experimental group were better able to identify a variety of feelings than were the control group at posttest.

The results of this study support the use of a clinically-based intervention program to teach positive social-emotional and problem-solving skills to children (Webster-Stratton, Reid, & Stoolmiller, 2008). The researchers maintain that young children are capable of learning new skills at a higher rate when the skills are presented in a positive manner.

Webster-Stratton, Reid, and Stoolmiller (2008) concluded that children, regardless of age, gender, or grade, can learn to problem solve through direct training programs. They believe programs dealing with problem solving not only benefit children, but create a more positive teacher who reflects a positive attitude in problem situations. Webster-Stratton, Reid, and Stoolmiller (2008) suggest that further research is needed to

determine the long-term impact of this program, not only on social development, but academics as well.

Gillies (2011) designed a study to analyze the questions teachers use to promote thinking, problem solving, and reasoning among students working in small groups. The goal of the study was to provide an understanding of the discourse students use when participating in small groups. Three teachers were randomly selected to participate in the study. Class sizes for the teachers ranged from 25 to 30 students.

An experimental design was used in which the three teachers participated in training prior to data collection. No control group was used in this study. The training consisted of a two-day workshop that introduced the teachers to the critical elements of social and individual constructivism needed to create a cooperative learning environment. The teachers learned how to facilitate group discussions, promote engagement and learning, and teach students how to engage in small peer-based discussions. The data collection phase consisted of audio taping the teacher while conducting classroom lessons for 45 minutes. Following the lesson, on the last day of the week, small groups of students were audio taped during a small group activity.

Following the data collection phase, the audio tapes were collected and one tape was randomly selected from each of the teachers for analysis. Two audio tapes from the small group work were selected based on the teacher tape selected. All audio tapes were transcribed and analyzed using the coding process defined by the *Ask to Think Tel-Why Transactive Model* of peer tutoring (King, 1999). Further coding was conducted using the questions students constructed to communicate in their small groups, specifically the



types of questions asked and the information was summarized. The coding process was completed and verified with 100% agreement.

Data analysis indicated that the teachers promoted conversation among the students by using a variety of questioning techniques. The question types ranged from simple probing questions to more complex higher-level thinking questions to scaffold learning based on the needs of the students. Prior to breaking into small group activities, the teachers provided definitions of solutions to problems and reviewed previous scenarios solved in class. This provided an opportunity for the teacher to connect the current lesson to prior experiences of the class. During the small group activities, the students used a variety of probing and challenging questions as modeled by the teachers. The groups identified various problems and used questioning techniques which created engagement in reciprocal conversations.

Gilles (2011) concluded that the use of higher levels of questioning provides more opportunities for children to consider various ideas when provided with a problem. These opportunities allowed for reciprocal conversations among the students before coming to a conclusion concerning a problem. Gilles (2011) maintained that the interaction between teacher probes and small group discussion is critical to the development of problem-solving skills because it allows students to connect prior knowledge to solve a variety of novel problems.

## **Summary**

Problem-solving instruction for typically developing children in early childhood and elementary settings has occurred primarily in clinical settings and only recently in school classrooms (Webster-Stratton et al., 2008). The use of teacher training, one-on-

one modeling, and scaffolding of instructional lessons has been effective in increasing the ability of young children to become proficient problem solvers (Dincer & Guneyasu, 1997, 2001; Gross, 2005). By acquiring the knowledge of how to problem solve, children are better prepared to deal with problem situations as they occur (Vestal & Jones, 2004). Numerous natural accounts of problem situations arise throughout the day, within the classroom environment, allowing for practice in problem solving (Gross, 2005). When situations occur, teachers who facilitate the use of positive problem solving have more opportunities to provide constructive feedback and encourage the use of pro-social interactions to solve these problems (Baker-Henningham et al., 2009).

### **Problem-Solving Instruction for Students with Developmental Disabilities**

The application of problem-solving skills during spontaneous real-life situations is a reflection of task persistence, social skills, self reliance, and self-determination skills (Agran et al., 2002; Brotherson et al, 2008; Hess & Copeland, 2001). Research in the area of problem solving and the impact of these skills on adolescents with developmental disabilities has been a focus of researchers for many years (Agran et al., 2002; Palmer, 2010). The research indicates the need for problem-solving instruction for adolescents and more recently younger children (Glago, Mastropieri, & Scruggs, 2009; Palmer & Wehmeyer, 2003). Strategic instruction using teacher-directed lessons, real-life scenarios, role play, and games has been studied to determine the impact of problem-solving instruction on children with learning and emotional disabilities. This instruction increased the ability of children to follow problem-solving steps to set personal and academic goals (Cote, 2009; Glago et al., 2009; Wehmeyer & Palmer, 2003).

The importance of the development of problem solving as critical to cognitive, language, social development calls for this instruction in the early years. Prior to recent research, problem-solving interventions have mainly focused on the social or physical inclusion of children with disabilities (Salisbury et al., 1997). Although typical students have been included in these studies, students with disabilities are often present, but not included (Diamond, 1993; Salisbury et al., 1997). However, recent reports indicate that young children can learn to solve problems through the use of instruction designed at their cognitive level, thus increasing a need for a teaching protocol for this population (Keen, 2011). It is imperative to look to the programs designed for typically developing children, recent research with young children with developmental disabilities, and interventions for older children to determine efficient and effective means to teach young children in the early childhood environment how to problem solve.

### **Early Childhood Education**

Intensive early intervention services have been the focus of early childhood special education for many years (Keen, 2011). Although researchers have investigated the impact of problem-solving instruction with young children at-risk for behavior problems, limited research for young children with developmental disabilities is available. Recently, indication of delays in the ability to problem solve has been recognized as a concern in the early years and created a need for research in this area (Joseph & Strain, 2010). Young children who are unable to independently problem solve have decreased chances of being integrated with their typically developing peers in the general education environment (Agran et al., 2002). The impact of the home environment, parent-child relationships, and teaching through systematic instruction to increase the acquisition of problem-solving skills has recently been investigated

(Brotherson et al., 2008; Karnes et al., 2005). It is critical to examine the effectiveness of these programs in order to determine an effective approach for teaching young children these skills.

Brotherson, Cook, Erwin, and Weigel (2008) designed a study to ascertain the impact of personal family views and the home environment on the development of self-determination among young children with disabilities. The goal of the study was to define specific family characteristics that influence self-determination and how those characteristics impact self-determination development. Families of young children with physical and developmental disabilities were recruited to participate in the study. Thirty families with 31 children, ages 3- to 8-years old, agreed to participate (Brotherson, Cook, Erwin, & Weigel, 2008). The sample consisted of one set of twins, 20 girls, and 11 boys.

A grounded theory method of data collection, that used notes and memo writing, was used to understand family characteristics within the home environment (Brotherson et al., 2008). The researchers met with families once, for an average of two hours, to complete the observation and interviews. The families then participated in semi-structured interviews designed to better understand the characteristics within each environment. Interviews focused on eliciting responses related to self-determination and how choice making and independence were fostered in the home. In-home observations were conducted and recorded using photographs and written documentation. During the observations, notes were made of accommodations and modifications in the home environment.

The data were analyzed using a qualitative coding process to synthesize the data collected (e.g., field notes, observations, photographs, and parent interviews) and put it

into categories (Brotherson et al., 2008). Data synthesis included initial coding to sort common themes, and once common themes were identified the data were further grouped into categories that demonstrated common characteristics. Once specific categories were established for each family, vignettes were written about each family. These vignettes synthesized the observations, modifications, and strategies used in the home.

Results from the coding indicated that families fostered the development of self-determination skills in the home environment through the creation of a comfortable environment in which the children felt supported and welcome (Brotherson et al., 2008). The environments supported the development of choice making, problem-solving skills, and independence by using accommodations and modifications when needed. Simple modifications were apparent through strategically placed materials, necessary for everyday use, within reach of the child. The observations also revealed that the children were encouraged to try things on their own, ask for help when needed, and attempt to solve problems as they occurred.

Brotherson et al. (2008) concluded that families were successful in providing environments as well as emotional support needed to promote self-determination for young children with physical and developmental disabilities. They maintained that the home environment is a perfect opportunity for young children with disabilities to learn how to become independent problem solvers and choice makers, both skills that contribute to the development of self-determination skills. They recommended further research in the development of self-determination over time for young children with disabilities (Brotherson et al., 2008).

Karnes, Johnson, and Beauchamp (2005) conducted an exploratory study to ascertain the impact of teaching problem-solving strategies to young children with disabilities. The focus of the study was to determine the usefulness of verbalization strategies when solving problems. Ten children ranging from 5 to 6-years of age with disabilities were selected for the study (Karnes, Johnson, & Beauchamp, 2005). Selection was based on a child's ability to complete a task, demonstration of low to moderate impulsivity, and a moderate ability level as rated by classroom teachers. The children attended a special education preschool.

A multiple treatment design was used to conduct the study (Karnes et al., 2005). The study was comprised of five phases. Pre baseline determined a pattern of task behavior for each participant. This was followed by a small group activity. Baseline was measured and determined by the on-task engagement and amount of time off-task. The design replication baseline phase was used to determine off-task behavior with replicating tasks. Once baseline was established, the design replication phase began (Karnes et al., 2005).

The replication phase consisted of 9 to 10 problem-solving lessons implemented in small group and one-on-one formats (Karnes et al., 2005). Each lesson focused on teaching a verbal-problem solving strategy through the use of fine-motor problem-solving tasks. Tasks were taught through the use of cognitive modeling, structured tasks, prompting, and reinforcement (Karnes et al., 2005). Puppets were used during the cognitive modeling process to model the verbalization needed to solve the problem. The puppet described the task, how to solve the task, and praised himself for completion of the task. Structured tasks provided immediate feedback from the teacher during these

activities. The use of prompting and reinforcement was used throughout each lesson to promote student engagement. Students were reinforced for following along with the puppets and completing the assigned tasks. The next phase, maze baseline, followed the same baseline procedures and was completed once engagement and off-task behaviors were established. The last phase, maze completion, consisted of ten lessons following the same format as the design replication phase (Karnes et al., 2005).

To determine the effectiveness of the instruction on each phase, both quantitative and qualitative data were collected (Karnes et al., 2005). During the problem-solving tasks, quantitative behavioral data were collected using time-sampling to determine the amount of time children were engaged with a task, engaged orally with a task, covertly engaged, or off task (Karnes et al., 2005). In addition to task engagement, problem-solving behavior was assessed during group work and during the teacher-directed, fine-motor lessons (four times a week). Problem-solving was rated by the intensity of child concentration with a task and task completion. Observers collected data using time samples, videos, and direct written observations of engagement and problem-solving (Karnes et al., 2005).

Time-sampling data analysis indicated that the children engaged in random approaches to solving a problem 70% of the time in the beginning of the study, meaning little systematic approach was used by the children (Karnes et al., 2005). This amount decreased to 42% during the last phase. The decrease indicates that the children were developing more systematic approaches to solving problems over time. While some children engaged in a methodical approach with no verbalization, many students engaged in trial and error approaches. When children were unable to solve problems on their first

attempt, trial and error approaches were applied 40 to 50% of the time. This indicated that the children were able to recognize that the solution did not solve the problem; thus adjusting occurred (Karnes et al., 2005). Overall, the content analysis indicated that 70% of the time the children were engaged actively in the problem-solving task (Karnes et al., 2005). In addition to independent acts to solve problems, the children engaged in planning and evaluation, including looking at pictures of finished products and engaging in self-talk during problem-solving time as well as asking for help.

Data collected in the form of written observations of problem-solving approaches were coded using content analysis (Karnes et al., 2005). The content analysis indicated that the mean percentage scores of systematic problem-solving approaches increased from 52.9% at baseline to 67.2% at intervention (Karnes et al., 2005). Engaging in a random approach and asking for help to solve a problem decreased over time. A visual analysis of the data at each phase indicated that the intervention was successful in increasing engagement for four children, somewhat successful for two children, and not effective for the remaining participants (Karnes et al., 2005).

The results of the analysis indicated that children in the study used a strategic approach to problem solving, while some used trial-and-error on independent tasks (Karnes et al., 2005). Data collected during the lessons suggest active engagement in a task increased with the implementation of problem-solving instruction and off-task behavior decreased (Karnes et al., 2005). Although the data did not yield a significant increase in a child's ability to use verbal strategies to solve problems, the results indicated that children did become more successfully engaged in fine-motor, problem-solving tasks over time (Karnes et al., 2005).



Karnes, Johnson, and Beauchamp (2005) concluded that structured problem-solving activities, paired with verbalizing problem-solving steps, may enhance the problem-solving ability of most young children with disabilities. They maintain that young children are capable of learning to engage in problem-solving tasks. While this model was successful in increasing the problem-solving of some children they recommend that a less intrusive form of instruction be considered for implementation in the early childhood environment (Karnes et al., 2005).

Research in the area of problem-solving for young children with developmental disabilities is very limited, but the research conducted thus far is promising (Brotherson et al., 2008; Karnes et al., 2005). Strategic instruction utilizing teacher facilitated lessons, real-life scenarios, and role-play have been successful in fostering the development of problem-solving skills for young children. These interventions have been effective in teaching young children with developmental disabilities to apply problem-solving strategies (Brotherson et al., 2008). This preliminary research supports the idea that young children with developmental disabilities are capable of learning to problem solve through the use of direct instruction and guided support (Brotherson et al., 2008; Joseph & Strain, 2010; Karnes et al., 2005). The research also calls for further exploration of appropriate instructional protocols for this group of students.

### **Elementary School**

Although instruction in problem solving typically occurs at the secondary level, researchers recently indicate the need to investigate this critical skill in the early years (Palmer & Wehmeyer, 2003). Unfortunately, instruction of problem-solving skills has not been conducted with young children with developmental disabilities at the early

elementary level until recently (Glago et al., 2009). Some researchers have examined the use of adapted models developed for adolescents in problem solving, while others have created daily direct instruction lessons plans for teacher implementation (Glago et al., 2009; Palmer & Wehmeyer, 2003). In addition to direct instruction in the classroom, parent-child interactions at the elementary level have been studied to determine if family relationships impact the development of problem solving (Fenning, Baker, & Juvonen, 2011).

Fenning, Baker, and Juvonen (2011) conducted a longitudinal study to determine the association between a child's social cognitive abilities and parent-child interactions. The goal of the study was to evaluate the impact of family relationships on the development of interpersonal relationships (including problem solving) of children with and without developmental delays (Fenning, Baker, & Juvonen, 2011). Participants were 5-year olds randomly selected from community agencies and preschools. A total of 146 families participated in the study. At the age of 5, an initial assessment using the *Stanford-Binet IV* (Thorndike et al., 1986) was used to determine a composite score of functioning to be used for group assignments. Two groups were formed, group one consisted of 107 typically developing children, while the second group contained 39 children with mild developmental delays (Fenning et al., 2011).

In this study, children in both groups were tested using a strengths-based model when they turned 8-years old. The strengths-based model of assessment consisted of a home visit to observe parent-child interactions and these were used to determine the child's social cognition in regards to casual reasoning, problem solving, perspective taking, and internal-state understanding. Problem-solving skills were characterized by the

child's ability to identify a problem, generate solutions, evaluate the solutions, discuss the solution, and plan for future situations (Fenning et al., 2011). Following the home visit, children were assessed using the *Social Problem Solving Measure* (SPSM) (CPPRG, 1991). The *SPSM* measures the child's responses to vignettes involving peers in various social situations. In addition to the *SPSM*, parents and teachers completed the *Social Skills Rating System* (SRSS) (Gresham, & Elliot, 1990). The *SRSS* was used to provide a reliable measure of the child's assertiveness, cooperation, and self-control (Fenning et al., 2011).

Upon completion of the observations and assessments, the data were analyzed and compared across both groups. The home visits were coded and evaluated using the *Emergent Social Cognition Observation System* (ESCOS) developed for the study (Fenning et al., 2011). Utilizing a 5-point scale, the *ESCOS* measures parent-child interactions to determine the child's social cognition in regard to casual reasoning, problem solving, perspective taking, and internal-state understanding. Results indicated that the parent-child interactions of children in both groups (with and without developmental delays) were significant in promoting the development of problem-solving skills. A univariate analysis of covariance indicated that typically developing children demonstrated more prosocial problem-solving strategies and more sophisticated parent-child interactions, while children with developmental delays demonstrated significantly more maladaptive strategies (aggression, physical acts, disruptiveness) (Fenning et al., 2011).

The results of coding the *SPSM* (CPPRG, 1991) indicated that the prosocial solutions presented consisted of asking and positive negotiating. These results were

significant across both groups (with and without developmental delays) (Fenning et al., 2011). Maladaptive solutions of aggression, physical acts, and verbal outbursts were significantly higher among children with developmental delays. Additionally, a strength-based analysis was completed (Fenning et al., 2011). During this analysis the results of the parent-child discourse, prosocial strategies produced, and the *SSRS* (Gresham, & Elliot, 1990) from both parents and teachers were combined to determine the relationship among the variables. A chi-square test, the comparative fit index, and a root mean square error of approximation were conducted (Fenning et al., 2011). Results of these analyses indicated that children with higher rated social skills demonstrated higher rates of problem solving.

Fenning, Baker, and Juvonen (2011) concluded that children in both groups (typically developing and those with developmental delays) were able to generate multiple problem-solving solutions to novel problems, however, typically developing children demonstrated a higher quality of appropriate solutions. Therefore, typically developing children are able to effectively produce positive emotional interactions during parent-child discourse, generate more appropriate solution to problems, and are rated as having better social skills when compared to peers with developmental delays (Fenning et al., 2011). The researchers maintain that while children with developmental delays are capable of generating plausible solutions to problems, interventions for children with developmental delays should focus on the development of improving independent solutions to problems. The researchers note that problem-solving ability and emotional discourse are strongly related to resiliency, thus indicating a need for intervention (Fenning et al., 2011). Fenning et al. (2011) concluded that these interventions should

focus on enhancing the development of social cognition and prosocial problem-solving through naturalistic and structured teaching approaches.

Glago, Mastropieri, and Scruggs (2009) conducted a study designed to ascertain the effect of explicit instruction on problem identification and problem-solving abilities of students with mild disabilities in the elementary setting. The goal of the study was to determine if students with disabilities were capable of learning and applying problem-solving strategies.

One public school participated in the study (Glago, Mastropieri, & Scruggs, 2009). Twenty-one 4- and 5-grade students, eligible for special education under the federal guidelines for a student with a learning or emotional disability, were randomly assigned to one of two groups (experimental or control). A pretest-posttest, randomized control group design was used for this study. Both the experimental and control groups participated in pretest, posttest, and maintenance assessments (Glago et al., 2009). However, only the experimental group received direct instruction in problem solving during the study.

Pretesting consisted of measuring student ability to demonstrate knowledge of problem solving by naming the five-steps of problem solving and applying those steps to various scenarios (Glago et al., 2009). Two problem-solving measures were used to determine student self-efficacy and student ability to describe problem solving using the *Problem-Solving Questionnaire* (Palmer, Wehmeyer, Gipson, & Agran, 2004). Students were observed completing a classroom activity to measure their ability to apply problem-solving strategies in the classroom. Upon completion of pretesting, the intervention group

received intervention lessons while the control group participated in silent reading in their classrooms (Glago et al., 2009).

The problem-solving intervention consisted of daily 30-minute self-determination lessons for a period of 6-weeks (Glago et al., 2009). All lessons followed a specially designed lesson plan to facilitate the learning of the five-steps to problem solving. Each daily lesson consisted of a review of the problem-solving steps, presentation of a scenario, opportunities to practice applying the steps to solve the problem within the scenario, discussion, and role play solutions.

Following the implementation phase of the intervention in the experimental classrooms, posttests were completed by the experimental and control groups. The posttest followed the same format as the pretest. Students were assessed in their ability to demonstrate knowledge of problem solving by naming the five-steps to problem solving and applying those steps to various scenarios (Glago et al., 2009). The *Problem-Solving Questionnaire* (Palmer et al., 2004) was used to determine a student's ability to recall and apply the steps needed to solve a problem. Students completed a seven-item, researcher developed questionnaire designed to measure the self-efficacy of each student (Glago et al., 2009). Finally, students were observed completing a classroom activity to measure the ability to apply problem-solving strategies in the classroom. Three weeks following the study, the students in the experimental and control group participated in maintenance assessments identical to pre- and posttest assessments.

All data collected on student measures were scored using rubrics (Glago et al., 2009). Pretest data indicated no significant difference between the experimental and control group. Nonparametric tests were used to analyze the results of the posttest. When

compared to the pretest the experimental group demonstrated significant differences in the ability to learn the problem-solving strategy when compared to the control group (Glago et al., 2009).

The problem-solving scenario, questionnaire, and self-efficacy measures were analyzed using three ANCOVAs (Glago et al., 2009). Significant results were indicated for the problem-solving scenario and problem-solving questionnaire (Palmer et al., 2004). Statistically significant results were reported for the ability of the students in the experimental group to appropriately apply problem-solving strategies to problem scenarios as well as their ability to appropriately answer the questions on the problem-solving questionnaire. The results of the self-efficacy measure indicated that the experimental students' ability to complete the self-efficacy measure increased from pretest to posttest, but did not yield significant results (Glago et al., 2009).

The generalization assessment (completion of an in class activity) was analyzed using an independent sample *t* test (Glago et al., 2009). Results of this analysis indicated a statistically significant difference between groups at posttest. These differences were further analyzed using an ANCOVA; these results indicated that students in the experimental group were significantly more capable of applying strategies to generate solutions to problems at posttest. Maintenance assessments conducted with the experimental group indicate that students maintained the ability to recall and apply the steps of the problem-solving strategy when given various scenarios.

Glago, Mastropieri, and Scruggs (2009) concluded that the use of problem-solving lessons were successful in the acquisition of problem-solving skills for 4- and 5-grade students with learning and emotional disabilities. They maintain that, when taught

on a consistent basis through the use of specific direct instruction, students can learn a problem-solving strategy, apply the strategy, generalize the strategy, and maintain the strategy over time. Glago et al. (2009) support the regular implementation of self-determination and problem-solving instruction across settings. They recommend that further study be done to determine the extent to which problem-solving skills can be taught to younger students (Glago et al., 2009).

Palmer and Wehmeyer (2003) conducted a study to determine the efficacy of using the *Self-Determined Learning Model of Instruction* (SDLMI) (Mithaug, Wehmeyer, Agran, Martin, & Palmer, 1998) to promote self-determination skills among children in the early elementary years. The goal of the study was to evaluate the impact of using the SDLMI (Mithaug et al., 1998) on the development of self-regulated problem-solving skills to enhance the development of self-determination among young children with developmental disabilities.

Fourteen experienced teachers in kindergarten through third grade classrooms across 11 elementary schools participated in the study. Fifty students, with a mean age of 7, participated in the study (Palmer & Wehmeyer, 2003). Of the 50 children, five students were in kindergarten, six students in first grade, nine students in second grade, and 30 students in third grade. All students were diagnosed with a learning disability, speech impairment, intellectual disability, gifted, or undergoing assessment for special education services.

The study used an experimental design consisting of training, pretest, intervention, and posttest. There was no control group. Prior to implementing the *SDLMI* (Mithaug et al., 1998), the teachers were trained on the implementation of the model. The



*SDLMI* is a model of teaching that provides a structured format to teach students to set goals, solve problems related to the goals, and evaluate the effectiveness of solutions through self-monitoring techniques. The model was originally designed for adolescents and has been adapted to be developmentally appropriate for younger children (Palmer & Wehmeyer, 2003).

Following the teacher training, pretests were completed for each student using the *American Institutes for Research Self-Determination Scale* (Wolman, Campeau, Dubois, Mithaug, & Stolarski, 1994). During this assessment, students were asked to define terms and provide an example of the term related to goal setting (interest and goal). In addition to the completion of the self-determination scale, each student was monitored using the *Goal Attainment Scale* (GAS) (Kiresuk, Smith, & Cardillo, 1994). The *GAS* provides an interactive means of establishing goals, a method to monitor achievement toward meeting the goals as well as determining the outcome of the goals. The children set five goals, all of which were monitored using the *SLDMI* (Mithaug et al., 1998; Palmer & Wehmeyer, 2003).

After the pretest and teacher training, implementation of the *SDLMI* (Mithaug et al., 1998) lessons began. Teachers used developmentally appropriate materials during a three-phase instructional model over a period of two months (Palmer & Wehmeyer, 2003). Through all three phases of the learning model, the teachers facilitated the learning of the steps needed to solve a problem. Each phase of the model focused on the fundamental steps needed to solve problems. These four sequential steps included: (1) identify the problem, (2) identify solutions to the problem, (3) identify barriers to reaching the solution, and (4) identify the outcome of the solution (Palmer & Wehmeyer,

2003). The sequential steps to solve a problem were taught to all of the children using modeling, teacher facilitation, and direct instruction.

Upon completion of the instructional activities, the teachers identified student achievement of the five *GAS* outcomes. In addition to teacher ratings on the *GAS* (Kiresuk et al., 1994), each student was assisted in the completion of the *GAS* scale from their perspective. Following implementation of the *SDLMI* (Mithaug et al., 1998), the students were assessed again using the *American Institutes for Research Self-Determination Scale* (Wolman, et al., 1994). During this assessment, the students defined terms and provided an example of the term related to goal setting (interest and goal).

Data collected using the *GAS* (Kiresuk et al., 1994) were analyzed to determine mean scores and standard deviations for both student and teacher-rated scores (Palmer & Wehmeyer, 2003). A paired sample *t* test was completed to determine the differences between teacher ratings and student ratings on the *GAS* assessments. Results from this analysis indicated that the goal attainment of the students was slightly above average. An additional analysis, using a chi-squared test, evaluated teacher-rated scores on the *GAS* across grade levels. This indicated that average scores on the *GAS* were above the expected range, indicating the model was successful. An additional *t* test was used to compare the pre-and-post scores on the *American Institutes for Research Self-Determination Scale* (Wolman, et al., 1994). Significant differences were reported between pre-and-posttest scores of this assessment. Students were able to generate more examples of a goal at posttest, when compared to the pretest scores.

The results of the study support the use of the *SDLMI* (Mithaug et al., 1998) in the early elementary years. Students across grades levels, kindergarten through third grade,

were able to learn the steps needed to set goals, problem solve to meet those goals, and evaluate the goals set. The teachers rated the use of the *SDLMI* as effective in facilitating the instruction of problem-solving to young children with developmental delays. They reported that the program was easy to implement and simple to incorporate within already established classroom routines (Palmer & Wehmeyer, 2003).

Palmer and Wehmeyer (2003) concluded that young children with disabilities who received problem solving instruction using the *SDLMI* (Mithaug et al., 1998) were capable of setting goals, working toward those goals, and evaluating the effectiveness of the plan they used to reach their goals. They maintain that through teacher facilitation and guidance with solving problems, children can develop these critical skills leading to future self-determination (Palmer & Wehmeyer, 2003). They recommended that instruction in the early years focus on the development of the attitudes and abilities needed to achieve self-determination in later years (Palmer & Wehmeyer, 2003).

Facilitation of problem-solving instruction focuses on teaching a series of strategic steps to work through problem situations across a variety of environments (Palmer & Wehmeyer, 2003). Teaching the steps needed to problem solve with young children with developmental disabilities through the use direct instruction, collaborative problem solving, and parent-child interactions were reported as effective modes of instruction to teach problem-solving skills (Gauvin & Rogoff, 1989; Glago et al., 2009; Palmer & Wehmeyer, 2003). While the interventions reviewed here are considered effective, the need to develop a teaching protocol for younger children with developmental disabilities should be priority (Keen, 2011).

## **Summary**

Planned situations that use teacher-facilitated instruction through direct instruction using reinforcement and feedback foster the development of problem-solving skills in both early childhood and the elementary years (Fenning et al., 2011; Karnes et al., 2005). Research indicates that younger children are capable of demonstrating the ability to recognize, determine a plan of action, and apply the plan to successfully solve a problem (Gauvin & Rogoff, 1989). Scaffolding instruction during teacher interactions, peer interactions, and independent goal setting increases task persistence across academic areas, as well as the number of prosocial solutions. These abilities result in the development of self-determination in the early years (Brotherson et al., 2008; Diamond, 1993; Glago et al., 2009; Gross, 2005; Palmer & Wehmeyer, 2003).

Multiple and varied opportunities to practice problem solving will promote the maintenance of problem-solving skills across multiple environments among young children (Dincer & Guneyusu, 2001; Vestal & Jones, 2004). Understanding the positive impact of problem-solving instruction on children with developmental disabilities supports the need for identification of the most efficient instruction in the early childhood classroom.

## **Using Literature to Teach Problem Solving**

Children's literature is an effective tool that can be used to teach a variety of skills to students with developmental disabilities (Konrad, Helf, & Itoi, 2007). Literature plays a critical role in the development of foundational skills needed for success in the later years and is effective in improving learning behaviors, comprehension, and to enhance positive behaviors (Sridhar & Vaughn, 2000). Using a step-by-step approach to the

delivery of literature, critical skills of problem-solving can be fostered (Joseph & Strain, 2010; Konrad et al., 2007; Sridhar & Vaughn, 2000). The goal of using literature to teaching problem solving is to find story books that correlate with critical deficits children are experiencing (Sridhar & Vaughn, 2000). During instruction of literacy groups, teachers should serve as the facilitator of the lesson by providing questions that promote the acquisition of problem solving (Konrad et al., 2007; Sridhar & Vaughn, 2000). Although literature is a rich component of instruction for teaching problem-solving skills, instruction in this area usually focuses on social behavioral deficits among children with at-risk behaviors, dealing with emotional events, and acceptance of peers with physical disabilities (Hune & Nelson, 2002; Konrad et al., 2007; Sridhar & Vaughn, 2000).

Research on the use of literacy-based instruction in problem solving among children with developmental disabilities is limited. Online literature searches were conducted in the EBSO and ERIC online systems. Various search terms were used (problem-solving strategy, problem solving and young children, literacy-based problem-solving, using literacy to teach problem-solving skills, problem solving and young children with developmental disabilities), but yielded few relevant results. Results included informational articles such as, using bibliotherapy, social problem solving, and mathematical problem solving. A relevant article was selected based on the use of a literacy-based intervention to teach the sequence of problem-solving to children in order to generate problem solving solutions (Hune & Nelson, 2002).

Hune and Nelson (2002) conducted a study to ascertain the effects of implementing a strategic problem-solving strategy among young children in the

preschool setting. The goal was to identify the impact of the problem-solving intervention on a child's ability to generate solutions to identified problems and decrease aggressive social behaviors.

The intervention was implemented within the experimental group on a single Head Start campus using one teacher, a teacher on a separate Head Start campus served as the control. Each group was comprised of four students (3- or 4-year olds) who were identified by their teachers as having at-risk behaviors and notable social deficits.

An A-B single-subject design was used in the study. Each student, across both groups (experimental and control), participated in pretest assessment, baseline observations, probe observation sessions, post assessment, and maintenance assessment and observations. At pretest, teachers rated each child's social behaviors using the *Social Skills Rating System: Preschool Form* (SRSS) (Gresham & Elliot, 1990). Through direct observation, baseline was collected by rating each child's behavioral solutions to various simulated social conflicts. During intervention, instructional probes were conducted prior to every instructional session during a ten-minute observation period. Data collectors assessed each child using a series of five social interaction probes. During each probe, children were given a social scenario and asked to provide plausible solutions to the scenario. The data collector rated the solutions to the problems as either aggressive or prosocial.

Following the social interaction probes, implementation of the problem-solving strategy occurred in the experimental group. Teachers in the experimental group provided a 10-minute small group lesson three days a week. Each lesson used a children literature book targeted to promote problem solving. Themes of the literature books focused on

playing with peers, gaining objects of desire, and stopping inappropriate actions of others. In addition to literature books, problem-solving picture cards were used along with positive reinforcement for appropriate behavior. The teacher began each lesson by introducing the behavioral expectations, purpose of the lesson, theme of the story, and review of the problem-solving strategy. A four-step problem-solving strategy, paired with picture prompts, was used to teach the components of problem-solving. Children were taught to: (a) decide the problem, (b) think of way to fix the problem, (c) indicate what they would do to fix the problem, and (d) see how their friend felt about the solution to the problem (Hune & Nelson, 2002). Each literature book was used five times to teach the problem.

During the intervention, the control (non-experimental) group teacher implemented the same literature books during small-group instruction. Each literature lesson described the purpose of the story, discussed the conflict and problem in the story, but did not discuss or analyze possible solution within the story. Students were provided positive reinforcement for engagement in daily literature lessons.

Following the problem-solving intervention, posttests were used to rate the social skills of each child across both groups (experimental and control) using the *SSRS* (Gresham & Elliot, 1990). Children also were observed during probing sessions to determine the maintenance of the skill for the experimental group and to determine an increase or decrease of behaviors in the non-experimental group.

The data were analyzed using a split method analysis. At pretest, the children in the experimental group consistently demonstrated aggressive responses to problems during observations and probes. After implementation of the intervention, no significant

decrease was noted in aggressive responses. Responses were nonsense and inconsistent until intervention change. At mid treatment, Hune & Nelson (2002) changed the session prompt to directly ask the children to remember the steps to solve the problems instead of asking how to solve the problem. Following the intervention change, a drastic decrease in aggressive behavior and a distinct increase in prosocial solutions were both noted in the experimental group. The children were within 20% of the target for 80% of the responses. Aggressive responses were reported as decreasing for three of the children in the experimental group. However, one child did not show a consistent decrease in the use of aggressive behaviors during the observed probing sessions. The non-experimental group did not demonstrate a decrease in aggressive behaviors from baseline to maintenance.

Frequency data collected throughout the probing sessions indicated that positive prosocial solutions were used during on-going play sessions and when access to materials were needed for two of the children (Hune & Nelson, 2002). The other children demonstrated some prosocial solutions, but used aggressive responses for most solutions presented. Following the phase change (adjusting the verbal prompt), three of the four children demonstrated more prosocial solutions. Children in the non-experimental group did not show a difference in the frequency of aggressive solutions presented during the probing sessions.

Teacher perceptions of behavior using the *SSRS* (Gresham & Elliot, 1990) were compared. Among the children in the experimental group, the teacher rated one child as having a significant decrease in problem behaviors. While two of the students showed a decrease in aggressive behaviors, it did not impact the teacher perceptions of their behavior problems. One student was rated as having no change in behavior. Among the



non-experimental (control), no significant change in teacher perceptions of behavior was noted.

The results of this analysis indicate that for the experimental children their aggressive responses during social problem situations were reduced after implementing the problem-solving literature strategy. Children in the experimental group showed a notable increase in the production of prosocial solutions, once the phase changed occurred. This change supports the need for verbal prompting during social conflicts for children with behavioral problems. Results of teacher perceptions of behavior indicated significant reduction in problem behaviors for one child in the experimental group. For the non-experimental group no changes were indicated for behavior change or demonstration of prosocial solutions.

Hune & Nelson (2002) concluded that it is possible to teach young children in the preschool setting a problem-solving strategy paired with verbal prompts and picture cues during literacy groups. They indicated that a natural progression of applying prosocial solutions may occur when children are introduced to the problem-solving strategy and maintained that children are capable of learning a strategy through the use of literacy and direct verbal instruction. They recommended further research using a group design for more control of the impact of the intervention. They also suggested that direct measures of solution(s) and a consistent instructional sequence should be used in natural environments to teach problem-solving (Hune & Nelson, 2002).

Children's literature is commonly used to teach social skills, emotional skills, and peer acceptance to young children (Konrad et al., 2007; Hune & Nelson, 2002; Sridhar & Vaughn, 2000). Although this literature is a recommended tool for teaching, applying this

method of teaching in classrooms for children with developmental disabilities is limited. However, researchers support the use of strategically designed literature instruction to facilitate the learning of problem solving, choice making, and self-determination (Konrad et al., 2007). The lack of research in this area indicates a critical need to explore a specified teaching format to address problem solving through literature for young children with developmental disabilities.

### **Using Direct Instruction to Teach Problem Solving**

Using direct instruction to teach problem-solving strategies has been effective in increasing on task behavior, completion of assignments, effective in meeting individual goals, and decreasing inappropriate behaviors among children in the early elementary years through adult life (Palmer, 2010). Direct instruction in problem solving utilizes a step-by-step sequence of foundational skills that have been found to be effective in teaching students with developmental disabilities (Shure, 2001; Shure & Spivack, 1972). Problem-solving sequences typically demonstrate four common steps, (1) identifying the presence of a problem, (2) generating solution(s) to the problems presented, (3) determining the most appropriate solution to apply to the problem and following through, and (4) evaluating the effectiveness of the solution (Cote et al., 2010, Glago et al., 2009, Palmer & Wehmeyer, 2003).

Agran, Blanchard, Wehmeyer, and Hughes (2002) designed a study to determine the effects of self-regulated problem-solving instruction. The goal of this study was to evaluate the use of direct instruction in self-regulated problem-solving on the improvement of classroom behaviors of students with developmental disabilities (Agran

et al., 2002). Four students, three boys and one girl attending middle school participated in the study. Students met state criteria for the provision of services under the area of developmental disabilities (autism, intellectual disability, or multiple impairments). The four students made up the experimental group and no control group was used.

Although the participants attended the same middle school, instruction in problem solving occurred across multiple environments (general education classes and the resource room) in the form of small-group and one-to-one instruction. A multiple-baseline-across-participants design using baseline, training, and posttraining to determine the effects of the intervention over time was used (Agran et al., 2002). During the baseline phase, the teachers identified potential target behaviors for each student using the *Goal Attainment Scale* (GAS) (Kiresuk & Lund, 1979). The scale is used to set a goal, determine the expected outcome of a goal, and identify projected progress of the student. At baseline, teachers observed the engagement of the behaviors for each student and did not provide reinforcement or feedback. Data were collected daily during each phase and students were given 1-point for a correct response and 0-points for an incorrect response. When consistencies of the target behaviors were noted, the next phase began. Prior to the training phase, students completed the *GAS* (Kiresuk & Lund, 1979) to identify the target behavior for the study.

The training phase focused on teaching the four-step sequence needed to problem solve using the *Self-Determined Learning Model of Instruction* (SDLMI) (Mithaug et al., 1998). Using the *SDLMI*, students were taught to verbalize each step of the problem-solving process; (a) recognize the problem, (b) what can I do about the problem, (c) implement the solution, and (d) evaluate the effectiveness of the solution. This means-end

chain was paired with cue cards provided in a format for the students to use when a problem occurred in both resource and general education. During training, the students practiced the sequence of steps at the beginning of class and during teacher created opportunities throughout the school day. Once the students were proficient in following the four-step sequence to problem solve, they were encouraged to apply this strategy to their target goal. Following the training phase, students were expected to continue to apply the problem-solving strategy to meet their personal goals and maintain the skill over a two-week period.

The frequency data collected throughout the study were analyzed to determine each student's ability to learn and maintain the skill over time. The data collected indicated that during baseline the target behaviors were performed at a low rate of frequency (ranging from 0% to 20%) (Agran et al., 2002). Student A had a mean of 9%, student B had a mean of 20%, and students C and D had a mean of 0%. Mastery of the problem-solving sequence was set at 80% during the training phase. Three students (A, B, and C) maintained a mastery of 100% over time (5 to 9 days), while student D demonstrated a mean of 88% for 8 days. Maintenance of application of the problem-solving skill was at 80% for a period of 8 days. Student A maintained the skill for 8 days, student B for 5 days, and student D for 2 days. Student C was still in the training phase, thus no maintenance data were collected. Upon completion of the study, all students achieved the goals set at baseline (Agran et al., 2002).

Results of this study indicated that the students were able to learn a self-regulated problem-solving strategy and use it across multiple environments. The students were able to pick a target behavior and apply the learned strategy to maintain their individual goals.

They reported that the use of the problem-solving strategy was effective and they felt comfortable using the strategy across settings. Teachers reported that the use of the strategy was helpful in keeping students engaged and on-task during instruction.

Agran et al., (2002) concluded that students with developmental disabilities are capable of learning to select a goal and devise a plan to meet the identified goal using a self-regulated problem-solving strategy. They maintained that the use of the problem-solving strategy is effective in teaching students to be self-regulated and ready for transition into adult life. They indicated that problem solving is a fundamental skill that should be taught in the school environment on a consistent basis. Agran et al. (2002) suggest that this method of problem-solving instruction is appropriate for use in inclusive settings to address various academic and behavioral goals and recommend further investigation of the use of this problem-solving strategy.

Cote et al., (2010) conducted a study to determine the impact of problem-solving instruction on the skill performance of children with developmental disabilities. The goal of the study was to develop a systematic form of instruction to teach problem solving to students with intellectual disabilities to complete a problem-solving process. The process taught to students occurred through the use of direct instruction. The study was conducted in a public middle school with one special education teacher. Four students (three girls and one boy) with a mean age of 11.7 participated in the study.

A multiple probe design was used to conduct the study with no control group. The design included baseline, treatment, and maintenance (Cote et al., 2010). Baseline was established using problem-situation measures (Cote et al., 2010; Glago, 2005). The problem situation measures consisted of 10 problem scenarios that students reviewed and

indicated possible solutions. Prior to the intervention, students completed a problem-solving step measure (Cote et al., 2010; Glago, 2005). The students were assessed to determine their knowledge of the three steps needed to solve a problem (what's the problem, how can you fix it, and why will it work). Students also were assessed using a problem-solving questionnaire (Cote et al., 2010; Glago, 2005). Students completed eight problem-solving related questions that were scored on a 5-point likert scale.

Following baseline and completion of all pretests, instruction began (Cote et al., 2010). Problem-solving instruction occurred during one 15-minute session five days a week. The instruction was conducted using a teacher script. The teacher introduced the problem-solving steps, introduced a scenario, discussed the scenario in depth, and provided feedback to the students (Cote et al., 2010). The lessons were supported through the use of teacher modeling and role-play as well as through literacy discussions. Students were provided multiple opportunities to practice the problem-solving sequence and encouraged to produce at least two relevant solutions to each problem presented (Cote et al., 2010).

Following the instruction phase, post assessments were conducted. Students were assessed using the problem-solving step measure, problem-solving questionnaire, and a series of 10 problem situation scenarios (Cote et al., 2010; Glago, 2005) identical to pretest. Following the post intervention assessments, the students were administered random probes using role-play situations to solve real-life problems (Cote et al., 2010). Students were evaluated on their ability to identify the problem, generate at least two relevant solutions, and identify the most appropriate solution. Maintenance was conducted following generalization probes using the 10 problem situation scenarios.

Prestudy baseline and overall treatment percentages were compared to determine the efficacy of the problem-solving intervention (Cote et al., 2010). Baseline was established for all students at 80% for three successive occasions. During the treatment phase, the students demonstrated 80% criterion. A visual analysis of the treatment data indicated that one student showed no immediate increase in the ability to problem solve, however, after three sessions the student was able to apply the strategy. One student demonstrated an immediate increase in the application of the strategy making it difficult to analyze the rate of change. The two remaining students demonstrated gradual progress, over time, in learning to apply the problem-solving strategy (Cote et al., 2010). During generalization, all students demonstrated an ability to apply problem-solving steps to novel role-play situation with up to 93% accuracy.

Analysis of the problem-solving step measure indicated that students were not able to name the three steps of problem solving, but following intervention, two students were able to identify key concepts of the steps and one student identified all three steps (Cote et al., 2010). Review of the problem-solving questionnaire indicated that the awareness of problem solving decreased on posttest but increased during maintenance.

Results of this analysis indicate that the students were able to learn and apply the problem-solving steps (Cote et al., 2010). The students with mild intellectual disabilities maintained the ability to problem-solve and the students with moderate intellectual disabilities were not able to consistently meet the 80% criterion level. This analysis indicates that students with moderate intellectual disabilities will need more opportunities and time to practice the problem-solving skills (Cote et al., 2010).

Cote et al. (2010) concluded that the proposed systematic instruction of problem-solving was effective in teaching middle school students with developmental disabilities to problem solve. They maintain that students are able to learn and apply a three step problem-solving sequence. Generalization of this skill occurred and was applied to various novel role-play situations in the classroom. The researchers recommended further research in the area of problem-solving instruction with students with developmental disabilities to add to the limited body of research.

The ability to learn and apply problem-solving steps in a variety of settings has been effective through the use of direct instruction (Agran et al., 2002; Cote et al., 2010, Glago et al., 2009, Palmer & Wehmeyer, 2003). Children with mild-to-moderate developmental disabilities are capable of learning this skill when practiced for an extended period of time (Cote et al., 2010). While researchers in the field have been successful in teaching problem-solving, there is a need for more research on problem-solving instruction.

### **Summary**

Problem-solving is a foundational skill that contributes to quality of life, academics, friendship, and independence (Agran et al., 2002; Angell, Stoner, & Fulk, 2010; Konrad et al., 2007). For most typically developing students the ability to problem solve will develop naturally over time. However, students with developmental disabilities will need direct instruction in problem solving (Keen, 2011). Because the ability to problem solve is a critical life component, instruction in this area is necessary (Angell, Stoner, & Fulk, 2010).



Research supports instruction in problem solving to teach children with and without disabilities to learn and apply problem-solving strategies (Agran et al., 2002; Glago et al., 2009, Hune & Nelson, 2002). While the research is limited, it does show that interventions that are strategically designed to teach the step-by-step components of problem-solving are effective in teaching this skill to younger children with developmental disabilities (Glago et al., 2009; Palmer & Wehmeyer, 2003).

## CHAPTER 3

### METHODOLOGY

#### **Overview**

Problem-solving skills are imperative to a child's growth and success across multiple environments, including general and special education (Agran, Blanchard, Wehmeyer, & Hughes, 2002; Agran, Wehmeyer, Cavin, & Palmer, 2010; Wellman, Facricious, & Chuan-Wen, 1987). The ability to solve a problem is a component of self-determination (Wehmeyer & Palmer, 2000). For young children in preschool, problem-solving instruction provides an introduction to problems, their solutions, and practice in evaluating decisions. Currently, most problem-solving research focuses on the early elementary years, secondary education, and post-secondary education (Agran et al., 2002; Palmer & Wehmeyer, 2003; Shaklee & Amos, 1985). However, problem-solving research involving preschool children with developmental disabilities is in the initial stages. Researchers suggest that young children are capable of solving problems and can be taught how to problem solve (Joseph & Strain, 2010; Shure & Spivack, 1980, 1982; Verma & Verma, 1994; Webster-Stratton & Hammond, 1997).

This study compared the use of Literacy-Based Structured Problem-Solving instruction with Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction problem-solving with young children in a preschool setting. The participants in the study were young children with developmental delays receiving special education services through an early childhood special education program. Six early childhood special education classrooms were selected randomly for participation in the study. The study compared students' ability to: (a) identify a problem, (b) generate a

solution(s), and (c) evaluate the solution as it pertained to the identified solution(s) across both instructional groups.

Three of the early childhood special education classrooms were assigned to Group 1 and used the Literacy-Based Structured Problem-Solving lessons. The remaining three classrooms were assigned to Group 2 and used the Literacy-Based Structured Problem-Solving lesson followed by Center-Based Direct Instruction problem-solving instruction. The study occurred four days a week, in both morning and afternoon sessions of the six classrooms, for a period of five weeks. Data were collected using pretest, posttest, and maintenance assessments and the results were evaluated using a mixed model ANOVA. Data were analyzed both within- and between the two groups.

Group 1 used the Literacy-Based Structured Problem-Solving lessons. During circle time, instruction occurred using age-appropriate children's literature depicting specific problem situations. Teachers used the books paired with a teacher script, and the four-day teaching routine was: (a) day one, problem identification, (b) day two, generation of a potential solution(s), (c) day three, evaluation of the potential solution(s), and (d) day four, application of the three problem-solving steps to the problem(s) presented in the story. Following the teacher-directed lesson, the children engaged in non-teacher directed problem-solving learning opportunities embedded within the classroom environment.

Group 2 used the Literacy-Based Structured Problem-Solving in circle followed by Center-Based Direct Instruction problem-solving lessons. Instruction for this group began with the same age-appropriate stories and followed the same teaching script as Group 1 in circle time over the four-day period. In addition, immediately following the

literature-based problem-solving instruction, the teachers implemented the Center-Based Direct Instruction problem-solving lessons. The center-based lessons used a set of problem-based picture scenario cards paired with a teacher script. Instruction focused on the following routine: (a) day one, problem identification, (b) day two, generation of a potential solution(s), (c) day three, evaluation of potential solution(s), and (d) day four, application of the three problem-solving steps to the problem(s) presented.

### **Research Question**

This research study was designed to address seven questions. They are:

Research Question 1: Does the ability of preschool-aged children with developmental disabilities to *identify a problem* increase with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to identify a problem when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 2: Does the ability of preschool-aged children with developmental disabilities to *identify a problem solution* increase with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to identify a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 3: Does the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* increase with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to evaluate a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 4: Is the ability of preschool-aged children with developmental disabilities to *identify a problem* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to maintain the ability to identify a problem when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 5: Is the ability of preschool-aged children with developmental disabilities to *identify a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to maintain the ability to identify a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 6: Is the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to maintain the ability to evaluate a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 7: Does the ability of preschool-aged children with developmental disabilities to name the three steps needed to solve a problem, (e.g., what is the problem, what is the solution, and evaluate the solution) differ with the use of Literacy-Based Structured Problem Solving when

compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to list the three steps needed to problem solve when compared to the use of Literacy-Based Structured Problem Solving alone.

### **Participants**

The participants selected for this study were young children with developmental delays receiving special education services. These children received services within early childhood special education classrooms located in a large Southwestern city in the United States. Six early childhood special education programs were selected to participate in this study, all of which were taught by licensed early childhood teachers. Teachers who participated in the study signed an informed consent (see Appendix A). Parents of the young children in the study signed an informed consent form agreeing to allow their child to participate (see Appendix B). Typically, each early childhood classroom has one paraprofessional working in it. Paraprofessionals signed an informed consent form (see Appendix C).

### **Students with Disabilities**

The young children who participated in this study attended early childhood special education programs. A total of 57 children were recruited to participate in this study. Participants attending the early childhood special education classrooms, in both morning and afternoon sessions (see Table 1), were selected based on the following

criteria: (a) within the ages of 3-to-5 years old, (b) had a current Individualized Education Plan (IEP), (c) attended an early childhood special education program, (d) had the ability to respond verbally to questions, (e) were able to sit at an activity for at least 10 minutes, and (f) qualified for early childhood special education services under the label developmental delay. According to the Nevada Administrative Code, a student qualifies for special education services under the category of developmental delay if they are under the age of 6, and demonstrates a delay of at least two standard deviations in one, or at least one standard deviation, in two or more of the following areas: receptive or expressive language, cognitive abilities, gross or fine motor function, self-help, and social emotional condition (NAC 388.430, 2008).



Table 1

*Demographics of Children*

Characteristics	Class A	Class B	Class C	Class D	Class E	Class F
Gender						
Male	9	3	10	4	3	10
Female	2	1	2	5	4	4
Total	11	4	12	9	7	14
Age						
Mean	4.6	4.4	4.6	4.6	4.3	4.5
Range	4.1-4.9	4.1-4.5	4.1-5.0	4.0-4.9	4.3-4.9	4.0-4.9
Ethnicity						
Caucasian	2	1	8	2	6	9
African American	6	0	2	2	0	3
Latino	3	1	1	1	0	1
Native American	0	0	0	0	0	0
Asian/Pacific Islander	0	1	0	0	1	1
Other	0	0	1	4	0	0
Total	11	4	12	9	7	14

## **Teachers**

Seven classroom teachers participated in the study (see Table 2). One of the classrooms was an early childhood special education inclusion program. This program is staffed with two licensed teachers in early childhood and early childhood special education. All teachers were certified to teach early childhood and signed an informed consent for participation and agreed to the intervention components of the study (see Appendix A). The six classrooms were randomly assigned to one of two instructional groups (Group 1 or Group 2). Upon assignment, the teachers were trained to implement the intervention according to the fidelity of instruction checklist for each instructional intervention routine (see Appendices D and E). Three teachers were assigned to instructional Group 1 and implemented the Literacy-Based Structured Problem-Solving intervention. The remaining four teachers were assigned to instructional Group 2 and implemented the Literacy-Based Structured Problem-Solving intervention followed by the Center-Based Direct Instruction using problem situation cards.

Table 2

*Demographics of Teachers*

Teacher	Gender	Age	Ethnicity	Education	Years Teaching in ECSE
A	Female	37	Latino	Bachelor of Education	1
B	Female	35	Caucasian	Bachelor of ECSE Education	9
C	Female	25	Caucasian	Master of Special Education	3
D	Female	35	Caucasian	Master of Special Education	5
E	Female	25	Caucasian	Master of Special Education	1
	Female	41	Caucasian	Bachelor of Education	10
F	Female	29	Caucasian	Bachelor of Education	1

**Paraprofessionals**

Early Childhood Special Education Programs have a paraprofessional present to assist with daily interventions (see Table 3). One classroom selected was an early childhood special education inclusion program staffed with two paraprofessionals. Paraprofessionals in five of the six classrooms signed an informed consent to participate (see Appendix C). The paraprofessional in classroom F did not participate in the study.

Paraprofessionals were responsible for setting up video cameras on a daily basis prior to the instructional interventions. Each paraprofessional was trained with their teachers.

Table 3

*Demographics of Paraprofessionals*

Assistant	Gender	Age	Ethnicity	Education	Years in ECSE
Class A	Female	56	Caucasian	Associate Degree	3
Class B	Female	38	Latino	High School	4
Class C	Male	49	Caucasian	Bachelor Degree	1
Class D	Female	38	Latino	High School	5
Class E	Female	23	Caucasian	High School	1
	Female	43	Caucasian	High School	1
Class F	Did not participate				

**Teacher Fidelity to Instruction**

Fidelity of instruction was collected and measured through the use of videotaped lessons. Videos were collected on Thursday of each week and reviewed immediately using the fidelity of instruction checklist for each instructional group (see Appendices D and E). Fidelity of the instruction was measured by the number of steps completed during

the instructional session. Fidelity of instruction implementation was calculated by  $[\text{agreements} / (\text{agreement} + \text{disagreements})] \times 100 = \text{percent of agreement}$  (Warner, 2008). If fidelity of instruction fell below 100%, corrective feedback was provided to the teachers. All feedback was provided by Monday, if corrective in nature it was provided via a phone call. Fidelity of instruction for Group 1 was 87.6% (see Table 4). Fidelity of Group 2 for the Literacy-Based Problem-Solving Instruction was 75.7% (see Table 5) and the fidelity for the Center-Based Direct Instruction Lessons was 98.1% (see Table 6).

**Interrater observers.** Two doctoral students with experience in teaching young children with developmental delays were trained on the fidelity of instruction. The raters were responsible for reviewing 25% of the videos of the weekly instructional lessons. Each interrater observer was assigned to one instructional condition (Literacy-Based Structured Problem-Solving Instruction or Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction) and was responsible for completing the fidelity of instruction checklist for their assigned instructional group. Reliability of instruction was calculated by  $[\text{agreements} / (\text{agreement} + \text{disagreements})] \times 100 = \text{percent of agreement}$  (Warner, 2008). The reliability of fidelity of instruction for Group 1 was 99.5% (see Table 7). The reliability of fidelity of instruction for Group 2 with the Literacy-Based Structured Problem-Solving was 97.9% (see Table 8) and the fidelity of the Center-Based Direct Instruction Lessons was 97.7 % (see Table 9).

### **Reliability of Assessments**

Pretest, posttest and maintenance assessments were re-scored to measure fidelity. One interrater observer was responsible for re-scoring 25% of the pretest, posttest, and maintenance assessments. The percentage of agreement for the assessments was

calculated by  $[\text{agreements} / (\text{agreements} + \text{disagreements}) \times 100 = \text{percent agreement}]$  (Warner, 2008). The percentage of reliability for the Problem-Solving Step Measure was 99.3% (see Table 10). The percentage of reliability for the Problem Situation Measure was 99.3% (see Table 11).

### **Setting**

The study was conducted in six early childhood special education programs for students with developmental delays in a large Southwestern urban school district. The school district provides public education to students both with and without disabilities, pre-kindergarten through twelfth grade. The schools selected for this study represent the economic, cultural, ethnic, and linguistic diversity of the school district. The early childhood special education programs in this study were located on six elementary school campuses that provide general and special education, kindergarten through fifth grade. The schools were selected based on availability and permission from the administration and school district.

The primary focus of the early childhood special education program was to provide a learning environment that is conducive to promoting development of skills (e.g., fine motor, gross motor, cognitive, self help, and social emotional) for children ages three-to-five with disabilities (NAEYC, 2009). Teacher-directed, child-initiated, and center-based activities were the primary instructional strategies used in the early childhood special education programs. Five classrooms in this study were staffed with one licensed special education teacher and one paraprofessional. One classroom was staffed with two teachers and two paraprofessionals. Each early childhood

program/classroom consisted of two instructional sessions, a morning and afternoon session. The classes were conducted four days a week with one day for parent involvement opportunities.

### **Instrumentation**

The research questions in this study were addressed through the use of two data collection measures. The data collection measures used were pretest, posttest, and maintenance assessments. The assessments selected for this study were designed and validated by Glago (2005) and Cote (2009) to measure the knowledge and application of early elementary children with developmental disabilities to problem solve. The assessments were adapted for use with young children with developmental delays with permission from the authors (see Appendix F).

#### **Problem-Solving Step Measure**

The problem-solving assessment was designed to measure the three steps of the problem solving process: (1) identify the problem, (2) generate a solution, and (3) evaluate the solution (Cote, 2009; Glago, 2005). During the pretest, posttest and maintenance assessments the child was asked to name the three steps needed to solve a problem. The child was given a ten-second response time and all answers were recorded using the problem-solving step measure form (see Appendix G).

#### **Problem Situation Measure**

The second assessment was used to assess the ability of the child to apply the steps in the problem solving process (Cote, 2009; Glago, 2005). The problem situation measure consists of five short vignettes of a problem situation. Each vignette is paired

with a corresponding picture for the child to look at as the vignette is being read aloud. Following each reading, the child were asked a series of questions: (1) what is the problem, (2) what is a solution, (3) why did it work? The responses were recorded on the assessment sheet (see Appendix H).

## **Materials**

Both the morning and afternoon sessions of the six classrooms received instructional materials created for the study. The problem-solving instruction will be delivered in two formats, literature-based problem-solving instruction through the use of children's literature and literature-based problem-solving instruction coupled with Center-Based Direct Instruction using problem-situation cards. Each of the six classrooms were assigned randomly to one of the two instructional groups (Group 1 and Group 2) and received training and materials needed to implement the instruction. Instructional materials used in this study were: (1) problem-solving poster, (2) problem-solving literature books, (3) problem-solving situation cards, and (4) video cameras.

### **Problem-Solving Poster**

The purpose of the problem-solving poster was to provide students and teachers with a visual representation of the steps needed to solve a problem and to record student responses (Chen, 2003). The poster was printed on large poster paper and consisted of three sections (see Appendix I). Each section was labeled to indicate the three problem-solving steps; (1) identifying the problem, (2) generating a solution to the problem, and (3) evaluating the solution to the problem/did it work. The first section was labeled and paired with a picture representation to indicate the need to ask, what is the problem? The



second section was labeled and paired with a picture to indicate the need to find a solution. The third section of the poster was labeled and paired with a picture indicating the evaluation of the solution.

### **Problem-Solving Literature Books**

The literature-based structured problem-solving books were children's literature. A total of five books were selected for the study based on the following criteria: (a) age appropriateness, (b) contained a problem to be solved, and (c) used illustrations (see Appendix J). Each instructional group (Group 1 and Group 2) used five literature-based problem solving books. The teacher followed a script during instruction (see Appendix K). During the training sessions, the teachers were provided with all instructional materials needed for each intervention (e.g., literature books and problem situation cards). Each set of materials included the weekly literature book, the teacher scripts for each day, a problem-solving poster, and the problem-solving situation cards.

### **Problem-Solving Situation Cards**

Because research suggests that problem solving should be taught through direct instruction to enhance problem solving skills (Joseph & Strain, 2010), Group 2 incorporated the use of Center-Based Direct Instruction using problem-solving situation cards. The problem-solving situation cards were photographs depicting real-life problem situations children may encounter (e.g., unable to open a door, a runny nose). Each set consisted of three cards that provided an opportunity to practice the problem-solving sequence (e.g. what is the problem, a solution to the problem, evaluation of the problem) through the use of direct instruction as a follow up activity to group problem-solving

instruction. Problem situation cards were paired with a teacher script (see Appendix L), that provides examples of questioning and prompting throughout center time.

### **Formative Evaluation**

All materials designed for the study underwent a formative evaluation. An expert in problem solving instruction for students with disabilities at the University of Nevada, Las Vegas reviewed the book and teacher script providing feedback. Revisions and modifications were made after receiving feedback for the scripted lesson for all instructional materials. An expert in reading instruction for children with disabilities reviewed the book and teacher scripts. Revisions and modifications were made to the scripted-literature lessons based on the feedback. One early childhood special education teacher reviewed the scripted-literature book instructional materials and the problem-solving situation cards. After teacher feedback was provided, changes were made to the materials. A small group of children ages four to six, who did not participate in the study, participated in mock lessons using the scripted materials. Their attention to the materials and ability to answer teacher-scripted questions were noted. After discussion with the teacher of the small group of children, specific adjustments were made to the length of the lesson and teacher script. After the university expert, reading expert, teacher, and student formative evaluations, the input was used to develop the remaining instructional materials.

### **Instructional Routines**

Each instructional routine took place four days a week for five weeks. Group 1 used the literature-based structured problem-solving lessons, while Group 2 began

instruction using the literature-based structured problem-solving lesson paired with the Center-Based Direct Instruction lesson (see Appendix M). Teachers were trained on the use of instructional materials prior to the beginning of the study.

### **Literature-based Structured Problem-Solving Lesson**

Both instructional groups (Group 1 and Group 2) began instruction using the literature-based structured problem-solving lessons. Teachers implemented the literature-based lesson four days a week during a fifteen-minute circle time that occurred at the beginning of class. The weekly instruction involved an introduction to and a review of the problem solving steps; (1) identify the problem, (2) identify a solution(s), and (3) evaluate the effectiveness of the identified solution(s). A new children's book was used each week, with the instructional format remaining consistent for the duration of the study.

**Monday.** The goal of the first day of instruction was to introduce the problem-solving materials. To begin the lesson, the teacher introduced the problem solving poster to the children and reviewed each section of the poster, emphasizing and defining the problem-solving words (e.g., problem, solution, and evaluation). The focus of this lesson was to identify the problem(s) within the book. The teacher talked about what it means to have a problem. A problem was defined for the children as the ability to recognize when something happens and it needs to be fixed or does not feel "right" (D'Zurilla & Goldfried, 1971). Following the definition of a problem, the teacher held up the book for the week and read the title and author of the book. The teacher indicated that the story would be about a problem and that the children needed to identify it. The teacher introduced the story using the teacher scripts provided, asked questions, and provided

prompts to the students as needed. Upon completion of the story, the identified problem was recorded on the problem-solving poster and served as a permanent model for the students for the rest of the week.

**Tuesday.** To begin the daily instruction, the teacher referred to the problem-solving poster while holding up the book for the week. The teacher discussed the problem previously identified by the children. Once the problem was reviewed, the teacher pointed to the next section of the poster (generate a solution) and told the students that today they would find a solution to the identified problem. The teacher then read the story using the teacher script, questions, and response prompts indicated in the script. Following the story, the teacher referred back to the problem-solving poster and reviewed the identified problem. As a group, the children identified a solution(s) to the problem. The teacher recorded the solution(s) on the poster.

**Wednesday.** Instruction for the day began by reviewing the problem-solving poster. With student participation, the problem and solution(s) were reviewed. The teacher then pointed to the third box on the poster and explained that today the children would focus on evaluating the solution. The teacher explained that it is important to discover whether or not the solution fixed the problem. The book was read following the teacher script, with the teacher asking questions and providing prompts when needed. Upon completion of the story, the teacher reviewed the problem-solving poster, step-by-step and the children determined if the solution worked or not.

**Thursday.** The instruction on Thursday focused on reviewing the lessons for the entire week. The teacher used the problem-solving poster to review each step of the problem-solving process, read the literature book using the script (e.g., prompting, asking

questions, and reinforcing responses). The problem-solving poster was reviewed again with a discussion focusing on the problem, the solution, and the evaluation of the problem presented in the book. The goal of this lesson was to reinforce that problem solving is a three-step process.

### **Center-Based Direct Instruction Lesson**

For Group 2, the Center-Based Direct Instruction with problem-solving situation cards occurred immediately following the literature-based problem-solving lesson. In order to receive the Center-Based Direct Instruction, the children were separated into small groups and provided a ten-minute instructional lesson using the problem-solving situation cards as a follow up activity to circle time. Two to four children at a time rotated through the center until all students received the direct instruction.

**Monday.** Following the circle time problem-solving instruction, the children met at the center in their assigned groups. The goal of the first day of instruction was to introduce the center-based problem solving materials. To begin the lesson, the teacher introduced the three problem-solving steps; (1) identify the problem, (2) identify a solution(s), and (3) evaluate the effectiveness of the identified solution(s), using the problem solving poster (see Appendix I). The teacher reviewed each section of the problem-solving poster while defining the words (e.g., problem, solution, and evaluation). The teacher then introduced the problem situation cards and explained that today the lesson focused on the first card, the problem. The teacher introduced the card using the teacher script provided, asked questions, and provided prompts to students as needed. After reviewing the card and identifying the problem in the picture, the identified

problem was recorded on the problem-solving poster and served as a permanent model for the students for the rest of the week.

**Tuesday.** Following the circle time problem-solving instruction, the children met at the center in assigned groups. To begin the small group instruction, the teacher reviewed the problem-solving poster and the identified problem from the previous day. The teacher explained that the lesson focused on the second card, the solution. The teacher introduced the card using the teacher script provided, asked questions, and provided prompts to students as needed. After reviewing the card and identifying the solution in the picture, the identified solution was recorded on the problem-solving poster serving as a permanent model for the students for the rest of the week.

**Wednesday.** After the circle time problem-solving instruction, the children met at the center in assigned groups. To begin the small group instruction, the teacher reviewed the problem-solving poster and the identified problem and solution from the previous days. The teacher explained that the lesson focused on the third card, the evaluation. The teacher introduced the card using the teacher script provided, asked questions, and provided prompts to students as needed. After reviewing the card and evaluating the solutions effectiveness in the picture, the evaluation was recorded on the problem-solving poster serving as a permanent model for the students for the last day of instruction.

**Thursday.** After the circle time problem-solving instruction, the children met at the center in their assigned groups. To begin the small group instruction, the teacher explained that the lesson would focus on a review of the problem-solving poster (the identified problem, solution, and evaluation). After the review was complete, each

student received their own set of problem situation cards to manipulate. The teacher asked questions and provide prompts to the students as needed while they put the cards in sequential order (e.g., card one was the problem, card two was the solution, card three was the evaluation).

### **Video Cameras**

Video cameras were used to record daily instruction for both groups (e.g., literacy-based instruction and center-based instruction). Video tapes were used to measure teacher fidelity of instruction. The cameras were provided to all classrooms. Paraprofessionals were trained to set up the camera prior to intervention on a daily basis.

### **Training**

Teachers and paraprofessionals involved in this study were trained to implement the interventions to ensure fidelity of instruction. They attended one training session prior to the implementation of the instructional interventions (e.g., Literacy-Based Structured Problem-Solving or Literacy-Based Structured Problem-Solving coupled with Center-Based Direct Instruction). The three teachers randomly assigned to Group 1 were trained to implement the Literacy-Based Structured Problem-Solving Lessons. The four teachers randomly assigned to Group 2 were trained to implement the Literacy-Based Structured Problem-Solving Lessons followed by the Center-Based Direct Instruction using Problem Situation Cards. Interrater observers were trained on their assigned instructional format prior to the intervention implementation. Training sessions were held at a central location.

## **Literacy-Based Structured Problem-Solving Training**

Teachers, paraprofessionals, and the interrater observer assigned to Group 1 were trained to implement the Literacy-Based Structured Problem-Solving intervention during a two-hour training session. To begin the training, the participants were introduced to the intervention. This included a review of the intervention timeline (see Appendix M), review of the literature books, and the teacher fidelity of instruction checklist. The participants observed the intervention being modeled during the training session.

The teachers and paraprofessionals sat in *circle time* while the instructor of the training modeled the lesson. The instructor of the lesson held the literature book up and followed the instructional script as it appeared on the back of each page of the book. After observing the modeled lesson, the teachers and paraprofessionals reviewed the fidelity of instruction checklist. Using the fidelity of instruction checklist, the teachers practiced implementing the lesson using the materials. During the practice sessions, corrective feedback and reinforcement was provided.

To complete the training, the participating teachers were observed teaching a mock lesson. They had to attain 100% accuracy on the teacher fidelity of instruction checklist during the training sessions. The formula used to calculate accuracy was  $[(\text{steps implemented correctly} / \text{total steps involved in implementation}) \times 100 = \text{percent of teacher fidelity}]$ . All teachers attained 100% accuracy during the training.

During the practice session, the paraprofessionals were trained to use the video cameras. Upon conclusion of the training, the intervention schedule was reviewed and time was provided for specific questions regarding the implementation of the intervention.



## Center-Based Direct Instruction Training

Teachers, paraprofessionals, and the interrater observer assigned to Group 2 were trained to implement the Literacy-Based Structured Problem-Solving intervention followed by Center-Based Direct Instruction using the problem-based situation cards. The three-hour training session began by introducing the intervention schedule, reviewing the literature books, and the teacher fidelity of instruction checklist. The teachers observed the intervention being modeled during the training session.

The teachers and paraprofessionals sat in *circle time* while the instructor of the training modeled the lesson. The instructor of the lesson held the literature book up and followed the instructional script on the back of each page of the book. After observing the modeled lesson, the teachers and paraprofessionals reviewed the fidelity of instruction checklist. Using the fidelity of instruction checklist, the teachers practiced implementing the lesson using the materials. During the practice sessions, corrective feedback and reinforcement was provided.

To complete this portion of the training, the participating teachers were observed teaching a mock lesson. They had to attain 100% accuracy on the teacher fidelity of instruction checklist. The formula used to calculate accuracy was  $[(\text{steps implemented correctly} / \text{total steps involved in implementation}) \times 100 = \text{percent of teacher fidelity}]$ . All teachers attained 100% accuracy during training.

The remainder of the training was used to model, practice, and provide feedback for the Center-Based Direct Instruction. The teachers observed the center-based intervention being modeled during the training session. The instructor of the training

modeled the use of the Center-Based Direct Instruction materials in the center. The instructor demonstrated a lesson following the teacher script.

Following a review of the teacher fidelity checklist, guided practice for the teachers occurred. At this time, corrective feedback was provided to the teachers. In order to complete the training session, the teachers were observed completing a mock lesson. Teachers had to attain 100% accuracy on the teacher fidelity of instruction checklist. The formula used to calculate accuracy was  $[(\text{steps implemented correctly} / \text{total steps involved in implementation}) \times 100 = \text{percent of teacher fidelity}]$ . All teachers attained 100% accuracy during training.

After completion of guided practice and teacher fidelity checks a question and answer session was conducted. During the practice session, the paraprofessionals were trained to use the video cameras.

### **Problem Solving Instruction**

Problem solving instruction should occur throughout the school day using direct and embedded learning opportunities (Joseph & Strain, 2010). Instruction should provide structured learning opportunities to facilitate the learning of the problem-solving process. Direct instruction in this study occurred through the use of Literacy-Based Instruction and Center-Based Direct Instruction.

### **Literature-Based Instruction**

The goal of the literature-based instruction was to teach children to identify and use the following problem-solving steps: (1) identify the problem(s), (2) identify a solution(s), and (3) evaluate the solution(s) to the identified problem. Through the use of

children's literature, children are capable of learning how to effectively identify problems and provide potential effective solutions (Forgan, 2002). Representations of problems through a picture format, paired with verbal cues have been found to be an effective method to enhance a child's ability to problem solve (McClinton, 1981).

Instructional Group 1 participated in the study by implementing the literature-based lessons four times a week during a fifteen-minute circle time at the beginning of class (morning and afternoon sessions) for five weeks. The weekly instruction was used to introduce and review the problem-solving steps each day of the week. Specifically, this was identify the problem (Monday), identify a solution(s) (Tuesday), evaluate the effectiveness of the identified solution(s) (Wednesday), and review the problem-solving process (Thursday). A new children's literature book was introduced each week.

### **Center-Based Instruction**

Center-based instruction consisted of direct instruction using problem situation cards. Direct instruction of problem-solving instruction allowed the students to receive additional support in learning the steps needed to effectively solve problems (Kalyuga & Hanham, 2011). Instructional Group 2 began each day by implementing the literature-based lesson four times a week during the fifteen-minute circle time at the beginning of class (morning and afternoon sessions) for five weeks. Specifically, this involved the steps of identifying the problem (Monday), identifying a solution(s) (Tuesday), evaluating the effectiveness of the identified solution(s) (Wednesday), and reviewing the problem-solving process (Thursday). A new literature book was introduced each week, but the instructional format remained consistent for the duration of the study. Following the literacy-based instruction the teachers implemented the Center-Based Direct

Instruction using problem-solving situation cards, four days a week during a ten-minute small group center time. Specifically, the picture cards were used to identify the problem (Monday), identify a solution(s) (Tuesday), evaluate the effectiveness of the identified solution(s) (Wednesday), and review the problem-solving process (Thursday).

### **Design and Procedures**

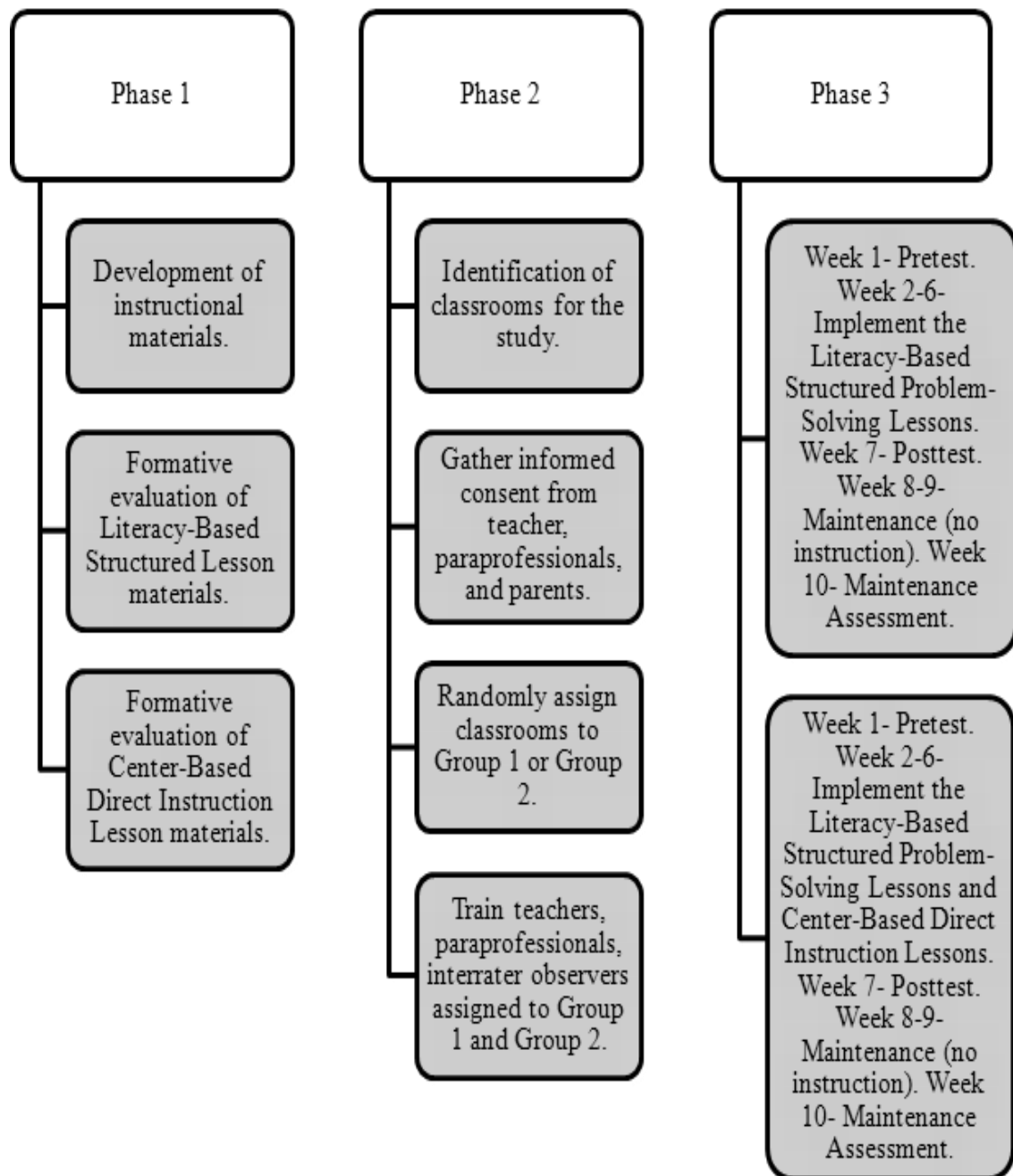
The study took place over the course of ten weeks (see Appendix M) and consisted of three phases. The three phases included the development of instructional materials, formative evaluation of materials and lessons, consent for participation, training of teachers and paraprofessionals, pretest, intervention, posttest, and maintenance assessments. See Figure 1 for a diagram of these phases.

#### **Phase One**

Phase one consisted of the formative evaluation of the instructional materials and lessons designed for this study. A formative evaluation occurred for the Literature-based Structured Problem-Solving Lessons as well as for the Center-Based Direct Instruction Lessons. After the formative evaluation of the sample materials (books and cards), the materials were created based on the model criteria.

Figure 1

*Phases of the Study*



**Problem-solving poster.** A problem-solving poster was designed to provide students and teachers with a visual representation of the steps needed to solve a problem as well as to provide a permanent representation of student responses (Chen, 2003). The poster was printed on large poster paper and consisted of three sections (see Appendix I). Each section is labeled to indicate the three problem-solving steps: (1) identifying the problem, (2) generating a solution to the problem, and (3) evaluating the solution to the problem. The first section was labeled and paired with a picture representation to indicate the need to ask, “what is the problem?” The second section was labeled “what is the solution?” and provide a picture indicating the need to find a solution. The third section was labeled “evaluate the solution” and also provided a picture stimulus.

**Literature-based structured problem-solving lesson development.** One book was selected and a teacher script was compiled for formative evaluation. An expert in problem-solving instruction for students with disabilities at the University of Nevada, Las Vegas reviewed the book, lesson, and teacher script. Revisions and modifications were made after receiving feedback for the lesson. An expert in reading instruction for children with disabilities reviewed the book and teacher script. Based on feedback from the reading expert adjustments to the teacher script were made. One early childhood special education teacher reviewed the literature book, lesson, and teacher script. After teacher feedback was provided, changes were made to the lesson. A mock lesson was delivered to a small group of children ages three to five. Children’s attention to the book and ability to answer teacher-scripted questions were noted. After the formative evaluation with the expert, teacher, and children was complete, the initial lessons were created. The remainder of the lessons were created using the results from the formative evaluation.

**Center-Based Direct Instruction development.** Problem-solving situation cards were developed for the five weeks of the intervention. The cards depicted real life problem situations children may encounter (e.g., spilling a drink, a runny nose). Each card provided an opportunity to practice the problem-solving sequence for the day of instruction (e.g. what is the problem, a solution to the problem, evaluation of the problem) through the use of direct instruction. Problem situation cards were paired with a teacher script (see Appendix L). An expert in problem-solving instruction for students with disabilities reviewed the picture cards, lesson, and teacher script. Revisions and modifications were made after receiving feedback for the lesson. One early childhood special education teacher reviewed the picture cards, lesson, and teacher script. After teacher feedback was provided, changes were made to the lesson. In addition to expert and teacher evaluation, a mock lesson was delivered to a small group of children ages 3 to 5. Children's attention to the cards and ability to answer teacher-scripted questions were noted. After expert, teacher, and student formative evaluation, the finalized set of problem situation cards were used as a model for the development of the entire set of cards for the study.

## **Phase Two**

Phase two of the study began with obtaining university IRB permission as well as meeting with the director of the professional development department of the school district. Once approval to complete the study was granted, principals were solicited for participation. Selecting school sites was based on the availability of an early childhood special education program with a licensed teacher. Once approval was obtained, informed consent forms were collected from teachers, paraprofessional, and parents (see

Appendices A, B, and C). In addition to recruitment, training of teachers and paraprofessionals occurred during this phase.

**Teacher and paraprofessionals.** The teachers selected to participate in the study were certified to teach early childhood special education. They signed an informed consent form as well as agreed to implement the intervention components of the study. Paraprofessionals were working in an early childhood special education classroom. The paraprofessional also signed an informed consent form.

**Student participants.** Students who participated in this study were selected based on the following criteria: (a) between the ages of 3 to 5 years old, (b) had a current Individualized Education Plan (IEP), (c) attended an early childhood special education program, (d) had the ability to respond verbally to questions, (e) were able to sit at an activity for at least 5 minutes, and (f) qualified for early childhood special education services under the label developmental delay. Parents of the children signed an informed consent form (see Appendix B).

**Consent.** Consent forms were generated and delivered to schools, teachers, paraprofessionals, and parents of students. All students in the class received a letter explaining the purpose of the study. Student consent forms were sent home via backpacks of the students. Data were only collected on the students who fit the criteria to participate in the study and who returned consent forms. All students visible in the videos signed parental consent forms for videotaping in the classroom as well participation (see Appendix B).

**Teacher and paraprofessional training.** After receiving the signed consent forms, the six classrooms were assigned randomly to one of two treatment groups (Group



1 and Group 2). Two training sessions were held for the teachers and paraprofessional participating in the study. Groups 1 and 2 were trained during separate sessions. Both trainings were conducted at a central location. Training sessions were used to explain the intervention schedule, the implementation of the instructional intervention, camera set up, teacher fidelity checklists, and provided practice sessions prior to implementation of the interventions to ensure fidelity of instruction. Three classrooms were assigned to Group 1 and attended a two-hour training session concerning the Literature-Based Structured Problem-Solving Lessons. The remaining three classrooms were assigned to Group 2 and attended a separate three-hour training session concerning the Literature-Based Structured Problem-Solving Lessons and the Center-Based Direct Instruction Lesson.

**Interrater observer training.** Each interrater observer was assigned to one instructional condition (Literacy-Based Structured Problem-Solving Instruction or Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction) and attended the teacher and paraprofessional training session for their assigned group. Raters were trained to complete the fidelity of instruction checklist for their assigned instructional group. During the training, each observer practiced using the fidelity of instruction checklist for their assigned group while viewing a model session of the intervention. In addition to being trained to review video sessions, one interrater observer was trained to serve as the fidelity of assessment observer for the pretest, posttest, and maintenance assessments during a one-on-one training session. This person rescored 25% of the assessments in the study.

### **Phase Three**

Phase three of this study took place over the course of 10 weeks of the study. This phase consisted of pretesting, instructional interventions, posttests, and maintenance assessments.

**Pretest.** Two pretests were given to all children participating in this study. The first assessment was the adapted *Problem-Solving Step Measure* (Cote, 2009; Glago, 2005). This assessment was used to measure the ability to list the three steps needed to solve a problem. The second measure was the adapted *Problem Situation Measure* (Cote, 2009; Glago, 2005). This assessment involved the use of problem scenarios paired with a picture to measure the child's ability to indicate the given problem, provide a solution to the problem, and evaluate the effectiveness of the solution.

**Instructional implementation of lessons.** Teachers and paraprofessionals began implementation of the problem-solving lessons after the pretesting was complete. The lessons were implemented for five weeks. During this time, Group 1 implemented the Literacy-Based Structured Problem-Solving Lessons and Group 2 implemented the Literacy-Based Structured Problem-Solving Lessons followed by the Center-Based Direct Instruction Lessons. Fidelity of instruction was monitored via video taped lessons on a weekly basis to ensure accurate implementation of the intervention.

**Posttest and maintenance.** Following the five weeks of the study, posttests were administered. Both of the assessments were re-administered to the children. After two weeks of no instructional intervention (maintenance phase), the maintenance assessments were completed following the same pretest and posttest format for all participants.

## Treatment of the Data

Data from the pretest, posttest, and maintenance assessments were used to answer the research questions:

Research Question 1: Does the ability of preschool-aged children with developmental disabilities to *identify a problem* increase with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *identify a problem* was greater after Literacy-Based Structure Problem Solving alone or after Literacy-Based Problem Solving combined with Center-Based Direct Instruction, a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Research Question 2: Does the ability of preschool-aged children with developmental disabilities to *identify a problem solution* increase with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *identify a problem solution* was greater after Literacy-Based Structured Problem Solving alone or after Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction, a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Research Question 3: Does the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* increase with the use of

Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *evaluate a problem solution* was greater after Literacy-Based Structured Problem Solving alone or after Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction, a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Research Question 4: Is the ability of preschool-aged children with developmental disabilities to *identify a problem* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *identify a problem* was better maintained after Literacy-Based Structured Problem Solving alone or after Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction, a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Research Question 5: Is the ability of preschool-aged children with developmental disabilities to *identify a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *identify a problem solution* was better maintained after Literacy-Based Structured Problem Solving alone or after Literacy-Based Structured Problem Solving combined with Center-

Based Direct Instruction, a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Research Question 6: Is the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if the ability of a preschool-aged child to *evaluate a problem solution* was better maintained after Literacy-Based Structured Problem Solving alone or after Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction a 2 (group) x 3 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

Data from the pretest and posttest assessments were used to answer the following research question:

Research Question 7: Does the ability of preschool-aged children with developmental disabilities to name the three steps needed to solve a problem, (what is the problem, what is the solution, and evaluate the solution) differ with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

Analysis: In order to determine if there was a significant difference in a student's ability to name the three steps needed to solve a problem, (what is the problem, what is the solution, and evaluate the solution) after the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving

combined with Center-Based Direct Instruction, a 2 (group) x 2 (time) ANOVA was used to analyze the data. An alpha level of .05 was set.

## CHAPTER 4

### RESULTS

Independence while applying problem-solving strategies is imperative to the development of appropriate social skills, interpersonal skills, independence, self-reliance, and ultimately self-determination (Agran et al., 2002; Dincer & Guneyasu, 1997; Greenwood et al., 2006; Palmer & Wehmeyer, 2003). Direct instruction in the development of problem-solving skills for individuals with developmental disabilities typically occurs during adolescence; however researchers have indicated that the foundation of problem solving begins to develop in the early years (Wehmeyer & Palmer, 2000). Recent investigations support that young children are capable of learning to apply problem-solving strategies across multiple environments (Joseph & Strain, 2010; Palmer & Wehmeyer, 2003). While problem solving instruction is supported in the early years, a strategic protocol for teaching young children with developmental disabilities to problem solve is needed.

The purpose of this study was to determine the impact of structured problem-solving instruction on the development of problem-solving skills of young children with developmental disabilities in the preschool setting. Two types of problem-solving instruction were compared. Specifically, this study compared the use of Literacy-Based Structured Problem-Solving instruction with Literacy-Based Structured Problem-Solving followed by a Center-Based Direct Instruction problem-solving lesson.

Research supports the use of direct-instruction methods to teach problem-solving to young children and adolescents with developmental disabilities (Cote et al., 2010; Glago, 2005; Hune & Nelson, 2002; Palmer & Wehmeyer, 2002). Recent studies have

incorporated the use of scenarios and children's literature to support the instruction of problem-solving skills, but have not focused on the use of literature or problem-based scenarios in isolation to teach this skill (Cote et al., 2010; Glago, 2005; Palmer & Wehmeyer, 2002). Materials were developed for the two instructional groups, evaluated by experts, and revised according to feedback prior to the study. Fifty-seven students participated in the study (see Table 1).

Six early childhood special education classrooms were assigned randomly to an instructional group (Group 1 or Group 2). Group 1 was comprised of 27 participants and Group 2 contained 30 participants. All participants in the study were preschool students between the ages of 4- and 5-year olds, qualified for early childhood special education services under the label of developmental delay according to the Nevada Administrative Code (2007), and were able to participate in an activity for at least 10 minutes. Group 1 consisted of 22 boys and 5 girls and Group 2 consisted of 17 boys and 13 girls.

Following the random group assignments, all children were assessed on their ability to generate the three steps needed to problem solve using the adapted problem-solving step measure (see Appendix G) (Cote, 2009; Glago, 2005). Children also were assessed using an adapted version of the scenario-based assessment (see Appendix H) to determine their ability to identify a problem, generate a solution to the problem, and evaluate the solution when shown a picture of a problem situation (Cote, 2009; Glago, 2005).

Group 1 implemented the literature-based lessons four days a week followed by naturally embedded problem-solving opportunities. Group 2 implemented the literature-based lesson four days a week followed by a Center-Based Direct Instruction lesson



using problem-situation cards. During the study, instructional lessons were videotaped to measure teacher fidelity. After five weeks of instructional lessons, posttests were conducted. Each child was assessed using the problem-solving step assessment and the problem situation measure (Cote, 2009; Glago, 2005). Following a two-week period of no instruction each child was assessed again using maintenance assessments (problem-solving step assessment and the problem situation measure).

### **Teacher Fidelity to Instruction**

Teacher fidelity of instruction was collected through the use of videotaped lessons. Videos were analyzed using the fidelity of instruction checklist for each instructional group (see Appendices D and E) by observer A. Fidelity of instruction of the literacy-based problem-solving intervention was calculated for Group 1 by  $(\text{number of lessons with 100\% fidelity}) / (\text{total number of lessons}) \times 100 = \text{percent of teacher fidelity}$ . A total of 92 literacy-based problem-solving lessons with 100% fidelity were recorded out of 105 lessons for Group 1. Fidelity of instruction for Group 1 was 87.6% (see Table 4). These data indicate that the teachers in Group 1 were able to implement the Literacy-Based Structured Problem-Solving lessons with a high degree of fidelity.

Table 4

*Group 1 Teacher Fidelity of Literacy-Based Instruction*

Source	Lessons with 100% fidelity	Total number of lessons	Percent of Fidelity
Fidelity Checklist	92	105	$92 \div 105 = 87.6\%$
Group 1 Teacher Fidelity = 87.6%			

Fidelity of instruction for Group 2 was measured for both the literacy-based problem-solving lessons and the Center-Based Direct Instruction lessons. Fidelity of instruction of the literacy-based problem-solving lessons were calculated by (number of lessons with 100% fidelity)/ (total number of lessons) x 100 = percent of teacher fidelity. A total of 84 literacy-based problem-solving lessons with 100% fidelity were recorded out of 111 lessons. Fidelity of instruction for the literacy-based problem-solving lessons was 75.7% for Group 2 (see Table 5). These data appear to indicate that teachers in Group 2 did not implement the Literacy-Based Structured Problem-Solving lessons with as high degree of fidelity as Group 1. However, these data were skewed by one teacher who encountered difficulty implementing the lessons, even with corrective feedback.

Table 5

*Group 2 Teacher Fidelity of Literacy-Based Instruction*

Source	Lessons with 100% fidelity	Total number of lessons	Percent of Fidelity
Fidelity Checklist	84	111	$84 \div 111 = 75.7\%$
Group 2 Literacy-Based Teacher Fidelity = 75.7%			

Fidelity of the Center-Based Direct Instruction lessons using problem situations cards were calculated by (number of lessons with 100% fidelity)/ (total number of lessons) x 100 = percent of teacher fidelity. A total of 106 lessons with 100% fidelity were recorded out of 108 lessons. Fidelity of instruction of Center-Based Direct Instruction lessons was 98.1% (see Table 6). These data appear to indicate that the teachers in Group 2 implemented the Center-Based Direct Instruction lessons with a high degree of fidelity.

Table 6

*Group 2 Teacher Fidelity of Center-Based Direct Instruction*

Source	Lessons with 100% fidelity	Total number of lessons	Percent of Fidelity
Fidelity Checklist	106	108	$106 \div 108 = 98.1\%$
Group 2 Center-Based Teacher Fidelity = 98.1%			

### **Interrater Observers**

Two doctoral students participated as interrater observers in this study (observers B and C). Each interrater observer was assigned to one instructional group (Literacy-Based Structured Problem-Solving Instruction or Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction). The interrater observers were responsible for completing fidelity checklists for 25% of the videos for their assigned group (see Appendices D and E).

#### **Interrater Agreement for Group 1**

Interrater agreement for fidelity of instruction for Group 1 (Literacy-Based Structured Problem-Solving) was measured using the implementation of instruction checklist found in Appendix D. Interrater Observer B, assigned to Group 1 (Literacy-Based Structured Problem-Solving) viewed 25% of videotaped session and scored each session according to the specific lesson guidelines. Completed fidelity checklists were compared to the data collected by Observer A, during weekly fidelity checks. There were six items on the instructional checklist for Monday, seven items for Tuesday, and eight items for intervention on Wednesday and Thursday.

The assessments were randomly selected and scored in accordance with the appropriate checklist (see Appendix D). A total of 184 steps were possible on the selected instructional checklists. The scores for all items on the checklist were compared and interrater agreement was calculated by  $[\text{agreements} / (\text{agreements} + \text{disagreements})] \times 100 = \text{percent of agreement}$ . Interrater agreement for Group 1 Literacy-Based Structured Problem-Solving instruction was 99.5%. These findings indicate a high level of interrater

agreement of fidelity of Literacy-Based Structured Problem-Solving lesson for Group 1 (see Table 7).

Table 7

*Group 1 Interrater Reliability for Fidelity of Literacy-Based Lessons*

Source	Observer A & B	Percent of Agreement
Fidelity Checklist	184/183	$[183 / (183 + 1)] \times 100 = 99.5\%$
Group 1 Interrater Reliability = 99.5%		

**Interrater Agreement for Group 2**

Interrater agreement for fidelity of instruction for Group 2 (Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction) was measured using the implementation of instruction checklists found in Appendices D and E. Interrater Observer C, was assigned to Group 2 and viewed 25% of videotaped session. Each session was scored according to the specific lesson guidelines. Completed fidelity checklists were compared to the data collected by Observer A, during weekly fidelity checks.

For the Literacy-Based Structured Problem-Solving Lessons there were six items on the instructional checklist for Monday, seven items for Tuesday, and eight items for the instruction on Wednesday and Thursday. The assessments were selected randomly and scored in accordance to the corresponding checklist (see Appendix D). A total of 193 steps were possible on the selected instructional checklists. The scores for all items on the checklist were compared and interrater agreement was calculated by [agreements/

(agreements + disagreements)] x 100 = percent of agreement. Interrater agreement for Group 2 Literacy-Based Structured Problem-Solving instruction was 97.9%. These findings indicate a high level of interrater agreement of fidelity of Literacy-Based Structured Problem-Solving lesson for Group 2 (see Table 8).

Table 8

*Group 2 Interrater Reliability for Fidelity of Literacy-Based Lessons only*

Source	Observer A & C	Percent of Agreement
Fidelity Checklist	193/189	$[189 / (189 + 4)] \times 100 = 97.9\%$
Group 2 Interrater Reliability = 97.9%		

Interrater reliability checklists were completed for 25% of the videotaped Center-Based Direct Instruction Lessons by Observer C. The checklists consisted of six items on Monday and seven items for instruction on Tuesday, Wednesday, and Thursday (see appendix E). The videos were selected randomly and scored in accordance to the appropriate checklist. A total of 128 steps were possible based on the selected instructional checklists. The scores for all items on the checklist were compared and interrater agreement was calculated by  $[\text{agreements} / (\text{agreements} + \text{disagreements})] \times 100 = \text{percent of agreement}$ . Interrater agreement for Group 2 Center-Based Direct Instruction was 97.7%. These findings indicate a high level of interrater agreement of fidelity of Center-Based Direct Instruction for Group 2 (see Table 9).

Table 9

*Group 2 Interrater Reliability for Fidelity of Center-Based Lessons only*

Source	Observer A & C	Percent of Agreement
Fidelity Checklist	128/125	$[125 / (125 + 3)] \times 100 = 97.7\%$
Group 2 Interrater Reliability = 97.7%		

**Reliability of Assessments**

Interrater Observer B was responsible for re-scoring 25% of the pretest, posttest, and maintenance assessments for both groups (Group 1 and Group 2). Pretest, posttest, and maintenance assessments were rescored to measure fidelity. The percentage of fidelity was calculated by  $[\text{agreements} / (\text{agreements} + \text{disagreements})] \times 100 = \text{percent agreement}$ .

**Problem-solving step measure.** The problem-solving assessment consists of the three steps of the problem solving process: (a) identify the problem, (b) generate a solution, and (c) evaluate the solution (Cote, 2009; Glago, 2005). Forty-five pretest, posttest, and maintenance assessments were rescored for Group 1 (Literacy-Based Problem-Solving) and Group 2 (Literacy-Based Problem Solving followed by Center-Based Direct Instruction). A total of 135 steps were possible based on the assessment. Interrater reliability of the problem-solving step measure was 99.3% (see Table 10). These results indicate that the assessment was scored with a high level of fidelity.

Table 10

*Reliability of the Problem-Solving Step Measure*

Assessment	Observer A & B	Percent of Agreement
Problem-Solving Step Measure	135/134	$[134 / (134 + 1)] \times 100 = 99.3\%$
Reliability of Assessment = 99.3%		

**Problem situation measure.** The problem situation assessment consists of five short vignettes followed by three questions: (a) what is the problem, (b) what is a solution, and (c) why did it work? A total of 45 pretest, posttest, and maintenance assessments across both groups (Group 1 and Group 2) were rescored to measure fidelity of the assessment. Twenty-nine disagreements occurred out of 675 steps possible. Interrater reliability of the assessment was 95.7% (see Table 11). These results indicate that the assessment was scored with a high level of fidelity.

Table 11

*Reliability of the Problem Situation Measure*

Assessment	Observer A & B	Percent of Agreement
Problem Situation Measure	675/646	$[646 / (646 + 29)] \times 100 = 95.7\%$
Reliability of Assessment = 95.7%		



### **Analysis of Problem Solving Measures**

The problem-solving skills of the participants in both groups (Group 1 and Group 2) were assessed using two data collection measures a total of three times: (a) at pretest, prior to intervention, (b) at posttest, following five weeks of instruction, and (c) following a two week maintenance period. The assessments used for this study were designed and validated by Glago (2005) and Cote (2009) to measure the knowledge and application of problem-solving skills of early elementary children with developmental disabilities. The assessments were modified for use with young children with developmental delays.

#### **Problem Situation Measure**

The problem situation measure was designed to assess the ability of children to apply the steps needed to problem solve in a variety of problem-based scenarios (Cote, 2009; Glago, 2005). The problem situation measure consisted of five short problem-based scenarios paired with a corresponding picture for the child to view while the vignette was read aloud. Following each reading, the child was asked a series of questions: (a) what is the problem, (b) what is a solution, and (c) why did it work? Each response was recorded verbatim on the assessment sheet (see Appendix D). The scores obtained from the pretest, posttest, and maintenance assessments were analyzed to determine the effectiveness of the Literacy-Based Problem-Solving lessons and the Center-Based Direct Instruction lessons on the acquisition of problem-solving skills among young children with developmental disabilities. Descriptive and inferential statistics were used to compare the scores of each question on the problem situation measure. Descriptive statistics for the identification of the problem, the solution and the evaluation of the solution are presented in Tables 12, 13, and 14.

Table 12

*Summary of Means and Standard Deviations for Problem Situation Measure  
Identification of the Problem*

Assessment	Mean	Standard Deviation	N
Pretest			
Group 1	4.04	3.33	27
Group 2	4.83	2.94	30
Posttest			
Group 1	5.85	2.28	27
Group 2	8.17	4.19	30
Maintenance			
Group 1	6.04	3.13	27
Group 2	7.47	4.06	30

Table 13

*Summary of Means and Standard Deviations for Problem Situation Measure  
Identification of the Solution*

Assessment	Mean	Standard Deviation	N
Pretest			
Group 1	4.41	4.15	27
Group 2	5.37	3.30	30
Posttest			
Group 1	6.63	4.35	27
Group 2	8.57	4.33	30
Maintenance			
Group 1	6.26	3.63	27
Group 2	9.50	4.41	30

Table 14

*Summary of Means and Standard Deviations for Problem Situation Measure  
Evaluation of the Solution*

Assessment	Mean	Standard Deviation	N
Pretest			
Group 1	2.67	2.17	27
Group 2	3.60	2.13	30
Posttest			
Group 1	4.44	2.93	27
Group 2	5.93	3.84	30
Maintenance			
Group 1	5.15	2.97	27
Group 2	7.23	3.73	30

Data from the pretest, posttest, and maintenance assessments from the Problem Situation Measure were used to answer the following research questions:

Research Question 1: Does the ability of preschool-aged children with developmental disabilities to *identify a problem* increase with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

It was predicted that the literacy-based problem solving followed by the Center-Based Direct Instruction would result in increased ability to identify a problem when compared to literacy-based problem solving alone.

Research Question 2: Does the ability of preschool-aged children with developmental disabilities to *identify a problem solution* increase with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

It was predicted that the literacy-based problem solving followed by the Center-Based Direct Instruction would result in increased ability to identify a problem solution when compared to literacy-based problem solving alone.

Research Question 3: Does the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* increase with the use of Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction when compared to Literacy-Based Structured Problem Solving?

It was predicted that the literacy-based problem solving followed by the Center-Based Direct Instruction would result in increased ability to evaluate a problem solution when compared to literacy-based problem solving alone.

Research Question 4: Is the ability of preschool-aged children with developmental disabilities to *identify a problem* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-

Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction would result in an increased ability to maintain the ability to identify a problem when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 5: Is the ability of preschool-aged children with developmental disabilities to *identify a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction will result in an increased ability to maintain the ability to identify a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Research Question 6: Is the ability of preschool-aged children with developmental disabilities to *evaluate a problem solution* better maintained with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the use of Literacy-Based Structured Problem-Solving lessons combined with Center-Based Direct Instruction will result in an increased ability

to maintain the ability to evaluate a problem solution when compared to the use of Literacy-Based Structured Problem Solving alone.

Data were collected using the problem situation measures and were analyzed using a 2 x 3 (group x time) ANOVA with repeated measures on time. Alpha was set at .05. The test for interaction was not significant [ $F(2, 110) = 0.967, p = .383$ ]. However, the F test for “time” was significant, [ $F(2, 110) = 13.369, p < .001$ ]. Pairwise comparisons indicated that there was an increased ability to *identify a problem* across time for both groups from pretest to posttest ( $p < .001$ ), while no difference was noted from posttest to maintenance ( $p = .922$ ) (see Table 15). There also was a significant “group” effect [ $F(1, 55) = 5.509, p = .023$ ] indicating that Group 1 and Group 2 were significantly different (see Table 16). Examination of the group means shows the largest difference existed at posttest. These results indicate that Group 2 (Literacy-based problem-solving lessons followed by Center-Based Direct Instruction) were able to accurately identify more problems at posttest (see Table 17).

Table 15

*Tests of Within-Subjects Effects for the Ability to Identify a Problem*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Time	228.487	2	114.244	13.369	<.001*
Error (Time)	940.027	110	8.546		

Note. \*  $p < .05$ .

Table 16

*Tests of Between-Subjects Effects for the Ability to Identify a Problem*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Group	97.666	1	97.666	5.509	.023*
Error	975.106	55	17.729		

Note. \*  $p < .05$ .

Table 17

*Pairwise Comparisons of Pretest, Posttest, and Maintenance Assessments  
Ability to Identify a Problem*

Time	Time	Mean Difference	P
Pretest	Posttest	-2.574	<.001*
	Maintenance	-2.317	<.001*
Posttest	Pretest	2.574	<.001*
	Maintenance	.257	.922
Maintenance	Pretest	2.317	<.001*
	Posttest	-.257	.922

Note. \* The mean difference is significant at the .05 level.

The data were collected and analyzed using a 2x3 (group x time) ANOVA with repeated measures on “time” to ascertain the ability to *generate a solution to a problem* after intervention. An alpha of .05 was set. The test for interaction was not significant [ $F(2,110) = 2.59, p=.079$ ]. The F test for “time” was significant [ $F(2,110) = 21.609, p <$



.001] (see Table 18). Pairwise comparisons indicated that the children demonstrated an increased ability to generate a solution to a problem from pre- to posttest ( $p < .001$ ). The difference between posttest and maintenance was not significant ( $p = .883$ ). The F test for “group” was significant [ $F(1, 55) = 5.122, p = .028$ ] (see Table 19). Examination of the group means shows the largest difference existed at maintenance (see Table 20).

Table 18

*Tests of Within-Subjects Effects for the Ability to Generate a Solution*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Time	310.452	2	155.226	21.609	$p < .001^*$
Error (Time)	790.168	110	7.183		

Note. \*  $p < .05$ .

Table 19

*Tests of Between-Subjects Effects for the Ability to Generate a Solution*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Group	178.405	1	178.405	5.122	.028*
Error	1915.665	55	34.830		

Note. \*  $p < .05$ .

Table 20

*Pairwise Comparisons of Pretest, Posttest, and Maintenance Assessments  
Ability to Generate a Solution*

Time	Time	Mean Difference	P
Pretest	Posttest	-2.711	<.001*
	Maintenance	-2.993	<.001*
Posttest	Pretest	2.711	<.001*
	Maintenance	-.281	.883
Maintenance	Pretest	2.993	<.001*
	Posttest	2.81	.883

*Note.* \* The mean difference is significant at the .05 level.

The ability to *evaluate a solution to a problem* was analyzed using a 2x3 (group x time) ANOVA with repeated measures on “Time.” Alpha was set at .05. The test for interaction was not significant [ $F(2,110) = 0.95$ ,  $p = .839$ ]. The F test for “time” was significant, [ $F(2,110) = 27.87$ ,  $p < .001$ ] (see Table 21). Pairwise comparisons indicated a significant increase in the ability to evaluate a solution to a problem from pretest to posttest ( $p < .001$ ), and from posttest to maintenance ( $p = .022$ ). There also was a significant “group” effect ( $F = 5.338$ ,  $p = .025$ ) (see Table 22). Examination of the group means shows the largest difference existed at maintenance (see Table 23).

Table 21

*Tests of Within-Subjects Effects for the Ability to Evaluate a Solution*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Time	276.191	2	138.096	27.873	p < .001*
Error (Time)	544.990	110	4.954		

*Note.* \* p < .05.

Table 22

*Tests of Between-Subjects Effects for the Ability to Evaluate a Solution*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Group	96.237	1	96.237	5.338	.025*
Error	991.517	55	18.028		

*Note.* \* p < .05.

Table 23

*Pairwise Comparisons of Pretest, Posttest, and Maintenance Assessments  
Ability to Evaluate a Solution*

Time	Time	Mean Difference	P
Pretest	Posttest	-2.056	<.001*
	Maintenance	-3.057	<.001*
Posttest	Pretest	2.056	<.001*
	Maintenance	-1.002	.022*
Maintenance	Pretest	3.057	<.001*
	Posttest	1.002	.022*

*Note.* \* The mean difference is significant at the .05 level.

### **Problem-Solving Step Measure**

The problem-solving assessment was designed to measure the three steps of the problem solving process: (a) identify the problem, (b) generate a solution, and (c) evaluate the solution (Cote, 2009; Glago, 2005). Each child was given the assessment during a one-on-one session. The child was given a response time of ten-seconds and all answers were recorded on the assessment form (see Appendix G). The scores obtained from the pretest and posttest assessments were analyzed to determine the effectiveness of the Literacy-Based Problem-Solving lessons and the Center-Based Direct Instruction lessons on the acquisition of problem-solving skills among young children with developmental disabilities. Descriptive and inferential statistics were used to compare the scores on the problem-solving step measure (see Table 24). At pretest none of the children were able to name any steps to problem-solving. Group 1 did not have any

children who were able to name the three steps to problem-solving resulting in both groups scoring zero. However, the participants in Group 2 did demonstrate some ability, however minimal, to name the steps in the on the problem-solving step measure, indicating some growth over time.

Table 24

*Summary of Means and Standard Deviations for Problem-Solving Step Measure*

Group	Assessment	Mean	Std. Deviation	N
1	Pretest	.00	.000	27
2	Pretest	.00	.000	30
1	Posttest	.00	.000	27
2	Posttest	.67	1.093	30

Data from the pretest and posttest from the Problem-Solving Step Measure were used to answer the following research question:

Research Question 7: Does the ability of preschool-aged children with developmental disabilities to name the three steps needed to solve a problem, (what is the problem, what is the solution, and evaluate the solution) differ with the use of Literacy-Based Structured Problem Solving when compared to Literacy-Based Structured Problem Solving combined with Center-Based Direct Instruction?

It was predicted that the Literacy-Based Structured Problem Solving followed by the Center-Based Direct Instruction would result in an increased ability to name the three steps needed to problem-solve.

The data collected using the problem-solving step measures were analyzed using a 2 x 2 (group x time) ANOVA with repeated measures on “time.” An alpha of .05 was set for this analysis. The test for interaction was significant [ $F(2,110) = 7.312, p=.001$ ] (see Table 25). The interaction was significant due to identical means across all three measurement times for Group 1 (Literacy-Based Structured Problem-Solving) and significantly different means across measurement times for Group 2 (Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction). Simple main effects analysis revealed a significant “time” effect for group 2 [ $F(1,55) = 8.954, p = .004$ ] (see Table 26). Pairwise comparisons for Group 2 revealed that the children’s ability to generate the steps needed to problem solve significantly increased from pretest to posttest ( $p = .007$ ), and from posttest to maintenance ( $p=.05$ ) (see Table 27).

Table 25

*Test of Within-Subjects Effects for the Problem-Solving Step Measure*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Time	3.253	2	1.626	7.312	.001*
Error (Time)	24.467	110	.222		

*Note.* \*  $p < .05$ .

Table 26

*Test of Between-Subjects Effects for the Problem-Solving Step Measure*

Source	Type III Sum of Squares	df	Mean Squared	F	Sig.
Group	3.837	1	3.837	8.954	.004*
Error (Time)	23.567	55	.428		

*Note.* \*  $p < .05$ .

Table 27

*Pairwise Comparisons of Problem-Solving Step Measure*

Time	Time	Mean Difference	P
Pretest	Posttest	-.667	.007*
	Maintenance	-.233	.195
Posttest	Pretest	.667	.007*
	Maintenance	.433	.050*
Maintenance	Pretest	.233	.195
	Posttest	-.433	.050*

*Note.* \* The mean difference is significant at the .05 level.

Independent *t*-tests were used to test for group differences at posttest and maintenance. Group 2 scored significantly higher at posttest [ $t(55) = -3.165$ ,  $p = .003$ ] but not at maintenance [ $t(55) = -1.784$ ,  $p = .080$ ] (see Table 28). This suggests that the children in Group 2 (Literacy-Based Structured Problem-Solving followed by Center-

Based Direct Instruction) demonstrated an increased ability to name the three steps needed to problem solve, significantly greater than did the students in Group 1 (Literacy-Based Structured Problem-Solving).

Table 28

*Independent Samples t- tests for Group 2 only*

Time	Mean Difference	Standard Error Difference	t	df	Sig.(2- tailed)
Posttest	-.667	.211	-3.165	55	.003*
Maintenance	-.233	.13078	-1.784	55	.080

*Note.* \*  $p < .05$



## CHAPTER 5

### DISCUSSION

Problem solving is a critical skill that is imperative to the development of independence, social relationships, a high quality of life, and ultimately self-determination of students with and without disabilities (Agran et al., 2002; Dincer & Guneyasu, 1997; Palmer & Wehmeyer, 2003). Proficiency in problem-solving is the ability to: (a) accurately identify a problem, (b) generate solution(s) to the problem, (c) apply the solution(s) to the fix the problem, and (d) evaluate the consequences of the solution(s) across multiple environments and situations (Greenwood et al., 2006; Palmer & Wehmeyer, 2003; Rubin & Rose-Krasnor, 1992). As one of the most difficult skills learned in life, problem-solving has been a focus among researchers for many years (Newman, 1997; Palmer, 2010). This research typically focuses on the development of problem-solving among adolescents with developmental disabilities (Wehmeyer & Palmer, 2000). However, the last decade of research emphasizes the ability of younger children with developmental disabilities to develop and learn problem-solving strategies (Agran et al., 2002; Cote, 2009; Glago et al., 2009; Wehmeyer & Palmer, 2003).

Effective instruction for students with developmental disabilities occurs through the use of embedded lessons, direct and guided teacher instruction, children's literature, role-play, and scenarios (Cote, 2009; Glago et al., 2009; Joseph & Strain, 2010; Sure & Spivack, 1972). This research supports the notion that children with developmental disabilities are capable of learning problem-solving strategies in the elementary years (Glago et al., 2009; Palmer & Wehmeyer, 2003). Problem-solving is a continually developing skill that originates in the early years and should be fostered through effective

support and instruction (Wehmeyer & Palmer, 2000). The call for specially designed instruction creates a need for an efficient teaching protocol designed to teach problem-solving skills to children with developmental disabilities in the preschool setting.

The purpose of this study was to ascertain the impact of structured problem-solving instruction on young children with developmental disabilities. Specifically, this study compared the use of two types of problem solving instruction on the acquisition of problem-solving skills. The two interventions designed for this study were, Literacy-Based Structured Problem-Solving and Center-Based Direct Instruction using problem solving situation cards. The premise of this study was to determine an effective method to teach with young children with developmental disabilities how to problem solve. It was believed that the combined intervention (Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction) would increase the knowledge of problem-solving skills among young children with developmental disabilities more than the Literacy-Based Problem-Solving instruction followed by embedded problem-solving opportunities.

This study involved 57 children with developmental disabilities from six self-contained preschool classrooms across six public schools. The schools were located in large urban school district in the Southwestern United States. All participants in this study were eligible for special education services under the category of developmental delay according to the Nevada Administrative Code (2007), for students between the ages of 4- and 5-year olds, and were able to sit at an activity for at least 10 minutes.

Classes were assigned randomly to one of two instructional conditions. Three classrooms were assigned to Group 1 (Literacy-Based Structured Problem-Solving)

(n=27) and three classrooms were assigned to Group 2 (Literacy-Based Structured Problem-Solving followed by Center-Based Direct Instruction) (n=30). Group 1 received literature-based problem-solving lessons during a daily circle time, four days a week, for five weeks, followed by naturally embedded problem-solving opportunities. Group 2 received literacy-based problem-solving lessons during circle time, followed by small group Center-Based Direct Instruction lessons using problem-solving situation cards, four days a week, for five weeks.

### **Acquisition of Problem Solving Skills**

The children were administered the adapted Problem-Solving Step Measure (Cote, 2009; Glago, 2005) and the adapted Problem Situation Measure (Cote, 2009; Glago, 2005) a total of three times: (a) at pretest, prior to intervention, (b) at posttest, immediately following five weeks of instruction, and (c) at the conclusion a two-week maintenance period. All children were assessed during one-on-one sessions and responses were recorded verbatim.

The problem situation measure was designed to measure the ability of the children to apply the steps needed to problem solve in a variety of problem-based scenarios (Cote, 2009; Glago, 2005). A total of five problem situation measures were used. Each measure consisted of a short problem-based scenario paired with a corresponding picture. The children were shown a picture while the scenario was read aloud. Following each reading, the child was asked three questions: (a) what is the problem, (b) what is a solution, and (c) why did it work?

The problem-solving step measure was designed to measure the three steps of the problem solving process: (1) identify the problem, (2) generate a solution, and (3) evaluate the solution (Cote, 2009; Glago, 2005). The scores obtained from the pretest and posttest assessments were analyzed using SPSS to determine the effectiveness of the Literacy-Based Structured Problem-Solving lessons and the Center-Based Direct Instruction lessons on the acquisition of problem solving skills.

Data collected from the Problem Situation Measures were analyzed to determine if there were significant gains over time and differences between groups on the ability to identify a problem, identify a solution to the problem, and to evaluate the solution to the problem. It was predicted that the Literacy-Based Structured Problem-Solving lessons paired with the Center-Based Direct Instruction would produce greater gains in the ability to identify a problem, identify a problem solution, and to evaluation the solution when presented with a problem scenario. Additionally, the data were analyzed to determine if the children were able to maintain these skills two weeks following the conclusion of the instruction. It was predicted that the Literacy-Based Structured Problem-Solving lessons paired with the Center-Based Direct Instruction would produce greater ability to maintain these skills after intervention.

Results of this analysis indicate that both Group 1 (Literacy-Based Structured Problem-Solving) and Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) made significant gains in the ability to *identify a problem* from pretest to posttest. However, there was no change from posttest to maintenance for either group. Further analysis of this acquisition of *identifying a problem* at posttest indicated that the children in Group 2 (Literacy-Based Structured Problem-

Solving) were better able to identify a problem when presented with various problem situation cards after receiving the instruction. These results indicate that the use of the Literacy-Based Structured Problem-Solving instruction immediately followed by the Center-Based Direct-Instruction was successful in teaching young children with developmental disabilities to identify a problem.

The ability to generate a solution to a problem was analyzed for both groups. Results of this analysis indicate that both Group 1 (Literacy-Based Structured Problem-Solving) and Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) made significant gains in the ability *identify a problem solution* from pretest to posttest and demonstrated no changes from posttest to maintenance. Further analysis of the difference between groups at posttest indicate that the children in Group 2 (Literacy-Based Structured Problem-Solving) demonstrated more accuracy with *identifying a problem solution* when presented with various problem situation cards after receiving the instruction. The results of this analysis indicate that young children with developmental disabilities are capable of learning how to identify a problem solution through the use of direct instruction using Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction.

The data collected for the acquisition and maintenance of the *ability to evaluate a problem solution* using the problem situation measure were used to determine if the children were able to communicate the effectiveness of their selected solutions (e.g., evaluate their solution). Results of this analysis indicate that both Group 1 (Literacy-Based Structured Problem-Solving) and Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) made significant gains in the

ability *evaluate a problem solution* from pretest to posttest. However, further analysis indicated that Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) demonstrated more accuracy with *evaluating a problem solution* when presented with various problem situation cards after receiving the instruction. Analysis of the maintenance of *evaluating a problem solution* indicates a difference from posttest to maintenance for both groups. However, Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) demonstrated more accuracy of this skill at maintenance. Results of this analysis indicate that the use of Literature-Based Structured Problem-Solving paired with Center-Based Direct Instruction was more effective in teaching young children with developmental disabilities to learn how to evaluate self-generated solutions to problems and to maintain this skill over time.

Data collected using the problem-solving step measure (Cote, 2009; Glago, 2005) were analyzed to determine the acquisition of the problem-solving steps. Results of this analysis indicate a significant difference between both groups from pretest to posttest. Although these results indicate significant increase overtime for Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) few students were able to name all three steps. Because Group 1 (Literacy-Based Structured Problem-Solving) was unable to name any of the steps of the problem-solving process, the scores of Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) were significantly higher. Although most children in both groups were unable to produce the three steps to problem-solving in the correct

sequence, an analysis of the verbatim responses recorded on the assessments provides critical information about the acquisition of the problem-solving steps.

Recorded responses for both Group 1 and Group 2 on the problem-solving step measure indicate that some students provided relevant responses to indicate an understanding of the three steps. Two children in Group 1 (Literacy-Based Structured Problem-Solving) provided responses for the first two steps. Responses for the first step (Problem) included *fix* and *he lost something*. Step two (solution) responses included *ask for help* and *fix it*. These two responses indicate that these two children in Group 1 (Literacy-Based Structured Problem-Solving) were able to gain an understanding of the concept of problem solving.

Responses among Group 2 (Literacy-Based Structured Problem-Solving paired with the Center-Based Direct Instruction) were more abundant. For step one (problem) children responded with, *I don't know the problem to fix, fix the problem, if I spill something, 1, 2, 3, I can't open it, and the boy lost his goggles*. Responses for step two (solution) included *tell your mom, my dad can do it with a screwdriver, and ask for help*. Some children indicated an understanding of the third step (evaluate) by providing responses such as; *see if it works or not* and *did it fix it*. These responses align with the instruction that took place during the Literacy-Based Structured Problem-Solving lessons and the Center-Based lessons but do not match the exact wording needed to receive a point on the assessment. For example, during daily instruction children were asked to see if it worked to fix the problem. Some children remembered the wording “fix”. Comparisons of these verbatim responses indicate that while a small number of children

were able to accurately identify the three steps, some children did gain an understanding of the concept of knowing a problem, fixing it, and seeing if it worked.

### **Conclusions**

There are eleven conclusions that can be drawn from this study. They are based on the quantitative data that were collected. The limitations of this study should be considered when evaluating these conclusions.

1. The most effective method for teaching preschool-age (4- and 5-year olds) children with developmental disabilities to problem solve is through the use of Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction.
2. Preschool-age children (4- and 5-year olds) with developmental disabilities can be taught how to problem solve using Literacy-Based Structured Problem-Solving alone.
3. Preschool-age children (4- and 5-year olds) are able to *identify a problem* when presented with a picture scenario after receiving instruction using Literacy-Based Structured Problem-Solving Lessons and Center-Based Direct Instruction.
4. Children who received the Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction had a significantly higher ability to *identify a problem* when compared to children who received Literacy-Based Structured Problem-Solving alone.



5. Preschool-age children (4- and 5-year olds) are able *to identify a problem solution* when presented with a picture scenario after receiving instruction using Literacy-Based Structured Problem-Solving Lessons and Center-Based Direct Instruction.
6. Preschool-age children (4- and 5-year olds) with developmental disabilities who received the Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction had a significantly higher ability to *identify a problem solution* when compared to children who received Literacy-Based Structured Problem-Solving alone.
7. Preschool-age children (4- and 5-year olds) are able *to evaluate a problem solution* when presented with a picture scenario after receiving instruction using Literacy-Based Structured Problem-Solving Lessons and Center-Based Direct Instruction.
8. Preschool-age children (4- and 5-year olds) with developmental disabilities who received the Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction had a significantly higher ability to *evaluate a problem solution* when compared to children who received Literacy-Based Structured Problem-Solving alone.
9. Preschool-age children (4- and 5-year olds) with developmental disabilities who received the Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction for teaching were able to maintain the ability *to evaluate a problem solution*.

10. Preschool-age children (4- and 5-year olds) with developmental disabilities who received the Literacy-Based Structured Problem-Solving paired with Center-Based Direct Instruction were able to learn the three steps of the problem solving process (problem, solution, and evaluation).
11. Preschool-age children (4- and 5-year olds) with developmental disabilities learn how to problem-solve through the use of direct instruction.

### **Recommendations for Further Study**

Adults with disabilities report that problem solving is a critical life skill needed to function as a successful member of the community (Angell, Stoner, & Fulk, 2010). However, instruction in this area does not typically occur until later elementary years or secondary school. Due to a lack of instruction, adolescents and young children often lack the ability to identify problems, generate solutions to those problems, and to appropriately apply and evaluate solutions to problems. Since problem solving is identified as a foundational skill that begins development in early childhood, it is critical to identify a teaching protocol for use in the early childhood classroom (Stevens, 2009; Wehmeyer & Palmer, 2000). Research is needed to support the development of an effective teaching protocol for use with young children with developmental disabilities. Based on the results of this study the following recommendations are suggested for further study.

1. An expansion of this study should be conducted to determine if three-year old children with developmental disabilities are capable of learning to problem solve.

2. An expansion of this study should be conducted to determine the acquisition of problem-solving skills among five and six year old children with developmental disabilities, including children with autism.
3. A replication of this study should be conducted over a longer period of time.
4. A replication of this study should be conducted to include three groups, a group who receives only Literacy-Based Structured Problem-Solving, a group who receives only Center-Based Direct Instruction, and a group who receives the combined instruction (Literacy-Based Structured Problem-Solving and Center-Based Direct Instruction).
5. Further research should focus on the development of a teacher training program in the area of problem-solving instruction.
6. Research should be conducted to compare the acquisition and development of problem-solving skills among typically developing children and children with developmental disabilities.
7. Additional research should be conducted among young children to determine the impact of gender, ethnicity, language gaps, and disabilities on the development of problem-solving skills.

### **Summary**

Limited research has been conducted on the acquisition of problem-solving skills of young children with developmental disabilities. However, research supports the use of literacy-based instruction as a critical tool for instruction when working with young children with developmental disabilities (Konrad, et al., 2007). Through the use of

literature, children can be taught a step-by-step approach to deficit skills (Sridhar & Vaughn, 2000). Using explicitly designed direct-instruction methods, researchers have noted the ability to teach young children to problem solve (Cote, 2009; Glago, 2005, Agran et al., 2002; Palmer, 2010). This study incorporated the use of literacy-based instruction and direct teaching methods to determine effective methods for teaching young children with developmental disabilities to problem solve.

Two types of direct instruction were designed and used for this study. The first method of direct instruction was the use of Literacy-Based Structured Problem-Solving lessons. Scripted literacy lessons were created for five different children's literature books. The second method of instruction was Center-Based Direct Instruction using problem-solving picture cards. These cards taught the three steps of problem solving through the use of problem-solving sequencing cards. Prior to this study limited research had been conducted involving the use of literacy to teach problem-solving to children with developmental disabilities in the preschool setting. No research has been conducted using problem situation cards.

Results of this study demonstrate that preschool-age children with developmental disabilities are capable of learning how to problem solve through the use of direct instruction that uses a step-by-step sequence of problem-solving. The use of a step-by-step process to teach problem solving has been reported as an effective way to teach means end thinking for several decades (Shure, 2001; Shure & Spivack, 1972) and the current study supports this research. The results of the current study also supports previous research conducted using scripted programs with children who are typically developing or at-risk for developing behavior and oppositional defiant disorders (Anliak

& Sahin, 2010; Dincer & Guneyusu, 1997; Vestal & Jones, 2004; Webster-Stratton et al., 2008).

This study contributes to the literature supporting the use of direct instruction to teach children to problem solve (Cote, 2009; Glago, 2005, Agran et al., 2002). However, it expands previous research with its significant findings that young children with developmental disabilities can be taught the problem solving process. Young children with developmental disabilities receiving early intervention services are capable of learning how to problem solve (Joseph & Strain, 2010). Teachers should use explicit direct instruction through the use of Literacy-Based Structured Problem-Solving and Center-Based Direct Instruction using problem situation cards to enhance the development of problem solving with young children with developmental disabilities. Because problem solving is a determinant of independence, quality of life, functional social skills, and self-determination, instruction is critical in the early years for the population (Agran et al., 2002; Dincer & Guneyusu, 1997; Palmer & Wehmeyer, 2003).

Appendix A  
Teacher Consent Forms



## **TEACHER INFORMED CONSENT**

### **Department of Special Education and Early Childhood Education**

**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

**INVESTIGATOR(S):** Lindsay Diamond and Kyle Higgins

**CONTACT PHONE NUMBER:** (702) 895-3205 (department), 895-1101 (Dr. Higgins)

#### **Purpose of the Study**

You are invited to participate in a research study. The purpose of this study is to research the learning effects of whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards on the knowledge of problem-solving skills with young children with developmental delays.

#### **Participants**

You are being asked to participate in the study because you are currently a licensed teacher in a self-contained special education classroom for preschool-aged students with developmental delays.

#### **Procedures**

If you volunteer to participate in this study, you will be asked to do the following: (a) be videotaped while involved in whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards (half of the students will receive a 15-minute whole group, literature-based problem-solving instruction for five weeks and the other half will receive a 15-minute whole group, literature-based problem-solving instruction followed by a 10-minute small group center-based direct-instruction using problem-solving picture cards, four days a week for five weeks), (b) participate in a training session for your assigned research Group (literature-based problem-solving instruction will attend a three-hour training and literature-based problem-solving instruction followed by a small group center-based direct-instruction using problem-solving picture cards will attend a four-hour training), (c) conduct the lessons for your assigned instructional groups (literature-based problem-solving instruction and literature-based problem-solving instruction followed by small group center-based direct-instruction using problem-solving picture cards). The research team will view the videos to measure fidelity of instruction. It is anticipated that the study will last for ten weeks.

#### **Benefits of Participation**

There may not be any direct benefits to you as a participant in this study. However, we hope to determine which type of instruction increases a child's acquisition and maintenance of problem solving skills.

#### **Risks of Participation**

There are risks involved in all research studies. This study may include only minimal risks. The only risk found within this research study is the possibility that privacy might be breached through the use of a video camera while recording lessons for the purposes of measuring teacher fidelity. The privacy may be breached if a member of the research team recognizes one of the students in the video during the review for teacher fidelity of instruction.

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

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**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

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The probability that this risk may occur is not likely. The severity if it does occur is extremely low. If privacy is breached through the video, it is not reversible. Again, however, the impact of this risk has extremely low severity.

Videos will only be reviewed by the research team to collect teacher fidelity data. There will be no additional viewing of the video. Following data collection, the video will be stored on a DVD in a locked filing cabinet within the Department of Special Education in the College of Education at the University of Nevada, Las Vegas.

**Cost /Compensation**

There will be no financial cost to you to participate in this study because all instruction will occur in your classrooms during the typical school day. The study will last for ten weeks. You will not be compensated for your time.

**Contact Information**

If you have any questions or concerns about the study, you may contact Dr. Higgins or Lindsay Diamond at (702) 895-3205. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794 or via email at IRB@unlv.edu.**

**Voluntary Participation**

Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

**Confidentiality**

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for three years after completion of the study. After the storage time the information gathered will be destroyed after three years.

**Participant Consent:**

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant Name (Please Print)

***Approved by the UNLV IRB. Protocol 1104-3789M***

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Appendix B

Parent Consent Forms



## **PARENT PERMISSION FORM GROUP 1**

**Department of Special Education and Early Childhood Education**

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**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

**INVESTIGATOR(S):** Lindsay Diamond and Kyle Higgins

**CONTACT PHONE NUMBER:** (702) 895-3205 (department), 895-1101 (Dr. Higgins)

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### **Purpose of the Study**

Your child is invited to participate in a research study. The purpose of this study is to research the learning effects of whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards on the knowledge of problem-solving skills with young children with developmental delays.

### **Participants**

Your child is being asked to participate in the study because he or she fits this criteria: Your child is (a) within the ages of 3-to-5 years old, (b) has a current Individualized Education Plan (IEP), (c) attends an early childhood special education program, (d) has the ability to respond verbally to questions, (e) is able to sit at an activity for at least 5 minutes, and (f) qualifies for early childhood special education services under the label developmental delay.

### **Procedures**

If you volunteer your child to participate in this study, he or she will be asked to do the following: (a) be videotaped while involved in a 15-minute whole group, literature-based problem-solving instruction lesson four days a week for five weeks, (b) participate in the assessment of the or knowledge of problem solving before and after intervention as well as two weeks following the intervention. The special education teacher in your child's classroom will conduct lessons for both interventions. The assistant will set up a video camera to record students when the lessons are being given. The research team will view the videos to measure fidelity of instruction. It is anticipate that the study will last for ten weeks.

### **Benefits of Participation**

There may be direct benefits to your child as a participant in this study, such as an increase in their knowledge of problem-solving skills. However, we hope to determine which type of instruction increases a child's acquisition and maintenance of problem-solving skills.

*Approved by the UNLV IRB. Protocol 1104-3789M*

*Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12*

**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

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**Risks of Participation**

There are risks involved in all research studies. This study may include only minimal risks. The only risk found within this research study is the possibility that privacy might be breached through the use of a video camera while recording lessons for the purposes of measuring teacher fidelity. The privacy may be breached if a member of the research team recognizes one of the students in the video during the review for teacher fidelity of instruction.

The probability that this risk may occur is not likely. The severity if it does occur is extremely low. If privacy is breached through the video, it is not reversible. Again, however, the impact of this risk has extremely low severity.

Videos will only be reviewed by the research team to collect teacher fidelity data. There will be no additional viewing of the video. Following data collection, the video will be stored on a DVD in a locked filing cabinet within the Department of Special Education in the College of Education at the University of Nevada, Las Vegas.

**Cost /Compensation**

There will not be financial cost to you to participate in this study because this study will occur in your child's classroom during the typical school day. The study will last for ten weeks. Your child will not be compensated for their time.

**Contact Information**

If you have any questions or concerns about the study, you may contact Dr. Kyle Higgins or Lindsay Diamond at **895-3205**. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794 or via email at IRB@unlv.edu.**

**Voluntary Participation**

Your agreement for your child to participate in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

**Confidentiality**

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for three years after completion of the study. After the storage time the information gathered will be destroyed.

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

**Participant Consent:**

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

\_\_\_\_\_  
Signature of Parent

\_\_\_\_\_  
Child's Name (Please print)

\_\_\_\_\_  
Parent Name (Please Print)

\_\_\_\_\_  
Date



## **PARENT PERMISSION FORM GROUP 2**

### **Department of Special Education and Early Childhood Education**

**TITLE OF STUDY:** Problem Solving Intervention: Impact on Young Children with Developmental Disabilities

**INVESTIGATOR(S):** Lindsay Diamond and Kyle Higgins

**CONTACT PHONE NUMBER:** (702) 895-3205 (department), 895-1101 (Dr. Higgins)

#### **Purpose of the Study**

Your child is invited to participate in a research study. The purpose of this study is to research the learning effects of whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards on the knowledge of problem-solving skills with young children with developmental delays.

#### **Participants**

Your child is being asked to participate in the study because he or she fits this criteria: Your child is (a) within the ages of 3-to-5 years old, (b) has a current Individualized Education Plan (IEP), (c) attends an early childhood special education program, (d) has the ability to respond verbally to questions, (e) is able to sit at an activity for at least 5 minutes, and (f) qualifies for early childhood special education services under the label developmental delay.

#### **Procedures**

If you volunteer your child to participate in this study, he or she will be asked to do the following: (a) be videotaped while involved in whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards, students will receive a 15-minute whole group, literature-based problem-solving lesson followed by a 10-minute small group center-based direct-instruction lesson using problem-solving picture cards, four days a week for five weeks, (b) participate in the assessment of the or knowledge of problem solving before and after intervention as well as two weeks following the intervention. The special education teacher in your child's classroom will conduct lessons for both interventions. The assistant will set up a video camera to record students when the lessons are being given. The research team will view the videos to measure fidelity of instruction. It is anticipated that the study will last for ten weeks.

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

**TITLE OF STUDY:** Problem Solving Intervention: Impact on Young Children with Developmental Disabilities

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**Benefits of Participation**

There may be direct benefits to your child as a participant in this study, such as an increase in their knowledge of problem-solving skills. However, we hope to determine which type of instruction increases a child's acquisition and maintenance of problem-solving skills.

**Risks of Participation**

There are risks involved in all research studies. This study may include only minimal risks.

The only risk found within this research study is the possibility that privacy might be breached through the use of a video camera while recording lessons for the purposes of measuring teacher fidelity. The privacy may be breached if a member of the research team recognizes one of the students in the video during the review for teacher fidelity of instruction.

The probability that this risk may occur is not likely. The severity if it does occur is extremely low. If privacy is breached through the video, it is not reversible. Again, however, the impact of this risk has extremely low severity.

Videos will only be reviewed by the research team to collect teacher fidelity data. There will be no additional viewing of the video. Following data collection, the video will be stored on a DVD in a locked filing cabinet within the Department of Special Education in the College of Education at the University of Nevada, Las Vegas.

**Cost /Compensation**

There will not be financial cost to you to participate in this study because this study will occur in your child's classroom during the typical school day. The study will last for ten weeks. Your child will not be compensated for their time.

**Contact Information**

If you have any questions or concerns about the study, you may contact Dr. Kyle Higgins or Lindsay Diamond at **895-3205**. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794 or via email at IRB@unlv.edu.**

**Voluntary Participation**

Your agreement for your child to participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

**Confidentiality**

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you or your child to this study. All records will be stored in a locked facility at UNLV for three years after completion of the study. After the storage time the information gathered will be destroyed.

**Participant Consent:**

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

\_\_\_\_\_  
Signature of Parent

\_\_\_\_\_  
Child's Name (Please print)

\_\_\_\_\_  
Parent Name (Please Print)

\_\_\_\_\_  
Date

## Appendix C

### Paraprofessional Consent Forms





## **PARAPROFESSIONAL INFORMED CONSENT**

### **Department of Special Education and Early Childhood Education**

---

**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

**INVESTIGATOR(S):** Lindsay Diamond and Kyle Higgins

**CONTACT PHONE NUMBER:** (702) 895-3205 (department), 895-1101 (Dr. Higgins)

---

#### **Purpose of the Study**

You are invited to participate in a research study. The purpose of this study is to research the learning effects of whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards on the knowledge of problem-solving skills with young children with developmental delays.

#### **Participants**

You are being asked to participate in the study because you are currently a paraprofessional in a self-contained special education classroom for preschool-aged students with developmental delays.

#### **Procedures**

If you volunteer to participate in this study, you will be asked to do the following: (a) be videotaped while involved in whole group, literature-based problem-solving instruction and small group center-based direct-instruction using problem-solving picture cards (half of the students will receive a 15-minute whole group, literature-based problem-solving instruction for five weeks and the other half will receive a 15-minute whole group, literature-based problem-solving instruction followed by a 10-minute small group center-based direct-instruction using problem-solving picture cards, four days a week for five weeks), (b) participate in a training session for your assigned research Group (literature-based problem-solving instruction will attend a three-hour training and literature-based problem-solving instruction followed by a small group center-based direct-instruction using problem-solving picture cards will attend a four-hour training), (c) set up a video camera prior to daily lessons. The research team will view the videos to measure fidelity of instruction. It is anticipated that the study will last for ten weeks.

#### **Benefits of Participation**

There may not be any direct benefits to you as a participant in this study. However, we hope to determine which type of instruction increases a child's acquisition and maintenance of problem solving skills.

#### **Risks of Participation**

There are risks involved in all research studies. This study may include only minimal risks. The only risk found within this research study is the possibility that privacy might be breached through the use of a video camera while recording lessons for the purposes of measuring teacher fidelity. The privacy may be breached if a member of the research team recognizes one of the students in the video during the review for teacher fidelity of instruction.

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

---

**TITLE OF STUDY:** Problem Solving Interventions: Impact on Young Children with Developmental Disabilities

---

The probability that this risk may occur is not likely. The severity if it does occur is extremely low. If privacy is breached through the video, it is not reversible. Again, however, the impact of this risk has extremely low severity.

Videos will only be reviewed by the research team to collect teacher fidelity data. There will be no additional viewing of the video. Following data collection, the video will be stored on a DVD in a locked filing cabinet within the Department of Special Education in the College of Education at the University of Nevada, Las Vegas.

**Cost /Compensation**

There will be no financial cost to you to participate in this study because all instruction will occur in your classrooms during the typical school day. The study will last for ten weeks. You will not be compensated for your time.

**Contact Information**

If you have any questions or concerns about the study, you may contact Dr. Higgins or Lindsay Diamond at (702) 895-3205. For questions regarding the rights of research subjects, any complaints or comments regarding the manner in which the study is being conducted you may contact **the UNLV Office of Research Integrity – Human Subjects at 702-895-2794 or toll free at 877-895-2794 or via email at IRB@unlv.edu.**

**Voluntary Participation**

Your participation in this study is voluntary. You may refuse to participate in this study or in any part of this study. You may withdraw at any time without prejudice to your relations with the university. You are encouraged to ask questions about this study at the beginning or any time during the research study.

**Confidentiality**

All information gathered in this study will be kept completely confidential. No reference will be made in written or oral materials that could link you to this study. All records will be stored in a locked facility at UNLV for three years after completion of the study. After the storage time the information gathered will be destroyed after three years.

**Participant Consent:**

I have read the above information and agree to participate in this study. I am at least 18 years of age. A copy of this form has been given to me.

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Participant Name (Please Print)

***Approved by the UNLV IRB. Protocol 1104-3789M***

***Received: 08-05-11 Approved: 08-25-11 Expiration: 08-24-12***

## Appendix D

### Fidelity of Instruction Checklist

#### Literacy-Based Structured Problem-Solving Lessons

## Literacy-Based Structured Problem-Solving Lessons

### Fidelity of Instruction Checklist

Monday

Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered in small group during circle time.	Yes	No
2. The problem-solving poster was introduced.	Yes	No
3. Definition of a “problem” was provided.	Yes	No
4. The teacher followed the teacher script provided.	Yes	No
5. Children were praised for their responses.	Yes	No
6. The problem in the book was recorded on the problem-solving poster.	Yes	No

# Literacy-Based Structured Problem-Solving Lessons

## Fidelity of Instruction Checklist

Tuesday

Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered in small group during circle time.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. Definition of a “problem” was reviewed.	Yes	No
4. Teacher introduced the definition of a “solution”.	Yes	No
5. The teacher followed the teacher script provided.	Yes	No
6. Children were praised for their responses.	Yes	No
7. The solution in the book was recorded on the problem-solving poster.	Yes	No

# Literacy-Based Structured Problem-Solving Lessons

## Fidelity of Instruction Checklist

Wednesday

Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered in small group during circle time.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. Definition of a “problem” was reviewed.	Yes	No
4. Definition of a “solution” was reviewed.	Yes	No
5. Teacher introduced the definition of an “evaluation”.	Yes	No
6. The teacher followed the teacher script provided.	Yes	No
7. Children were praised for their responses.	Yes	No
8. The evaluation of the solution to the problem in the book was recorded on the problem-solving poster.	Yes	No

# Literacy-Based Structured Problem-Solving Lessons

## Fidelity of Instruction Checklist

Thursday

Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered in small group during circle time.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. Definition of a “problem” was reviewed.	Yes	No
4. Definition of a “solution” was reviewed.	Yes	No
5. Definition of an “evaluation” was reviewed.	Yes	No
6. The teacher followed the teacher script provided.	Yes	No
7. Children were praised for their responses.	Yes	No
8. The entire problem-solving process was reviewed while using the problem-solving poster.	Yes	No

## Appendix E

### Fidelity of Instruction Checklist

#### Center-Based Direct Instruction



# Fidelity of Instruction Checklist

## Center-Based Direct Instruction

Monday

Teacher Name:	Date:	
Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered during small group centers following the literature-based structured problem-solving lesson.	Yes	No
2. The problem-solving poster was introduced.	Yes	No
3. Definition of a “problem” was provided.	Yes	No
4. The problem situation cards were introduced focusing on the “problem” card.	Yes	No
5. The teacher followed the teacher script provided.	Yes	No
6. The topic of the day’s instruction (e.g., problem, solution, evaluation) was recorded on the problem-solving poster.	Yes	No

# Fidelity of Instruction Checklist

## Center-Based Direct Instruction

Tuesday

Teacher Name:	Date:	
Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered during small group centers following the literature-based structured problem-solving lesson.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. The “problem” recorded on the problem-solving poster was reviewed.	Yes	No
4. Definition of a “solution” was introduced.	Yes	No
5. The problem situation card for “solution” was introduced.	Yes	No
6. The teacher followed the teacher script provided.	Yes	No
7. The topic of the day’s instruction (e.g., problem, solution, evaluation) was recorded on the problem-solving poster.	Yes	No

# Fidelity of Instruction Checklist

## Center-Based Direct Instruction

Wednesday

Teacher Name:	Date:	
Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered during small group centers following the literature-based structured problem-solving lesson.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. The “problem” recorded on the problem-solving poster was reviewed.	Yes	No
4. The “solution” recorded on the problem-solving poster was reviewed.	Yes	No
5. The problem situation card for “evaluation” was introduced.	Yes	No
6. The teacher followed the teacher script provided.	Yes	No
7. The topic of the day’s instruction (e.g., problem, solution, evaluation) was recorded on the problem-solving poster.	Yes	No

# Fidelity of Instruction Checklist

## Center-Based Direct Instruction

Thursday

Teacher Name:	Date:	
Directions: Circle yes or no for completion of the step.		
1. The lesson was delivered during small group centers following the literature-based structured problem-solving lesson.	Yes	No
2. The problem-solving poster was reviewed.	Yes	No
3. The “problem” recorded on the problem-solving poster was reviewed.	Yes	No
4. The “solution” recorded on the problem-solving poster was reviewed.	Yes	No
5. The “evaluation” recorded on the problem-solving poster was reviewed.	Yes	No
6. Student’s we allowed time to manipulate the cards.	Yes	No
7. The teacher followed the teacher script provided.	Yes	No

## Appendix F

### Approval for use of Assessments

---

University of Nevada Las Vegas  
Department of Special Education  
4505 South Maryland Parkway  
Box 453014  
Las Vegas, NV 89154

01/12/2011

Debra Cote, Ph.D.  
Department of Special Education  
Cal State Fullerton  
College Park 570  
P.O. Box 6868  
Fullerton, CA 92834

Dear Dr. Debra Cote:

I am completing a doctoral dissertation at The University of Nevada Las Vegas entitled "Problem Solving Interventions: Impact on Young Children with Developmental Disabilities." I would like your permission to adapt and reprint in my dissertation excerpts from the following:

Cote, D. L. (2009). Increasing skill performances of problem-solving in students with intellectual disabilities (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses Database. (AAT 3383975).

The excerpts to be adapted or reprinted are the Problem-Solving Pretest Questionnaire, Problem-Solving Posttest Questionnaire, Problem-Solving Step Measure, Problem Situation Baseline Measure, Problem Situation Measure, Problem Situation Maintenance Measure, Problem Solving Retention Measure, Problem-Solving Step Measure Scoring Rubric, and the Problem Situation Measure Scoring Rubric.

The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by ProQuest through its UMI® Dissertation Publishing business. ProQuest may produce and sell copies of my dissertation on demand and may make my dissertation available for free internet download at my request. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own [or your company owns] the copyright to the above-described material.

If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,  
Lindsay Lile Diamond

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Debra Cote  
Debra Cote, Ph.D.

Date: 1-18-11

University of Nevada Las Vegas  
Department of Special Education  
4505 South Maryland Parkway  
Box 3014  
Las Vegas, NV 89154

01/20/2011

Dr. Karen Glago Durocher  
Office of Special Education Instruction  
3877 Fairfax Ridge Rd., 3-029  
Fairfax, VA 22030

Dear Dr. Glago Durocher:

I am completing a doctoral dissertation at The University of Nevada Las Vegas entitled "Problem Solving Interventions: Impact on Young Children with Developmental Disabilities." I would like your permission to adapt and reprint in my dissertation excerpts from the following:

Glago, K. D. (2005). The effect of problem solving self-determination instruction on elementary students with learning disabilities and emotional disabilities (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses Database. (AAT 3163727).

The excerpts to be adapted or reprinted are the Problem Solving Strategy Measure, Scenario Worksheet Measures (pretest and posttest), Practice Scenario Worksheets, and Scoring Rubrics.

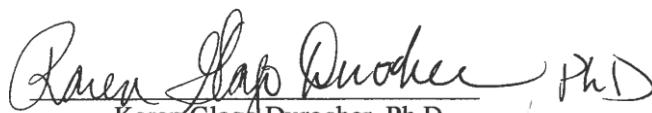
The requested permission extends to any future revisions and editions of my dissertation, including non-exclusive world rights in all languages, and to the prospective publication of my dissertation by ProQuest through its UMI® Dissertation Publishing business. ProQuest may produce and sell copies of my dissertation on demand and may make my dissertation available for free internet download at my request. These rights will in no way restrict republication of the material in any other form by you or by others authorized by you. Your signing of this letter will also confirm that you own [or your company owns] the copyright to the above-described material.



If these arrangements meet with your approval, please sign this letter where indicated below and return it to me in the enclosed return envelope. Thank you very much.

Sincerely,  
Lindsay Lile Diamond

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

  
Karen Glagg Durocher, Ph.D.

Date: 2/2/11

## Appendix G

### Problem-Solving Step Measure

### Problem-Solving Step Measure

Student Name:		Classroom:	
Pretest   Posttest Maintenance	Date:	Assessor:	
Name the three steps of problem solving:			Circle one of the following: (+) = correct answer (-) = incorrect answer
1.			+      -
2.			+      -
3.			+      -

Appendix H

Problem Situation Measure

### Problem Situation Measure

Student Name:	Classroom:			
Pretest   Posttest   Maintenance	Date:	Assessor:		
Direction: Read the following scenario while showing the child a picture of the scenario. After reading the story ask the child the following questions.				
Madison wants to go outside. Madison can't open the door.				
Directions: Please circle the number that indicates how well the child answers the questions.	No Response	Incorrect	Partially Correct	Correct
1. What is the problem?	0	1	2	3
2. What could you do to fix it?	0	1	2	3
3. Why will it work?	0	1	2	3

### Problem Situation Measure

Student Name:	Classroom:			
Pretest   Posttest   Maintenance	Date:	Assessor:		
<p>Direction: Read the following scenario while showing the child a picture of the scenario. After reading the story ask the child the following questions.</p>				
<p>Jenny wants a glass of juice. The juice container is too heavy.</p>				
<p>Directions: Please circle the number that indicates how well the child answers the questions.</p>	No Response	Incorrect	Partially Correct	Correct
1. What is the problem?	0	1	2	3
2. What could you do to fix it?	0	1	2	3
3. Why will it work?	0	1	2	3

### Problem Situation Measure

Student Name:	Classroom:			
Pretest   Posttest   Maintenance	Date:	Assessor:		
<p>Direction: Read the following scenario while showing the child a picture of the scenario. After reading the story ask the child the following questions.</p>				
<p>Brad wants to color. Brad cannot open the marker.</p>				
<p>Directions: Please circle the number that indicates how well the child answers the questions.</p>	No Response	Incorrect	Partially Correct	Correct
1. What is the problem?	0	1	2	3
2. What could you do to fix it?	0	1	2	3
3. Why will it work?	0	1	2	3

### Problem Situation Measure

Student Name:	Classroom:			
Pretest   Posttest   Maintenance	Date:	Assessor:		
<p>Direction: Read the following scenario while showing the child a picture of the scenario. After reading the story ask the child the following questions.</p>				
<p>Audrey likes to eat fruit. Audrey can't peel the fruit.</p>				
<p>Directions: Please circle the number that indicates how well the child answers the questions.</p>	No Response	Incorrect	Partially Correct	Correct
1. What is the problem?	0	1	2	3
2. What could you do to fix it?	0	1	2	3
3. Why will it work?	0	1	2	3


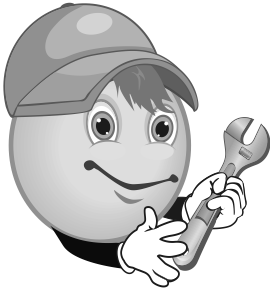
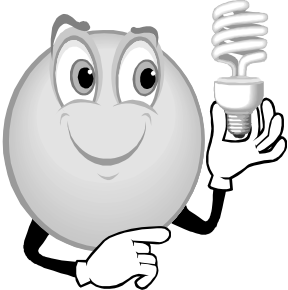


### Problem Situation Measure

Student Name:	Classroom:			
Pretest   Posttest   Maintenance	Date:	Assessor:		
<p>Direction: Read the following scenario while showing the child a picture of the scenario. After reading the story ask the child the following questions.</p>				
<p>David likes to eat chips. David cannot open the bag.</p>				
<p>Directions: Please circle the number that indicates how well the child answers the questions.</p>	No Response	Incorrect	Not Sure	Correct
1. What is the problem?	0	1	2	3
2. What could you do to fix it?	0	1	2	3
3. Why will it work?	0	1	2	3

Appendix I

Problem-Solving Poster

Problem Solving Step	Class Response
 <p><b>What is the Problem?</b></p>	
 <p><b>What is a Solution?</b></p>	
 <p><b>Evaluate the Solution.</b></p> <p><b>Did it work?</b></p>	

## Appendix J

### Problem-Solving Literature Books

Problem-Solving Literature Books		
Week	Author	Book
1	Ezra Jack Keats	<i>A Letter to Amy (1998)</i>
2	Ragnhild Scamell	<i>Apple Trouble (2006)</i>
3	Ezra Jack Keats	<i>Pet Show (2001)</i>
4	Mo Willems	<i>Knuffle Bunny (2004)</i>
5	Ezra Jack Keats	<i>Goggles (1998)</i>

## Appendix K

### Literature-Based Structured Problem-Solving Script

Monday - Thursday

# Literature-Based Structured Problem-Solving Script

Monday

<p>Problem-Solving Poster</p> <p>Section 1</p> <p>What is the Problem?</p>	<p><b>Today we are going to talk about problem solving.</b></p> <p><i>Read the line above while pointing to the problem-solving poster.</i></p> <p><b>What is a problem?</b></p> <p><i>Read the line above while pointing to the picture problem-solving poster labeled, what's the Problem?</i></p> <p><i>Praise children's attempts to answer the questions (e.g., oh good try, yes, a problem is when something happens that you need help with, or that is a good try).</i></p> <p><b>A problem is when something happens and you need help.</b></p> <p><b>A problem might be when you spill a glass of milk on the table.</b></p> <p><b>Spilling a drink is a problem because we need to clean it up.</b></p> <p><i>Read the lines above while pointing to the first picture on the poster.</i></p>
<p>Cover</p>	<p><b>Today we are going to read a book called "A Letter to Amy" by Ezra Jack Keats.</b></p> <p><b>Look at the cover of the book. What do you think the story will be about?</b></p> <p><i>Read the lines above and reinforce responses (e.g., yes, the book is about a boy, and he is wearing a raincoat).</i></p> <p><b>The book is about a boy named Peter.</b></p> <p><b>Let's look at the pictures in the book to see what kind of problem Peter has in the story.</b></p>

	<i>Read the lines above while pointing to Peter on the cover of the book.</i>
p.1	<p><b>It looks like Peter is writing a letter.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>
p. 2	<p><b>Oh on this page it looks like Peter finished writing his letter and now he is leaving.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>
p. 3	<p><b>What is happening on this page?</b></p> <p><i>Read the line above and praise responses (e.g., yes, it looks very dark and he is wearing a coat).</i></p> <p><b>Peter is holding the letter, he has a raincoat on and it looks like it might rain.</b></p> <p><i>Read the line above and point to the picture on the page.</i></p>
p. 4	<p><b>Oh no, what is happening on this page? It looks like Peter may have problem.</b></p> <p><i>Read the lines above while pointing to the picture. Reinforce responses (e.g., yes, there is thunder in the sky).</i></p> <p><b>The wind blew the letter out of his hand.</b></p> <p><b>Peter's problem is the letter blew out of his hand.</b></p> <p><b>What's the problem?</b></p> <p><i>Read the lines above and praise responses (e.g., yes, the problem is the wind blew the letter out of his hand).</i></p> <p><b>The problem is the wind blew the letter out of his hand.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>



p .5	<p><b>On this page it looks like the letter is blowing away. What do you see in the picture?</b></p> <p><i>Read the line above and praise responses (e.g., yes, the letter is flying in the air).</i></p> <p><b>On this page it looks like the letter is still blowing away.</b></p> <p><i>Read this line above.</i></p>
p.6	<p><b>Oh no, what is happening on this page?</b></p> <p><i>Read the line above and praise responses (e.g., yes, it looks like the girl is going to get the letter).</i></p> <p><b>It looks like the girl is going to catch the letter.</b></p> <p><b>What's the Problem?</b></p> <p><b>The problem is the letter is blowing away and the girl might catch it.</b></p> <p><i>Read the lines above while pointing to the picture.</i></p>
p.7	<p><b>What is happening in the picture?</b></p> <p><i>Read the line above and praise responses (e.g., yes, Peter caught the letter, the girl fell).</i></p> <p><b>It looks like Peter and the girl bumped into each other and Peter caught the letter.</b></p>
p.8	<p><b>Oh, it looks like Peter is putting the letter in the mailbox.</b></p> <p><i>Read the line above while pointing to the picture.</i></p> <p><b>What else is happening in this picture?</b></p> <p><i>Read the line above while pointing to the girl and praise responses (e.g., yes, she is running away).</i></p>

p.9	<p><b>It looks like Peter is walking with his dog.</b></p> <p><i>Read the lines above while pointing to the picture.</i></p>
p.10	<p><b>What is happening in this picture?</b></p> <p><i>Read the line above while pointing to the picture and praise responses (e.g., yes, he is looking out the window).</i></p> <p><b>It looks like Peter is looking out the window.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>
p.11	<p><b>Look at the picture, what do you think Peter is doing here?</b></p> <p><i>Read the line above while pointing to the picture. Praise responses (e.g., yes, he is standing with his mom, he is at a party).</i></p> <p><b>It looks like Peter is at a party.</b></p> <p><i>Read the lines above while pointing to the picture.</i></p>
p.12	<p><b>Oh, what is happening in this picture?</b></p> <p><i>Read the line above while pointing to the picture. Reinforce responses (e.g., yes, it looks like the girl has a bird).</i></p> <p><b>It looks like the girl came to the party and she has a bird.</b></p> <p><i>Read the lines above while pointing to the picture.</i></p>
p.13	<p><b>Wow, this picture looks like Peter is having fun. What is happening in this picture?</b></p> <p><i>Read the lines above and reinforce responses (e.g., yes, it is Peter's birthday).</i></p> <p><b>Peter is having a birthday party.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>

<p>Problem-Solving Poster</p> <p>Section 1</p> <p>What is the Problem?</p>	<p><b>The problem in the story is that Peter's letter blew away.</b></p> <p><b>What is the Problem?</b></p> <p><i>Read the lines above while pointing to the picture.</i></p> <p><b>Yes, the Problem is that Peter's letter blew away.</b></p> <p><b>Let's write our problem on our problem-solving poster.</b></p> <p><i>Read the lines above while pointing to the problem-solving poster. Write the problem on the poster.</i></p>
<p>Problem-Solving Poster</p> <p>Section 1</p> <p>What is the Problem?</p>	<p><b>Today we talked about what a problem is.</b></p> <p><b>What is the problem in our story?</b></p> <p><i>Read the lines above and point to the poster. Praise responses (e.g., yes, our problem is that Peter's letter blew away).</i></p> <p><b>The problem is Peter's letter blew away.</b></p> <p><b>Tomorrow we will talk about a solution to Peter's problem.</b></p> <p><i>Read the line above while pointing to the second section on the problem-solving poster.</i></p>

Literature-Based Structured Problem-Solving Script

Tuesday

<p>Problem-Solving Poster Section 1</p> <p>What is the Problem?</p>	<p><b>Today we are going to talk about problem solving.</b></p> <p><b>Yesterday we talked about a Problem.</b></p> <p><b>What is a problem?</b></p> <p><i>Read the line above while pointing to the picture on the problem-solving poster labeled, What's the Problem? Praise children's attempts to answer the questions (e.g., oh good try, yes, a problem is when something happens that you need help with or that is a good try).</i></p> <p><b>A problem is when something happens and you need help.</b></p> <p><b>A problem might be when you spill a glass of milk on the table.</b></p> <p><b>Spilling a drink is a problem because we need to clean it up.</b></p>
<p>Problem-Solving Poster Section 1</p> <p>What is the Problem?</p>	<p><b>What was Peter's problem?</b></p> <p><b>Peter's problem was he wrote a letter and it blew away.</b></p> <p><i>Read the line above while pointing to the first picture on the poster that is labeled, What's the Problem?</i></p> <p><i>Review the problem listed on the poster while pointing to the words next to the problem picture.</i></p> <p><i>Praise responses (e.g., yes, his letter blew high in the sky).</i></p>
<p>Problem-Solving Poster Section 2</p>	<p><b>Today we are going to talk about Solutions to Peter's problems.</b></p> <p><b>What is a solution?</b></p> <p><i>Read the line above while pointing to the second picture on the problem-solving poster.</i></p>

What is the Solution?	<p><i>Praise children's attempts to answer the questions (e.g., good job, yes, a solution is when you fix a problem that you had or that is a good try).</i></p> <p><b>A solution is when you try to fix a problem.</b></p> <p><b>A solution to a problem is to clean up the milk when you spill a glass of milk. Spilling the milk is a problem and we need to think of a solution to fix this problem. A solution would be to get a towel and wipe up the milk.</b></p>
Cover	<p><b>Today we are going to read the book "A Letter to Amy" by Ezra Jack Keats.</b></p> <p><b>Let's Read the book to find solutions to Peter's Problems.</b></p> <p><i>Read the line above and point to the picture.</i></p>
p.1	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>Peter is writing a letter to Amy.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>
p.2	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>Peter wrote his letter, put a stamp on it, and now he is going to mail it.</b></p> <p><i>Read the line above while pointing to the picture.</i></p>
p.3	<p><i>Read the lines on the page while pointing to the picture.</i></p>
p.4	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., the wind blew the letter).</i></p>

	<p><b>The problem is the strong wind blew the letter out of Peter’s hand.</b></p> <p><i>Read the line above while pointing to the letter blowing away in the picture.</i></p> <p><b>What is a solution to this problem?</b></p> <p><i>Read the line above while pointing to the letter blowing away. Praise student responses (e.g., yes, we can try to catch the letter).</i></p> <p><b>A solution to this problem is to try to catch the letter.</b></p> <p><i>Read the above line.</i></p>
p.5	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What is a solution to the problem?</b></p> <p><i>Read the lines above and praise student responses (e.g., yes, he tried to catch it with his foot).</i></p> <p><b>A solution is to try to stop it with his foot.</b></p> <p><i>Read the line above.</i></p>
p.6	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>The problem is the wind blew the letter high into the air.</b></p> <p><i>Read the line above while pointing to the letter blowing in the sky.</i></p> <p><b>What is a solution to this problem? How did Peter try to fix the problem?</b></p> <p><i>Read the lines above and praise responses (e.g., yes, he tried to chase it).</i></p> <p><b>A solution to this problem is to try and catch the letter.</b></p> <p><i>Read the above line.</i></p>
p.7	<p><i>Read the lines on the page while pointing to the picture.</i></p>

	<p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., letter blew toward Amy).</i></p> <p><b>The problem is Amy might catch the letter.</b></p> <p><i>Read the line above while pointing to Amy.</i></p> <p><b>Let's read on to see what a solution to this problem is.</b></p> <p><i>Read the above line.</i></p>
p.8	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., Peter bumped into Amy).</i></p> <p><b>The problem is Peter bumped Amy.</b></p> <p><i>Read the line above while pointing to Amy and Peter.</i></p> <p><b>What is a solution to this problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., yes, he can help Amy get up).</i></p> <p><b>A solution is he could help Amy get up.</b></p> <p><i>Read the above line.</i></p>
p.9	<i>Read the lines on the page while pointing to the picture.</i>
p.10	<i>Read the lines on the page while pointing to the picture.</i>
p.11	<i>Read the lines on the page while pointing to the picture.</i>
p.12	<i>Read the lines on the page while pointing to the picture.</i>
Problem-	<b>Peter has a problem in this book. Peter wrote a letter and the wind</b>

Solving	<b>blew it away.</b>
Poster	<b>What was a solution to the problem?</b>
Section 2	<i>Read the lines above while pointing to the second section of the problem-</i>
What is a	<i>solving poster and praise responses (e.g., yes, Peter can catch the letter).</i>
Solution?	
Problem-	<b>Let's write the solution to Peter's problem on the problem solving</b>
Solving	<b>poster.</b>
Poster	<b>A solution is for Peter to catch the letter and put it in the mailbox.</b>
Section 2	<i>Read the lines above and write the solution on the problem-solving</i>
What is a	<i>poster.</i>
Solution?	
Problem-	<b>Today we talked about solutions to his problem and tomorrow we</b>
Solving	<b>will evaluate the solutions to see if they worked to solve the problem.</b>
Poster	<i>Read the above line while pointing to the problem-solving poster.</i>



Literature-Based Structured Problem-Solving Script

Wednesday

<p>Problem-Solving Poster</p> <p>Section 1</p> <p>What is the Problem?</p>	<p><b>Today we are going to talk about problem solving.</b></p> <p><b>On Monday we talked about a problem that Peter has and yesterday we talked about a solution to Peter’s problem.</b></p> <p><i>Read the above lines while pointing to the problem-solving poster.</i></p> <p><b>What is a problem?</b></p> <p><i>Read the line above while pointing to the picture problem-solving poster labeled, What’s the Problem? Praise children’s attempts to answer the questions (e.g., oh good try, yes, a problem is when something happens that you need help with or that is a good try).</i></p> <p><b>A problem is when something happens and you need help.</b></p>
<p>Problem-Solving Poster</p> <p>Section 1</p> <p>What is the Problem?</p>	<p><b>Do you remember what Peter’s problem was?</b></p> <p><i>Read the line above and praise responses (e.g., yes, he lost his letter).</i></p> <p><b>Peter’s problem was that his letter to Amy was blown away in the wind.</b></p> <p><i>Read the line above while pointing to the picture first picture on the poster that is labeled, What’s the Problem? Review the problem listed on the poster while pointing to the words next to the problem picture. Praise responses and answers (e.g., yes, his letter blew high in the sky).</i></p>
<p>Problem-Solving Poster</p>	<p><b>Yesterday we talked about a Solution to Peter’s Problem.</b></p> <p><b>What is a solution?</b></p> <p><i>Read the line above while pointing to the second picture on the problem</i></p>

Section 2  What is the Solution?	<p><i>solving poster. Praise children's attempts to answer the questions (e.g., good job, yes, a solution is when you fix a problem that you have or that is a good try).</i></p> <p><b>A solution is when you try to fix a problem.</b></p>
Problem-Solving Poster Section 2  What is the Solution?	<p><b>What was a solution to Peter's problem?</b></p> <p><i>Read the lines above and praise responses (e.g., yes, he tried to catch the letter, he put the mail in the mailbox).</i></p> <p><b>A solution to Peter's problem is that he caught the letter. Once he caught the letter he put it in the mailbox.</b></p>
Problem-Solving Poster Section 3  Evaluate the Solution.	<p><b>What does it mean to evaluate the solution?</b></p> <p><i>Read the lines above while pointing to the picture on the page. Praise students for their responses (e.g., yes, evaluate means to decide if the solution worked to solve the problem).</i></p> <p><b>Evaluating the Solution means we have to decide if the solution worked to solve the problem.</b></p> <p><b>Let's see if these solutions worked to solve Peter's problems.</b></p> <p><i>Read the lines above.</i></p>
Cover	<p><b>Today we are going to read the book "A Letter to Amy" by Ezra Jack Keats.</b></p> <p><b>Let's Read the book to evaluate the solutions to Peter's Problem.</b></p> <p><i>Read the line above and point to the cover.</i></p>
p.1	<i>Read the lines on the page while pointing to the picture.</i>

p.2	<i>Read the lines on the page while pointing to the picture.</i>
p.3	<i>Read the lines on the page while pointing to the picture.</i>
p.4	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., the wind blew the letter).</i></p> <p><b>The problem is the strong wind blew the letter out of Peter's hand.</b></p> <p><i>Read the line above while pointing to the letter blowing away in the picture.</i></p> <p><b>What is a solution to this problem?</b></p> <p><i>Read the line above while pointing to the letter blowing away. Praise student responses (e.g., yes, he can try to catch the letter).</i></p> <p><b>A solution to this problem is to try to catch the letter.</b></p> <p><i>Read the above line.</i></p> <p><b>Evaluate the solution. Did it work?</b></p> <p><b>No, because he did not catch the letter.</b></p> <p><i>Read the lines above and praise responses (e.g., no, he did not catch the letter).</i></p>
p.5	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What is another solution to the problem?</b></p> <p><i>Read the line above and praise student responses (e.g., yes, he tried to catch it with his foot).</i></p> <p><b>Another solution is to try to stop it with his foot.</b></p>

	<p><i>Read the line above.</i></p> <p><b>Evaluate the solution. Did it work?</b></p> <p><b>No, because he did not catch the letter.</b></p> <p><i>Read the lines above and praise responses (e.g., no, he did not catch the letter).</i></p>
p.6	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>The problem is the wind blew the letter high into the air.</b></p> <p><i>Read the line above while pointing to the letter blowing in the sky.</i></p> <p><b>What is a solution to this problem? How did Peter try to fix the problem?</b></p> <p><i>Read the lines above and praise responses (e.g., yes, he tried to chase it).</i></p> <p><b>A solution to this problem is to try and catch the letter.</b></p> <p><i>Read the above line.</i></p> <p><b>Evaluate the solution. Did it work?</b></p> <p><b>No because he did not catch the letter.</b></p> <p><i>Read the lines above and praise responses (e.g., no, he did not catch the letter).</i></p>
p.7	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., letter blew toward Amy).</i></p> <p><b>The problem is Amy might catch the letter.</b></p> <p><i>Read the line above while pointing to Amy.</i></p>

	<p><b>Let's read on to see what a solution to this problem is.</b></p> <p><i>Read the above line.</i></p>
p.8	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>What's the Problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., Peter bumped into Amy).</i></p> <p><b>The problem is Peter bumped Amy.</b></p> <p><i>Read the line above while pointing to Amy and Peter.</i></p> <p><b>What is a solution to this problem?</b></p> <p><i>Wait for a student response. Praise appropriate responses (e.g., yes, he can help Amy get up).</i></p> <p><b>A solution is that he can help Amy get up.</b></p> <p><i>Read the above line.</i></p> <p><b>Another solution is that Peter finally caught the letter.</b></p> <p><b>Do you think this worked? Let's read the next page to find out if catching the letter solves the problem.</b></p> <p><i>Read the lines above.</i></p>
p.9	<p><i>Read the lines on the page while pointing to the picture.</i></p> <p><b>Peter mailed the letter. Let's evaluate the solution. Did catching the letter work?</b></p> <p><i>Read the lines above and praise student responses (e.g., yes, he put it in the mailbox).</i></p> <p><b>Yes, it did work because when Peter caught the letter he was able to</b></p>

	<b>mail the letter.</b>
p.10	<i>Read the lines on the page while pointing to the picture.</i>
p.11	<i>Read the lines on the page while pointing to the picture.</i>
p.12	<i>Read the lines on the page while pointing to the picture.</i>
p. 13	<i>Read the lines on the page while pointing to the picture.</i>
p. 14	<i>Read the lines on the page while pointing to the picture.</i>
Problem-Solving Poster Section 3 Evaluate the Solution	<p><b>Evaluate the solution. Did mailing the letter work?</b></p> <p><i>Read the lines above and praise student responses (e.g., yes, Amy is at the party).</i></p> <p><b>The solution did work to solve the problem because Amy came to Peter's Party.</b></p> <p><b>Let's write our evaluation on our problem-solving poster.</b></p> <p><i>Read the lines above while pointing and writing on the problem-solving poster.</i></p>
Problem-Solving Poster	<p><b>Today we talked about evaluating the solutions to Peter's problems, tomorrow we will review Peter's problems, the solutions, and evaluate the solutions to the problems.</b></p> <p><i>Read the above line while pointing to the problem-solving poster.</i></p>

Literature-Based Structured Problem-Solving Script

Thursday

<p>Problem-Solving Poster Section 1</p> <p>What is the Problem?</p>	<p><b>Today we are going to talk about problem solving.</b></p> <p><b>On Monday we talked about a problem that Peter had and Tuesday we talked about solutions to Peter’s problem and yesterday we talked about evaluating Peter’s solutions to his problems.</b></p> <p><i>Read the above lines while pointing to the problem-solving poster.</i></p> <p><b>What is Peter’s Problem?</b></p> <p><i>Read the lines above while pointing to the problem-solving poster and praise responses (e.g., yes, he lost his letter).</i></p> <p><b>Peter’s problem was that his letter to Amy was blown away in the wind.</b></p> <p><i>Read the line above while pointing to the picture first picture on the poster that is labeled What’s the Problem? Review the problem listed on the poster while pointing to the words next to the problem picture. Praise responses and answers (e.g., yes, his letter blew high in the sky).</i></p>
<p>Problem-Solving Poster Section 2</p> <p>What is the Solution?</p>	<p><b>What was a solution to Peter’s problem?</b></p> <p><i>Read the lines above while pointing to the problem-solving poster and praise responses (e.g., yes, he tried to catch the letter; he put the mail in the mailbox).</i></p> <p><b>A solution to Peter’s problem is that he caught the letter. Once he caught the letter he put it in the mailbox.</b></p>

Problem-Solving Poster Section 3  Evaluate the Solution.	<p><b>Evaluate Peter’s solution. Did it work to catch the letter and mail it?</b></p> <p><i>Read the letter above while pointing to the problem-solving poster and praise responses (e.g., yes, it did work).</i></p> <p><b>Mailing the letter did work because Amy came to Peter’s party.</b></p> <p><i>Read the line above while pointing to the poster.</i></p>
Cover of the Book	<p><b>Today we are going to read the book “A Letter to Amy” by Ezra Jack Keats.</b></p> <p><b>I want you to listen for Peter’s problems, solutions to the problems and evaluate the solutions to the problems while I read you the book.</b></p> <p><i>Read the lines above and point to the cover of the book. Continue by reading the entire book, if students respond verbally by pointing out the problems or solutions provide praise and keep reading).</i></p>
Book	<p><i>Read the book.</i></p>
Problem-Solving Poster Section 1  What is the Problem?	<p><b>What is Peter’s Problem?</b></p> <p><i>Read the lines above while pointing to the problem-solving poster and praise responses (e.g., yes, he lost his letter).</i></p> <p><b>Peter’s problem was that his letter to Amy was blown away in the wind.</b></p> <p><i>Read the line above while pointing to the problem-solving poster.</i></p>
Problem-	<p><b>What was a solution to the problem?</b></p>



<p>Solving Poster Section 2 What is the Solution?</p>	<p><i>Read the lines above while pointing to the second section of the problem-solving poster and praise responses (e.g., yes, Peter can catch the letter).</i></p> <p><b>A solution is for Peter to catch the letter and put it in the mailbox.</b></p> <p><i>Read the lines above while writing the solution on the problem-solving poster.</i></p>
<p>Problem-Solving Poster Section 3 Evaluate the Solution.</p>	<p><b>Evaluate the Solution. Did mailing the letter work?</b></p> <p><i>Read the lines above and praise student responses (e.g., yes, Amy is at the party).</i></p> <p><b>The solution to mail the letter worked to solve the problem because Amy came to Peter's Party.</b></p> <p><i>Read the line above while pointing to the problem-solving poster.</i></p>
<p>Point to the Problem-Solving Poster</p>	<p><b>This week we talked about the three components' of problem solving.</b></p> <p><b>What is a problem? What is a solution? Evaluate the solution to the problem. Next week we will talk about more problems that we see in another book.</b></p> <p><i>Read the above lines while pointing to the problem-solving poster.</i></p>

Appendix L

Center-Based Direct Instruction Scripts

Monday-Thursday

Center-Based Direct Instruction Scripts

Monday

**This week we are going to talk about problem solving. There are three steps to problem solving.**

- 1. Identify the problem.**
- 2. Identify the solution.**
- 3. Evaluate the solution**

*Read the lines above while pointing to the problem-solving poster.*

**Today we are going to talk about a problem.**

**What is a problem?**

*Read the line above while pointing to the picture on the problem-solving poster labeled, What is the Problem? Praise children's attempts to answer the question (e.g., oh good try, yes, a problem is when something happens that you need help with, or that is a good try).*

**A problem is when something happens and you need help.**

**A problem might be when you spill a glass of milk on the table.**

**Spilling a drink is a problem because we need to clean it up.**

*Read the lines above while pointing to the first picture on the poster.*

**Today I have a Problem Situation Card that we are going to look at and try to identify the problem.**

*Read the lines above while holding the picture card.*

**Look at the picture, what is the problem?**

*Read the line above while holding the card and pointing to the picture. Make sure that all*

*of the children in the group have a chance to see the picture. Respond appropriately to student responses (e.g., yes, the boys shoe is untied, he might fall, those are all problems).*

**In this picture the boy has a problem.**

**The problem is his shoe is untied.**

**What might happen to the boy because his shoe is untied?**

*Read the lines above while pointing to the picture. Respond and praise student responses (e.g., yes, he may fall).*

**Let's look at the picture together.**

**What is the Problem?**

*Read the lines above while pointing to the picture and praise student responses (e.g., yes, the boys shoe is untied).*

**The problem is the boy's shoe is untied.**

**Let's write the problem on our problem-solving poster.**

*Read the lines above and point to the first section of the problem-solving poster. Use a marker to write down the identified problem. Write down, the boy's shoe is untied.*

**Today we learned what a problem is and we found a problem in our picture.**

*Read the line above while pointing to the picture.*

**The problem was the boy's shoe is untied.**

*Read the line above while pointing to the picture*

**Tomorrow we are going to talk about a solution to the boy's problem.**

*Read the lines above while pointing to the second picture and the problem-solving poster.*

Center-Based Direct Instruction Scripts

Tuesday

**Today we are going to talk about problem solving.**

**There are three steps to problem solving.**

- 1. Identify the problem.**
- 2. Identify the solution.**
- 3. Evaluate the solution**

*Read the lines above while pointing to the problem-solving poster.*

**Yesterday we talked about a problem.**

*Read the line above while pointing to the picture problem-solving poster labeled, What is the Problem?*

**A problem is when something happens and you need to fix it.**

**What problem did we find yesterday?**

*Read the line above while holding the problem picture and pointing to the problem-solving poster. Praise responses (e.g., yes, his shoe is untied).*

**The problem is the boy's shoe is untied.**

**Today we are going to talk about a solution to the boy's problem.**

**What is a solution?**

*Read the lines above while pointing to the second picture on the problem-solving poster.*

*Praise children's attempts to answer the questions (good job, yes, a solution is when you fix a problem that you had or that is a good try).*

**A solution is when you try to fix a problem.**

**A solution to a problem is to clean up the milk when you spill a glass of milk.**

<p><b>Spilling the milk is a problem and we need to think of a solution to fix this problem.</b></p> <p><b>A solution would be to get a towel and wipe up the milk.</b></p> <p><i>Read the lines above.</i></p>
<p><b>Today I have two Problem Solving Situation Cards that we are going to look at.</b></p> <p><i>Read the lines above.</i></p>
<p><b>This card is our problem.</b></p> <p><b>The Problem is the boy's shoe is untied.</b></p> <p><i>Read the lines above while holding the problem card.</i></p>
<p><b>The next card is a picture of a solution.</b></p> <p><b>What is the solution in this picture?</b></p> <p><b>How does the boy try to fix his problem?</b></p> <p><i>Read the lines above while holding the solution card and pointing to the picture. Make sure that all of the children in the group have a chance to see the picture. Respond appropriately to responses (e.g., yes, the boy asked for help). Provide a verbal and gestural prompt when needed (e.g., What do you see in the picture?).</i></p>
<p><b>In this picture the solution to the problem is to ask for help to tie his shoe.</b></p> <p><b>The solution is to tie his shoe.</b></p> <p><b>What is the solution?</b></p> <p><i>Read the lines above and respond appropriately to responses (e.g., yes, a solution is to tie his shoe, or to ask for help).</i></p>
<p><b>Let's write the solution on our problem-solving poster.</b></p> <p><i>Read the lines above and point to the second section of the problem-solving poster. Use a marker to write down the identified solution. Write down, ask for help to tie his shoe.</i></p>

**Today we learned what a solution to a problem is and we found a solution in our picture.**

**The solution is to ask for help to tie his shoe.**

*Read the lines above while pointing to the picture.*

**Tomorrow we are going to talk about the solution to the boy's problem and evaluate the solution.**

*Read the lines above while pointing to the third picture and the problem-solving poster.*

Center-Based Direct Instruction Scripts

Wednesday

**Today we are going to talk about problem solving.**

**There are three steps to problem solving.**

- 1. Identify the problem.**
- 2. Identify the solution.**
- 3. Evaluate the solution**

*Read the lines above while pointing to the problem solving poster.*

**Let's review the first two steps.**

**What is a problem?**

*Read the line above while pointing to the picture problem-solving poster labeled, What is the Problem? and reinforce responses (e.g., yes, when something needs to be fixed).*

**A problem is when something happens and you need to fix it.**

**What problem did we find?**

*Read the line above while holding the problem picture and pointing to the problem-solving poster. Praise responses (e.g., yes, his shoe is untied).*

**The problem is the boy's shoe is untied.**

**Now that we know the boy's problem, what is a solution to his problem?**

**What is a solution?**

*Read the line above while pointing to the second picture on the problem-solving poster.*

*Praise children's attempts to answer the questions (e.g., good job, yes, a solution is when you try to fix a problem).*

**A solution is when you try to fix a problem.**



**What solution did we find in the picture?**

*Read the lines above while pointing to the picture and the second section of the problem-solving poster. Praise children's attempts to answer the questions (e.g., good job, yes, a solution is to tie his shoe).*

**The solution is to ask for help to tie his shoe.**

**Today I have three Problem Solving Situation Cards that we are going to look at.**

*Read the lines above while holding the problem situation cards.*

**This card is our problem.**

**The Problem is the boy's shoe is untied.**

*Read the lines above while holding the problem card.*

**The next card is a picture of a solution.**

**The solution was to ask for help to tie his shoe.**

*Read the lines above while holding the solution card.*

**Today we are going to talk about the third step, evaluate.**

**What does it mean to evaluate the solution?**

*Read the line above while pointing to the third picture on the problem-solving poster.*

*Praise children's attempts to answer the questions (e.g., good job; yes, when you evaluate you check to see if it worked).*

**To evaluate the problem means to decide if the solution worked to fix the problem.**

*Read the line above while pointing to the third picture on the problem-solving poster.*

**Let's look at the third picture.**

**Evaluate the Solution. Did our solution work to fix our problem?**

*Read the line above while pointing to the evaluation picture.*

<p><b>Let's put the pictures together and see if the solution worked to solve our problem.</b></p> <p><i>Read the line above while pointing to the problem situation card set.</i></p>
<p><b>The Problem is the boy's shoe is untied.</b></p> <p><i>Read the lines above while holding the problem card.</i></p>
<p><b>The solution is to ask for help to tie his shoe.</b></p> <p><i>Read the line above while holding to the solution picture.</i></p>
<p><b>Evaluate the solution.</b></p> <p><b>Did the Solution work to fix the problem?</b></p> <p><i>Read the line above while pointing to the evaluation picture. Verbally reinforce student responses (e.g., yes, the solution worked).</i></p>
<p><b>Yes, asking someone to tie his shoe solved the problem because now his shoe is tied.</b></p> <p><i>Read the line above.</i></p> <p><b>Let's write the evaluation of the problem on our problem-solving poster.</b></p> <p><i>Read the line above while pointing to the third section on the problem-solving poster.</i></p> <p><i>Write yes on the poster in the evaluation section.</i></p>
<p><b>Tomorrow we will talk about the three steps to solving this problem.</b></p> <p><i>Read the line above while holding the picture cards.</i></p>

Center-Based Direct Instruction Scripts

Thursday

**Today we are going to talk about problem solving.**

**There are three steps to problem solving.**

- 1. Identify the problem.**
- 2. Identify the solution.**
- 3. Evaluate the solution**

*Read the lines above while pointing to the problem-solving poster.*

**Let's review problem situation cards we are using this week.**

**I am going to give each of you a picture of the problem.**

*Read the lines above while passing out the problem picture card.*

**Look at the picture.**

**What is the problem?**

*Read the lines above while pointing to the problem picture. Praise responses (e.g., yes, his shoe is untied).*

**The problem is the boy's shoe is untied.**

*Read the line above while pointing to the picture.*

**Now I am going to give each of you a picture of the solution.**

*Read the lines above while passing out the problem solution picture card.*

**Look at the picture.**

**What is the solution?**

*Read the lines above while pointing to the solution picture card. Praise children's attempts to answer the questions (e.g., good job, yes, a solution is to tie his shoe).*

**The solution is to ask for help to tie his shoe.**

*Read the line above while pointing to the picture.*

**Now I am going to give each of you the evaluation picture.**

*Read the lines above while passing out the problem solution picture card.*

**Look at the picture.**

**Did the solution to fix the problem work?**

*Read the line above while pointing to the evaluation picture card. Verbally reinforce student responses (e.g., yes, the solution worked).*

**Yes, asking someone to tie his shoe solved the problem because now his shoe is tied.**

*Read the line above while pointing to the picture card.*

**Now I want you to practice putting your cards in order.**

*Read the line above while collecting the problem cards. Shuffle each set of cards and return to the children.*

**I want you to look for the problem, the solution, and the evaluation cards. Try to put them in order.**

*Read the lines above. Monitor the activity of the children and reinforce them for trying (e.g., yes, that card goes first because it is the problem).*

**Great job, now let's review the problem-solving poster.**

*Read the line above and point to the problem-solving poster.*

**What is the problem?**

**The problem is the boy's shoe is untied.**

*Read the line above while pointing to the first section of the problem-solving poster.*

**What is the solution?**

**The solution is to ask for help to tie his shoe.**

*Read the line above while pointing to the second section of the problem-solving poster.*

**Let's evaluate. Did the solution work to fix the problem?**

**Yes, the solution worked because he had someone tie his shoe.**

*Read the line above while pointing to the third section of the problem-solving poster.*

**Great job, next week we will talk about a new problem.**

*Read the line above.*

Appendix M

Timeline of Study

### Timeline of the Study

Week 1	<ul style="list-style-type: none"><li>• Pretest</li><li>• Group 1 and Group 2</li></ul>
Week 2-6	<ul style="list-style-type: none"><li>• Group 1<ul style="list-style-type: none"><li>• Implement Literacy-Based Structured Problem-Solving Lessons</li></ul></li><li>• Group 2<ul style="list-style-type: none"><li>• Implement Literacy-Based Structured Problem-Solving Lessons followed by Center-Based Direct Instruction Lessons</li></ul></li></ul>
Week 7	<ul style="list-style-type: none"><li>• Posttest</li><li>• Group 1 and Group 2</li></ul>
Week 8-9	<ul style="list-style-type: none"><li>• No Instruction</li></ul>
Week 10	<ul style="list-style-type: none"><li>• Maintenance Assessments</li><li>• Group 1 and Group 2</li></ul>

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### **Teaching Experience**

Project Facilitator, Early Childhood Special Education ARL  
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Professional Development Department, CCSD

- Provide mentoring and support to new special education teachers in alternative route to licensure programs. This support includes 150 hours of training and orientation to special education, weekly instructional support, IEP guidance and development support. My areas of mentoring are in classrooms providing services in early childhood special education teachers or autism.

Growth Model Trainer (2011- present)

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- As a growth model trainer, it is my responsibility to support and facilitate the Growth Model Initiative at the individual school level. This is a district wide initiative.

Classroom Teacher, ECSE-Autism (2005-2009)  
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ECE 722 Theoretical Bases of Early Childhood Education, Summer 2009  
Special Education Department, University of Nevada, Las Vegas

ECE 781 Field Experience in Early Childhood, Spring 2009  
Special Education Department, University of Nevada, Las Vegas

- Supervised graduate students in their field-based experience
- Conducted the required seminar that corresponds to field experience

**University Teaching Internship** (as part of doctoral requirement)

ESP 730 Parent Involvement in Special and General Education, Fall 2008  
Special Education Department, University of Nevada Las Vegas

**Practicum Experience** (as part of degree requirements)

Infant and Toddlers, September- December 2004  
UNLV/CSUN Preschool, Las Vegas, NV

Early Childhood Special Education, January- May 2005  
Ruth Fyfe Elementary School, Las Vegas, NV

General Education Second Grade, May- August 2005  
Elaine Wynn Elementary School, Las Vegas, NV

**Scholarship**

**Manuscripts in progress**

Ensuring Compliance: Accurate implementation of Assistive Technology  
(in progress). TARGET JOURNAL: *Intervention in School & Clinic*

Embedding Play into the Curriculum for Young Children with Disabilities (in  
progress). TARGET JOURNAL: *Young Exceptional Children*

Teacher Perspectives of Young Children's Interactions in Inclusive Environments  
(in progress). TARGET JOURNAL: *Early Childhood Education Journal*

Problem Solving for Young children with Disabilities (in progress).  
TARGET JOURNAL: *Teaching Exceptional Children*

**Presentations**

TED Annual Conference: Implementing Literature-Based Problem Solving in the  
Early Childhood Classroom, Austin, TX (2011)

CEC Annual Conference: Teaching Problem Solving to Young Children with  
Disabilities, National Harbor, MD (2011)

GRIPS Annual Conference: Alternative Strategy: An Innovative Approach to  
Teaching Field Experience in Graduate Education



Las Vegas, NV (2009)

TED Annual Conference: Preparing for the Inclusion of Young Children with Disabilities, Dallas, TX (2008)

Nevada Association for the Education of young Children (NevAEYC) Conference: Best Practice for Inclusion of Children with Disabilities in Early Childhood, Las Vegas, NV (2008)

TASH Annual Conference: Including Young Children with Severe Disabilities: Research-Based Best Practices That Work, Seattle, WA (2007)

### **Grant Experience**

Curricula developer and syllabi reviewer for the UNLV Department of Special Education **Highly Qualified, High Quality (HQ2) Special Educators**, CFDA 84.325T: Special Education Pre-service Training Improvement Grants, funded by the U.S. Department of Education, Office of Special Education Programs, 2008-2013

Proposal written for the U.S. Department of Education, Office of Special Education Programs Field Initiated Competition: *The Problem Solving Project for Young Children with Developmental Disabilities*

- All doctoral students in the Department of Special Education are required to take the course ESP 789 Grant Writing in Human Service. The major requirement of the course is to write a proposal following the RFP for a field-initiated competition. My proposal led to my dissertation topic.

### **Service**

Clark County School District

Professional Learning Communities in Early Childhood Special Education Planning Committee for the Clark County School District (2011- present)

Response-to-Intervention Planning Committee for the Clark County School District (2009- present)

Behavior Management in Early Childhood for Teach for America Seminar (Fall, 2009)

Data Collection in Early Childhood Workshop (Fall, 2009)

IEP Clinic For all Incoming Teachers (2010, 2011)

Early Childhood Roundtable For all Incoming Teachers (Spring, 2011)

## **UNLV**

University of Nevada Las Vegas Chapter of the Council for Exceptional Children

Doctoral Student Representative (2011-present)

Secretary (2010-2011) (elected position)

Treasurer (2008-2010) (elected position)

Founding member

## **National**

Review Board Member, Intervention in School & Clinic  
(2011- present)

## **Professional Memberships**

- Clark County Education Association
- Council for Exceptional Children, Division of Early Childhood
- Council for Exceptional Children, Council for Children with Behavioral Disorders
- Council for Exceptional Children, Teacher Education Division