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Validating the development of male and female preschoolers' help-seeking, goal-setting and planning, and self-evaluation using latent trait models

Reddy, Linda Ann, Ph.D.

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U·M·I
300 N. Zeeb Rd.
Ann Arbor, MI 48106

VALIDATING THE DEVELOPMENT OF MALE AND FEMALE PRESCHOOLERS' HELP SEEKING, GOAL SETTING AND PLANNING, AND SELF-EVALUATION USING LATENT TRAIT MODELS

by

Linda Ann Reddy

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As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Linda Ann Reddy

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and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

John R. Bergan	7/26/94 Date
	7-26-94 Date
Christine P. Dittrich	7-26-94 Date
	Date
	Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

John R. Bergan — Dissertation Director — 7/26/94 Date

John R. Bergan, Ph.D.

STATEMENT OF AUTHOR

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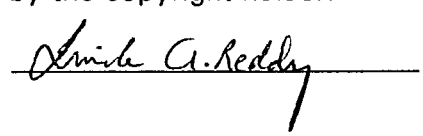
SIGNED: 

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DEDICATION

I wish to dedicate this dissertation to my parents for all the love and support they have given me. In addition, I would like to thank my parents for they have taught me the true meaning of success.

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ABSTRACT

The present study investigated the early development of three self-regulated learning strategies -- help seeking, goal setting and planning, and self evaluation for male and female preschoolers. Skill sequences were developed by identifying demand attributes that imposed requirements on cognitive functioning. The demand attributes of adult assistance and task complexity were identified for all three learning strategies. Variations in adult assistance and task complexity were examined to determine the relative difficulty for male and female preschoolers to perform skills within each learning strategy.

This study included data from 10,291 preschoolers, age 2 to 6 years, from Head Start and public preschool programs across the country. The sample included approximately 5,000 males and 5,000 females from culturally diverse backgrounds. Children were assessed by their preschool teachers over two months with a standardized observational assessment instrument.

A variety of latent trait models were used to test the developmental skill sequences of these learning strategies in relation to gender. Results revealed that variations in adult assistance and task complexity were related to the relative difficulty in performing these learning strategies. These findings support the notion that adult assistance can enhance the

development of preschooler's self-regulated learning strategies. In particular, adult assistance promotes preschoolers' skills to perform simple functions independently and complex functions (e.g., advance planning or checking in parts) with adult help. Gender differences were found in preschoolers' difficulties in self-evaluating and seeking help. For example, females had more difficulty than males checking completed work with adult help and checking an activity in parts with adult help. Males had less difficulty checking a completed activity independently than females. Results also suggested that males are more sensitive to the presence of adult assistance when performing complex checking (i.e., checking in parts) than females. In addition, females were found to be more skilled than males in seeking assistance from adults in the classroom. No gender differences were found in goal setting and planning. The results from this study support the importance of social influences on preschoolers' development of self-regulated learning strategies. Future research directions and implications were also addressed.

INTRODUCTION

The importance of self-initiated learning has been recognized by politicians and researchers for sometime (Gardner 1963; Zimmerman & Martinez-Pons, 1992). Those children who actively obtain information and take steps to master materials are referred to as self-regulated learners (Zimmerman, 1989). Self-regulated learners display heightened levels of motivation and persistence in the their learning process and seek ways to overcome obstacles to succeed. Although the notion of self-regulated learning has been recognized, it has not been until recently that research has examined how children master their own learning.

Recent literature has shown that learning strategies such as self-evaluation, goal setting and planning, and help seeking can optimize children's academic achievement and social adjustment (e.g., Schunk, 1990; Bulter, 1990; Beal, 1994). For example, the strategy of goal setting and planning has been found to optimize personal functioning such as the belief in one's ability to achieve an outcome (Bandura, 1986). The strategy of self-evaluation has been shown to enhance academic performance (Bulter, 1990), while seeking social assistance, obtaining information from a knowledgeable person or resource book has been found to optimize students' learning environments (Newman, 1990). Research conducted by Zimmerman and Martinez-Pons (1986; 1988) have found that students' use

of self-regulated learning strategies to be positively correlated with academic track placement and teachers' judgements of classroom performance. For example, lower track students reported using learning strategies less often than students in advanced tracks. In addition, teachers' judgements of academic performance were more positive among high frequency learning strategy users than low frequency learning strategy users. Other researchers (Pintrich & DeGroot, 1990) have shown that the use of learning strategies positively related to students' level of intrinsic value and self efficacy, and negatively related to levels of test anxiety. Although research has identified the positive correlates associated with the use of self-regulated learning strategies, studies have yet to systematically study the development of learning strategies, in particular in the area of early childhood.

Research on the early development of self-regulated learning strategies would afford a more comprehensive understanding of how preschoolers acquire learning strategies. Knowledge of the developmental skill sequences of preschoolers' self-evaluation, help seeking, and goal setting and planning provides educators and parents important mechanisms to teach children these learning strategies. Thus, children who learn these three learning strategies early on in development will be better suited to solve challenging tasks independently in the future.

Investigating the early development of self-evaluation, help seeking, and goal setting and planning can best be conducted within a social context. Vygotsky (1978) viewed self-regulated learning as an activity which develops in the context of early adult-child interactions. At an early age children's social interactions are mediated by adults' words and gestures in their environment. Gradually from these social experiences with adults, children develop the ability to perform functions by themselves.

Researchers' inspired by Vygotsky's zone of proximal development have investigated how adults can facilitate children's development (e.g., Wertsch, 1984; Wood, Bruner, & Ross, 1976). Studies have found that children who engaged in joint problem solving activities with adults exhibited better problem solving than children who problem solved alone (e.g., Radziszewska & Rogoff, 1988; 1991; Wood & Middleton, 1975). Wood and her associates (Wood, Bruner, & Ross, 1976; Wood & Middleton, 1975) have examined teachers' role in guiding children to move from joint to independent problem solving. Their findings revealed that the gradual withdrawal of adult assistance as a function of children's increased mastery of a task successfully maintained children's attention and motivation to tasks. These results suggest that adult interventions tailored to children's developmental level can successfully enhance children's abilities to independently solve problems.

The type of adult assistance and the manner in which help is provided to children during joint problem solving is influenced by gender type. It has been known for sometime that gender type influences social interactions between adults and children (e.g., Serbin & O'Leary, 1972; Bandura & Walters, 1963; Sears & Feldman, 1966; Bussey & Bandura, 1993). For example, male preschoolers are encouraged by teachers to be more independent in their problem solving, while female preschoolers are reinforced more often for being dependent and reliant on help from teachers. Teachers are also more likely to take over and complete a task for a female than a male. It is clear that social influences operate differently depending on a child's gender and may have profound effects on male and female preschoolers' problem solving capabilities. Thus, social interactions may significantly influence young children's use and development of learning strategies. Research focused on identifying gender differences in preschoolers' self-regulated learning could be of valuable use in challenging beginning attitudes regarding males' and females' self-initiated learning.

Investigating the early development of self-evaluation, help seeking, and goal setting and planning skills provides an indepth understanding of how male and female preschoolers' regulate their learning process within a social context. It has been recognized that learning and development evolve from sequential changes in capabilities reflecting higher levels of cognitive

functioning (Piaget, 1952). In the past, skill sequencing assumed that more complex skills evolved from simpler component skills (Gagne, 1962). It is now recognized that developmental skill orderings may occur in many ways, only one of which involves the acquisition of component skills. Research conducted by Bergan, Stone, and Feld (1984) found that skill sequencing may take place when a simple rule applied to a set of tasks is replaced by a more complex rule.

Developmental skill sequences can be constructed by identifying task demands that impose requirements on cognitive functioning. This study adopted Newell and Simon's (1972) task demand approach. Developmental sequences or cognitive procedures are created first by identifying task demands and then varying the value of task demands. Task demands affect the difficulty in performing cognitive functions. For example, in the case of counting, task difficulty may be affected by task demands such as the starting point, range of numbers, and direction of the sequence (i.e., forward or backward). In constructing developmental skill sequences, consideration must also be made to the social processes involved in children's learning. Vygotsky (1978) described that children's cognitive functioning evolved from shared problem solving interactions between adults or peers. Children who are only capable of partially mastering tasks independently, can successfully perform tasks when assisted by adults. Thus, once children

internalize these shared experiences with adults, they can then perform more complex tasks independently.

The primary purpose of this study was to systematically investigate the skill sequences of self-evaluation, help seeking, and goal setting and planning in relation to gender. A cognitive procedure refers to a set of actions performed on an object to achieve a goal. Cognitive procedures may be defined in terms of attributes associated with demands on cognitive functioning. Based on previous literature, task demands were identified for each learning strategy. By varying the value of demand attributes, items were developed which represented the skills within each developmental skill sequence.

In this study, ***adult assistance*** was identified as a significant demand attribute for the development of male and female preschoolers' self-evaluation, help seeking, and goal setting and planning. Research has shown that children involved in collaborative interactions with adults display advanced problem solving than children who problem solve alone (e.g., Gauvain & Rogoff, 1989). A number of studies conducted by Rogoff and her associates (e.g., Rogoff, in press; Radziszewska & Rogoff, 1988; 1991) found children who problem solve with adults exhibit more sophisticated goal setting and planning. They also integrate forms of planning, use materials in planning, and display greater awareness of resources and

constraints involved in the planning process compared to children who problem solve independently. In addition, research has shown that joint problem solving enhances young children's independent problem solving abilities (e.g., Gauvain & Rogoff, 1990). Children who problem solved with adults independently display more efficient planning and greater foresight in their planning strategies than children who problem solved alone. Although research has not been conducted on how adult assistance influences the development of children's self-evaluation and help seeking, it is clear that adult guidance will play a significant role on the early development of these learning strategies.

Another demand attribute that was identified for all three learning strategies was ***task complexity***. For the strategy of goal setting and planning, goal and planning complexity was identified as a demand attribute in which the presence or absence of advanced planning was examined. Research has consistently shown with age advance planning becomes more efficient, flexible, and sophisticated. Gardner and Rogoff (1990) found that older children's use of advance planning is related to their ability to adapt to task circumstances. For example, older children presented mazes to solve under conditions which stressed accuracy and speed displayed more sensitivity to differences in tasks and goals, greater flexibility in adapting plan strategies, and more often recognized the benefits of planning in

advance than younger children. Thus, older children were more likely than younger children to plan ahead to achieve their goals.

For the strategy of help seeking, task complexity was identified as a demand attribute, in which asking for help at appropriate times and in appropriate ways was studied. Research has indicated that help seeking is positively related to children's role-taking abilities. Wilson and Shantz (1977) found older children more skilled in taking the perspective of a potential helper than younger children. With age, it becomes increasingly more difficult for children to obtain help from others without being sensitive to the feelings and thoughts of potential helpers. Thus, age becomes an important factor in how children determine when to asks for help and how to ask for help.

For the strategy of self-evaluation, checking complexity was identified as a demand attribute, in which checking after completing an activity and checking an activity in parts were examined. As previously discussed, research has shown collaborative problem solving between children and adults promotes young children's advance planning capabilities (e.g., Gardner & Rogoff, 1990; Wellman, Fabricius, & Sophian, 1985). In a similar fashion, adult guidance may facilitate children's advance checking skills. Children who have acquired advanced evaluation capabilities (i.e., checking in parts) will be better prepared to independently evaluate their progress on

challenging activities and more likely to accomplish their goals.

The demand attribute approach to creating developmental skills sequences provides a systematic way to investigate the skills and processes involved in the early development of self-regulated learning strategies. Recently, technological advances have made it possible to empirically validate skill sequences in relation to gender (Thissen, 1991). This study used latent trait models with the aid of recent technology (i.e., MULTILOG) to test hypotheses related to developmental skill sequences, composed of skills reflecting varying cognitive demands.

Hypotheses

The present study investigated the assumption of unidimensionality for help seeking, goal setting and planning, and self-evaluation. First, it was hypothesized that each learning strategy represented a single factor. This study also validated the development of male and female preschoolers' help seeking, goal setting and planning, and self-evaluation. Second, it was hypothesized that the development of preschoolers' help seeking skills are hierarchically ordered by difficulty as follows: asks for help when encouraged by an adult, recognizes when help is needed, asks help at appropriate times, asks help in appropriate ways, and asks for help appropriately without adult encouragement. Third, it was hypothesized that the development of goal setting and planning skills are hierarchically ordered

by difficulty as follows: sets simple goals with adult help, sets simple goals independently, sets complex goals without planning ahead, and sets complex goals and plans ahead with adult help. Fourth, it was hypothesized that development of self-evaluation skills are hierarchically ordered by difficulty as follows: checks completed work when asked by an adult, checks completed work independently, and checks a long activity in parts when asked by an adult.

This study examined how levels of adult assistance related to preschoolers' difficulties in performing three learning strategies. Research has consistently shown that children involved in collaborative interactions with adults exhibited more efficient and sophisticated problem solving than children who problem solved alone (e.g., Radziszewska & Rogoff, 1988; 1991; Wood & Middleton, 1975; Vygotsky, 1978). In this study, a fifth hypothesis examined was that asking for help with adult encouragement was less difficult than asking for help without adult encouragement. Sixth, it was proposed that independently setting goals and planning was more difficult than setting goals and planning with adult guidance. Seventh, it was hypothesized that evaluating a simple activity independently was more difficult than evaluating a simple activity with adult help.

The present study also investigated how levels of task complexity related to preschoolers' difficulties in performing three learning strategies.

Eighth, it was proposed that asking for help at appropriate times was less difficult than asking for help in appropriate ways. For goal setting and planning, a nineth hypothesis tested was that independently setting goals without planning ahead was less difficult than setting goals and planning ahead with adult guidance. Consistent with this, research has shown that joint problem solving between children and adults facilitates young children's use of advance planning and enhances children's advance planning capabilities (e.g., Gardner & Rogoff, 1990; Wellman, Fabricius, & Sophian, 1985). In a similar fashion, adult assistance may encourage young children to check over completed work and promote their abilities to evaluate more complex tasks which require checking in parts. Thus, a tenth hypothesis examined was that checking a long activity in parts with adult assistance was more difficult than checking completed work independently.

The following study also examined gender differences in the development of help seeking, goal setting and planning, and self-evaluation. Eleventh, it was hypothesized that the difficulty in seeking adult assistance was greater for males than females in the classroom. Research has consistently found gender differences in males' and females' help seeking behavior (e.g., McMullen & Gross, 1983; Newman & Goldin, 1990). In general, it has been found that females more often seek out help than males, verbalize their personal needs more readily, and recognize the benefits of

obtaining assistance from their environment. In addition, it was also proposed that the development of goal setting and planning and self-evaluation varied between male and female preschoolers. Twelveth, it was hypothesized that females would have more difficulty in setting goals and planning and self-evaluating than males. Supporting this hypothesis, research has shown social influences operate differently depending on gender type and profoundly affect male and female preschoolers' independent problem solving and achievement orientation (e.g., Bandura, 1986; Dweck, 1986; Serbin & O'Leary, 1975). Thus, it is speculated in this study that social influences may affect children's development of learning strategies.

LITERATURE REVIEW

This chapter presents the literature on the social origin of self-regulated learning strategies in young children. It provides an overview of theoretical perspectives that underscore the influence gender has on the development of children's self-regulated learning strategies. Current research on the developmental nature of children's help seeking, goal setting and planning, and self-evaluation will also be reviewed.

Social Origin of Self-Regulated Learning Strategies

The early development of self-regulated learning can be conceptualized as a social phenomenon. Vygotsky (1978) hypothesized that the development of children's abilities to self-regulate is a social process in which children's basic capabilities evolve into higher cognitive functions during social interactions. From his perspective adults play a significant role in children's self-regulated learning. At an early age, children's self-regulated learning is guided by adults' words and mannerisms in their environment. Knowledge gained from these social interactions gradually become internalized into the child's own personal skills.

In interactions with adults, children are able to accomplish tasks they could not do on their own. Vygotsky distinguished between this level of development, (the level of potential development), and a second level, representing tasks the child can accomplish alone. These levels of task

performance represent the child's level of independent problem solving and level of functioning under conditions in which assistance is provided in social situations. They form what Vygotsky called the "zone of proximal development" (Vygotsky, 1978).

Vygotsky (1978) defines the zone of proximal development as the "distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). The zone of proximal development includes skills which are incomplete, but in the process of development. Therefore, interactions with adults or more capable peers provide children learning opportunities to apply skills that are in the process of developing, even though they would not be able to apply them independently.

Vygotsky asserted that the level at which a child can perform a task with assistance should be taken into consideration when assessing a child's capabilities and designing instruction. In his view, assessment and instruction should proceed ahead of development, fostering those skills which are in the stage of maturing. Vygotsky's viewpoint is supported by Bergan and Stone's (1986) findings which suggest benefits in targeting assessment and instruction ahead of the children's current level of functioning.

Researchers influenced by the writings of Vygotsky have focused their attention on the "zone of proximal development" or "region of sensitivity" for optimizing children's learning and development (e.g., Ellis & Gauvain, 1993; Rogoff & Gardner, 1984; Wertsch, 1984). During collaborative problem solving between an adult and child, the adult must first judge the child's "region of sensitivity" to instruction. Rogoff and Gardner (1984) suggest that by structuring learning opportunities so that the requirements of the task build on what the child already knows, generalization of skills to more difficult tasks are promoted. The adults must then gradually adjust the transfer of task responsibility to the child's developing capabilities. The transfer of task responsibility is commonly referred to as scaffolding. It has been well documented that the gradual withdrawal of adult assistance as a function of children's increased mastery of a task can successfully maintain children's attention and motivation to tasks (Ellis & Gauvain, 1993; Wood, Bruner, & Ross, 1976; Wood & Middleton, 1975). Thus, adult assistance geared to children's developmental levels can successfully promote children's abilities to independently solve problems .

Although the effectiveness of scaffolding techniques in promoting children's development have been documented, research has yet to examine how variations of adult assistance relate to the relative difficulty for

preschoolers to seek adult assistance, set goals and plans, and self-evaluate. In particular, it remains unclear how adult assistance is associated with the development of help seeking, goal setting and planning, and self-evaluation in relation to gender.

Gender and Development of Self-Regulated Learning Strategies

The development of children's self-regulated learning is also influenced by gender type. From a social cognitive perspective, children acquire sex-typed knowledge and behaviors from a wide variety of social influences in the environment. Research has demonstrated that the processes of reinforcement and imitation influence the development of gender-linked behavior and problem solving (e.g., Bandura, 1977; 1986). It has been shown that teachers and administrators hold different expectations for females and males and interact with them in ways which reinforce passive and dependent behaviors in females and assertive, competitive, and independent behaviors in males (Levitin & Chananie, 1972). Investigations on teacher and student interactions revealed male preschoolers were encouraged to be more independent in their learning, while females were reinforced more for being dependent and reliant on help from teachers. Moreover, teachers were more likely to take over and complete a task for a female than a male (Serbin & O'Leary, 1975). Similar findings have been found in studies on parent-child interactions (Maccoby & Jacklin, 1974). In

addition, problem solving strategies demonstrated by adults could be modeled by children, especially if the child identifies with the model (Bandura, 1986; Bandura & Mischel, 1965). Fisher and Troney (1976) found that children's tendencies to model help seeking behavior are consistent with sex-role norms. They predicted that the extent to which elementary school children modeled sex-role norms, asking for help would be seen as a more appropriate problem solving strategy for females than males.

From a cognitive perspective, Martin's Schematic Processing Theory indicated that young children develop organized knowledge structures, called gender schemas, about their own gender and others' gender. These incorporated schemas influence the way children think and behave in the social contexts. For example, Martin and Halverson (1981) conducted a study that investigated the preference for sex-appropriate and sex-inappropriate toys among male and female preschoolers. Their results revealed that preschoolers who have acquired gender labeling are more likely to play with traditional gender-linked toys than those who did not master gender labeling. On the other hand, Carter and Levy (1988) found gender knowledge as a reliable predictor of memory and preferences for gender-consistent play activities rather than gender-inconsistent play activities. It is possible that gender schemas may also influence the selection and development of learning strategies for young children. For example,

consistent with the female gender schema, teachers may selectively attend to the need for help in females, assimilate this information more readily and even recall more episodes in which adult assistance was required in females than males. In this regard, females may obtain adult help more often than males and have less opportunities for independent problem solving.

It seems likely that socialization processes may enhance self-initiated learning in males and dependent problem solving in girls. Since females gain less experience at independent problem solving than males, females may eventually develop the expectation that help from others is necessary for successful achievement. It is clear that social influences operate differently depending on a child's gender and may have profound effects on the development of preschoolers' help seeking, goal setting and planning, and self-evaluation strategies.

Self-Regulated Learning Strategies

The learning strategies of help seeking, goal setting and planning, and self-evaluation play significant roles in children's academic achievement and social adjustment. Research has shown that the use of such learning strategies are positively correlated with academic track placement, teachers' judgement of students' classroom performance, self concept, and self-efficacy (e.g., Zimmerman & Martinez-Pons, 1986; 1988; Schunk, 1990). Although investigations have examined the correlates related to the use of

such strategies, few studies have examined the developmental nature of these learning strategies in early childhood.

Help Seeking. Children's abilities to utilize adults and peers appropriately as resources to cope with difficulties encountered in learning situations are considered one of the most important social skills children can acquire (Anderson & Messick, 1974; Nelson-Le Gall, 1985). Inspite of the adaptive role help seeking plays in children's problem solving, few investigations have been conducted on the development of children's help seeking skills. Studies have found some evidence of developmental differences in seeking academic assistance (e.g., Nelson-Le Gall 1981; Newman & Schwager, 1992). One factor that has been found to improve with age is the awareness of the need for help (Baker & Brown, 1983). As children age they develop a greater understanding of their own cognitive and non-cognitive capabilities and resources available to them in their environment. Therefore, once children become more aware of what is needed to perform effectively they are better prepared to take steps to meet the demands of the problem solving situation. Researchers have also suggested that developmental differences exist in the initiative in deciding to seek help (DePaulo & Fisher, 1980). DePaulo and Fisher (1980) assert that the decision to obtain help is related to children's judgements of the relative benefits and costs associated with seeking help. Although help is often

useful and indispensable to achieve goals, with age, children perceive less credit being given to tasks in which help was solicited and a loss of competence in their own eyes or the eyes of the potential helper(s).

Research has also shown that the identification of potential helpers (Barnett, Darcie, Holland, & Kobasigawa, 1982) and strategies to elicit help (Nelson-Le Gall & Glor-Scheib, 1985) change with age. Preschoolers' choices for helpers are strongly influenced by the age of the potential helper (Edwards & Lewis, 1979; Nelson-Le Gall & Gumerman, 1981). For example, Edwards and Lewis (1979) reported that preschoolers tend to prefer adults and older children when help involves a teaching function. Nelson-Le Gall and Gumerman (1981) found that choice of preferred helpers shifts from parents to teachers to peers with increasing age. Older children display more knowledge of the characteristics of effective helpers and the type of information the helper would need to be productive (Barnett, Holland, & Kobasigawa, 1980). In terms of the methods to elicit help, nonverbal and verbal strategies have been found to vary with age. Young children tend to rely on nonverbal strategies such as eye contact, crying, and expressing confusion, while older children tend to ask "yés-no questions" and "Wh-questions" (e.g., What is the sum of 14 and 17 ?). Thus, the type of strategy used places different cognitive demands on the helpee and potential helper (Cazdin, 1972).

Age differences in children's help seeking have also been associated with children's role-taking abilities (Wilson & Shantz, 1977). Wilson and Shantz (1977) have reported that help seeking and role-taking abilities are positively correlated with age. In many cases children who wish to obtain assistance must take the viewpoint of the prospective helper. To successfully obtain help children must determine when it is best to ask for help. They must also identify effective ways to request assistance. As children age they may find it increasingly more difficult to request help without being sensitive to the feelings and thoughts of potential helpers. Therefore, age may play a significant factor in how children determine when to ask for help and how they effectively request such assistance. A question that remains unclear is how the difficulty of asking for help at appropriate times and in appropriate ways changes with age. This is an important question that needs to be addressed.

To date, literature has yet to examine how the development of preschoolers' help seeking skills relates to variations in adult assistance. A particularly significant question is how variations in adult assistance are related to the difficulty of asking for help in relation to gender.

Goal Setting and Planning. Children's goal setting and planning abilities assist children in systematically and efficiently performing many academic tasks. Research has consistently reported that with age children

become more skilled in their formulation of goals and plans and better able to create and use more extensive and varied plans in achieving goals (e.g., Baker-Sennett, Matusov, & Rogoff, 1993; Kreitler & Kreitler, 1987; Wellman, Fabricius, & Sophian, 1985). In addition, studies have found that children's goal setting and planning in advance abilities increase with age (e.g., Gardner & Rogoff, 1990; Wellman, Fabricius, & Sophian, 1985). Researchers have postulated that older children's use of deliberate planning strategies is related to their better ability to adapt to circumstances of tasks (Gardner & Rogoff, 1990). Gardner and Rogoff (1990) studied older (i.e., ages 7 to 10) and younger (i.e., ages 4 to 7) children's advance and improvisational planning in three maze tasks with varied speed conditions and stressed accuracy. Results indicated that older children are more sensitive to differences among tasks and goals and display greater flexibility in adapting planning strategies to achieve goals than younger children. For example, when time pressures were not imposed, older children planned more in advance, however when speed as well as accuracy was emphasized, children of both ages planned more during action while older children used slightly less advance planning than did the younger children. Findings also suggested that older children more often recognize the benefits associated with planning in advance than younger children. Therefore, older

children are more likely than younger children to modify their planning strategies to task circumstances.

As Rogoff, Lacasa, Baker-Sennett, and Goldsmith (1992) pointed out, everyday problem solving often necessitates flexibility in planning. From their perspective, goal setting and planning is an active and dynamic process in which flexibility and creatively are adapted to how a social event proceeds. The importance of flexibility in planning is especially notable when planning involves social and cultural activities. Presently, it is not fully known how planning strategies differ among males and females. A significant research question which remains unanswered is how planning complexity relates to the difficulty in setting goals and planning among male and female preschoolers.

Recently, studies inspired by the work of Vygotsky have begun to examine the role adults and peers have in fostering children's development of planning skills (e.g., Rogoff, in press; Gauvain & Rogoff, 1989). A handful of studies have found that children's problem solving skills benefit from collaborative interactions with adults or peers (e.g., Galchan & Light, 1982; Gauvain & Rogoff, 1989; Radziszewska & Rogoff, 1988; 1991). For example, children working on Tower of Hanoi tasks and who are forced to make mutual decisions display better problem solving than children who problem solved alone (Galchan & Light, 1982). Radziszewska and Rogoff's

studies (1988; 1991) revealed that children who planned with adults in imaginary errands exhibited more sophisticated and integrated forms of planning which include longer planned sequences and greater verbalization of plan strategies than children who worked with peers. They also found adult and child groups were twice as likely to explore the layout before making moves and state planning strategies explicitly. In addition, child and adult groups more readily attended to constraints involved in the planning process and more effectively used available information in planning than peer groups.

Studies have also reported that skills acquired during collaborative planning between adults and children carry over to children's independent performances (Gauvain & Rogoff, 1989). For example, Gauvain and Rogoff (1989) report that five year old children who developed routes to pick up grocery items without backtracking through a model store planned more efficiently and with greater foresight during collaborations with peers or adults who shared in decision making. In addition, results revealed that planning which involved shared task responsibility with a peer or adult was related to advanced planning and planning effectiveness in later individual planning.

Research on how social processes influence preschoolers' goal setting and planning capabilities requires further investigation. In particular, a critical question which merits further study is how variations of adult

assistance relate to the development of preschoolers' goal setting and planning in relation to gender.

Self-Evaluation. Children's abilities to self-evaluate their performances are found to influence the revisions of their work (Beal, 1987; 1990) and their requests for assistance when problem solving (Nelson-Le Gall, Kratzer, Jones, & DeCooke, 1990). Developmental research has shown that children's self-evaluation abilities increase with age (e.g., Newman, 1984; Pressley, Levin, Ghatala, & Ahmad, 1987b). For example, Newman (1984) found that the accuracy in children's evaluation of their math abilities was positively correlated with grade level. However, a recent investigation conducted by Bulter (1990) indicated that younger children who are asked to evaluate their performance against a tangible criterion of mastery (i.e., "draw this picture as accurately as you can"), appraise their work as realistically as older children. However, when children (i.e., 5, 7, and 10 year olds) are asked to self-evaluate in competitive conditions (i.e., "try to make the best copy in your group"), younger children (i.e., 5 year old) give more inflated self-evaluations than older children. Children's explanations of their ratings were also examined. Younger children were guided by nonnormative concepts of ability, which lead to an overoptimistic view of their competence in competitive conditions. On the other hand, older children tended to adopt normative criteria for self-assessment which

represented realistic evaluations of their competence and performance during both competitive and mastery conditions.

Beal (1990) conducted three studies that examined children's developing abilities to evaluate and revise problematic texts. Children in the 4th and 6th grade were asked to evaluate three forms of text and suggest changes to make the text easier to understand. Results revealed that younger children were less likely to detect text problems than older children, but were as likely as older children to repair a problem once it was detected. In addition, 4th graders were more likely to overestimate the quality of their revisions than 6th graders.

Although investigations have examined the accuracy of children's abilities to evaluate academic tasks, research has yet to study how social influences such as adult assistance and children's gender affect the development of children's self-evaluation in early childhood. Literature has suggested that collaborative interactions between adults and children foster children's planning capabilities (e.g., Gauvain & Rogoff, 1989; Rogoff, 1990). Similarly, adult assistance may enhance preschoolers' skills to successfully accomplish simple evaluation tasks and activities which require more complex evaluation functions. The following study examined how

variations in adult assistance are associated with the difficulty in performing simple evaluation tasks (i.e., checking completed work) and complex evaluation tasks (i.e., checking in parts) in relation to gender.

Studying the Development of Self-Regulated Learning Strategies

There is a need for a more comprehensive view of the developmental nature of children's help seeking, goal setting and planning, and self-evaluation. Identifying the developmental skill sequences in preschoolers' learning strategies provides an indepth understanding of how males and females acquire learning strategies. Researchers have stated that learning and development involve sequential changes in capability, reflecting successively higher levels of cognitive functioning (e.g., Gagne, 1962; Piaget, 1952). Traditionally, the view of hierarchical sequencing has encompassed the assumption that more complex skills evolve from simpler component skills (Gagne, 1977). Researchers now recognize that hierarchical ordering may occur in many ways, only one of which involves the acquisition of component skills (e.g., Bergan, Stone, & Feld, 1984; Flavell, 1972). For example, Bergan, Stone, and Feld (1984) found that hierarchical sequencing may take place in instances in which a simple rule applied to a given set of math tasks is replaced by a more complex rule. The extent to which a rule is replaced or applied is determined by the nature of the task.

The manner in which tasks are represented has been found to effect the processes an individual uses to performance the task (Newell & Simon, 1972). For example, Lawler (1981) presented an addition problem of 75 + 26 in two different ways to a young child. The child was first asked to solve a task in a traditional vertical format similar to the work sheets found in elementary schools. The child was then requested to add 75 cents and 26 cents. Results revealed that the child was unable to perform the carrying operation for the first task, but easily solved the problem when it was presented in an applied format. This example illustrates the importance of assessing children's capabilities in a wide variety of learning contexts.

The approach for constructing developmental skill sequences involves identifying task demands that impose various requirements on cognitive functioning (Newell & Simon, 1972). Task demands may affect task performance in a number of ways. For example, task demands may change task complexity by influencing the number of steps and the types of rules required to successfully perform the task. Developmental sequences are created by varying task demands. In the case of counting, task difficulty may be affected by task demands such as the starting point, range of numbers, and direction of the sequence (i.e., forward, backward). Thus, task demands can be viewed as controlling the cognitive capabilities that are necessary for successful performance (Newell & Simon, 1972).

Developmental skill sequences may also be profoundly influenced by social processes in the child's environment. Vygotsky (1978) describes that children's cognitive functioning can evolve into higher psychological processes through social interactions between adults or more capable peers. Thus, children who are only capable of partially mastering a task independently, can successfully perform tasks when assisted by more capable individuals. Eventually from shared problem solving, children perform more complex functions independently.

The primary purpose of the present study is to systematically investigate the skills involved in three learning strategies. A cognitive procedure refers to a set of processes or actions performed on an object to achieve a goal. Cognitive procedures may be defined in terms of attributes associated with demands on cognitive functioning. This approach enables cognitive procedures to be characterized in terms of processes associated with task difficulty. Variations in task difficulty provide a basis for identifying developmental skill sequences within each learning strategy. Demand attributes associated with each cognitive procedure were identified. By varying the value of demand attributes, items were developed which

represented the skills within each developmental sequence. This provided a systematic approach for identifying specific skills orderings and a more comprehensive understanding of children's functioning in each learning strategy.

This study used latent trait (item response) models to empirically validate hierarchical skill sequences (Bock & Lieberman, 1970; Lord, 1980). Latent trait models with the aid of recent technological advances (see, Thissen, 1991; Thissen, Steinberg, & Wainer, 1993) provided a means to test hypotheses associated with developmental skill sequences in relation to gender.

METHOD

Sample

The present study consisted of 10,291 preschool children enrolled in Head Start and private preschool programs from across the country. The subjects ranged in age from 2.0 to 6.11 years of age. Table 1 indicates the number and percentage of subjects within 1 year age ranges. The majority of the subjects in this sample were 4.0 to 4.11 years of age, encompassing (n = 5,455) 53 percent of the sample. Data on subjects' age was not available for 21 percent (n = 2,158) of the sample. The sample consisted of appropriately equal numbers of males (n = 5,019) and females (n = 4,897), respectively, 375 of which provided no information on gender (see Table 2). The ethnic distribution of this sample is shown in Table 3. This study primarily contained Caucasian (33%) and Native American (28%) children. There were a smaller number of Mexican American (13%), African American (11%), and Asian (2%) children. The Hispanic Other group (7%) included Puerto Rican, Cuban, and other Hispanic children. Data on subject's ethnicity was not available for only 4 percent of the sample.

Instrumentation

The present study utilized items from the Social Development Scale in the Measurement and Planning System Developmental Observational Assessment for Preschool (MAPS-PL) (Bergan, Feld, Reddy, Li, Schwarz, &

Cheng, 1992). Items only from the help seeking, goal setting and planning, and self-evaluation procedures were used.

The MAPS Developmental Observation Scales are path-referenced assessment instruments designed for children enrolled in Head Start, private and public preschool centers. The intended purpose of the instrument is to provide information on children's abilities (e.g., developmental level) which can be used to assist teachers and parents in planning developmentally appropriate learning opportunities for children in school or at home.

This study examined 12 items in three self-regulated learning strategies: help seeking, goal setting and planning, and self-evaluation. Each self-regulated learning strategy is described as a cognitive procedure which reflects a developmental progression of skills. The cognitive procedure for help seeking contained five skills: asks for help when encouraged by an adult, recognizes when he or she needs help, asks for help at appropriate times, asks for help in appropriate ways, and asks for help appropriately without encouragement. The cognitive procedure for goal setting and planning included four skills: sets simple goals with help, sets simple goals independently, sets a complex goal without planning ahead, and sets a complex goal and plans ahead with help. The cognitive procedure for self-

evaluation included three skills: checks completed work when asked, checks completed work independently, and checks a long activity in parts when asked.

Item Development. Cognitive procedures and their demand attributes were identified for each learning strategy. The conceptualization for the cognitive procedures and their demand attributes were based on a review of the current developmental research as well as resource and curriculum materials from a wide variety of sources. In addition, researchers, Head Start administrators, private child care directors, educators, and parents contributed to the development of the Social Development Scales. Their input helped to ensure that the content of this scale included important social skills which were reflected in diverse sociocultural populations.

The cognitive procedures and demand attributes for this study are presented in Tables 4, 5, and 6. The cognitive procedure of help seeking is shown in Table 4. This procedure reflects two demand attributes, adult assistance and task complexity. Table 5 shows the cognitive procedure of goal setting and planning. This procedure consists of two demand attributes, adult assistance and goal and planning complexity. The cognitive procedure of self-evaluation is presented in Table 6. This procedure reflects two demand attributes, adult assistance and checking complexity. For all three cognitive procedures, demand attribute values were coded as "yes" or

"no" indicating whether or not the demand was reflected in the skill. Skills involved in the developmental sequences were created by varying the values of the attributes.

Procedures for Scale Administration

The MAPS Developmental Observation Scale for Social Development was used to assess children's capabilities in small groups, individually, or at moments during the course of daily classroom routines. The examiners were teachers from various centers and schools across the country. The teachers who were selected to administer the scales were trained directly by staff from the ATI Children Development Center. Teachers were trained on how to observe children's capabilities over a two month time period in a variety of learning environments. Continuous observation was implemented to provide teachers many opportunities to assess children's capabilities in structured and unstructured learning contexts. Observational assessment also enhanced the accuracy of teachers' recordings and sensitivity to social and cultural factors.

Teachers were trained on scoring procedures. Teachers were instructed to score a "Y" when they observed a child demonstrating a capability most or all of the time and a "N" when they observed a child accomplishing a capability only sometimes or not at all. Teachers were then instructed to transcribe their observations onto scannable forms and to send

them to ATI Children Development Center for computer scoring. All skills were scored as "0" if observed some of the time or not at all and "1" if observed most of the time or all of the time.

Statistical Analyses

The following study used latent trait models to test the hypothesized developmental skill sequences. Latent trait analysis is particularly advantageous for developmental research in that they can be used to link item pools appropriately at different age levels, making it possible to examine developmental progressions across age (e.g., Stocking & Lord, 1983). In addition, latent trait models can be used to test hypotheses regarding the ordering of cognitive skills in a developmental sequence (Bergan & Stone, 1985; Thissen, 1985). Latent trait models provide a mechanism to test the assumption that a model adequately fits the data and to choose between models reflecting different hypotheses about the ordering of skills.

Latent trait analysis also includes confirmatory factor analysis. Confirmatory factor analysis was used to test the assumption of unidimensionality or a single latent trait for each cognitive procedure examined in this study. In contrast to traditional factor analysis, confirmatory factor analysis provides a means to test hypotheses regarding the relationship between manifest indicators and latent variables under a

single factor (Morris, Bergan, & Fulginiti, 1991; Joreskog & Sorbom, 1988). Traditional factor analytic approaches only allow researchers to examine possible latent variables for the purposes of formulating hypotheses for future testing.

Latent Trait Theory. Latent Trait Theory or Item Response Theory (IRT) can be seen originating from the early notion of "latent traits" introduced by Lazarsfeld (Lazarsfeld, 1950) and inspired by the work of Lord (Lord, 1952, 1980). Latent Trait Theory is based on the notion that the probability of a child's correct response to an item is determined by his or her ability and the item characteristic(s). Latent trait models provide a probabilistic method of linking children's item responses to latent constructs. This approach estimates scores on the trait (ability) and uses the scores to predict or explain item and test performance. Children's item responses represent a developmental model specifying the ordering of skills in a developmental sequence. A developmental sequence is composed of tasks ordered by difficulty on the latent trait scale. A child's position in the developmental sequence is directly linked to the latent ability since ability is measured on the same scale as task difficulty. Therefore, ability provides a measure of developmental level. The developmental level indicates the probability that the child will be able to perform tasks of varying difficulty in the sequence.

Latent trait models are based on a number of assumptions. Latent trait models assume a single latent ability which is referred to as unidimensional. This reflects the notion that only one ability is necessary to explain for a child's test performance. Thus, the probability of an item response is a function of a single latent trait. The basis for defining this scale is the item characteristic curve (ICC). The ICC plots the means of the conditional distributions of item scores at fixed ability levels. It reflects the probability of a child at a given ability level will respond correctly to a specific item of difficulty and discrimination (Bejar, 1983).

Latent trait models also assume local independence among items. Local independence means that at a particular value of theta, children's responses to different items on a scale are independent of each other (Hambleton, 1983). To ensure local independence exists, the errors for the different items are not correlated at a given level of theta. A child's performance on one item should not affect his or her performance on any other items. This implies that responses to any given item are only influenced by a child's ability (theta). If the assumption of local independence is achieved a single score will predict a child's test performance based on his or her theta.

Latent trait models also assume that the test to which the models fit are not administered under speeded conditions. Thus, children who

incorrectly respond to a given item do so because of their ability level rather than their lack of time to reach items during testing.

There are a number of latent trait models which provide different assumptions of what determines a child's response to a given item. The simplest model is the one-parameter model commonly referred to as the Rasch model (Rasch, 1960). This model assumes that the probability of a correct response to an item is determined by the child's ability level and the difficulty of the item. The Rasch model is based on the assumption that the guessing parameter (c_j) is set to zero and the item discrimination parameter (a_j) is set to equal one for all of the items. The a_j parameter is a measure of the relationship between a child's ability and the probability of getting an item correct. An item that discriminates well is one in which a small amount of change in ability is linked to a substantial amount of change in the probability of a correct performance. This model is useful when items are assumed to have equal discriminating power and guessing is assumed to be minimal.

The three-parameter model includes the c_j parameter (Brinbaum, 1968). It is particularly useful with multiple choice format tests. This model is appropriate when guessing is assumed to be a factor.

The two-parameter model measures child's responses by item difficulty, item discrimination, and ability. Under this model the c_j parameter

is set to zero and assumes that the probability of guessing an item correctly is minimal. The following study used a two-parameter model to compare models of hypothesized developmental skill sequences. This study assessed children's developmental skill sequences in three learning strategies on an observational assessment instrument. Since the children in this study were observed in a variety of learning contexts, the probability of teachers guessing whether or not a child has learned a given capability were assumed to be minimal. This model provided the flexibility to compare models by allowing the a_j and b_j parameters to be free to vary or to be constrained to be equal to other parameters.

Testing the Fit of Latent Trait Models. The likelihood ratio chi-square statistics was used to test the fit of hypothesized latent trait models to the data. Model comparisons were conducted when two models are found to be hierarchically related, in that one model contains all of the parameters of the other model plus one or more additional parameter estimates. For example, in model M1, it may be hypothesized that all a_j and b_j parameters are set to be free to vary. M1 reflects the hypothesis that the skills of asking for help at appropriate times and asking for help in appropriate ways do not relate the same to the underlying ability. M1 can then be compared to model M2 which restricts all a_j parameters to be equal and allows all b_j parameters to be free to vary. M2 indicates the hypothesis that the skills of asking for

help at appropriate times and asking for help in appropriate ways relate to the same degree to the underlying ability. M2 also indicates that the skills are hierarchically ordered by difficulty. In this case, M2 would be seen as more parsimonious since it estimates fewer parameters and more degrees of freedom. The chi-square for M1, the model with smaller number of degrees of freedom, may be subtracted from M2, the model with the larger number of degrees of freedom. The resultant is referred to as the chi-square distribution. The difference chi-square indicates the extent to which M1 improves significantly on the fit of the data than M2. That is, whether or not the additional parameters contained in M1 with the smaller number of degrees of freedom contributes significantly to the fit of the data. Since M2 is more parsimonious than M1, it would be selected as the preferred model unless M1 significantly improves on the model fit.

Testing the Fit of Confirmatory Factor Analysis Models. Hypotheses were tested by using confirmatory factor analysis by first specifying the model to be tested. Once the model was specified, it was then used to generate an expected correlation or covariance matrix which was compared to the observed data. The correspondence between the expected matrix and observed matrix was determined by the chi-square statistic. In order to identify the model that best fits the data, hierarchically related models were tested. A preferred model was selected based on goodness of fit to the data

and parsimony (Joreskog & Sorbom, 1988).

Methods of Estimation. Thissen's (1991) MULTILOG computer program was used to calculate a_j and b_j item parameter estimates which were used to validate the hypothesized developmental skill sequences. This program produces maximum likelihood parameter estimates. The MULTILOG program is also capable of testing hierarchical models by producing estimates of a_j and b_j items parameters under restrictions.

Joreskog and Sorbom's (1993) LISREL VIII computer program was used to compute various goodness of fit indices to test the fit of the model to the data. This program allows researchers to impose restrictions on model parameters that make it possible to test a broad range of hypotheses. Thus, for this study, restrictions on model parameters were made to test the unidimensionality of the factor structure of skills in each of the cognitive procedures examined in this study.

RESULTS

Confirmatory Factor Analyses by Learning Strategy

Confirmatory factor analyses were conducted to test the assumption of unidimensionality for the three learning strategies examined in this study. Since the chi-square statistic is sensitive to large sample sizes and departures from multivariate normality of observed variables, a sample of 617 (6%) children was randomly selected from the larger sample (n = 10,291). Table 7 presents the chi-squares, corresponding degrees of freedom, and parameters estimated under each model by cognitive procedure.

The procedure of Help Seeking resulted in a chi-square of .8 with 4 degrees of freedom (p = .90), providing an excellent fit for the data and fulfilling the assumption of unidimensionality. Table 8 presents the factor loadings and standard errors for the one factor model for the Help Seeking procedure.

The procedure of Goal Setting and Planning resulted in chi-squares of 1.10 with 1 degrees of freedom (p = .30), providing a good fit for the data and fulfilling the assumption of unidimensionality. Table 9 presents the factor loadings and standard errors for the one factor model for the Goal Setting and Planning procedure.

The procedure of Self-Evaluation resulted in chi-squares of .02 with 1 degrees of freedom ($p = .8$), providing an excellent fit for the data and fulfilling the assumption of unidimensionality. Table 10 presents the factor loadings and standard errors for the one factor model for the Self-Evaluation procedure.

Model Comparisons of Developmental Skill Sequences

The results from the hierarchical model comparisons for the developmental skill sequences are presented in Tables 11 through 19. The estimated items parameters are shown on Tables 11, 14, and 17. The degrees of freedom and the likelihood ratio statistic (L^2) are given by model in Tables 12, 15, and 18. The difference L^2 for each model comparison and corresponding degrees of freedom are presented on Tables 13, 16, and 19.

Help Seeking. Tables 11, 12, and 13 show the parameter estimates, hierarchical models, and model comparisons for Help Seeking. The Help Seeking procedure included the following skills in order of hypothesized difficulty: 1) asks for help when encouraged by an adult; 2) recognizes when he or she needs help; 3) asks for help at appropriate time, 4) asks for help in appropriate ways; and 5) asks for help appropriately without encouragement. The first model (M1) was the unrestricted two parameter model ($n = 9,983$). Ten parameters were examined under this model, 5 a_j and 5 b_j parameters. Degrees of freedom were calculated by subtracting the

number of estimated parameters plus one for the sample size from the number of the response patterns for 5 items (i.e., 32). Thus, there were 32 - (10 + 1) = 21 degrees of freedom for this model. The L^2 for M1 was 467.6, which did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 5 skills to be equal and allowed the difficulty parameters to be free to vary. Under M2, 6 parameters were estimated, 1 a_j parameter and 5 b_j parameters. The L^2 for M2 was 636.9 with 25 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons are shown on Table 13. The difference L^2 for the comparison of M1 and M2 was 169.3 with 4 degrees of freedom ($p < .01$), revealing that M1 significantly improved on the fit afforded by M2 and was the preferred model. This finding indicates that all 5 skills related differently to the underlying ability of Help Seeking.

The third model (M3) constrained all of the discrimination and difficulty parameters to be equal, estimating 2 parameters, 1 a_j parameter and 1 b_j parameter. The L^2 for M3 was 7734.6 with 29 degrees of freedom, offering a poor fit for the data. M1 is hierarchically related to M3. The difference L^2 was 7267 with 8 degree of freedom ($p < .01$), indicating that

M1 significantly improved on the fit afforded by M3 and was the preferred model. Thus, the discrimination and difficulty parameters were not found to be equal across skills.

Models 4 and 5 each included restrictions on the a_j and b_j parameters to test hypotheses about the ordering of the skills according to their difficulty and discrimination values. Model 4 (M4) restricted the discrimination and difficulty parameters for skills 3 and 4 to be equal (i.e., asks for help at appropriate times and asks for help in appropriate ways). The L^2 for M4 was 472.4 with 23 degrees of freedom ($p < .01$), providing an unacceptable fit for the data. M1 is hierarchically relate to M4. The difference L^2 for the comparison of M1 and M4 was 4.8 with 2 degrees of freedom ($p > .05$), indicating that M1 failed to significantly improve on the fit of the data afforded by M4. Since M4 was more parsimonious than M1 and M1 did not offer a significant improvement in the fit over M4, M4 was preferred over M1.

Model 5 (M5) constrained only the discrimination parameters for skills 3 and 4 to be equal. The L^2 for M5 was 1621.3 with 22 degrees of freedom ($p < .01$), offering a poor fit for the data. M4 is also hierarchically relate to M5. The difference L^2 for the comparison of M4 and M5 was 1148.9 with 1 degree of freedom. M4 significantly improved on the fit of

the data provided by M5. Since M4 was a more parsimonious model than M5 and significantly improved on the fit of the data over M5, it was selected as the preferred model for the Help Seeking cognitive procedure.

M4, the preferred model, supported the hypothesis that all 5 skills reflected a developmental progression. Results also supported the hypothesis that variations in adult assistance were related to the difficulty at which young children ask for assistance in the classroom. For example, asking for help when encouraged by an adult (i.e., skill 1) was less difficult than asking for help appropriately without encouragement (i.e., skill 5). It was also found that asking for help at appropriate times and in appropriate ways (i.e., skills 3 and 4) did not vary in terms of their discrimination and difficulty values. This suggests that teachers observed preschoolers asking for help at appropriate times and in appropriate ways not as separate, but rather as related capabilities. In addition, recognizing the need for help (i.e., skill 2) was less difficult than asking for help at appropriate times, in appropriate ways, and without encouragement.

Goal Setting and Planning. Tables 14, 15, and 16 show the parameter estimates, hierarchical models, and model comparisons for Goal Setting and Planning. The Goal Setting and Planning procedure included the following skills in order of hypothesized difficulty: 1) sets simple goals with help; 2) sets simple goals independently; 3) sets a complex goal without

plans; and 4) sets a complex goal and plans ahead with help. The first model (M1) was the unrestricted two parameter model (n = 9,970). Eight parameters were examined under this model, 4 a_j and 4 b_j parameters, resulting in 7 degrees of freedom. The L^2 for M1 was 637.9, providing an inadequate fit for the data ($p < .01$).

The second model (M2) restricted all of the discrimination parameters to be equal and allowed the difficulty parameters to be free to vary. M2 estimated 5 parameters, 1 a_j parameter and 4 b_j parameters. The L^2 for M2 was 904.8 with 10 degrees of freedom. M2 did not provide a good fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons are shown on Table 16. The difference L^2 for the comparison of M1 and M2 was 266.9 with 3 degrees of freedom ($p < .01$), indicating that M1 significantly improved on the fit afforded by M2 and was the preferred model. Thus, all 4 skills related differently to the underlying ability of Goal Setting and Planning.

The third model (M3) constrained on all of the discrimination and difficulty parameters to be equal, estimating 2 parameters, 1 a_j and 1 b_j parameter. Under M3, the L^2 was 9725.9 with 13 degrees of freedom, providing an unacceptable fit for the data. M1 is hierarchically related to M3. The difference L^2 for the comparison of M1 and M3 was 9088 with 3

degree of freedom ($p < .01$). M1 significantly improved on the fit afforded by M3 and was the preferred model. This suggests that the discrimination and difficulty parameters varied across skills.

Models 4, 5, 6, and 7 each included restrictions on the a_j and b_j parameters to test hypotheses about the ordering of the skills based on their discrimination and difficulty values. M1 is hierarchically related to M4, M5, M6 and M7. Model 4 (M4) restricted the discrimination and difficulty parameters for skills 3 and 4 to be equal (i.e., sets a complex goal without plans and sets a complex goal and plans ahead with help). The L^2 for M4 was 685.4 with 9 degrees of freedom ($p < .01$), providing an inadequate fit for the data. The difference L^2 for the comparison of M1 and M4 was 47.5 with 2 degrees of freedom ($p < .01$). This indicated that M1 significantly improved on the fit of the data afforded by M4. Since M1 was more parsimonious than M4, M1 was preferred over M4. Under Model 5 (M5) only the discrimination parameters for skills 3 and 4 were restricted to be equal. The L2 for M5 was 647 with 8 degrees of freedom, revealing an unacceptable fit for the data. The difference L^2 for the comparison of M1 and M5 was 9.1 with 1 degree of freedom. Thus, M1 significantly improved the fit of the data provided by M5 and was the preferred model.

Model 6 (M6) constrained the discrimination and difficulty parameters for skills 2 and 4 to be equal (i.e., sets simple goals independently and sets

a complex goal and plans ahead with help). The L^2 for M6 was 2256.9 with 9 degrees of freedom, indicating an unacceptable fit for the data. The difference L^2 for the comparison of M1 and M6 was 13.2 with 2 degrees of freedom ($p < .01$). This revealed that M1 significantly improved on the fit afforded by M6 and was the preferred model. Under Model 7 (M7) only the discrimination parameters for skills 2 and 4 were restricted to be equal. The L^2 for M7 was 641.7 with 8 degrees of freedom ($p < .01$), offering an inadequate fit for the data. The difference L^2 for the comparison of M1 and M7 was 3.8 with 1 degree of freedom ($p > .05$). M1 failed to significantly improve on the fit of the data over M7. Since M7 was a more parsimonious model than M1 and M1 did not significantly improve on the fit of the data afforded by M7, M7 was selected as the preferred model for the Goal Setting and Planning procedure.

M7, the preferred model, supported the assumption that all 4 skills reflected a developmental progression according to discrimination and difficulty. Results also showed that skill 2 (i.e., sets simple goals independently) and skill 4 (i.e., sets complex goals and plans ahead with help) related to the same degree to the ability dimension. Findings also supported the hypothesis that variations in adult assistance are related to the difficulty at which preschoolers establish goals and plan in the classroom. For example, teachers observed preschoolers setting simple

goals with help (i.e., skill 1) to be less difficult than setting simple goals without help (i.e., skill 2). In addition, results also supported the hypothesis that variations in the complexity of goal setting and planning were related to the difficulty at which preschoolers set goals and planned in the classroom. For example, setting a complex goal and planning ahead with help (i.e., skill 4) was more difficulty than setting a complex goal and not planning ahead (i.e., skill 3). Moreover, setting a simple goal without help was found less difficult than setting a complex goal without plans.

Self-Evaluation. Tables 17, 18, and 19 show the parameter estimates, hierarchical models, and model comparisons for Self-Evaluation. The Self-Evaluation procedure included the following skills in order of hypothesized difficulty: 1) checks completed work when asked; 2) checks completed work independently; and 3) checks a long activity in parts when asked. The first model (M1) was the unrestricted two parameter model (n = 9930). Six parameters were examined under this model, 3 a_i and 3 b_i parameters, resulting in 1 degree of freedom. The L^2 for M1 was 32.5, which did not provide a fit for the data ($p < .01$).

The second model (M2) restricted all of the discrimination parameters to be equal and allowed the difficulty parameters to be free to vary. M2 estimated 4 parameters, 1 a_i parameter and 3 b_i parameters. The L^2 for M2 was 232.1 with 3 degrees of freedom. M2 did not provide a good fit for the

data ($p < .01$). M1 is hierarchically related to M2. Model comparisons are shown on Table 19. The difference L^2 for the comparison of M1 and M2 was 199.6 with 2 degrees of freedom ($p < .01$), indicating that M1 significantly improved on the fit afforded by M2 and was the preferred model. This finding suggests that all 3 skills related differently to the underlying ability of Self-Evaluation.

The third model (M3) constrained on all of the discrimination and difficulty parameters to be equal, estimating 2 parameters, 1 a_j parameter and 1 b_j parameter. Under M3, the L^2 was 4437.4 with 5 degrees of freedom, providing a poor fit for the data. M1 is hierarchically related to M3. The difference L^2 for the comparison of M1 and M3 was 4404.9 with 4 degree of freedom ($p < .01$). M1 significantly improved on the fit afforded by M3 and was the preferred model. This suggests that the discrimination and difficulty parameters varied across skills.

Models 4 and 5 each included restrictions on the a_j and b_j parameters to test hypotheses about the ordering of the skills based on their discrimination and difficulty values. M1 is hierarchically related to Model 4 (M4) and Model 5 (M5). M4 restricted the discrimination and difficulty parameters for skills 2 and 3 to be equal (i.e., checks completed work when asked and checks a long activity in parts when asked). The L^2 for M4 was 66.1 with 3 degrees of freedom ($p < .01$), providing an inadequate fit for the

data. The difference L^2 for the comparison of M1 and M4 was 33.6 with 2 degrees of freedom ($p < .01$). This indicated that M1 significantly improved on the fit of the data afforded by M4. Since M1 was more parsimonious than M4, M1 was preferred over M4. Under M5, only the discrimination parameters for skills 2 and 3 were restricted to be equal. The L2 for M5 was 32.9 with 2 degrees of freedom, offering an unacceptable fit for the data. The difference L^2 for the comparison of M1 and M5 was .4 with 1 degree of freedom. Thus, M1 did not provide a significant improvement on the fit of the data over M5 ($p > .10$). Since M5 was a more parsimonious model than M1, it was selected as the preferred model for the Self-Evaluation procedure.

M5, the preferred model, supported the assumption that all 3 skills reflected a developmental progression according to discrimination and difficulty. It was found that skill 2 and skill 3 related to the same degree to the underlying ability dimension. M5 also supported the hypothesis that variations in adult assistance are associated with the relative difficulty at which preschoolers evaluated their classroom work. For example, checking completed work independently was found to be more difficult than checking completed work when asked to do so by an adult. M5 also supported the hypothesis that the complexity of the checking method was related to the

difficulty of evaluating one's work. Checking work after it has been completed independently was found to be less difficult than checking a long activity in parts when asked (i.e., skill 3).

Model Comparisons of Differential Item Functioning (DIF) by Gender

The results from hierarchical model comparisons of differential item functioning (DIF) for male (reference group) and female (focal group) preschoolers are presented in Tables 20 through 39. The estimated item parameters by gender are shown on Tables 20, 21, 26, 27, 34, and 35. The degrees of freedom and the L^2 are given by model in Tables 32, 28, 30, 36, and 38. The difference L^2 for each model comparison and corresponding degrees of freedom are presented on Tables 23, 29, 31, 36, and, 39. Hierarchical models of population parameters (μ) for the focal and reference groups are shown on Tables 24 and 32. Model comparisons of μ parameters for focal and reference groups are presented on Tables 25 and 32.

Help Seeking by Gender. Tables 20, 21, 22, 23, 24, and 25 show the parameter estimates, hierarchical models, and model comparisons for Help Seeking by gender. The first model (M1) was the unrestricted two parameter model. The parameter estimates for M1 are presented on Table 20. Twenty-two parameter estimates were examined under this model, 10 a_j parameters, 10 b_j parameters, 1 μ, and 1 σ. Degrees of freedom were

calculated by subtracting the number of estimated parameters plus the number of groups being examined from the total number of response patterns for 5 items (i.e., 64). Thus, there were 64 - (22 + 2) = 40 degrees of freedom for this model. On Table 22, the L^2 for M1 was 429.6, which did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 5 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 17 parameters were estimated, 5 a_j parameter, 10 b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 433.2 with 45 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons of M1 and M2 were made to determined whether DIF was observed in the discrimination parameters between gender groups. Model comparisons for DIF are shown on Table 23. The difference L^2 for the comparison of M1 and M2 was 3.6 with 5 degrees of freedom ($p > .10$), indicating that M1 did not provide a significant improvement on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit offered by M2, M2 was selected as the preferred model. M2, as the preferred model, indicated that DIF was not observed in the discrimination parameters for the Help Seeking procedure.

The third model (M3) restricted the discrimination and difficulty

parameter estimates for all 5 skills to be equal across groups. M3 estimated 12 parameters, 5 a_i, 5 b_i, 1 μ, and 1 σ. The parameter estimates for M3 are presented in Table 21. The L^2 for M3 was 438.7 with 50 degrees of freedom, offering a poor fit for the data ($p < .01$). M2 is hierarchically related to M3. Model comparisons of M2 and M3 were made to determine whether DIF was observed in the difficulty parameters between gender groups. The difference L^2 for the comparison of M2 and M3 was 5.5 with 5 degrees of freedom ($p > .10$), indicating that M2 did not provide a significant improvement on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data offered by M3, M3 was selected as the preferred model. M3, the preferred model, illustrated that DIF was not observed in the difficulty parameters for the Help Seeking procedure.

Table 24 presents hierarchical models of μ parameter estimates set free to vary and constrained to be equal across the focal and reference groups. M3, the overall preferred model for the Help Seeking procedure (see Table 21) was used to determine whether a significant difference existed between the focal and reference groups' μ. The model comparisons of μ parameters for the focal and reference groups are presented on Table 25. Under M1, μ parameters were set free to vary across the focal and reference groups. The L^2 for M1 was 432.2 with 49 degrees of freedom, providing an

unacceptable fit for the data ($p < .01$). M2 constrained the μ parameters to be equal across the focal and reference groups. The L^2 for M2 was 462.2 with 50 degrees of freedom, indicating a poor fit for the data ($p < .01$). M1 and M2 are hierarchically related. On Table 25, the difference L^2 for the comparison of M1 and M2 was 30 with 1 degree of freedom ($p < .01$). M1 provided a significant improvement on the fit of the data over M2 and was selected as the preferred model. Under M1, the focal group's μ was .18 and the reference group's μ was .05. This finding suggests that teachers' observed female preschoolers in general to be more skilled than males in asking for help in the classroom.

Goal Setting and Planning by Gender. Tables 26, 27, 28, 29, 30, 31, 32, and 33 show the parameter estimates, hierarchical models, and model comparisons for Goal Setting and Planning by gender. The first model (M1) was the unrestricted two parameter model. The parameter estimates for M1 are presented on Table 26. Eighteen parameter estimates were examined under this model, 8 a_j parameters, 8 b_j parameters, 1 μ, and 1 σ. On Table 28, the L^2 for M1 was 386 with 12 degrees of freedom. M1 did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 4 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 14 parameters were estimated, 4 a_j parameter, 8

b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 413.1 with 16 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 29. The difference L^2 for the comparison of M1 and M2 was 27.1 with 4 degrees of freedom ($p < .01$), indicating that M1 provided a significant improvement on the fit of the data afforded by M2 and was the preferred model. M1, the preferred model, indicated that DIF was observed in the discrimination parameters for the Goal Setting and Planning procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 4 skills to be equal across groups. M3 estimated 10 parameters, 4 a_j, 4 b_j, 1 μ, and 1 σ. The parameter estimates for M3 are presented in Table 27. The L^2 for M3 was 418.9 with 20 degrees of freedom, offering a poor fit for the data ($p < .01$). M1 is hierarchically related to M2. On Table 29, the difference L^2 for the comparison of M2 and M3 was 5.8 with 4 degrees of freedom ($p > .10$), indicating that M2 failed to significantly improve on the fit of the data afforded by M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data over M3, M3 was selected as the preferred model. M3, the preferred model, revealed that DIF was not observed in the difficulty parameters for the Goal Setting and Planning procedure.

Since DIF was observed in the discrimination parameters for the Goal

Setting and Planning procedure, models were compared to examine the variation in a_j parameter estimates between gender groups for each skill. Table 30 and 31 present the hierarchical models and model comparisons of DIF for a_j parameters for Goal Setting and Planning by gender. Model (M4) restricted the a_j parameters in skill 1 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M4 was 393.7 with 13 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). Table 31 presents the model comparisons for DIF of a_j parameters for Goal Setting and Planning. M4 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M4 was 7.7 with 1 degree of freedom ($p < .01$). M1 was found to significantly improve on the fit of the data over M4. This finding indicates that DIF was observed in the discrimination parameters for skill 1. Thus, the skill of setting simple goals with help related differently to the underlying ability of Goal Setting and Planning for the focal and reference group (e.g., $a_F = 2.47$, $a_R = 2.96$).

Model 5 (M5) restricted the a_j parameters in skill 2 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M5 was 398.3 with 13 degrees of freedom, providing a poor fit for the data ($p < .01$). M5 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M5 was 12.3 with 1 degree of freedom ($p < .01$), indicating that M1 provided a significant improvement on

the fit of the data over M5. This finding indicates that DIF was observed in the discrimination parameters for skill 2. Thus, the skill of setting simple goals independently related differently to the underlying ability of Goal Setting and Planning for the focal and reference group (e.g., $a_F = 3.75$, $a_R = 10.46$).

Model 6 (M6) restricted the a_j parameters in skill 3 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M6 was 385.6 with 13 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M6 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M6 was .4 with 1 degree of freedom ($p > .10$). This indicates that M1 failed to provided a significant improvement on the fit of the data over M6. Thus, DIF was not observed in the discrimination parameters for skill 3.

Model 7 (M7) restricted the a_j parameters in skill 4 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M7 was 388.9 with 13 degrees of freedom, revealing an inadequate fit for the data ($p < .01$). M7 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M7 was 2.9 with 1 degree of freedom ($p > .05$), indicating that M1 failed to significantly improve on the fit of the data over M7. Thus, DIF was not observed in the discrimination parameters for skill 4.

Table 32 presents hierarchical models of μ parameter estimates set free to vary and constrained to be equal across focal and reference groups. M1, the overall preferred model for the Goal Setting and Planning procedure (see Table 26) was used to determine whether a significant difference existed between the focal and reference groups' μ. Under M1, μ parameters were set free to vary across the focal and reference groups. The L^2 for this model was 243.7 with 11 degrees of freedom, providing a poor fit for the data ($p > .01$). M2 constrained the μ parameters to be equal across the focal and reference groups. The L^2 for M2 was 246.4 with 12 degrees of freedom, indicating an unacceptable fit for the data ($p > .01$). M1 and M2 are hierarchically related. On Table 33, the difference L^2 for the comparison of M1 and M2 was 2.7 with 1 degree of freedom ($p > .10$). M1 did not significantly improve on the fit of the data over M2. Since M2 was more parsimonious than M1 and M1 did not provide a significant improvement on the fit of the data offered by M2, M2 was selected as the preferred model. The focal and reference groups' μ for M2 was .29. This suggests that teachers observed male and female preschooler's goal setting and planning skills to be similar in the classroom.

Self-Evaluation by Gender. Tables 34, 35, 36, 37, 38, and 39 show the parameter estimates, hierarchical models, and model comparisons for Self-Evaluation by gender. The first model (M1) was the unrestricted two

parameter model. The parameter estimates for M1 are presented on Table 34. Thirteen parameter estimates were examined under M1, 5 a_j parameters, 6 b_j parameters, 1 μ, and 1 σ. On Table 36, the L^2 for M1 was 18.2 with 1 degrees of freedom. M1 did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 3 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 11 parameters were estimated, 3 a_j parameter, 6 b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 18.2 with 3 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 37. The difference L^2 for the comparison of M1 and M2 was 0 with 2 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters for the Self-Evaluation procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 3 skills to be equal across groups. M3 estimated 8 parameters, 3 a_j, 3 b_j, 1 μ, and 1 σ. The L^2 for M3 was 50.1 with 6

degrees of freedom, offering a poor fit for the data ($p < .01$). M2 is hierarchically related to M3. On Table 37, the difference L^2 for the comparison of M2 and M3 was 31.9 with 3 degrees of freedom ($p < .01$). M2 provided a significant improvement on the fit of the data afforded by M3 and was selected as the preferred model. The parameter estimates for M2 are presented in Table 35. M2, the preferred model, revealed that DIF was observed in the difficulty parameters for the Self-Evaluation procedure.

Since DIF was observed in the difficulty parameters for the Self-Evaluation procedure, models were compared to examine the variation in b_j parameters between gender groups for each skill. Tables 38 and 39 present the hierarchical models and model comparisons of DIF for the b_j parameter for the Self-Evaluation by gender. Model 4 (M4) restricted the a_j and b_j parameters for skill 1 to be equal across groups and allowed the other a_j and b_j parameters to be free to vary. The L^2 for M4 was 34.4 with 2 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). Table 39 presents the model comparisons for DIF of b_j parameters for Self-Evaluation. M4 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M4 was 16.2 with 1 degree of freedom ($p < .01$). M1 was found to significantly improve on the fit of the data over M4. This finding

indicates that DIF was observed in the difficulty parameters for skill 1. Thus, the difficulty parameters of checks completed work when asked was found to be significantly different between the focal and reference groups (e.g., $b_F = -.31$, $b_R = -.47$).

Model 5 (M5) restricted the a_j and b_j parameters in skill 2 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M5 was 31.1 with 2 degrees of freedom ($p < .01$). M5 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M5 was 12.9 with 1 degree of freedom ($p < .01$), indicating that M1 provided a significant improvement on the fit of the data over M5. This finding indicates that DIF was observed in the difficulty parameters for skill 2. Thus, the difficulty parameters of checks completed work independently was found to be significantly different for the focal and reference groups (e.g., $b_F = .50$, $b_R = .42$).

Model 6 (M6) restricted the a_j and b_j parameters in skill 3 to be equal across groups and allowed the other a_j parameters and b_j parameters to be free to vary. The L^2 for M6 was 22.3 with 2 degrees of freedom ($p < .01$). M6 is hierarchically related to M1. The difference L^2 for the comparison of M1 and M6 was 4.1 with 1 degree of freedom ($p < .05$). This finding indicates that DIF was observed in the difficulty parameters for skill 3. Thus, the difficulty parameters of checks a long activity in parts when asked

was found to be significantly different for the focal and reference groups (e.g., $b_F = .51$, $b_R = .46$).

Model Comparisons of DIF by Matched Gender

Additional analyses were conducted to verify the DIF results found between gender groups. Two samples of female preschoolers (n = 1,468) and two samples of male preschoolers (n = 1,505) were randomly selected with replacement and used to determine whether DIF existed between matched gender groups. Hierarchical models and model comparisons of DIF for female preschoolers are presented on Tables 40, 41, 44, 45, 48, and 49. Hierarchical models and model comparisons of DIF for male preschoolers are presented on Tables 42, 43, 46, 47, 50, and 51.

Help Seeking by Matched Gender. Tables 40, 41, 42, and 43 present the hierarchical models and model comparisons for Help Seeking by matched gender groups. Hierarchical models for female preschoolers are shown on Table 40. The first model (M1), was the unrestricted two parameter model. Twenty-two parameters were estimated under M1, 10 a_j parameters, 10 b_j parameters, 1 μ, and 1 σ. The L^2 for M1 was 193.2 with 40 degrees of freedom. M1 did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 5 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 17 parameters were estimated, 5 a_j parameter,

10 b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 196.3 with 45 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 41. The difference L^2 for the comparison of M1 and M2 was 3.1 with 5 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters among females for the Help Seeking procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 5 skills to be equal across groups. M3 estimated 12 parameters, 5 a_j, 5 b_j, 1 μ, and 1 σ. The L^2 for M3 was 200.5 with 50 degrees of freedom, offering a poor fit for the data ($p < .01$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 4.2 with 5 degrees of freedom ($p > .10$). M2 failed to significantly improve on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data over M3, M3 was selected as the preferred model. M3, the preferred model, indicated that DIF was not observed in the discrimination and difficulty parameters among females for the Help Seeking procedure.

Table 42 presents the hierarchical models for Help Seeking for male preschoolers. The first model (M1) was the unrestricted two parameter model. The L^2 for M1 was 195.8 with 40 degrees of freedom, providing an unacceptable fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 5 skills to be equal across groups and allowed the difficulty parameters to be free to vary. The L^2 for M2 was 200.1 with 45 degrees of freedom, providing a poor fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 43. The difference L^2 for the comparison of M1 and M2 was 4.3 with 5 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters among males for the Help Seeking procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 5 skills to be equal across groups. The L^2 for M3 was 203.1 with 50 degrees of freedom, offering an unacceptable fit for the data ($p < .01$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 3.0 with 5 degrees of freedom ($p > .10$).

M2 failed to significantly improve on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data over M3, M3 was selected as the preferred model. M3, the preferred model, indicated that DIF was not observed in the discrimination and difficulty parameters among males for the Help Seeking procedure.

Goal Setting and Planning by Matched Gender. Tables 44, 45, 46, and 47 present the hierarchical models and model comparisons for Goal Setting and Planning by matched gender groups. Hierarchical models for female preschoolers are shown on Table 44. The first model (M1) was the unrestricted two parameter model. Eighteen parameters were estimated under M1, 8 a_j parameters, 8 b_j parameters, 1 μ, and 1 σ. The L^2 for M1 was 189.8 with 12 degrees of freedom. M1 did not provide a good fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 4 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 14 parameters were estimated, 4 a_j parameter, 8 b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 198.4 with 16 degrees of freedom, providing an unacceptable fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 45. The difference L^2 for the comparison of M1 and M2 was 8.6 with 4 degrees of freedom ($p > .05$), indicating that M1 failed to significantly

improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters among females for the Goal Setting and Planning procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 4 skills to be equal across groups. M3 estimated 10 parameters, 4 a_j, 4 b_j, 1 μ, and 1 σ. The L^2 for M3 was 236.2 with 20 degrees of freedom, offering a poor fit for the data ($p < .01$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 37.8 with 4 degrees of freedom ($p < .01$). M2 significantly improved on the fit of the data over M3 and was selected as the preferred model. M2, the preferred model, indicated that DIF was observed in the difficulty parameters among females for the Goal Setting and Planning procedure. This finding suggests that the skills in this procedure do not accurately measure the underlying capability of Goal Setting and Planning. This is evident by the fact that the Multilog Program was unable to compute a standard error estimaté for skill 3 when analyses were conducted to test the developmental skill sequence for this procedure.

Table 46 presents the hierarchical models for Goal Setting and Planning for male preschoolers. The first model (M1) was the unrestricted

two parameter model. The L^2 for M1 was 92.1 with 12 degrees of freedom, providing an unacceptable fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 4 skills to be equal across groups and allowed the difficulty parameters to be free to vary. The L^2 for M2 was 99.1 with 16 degrees of freedom, providing a poor fit for the data ($p < .01$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 47. The difference L^2 for the comparison of M1 and M2 was 7 with 4 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters among males for the Goal Setting and Planning procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 4 skills to be equal across groups. The L^2 for M3 was 106.1 with 20 degrees of freedom, offering an unacceptable fit for the data ($p < .01$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 7 with 4 degrees of freedom ($p > .10$). M2 failed to significantly improve on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data

over M3, M3 was selected as the preferred model. M3, the preferred model, indicated that DIF was not observed in the discrimination and difficulty parameters among males for the Goal Setting and Planning procedure.

Self-Evaluation by Matched Gender. Tables 48, 49, 50, and 51 present the hierarchical models and model comparisons for Self-Evaluation by matched gender groups. Hierarchical models for female preschoolers are shown on Table 48. The first model (M1) was the unrestricted two parameter model. Thirteen parameters were estimated under M1, 5 a_j parameters, 6 b_j parameters, 1 μ, and 1 σ. The L^2 for M1 was 3.5 with 1 degrees of freedom, providing an acceptable fit for the data ($p > .05$).

The second model (M2) constrained the discrimination parameters for all 3 skills to be equal across groups and allowed the difficulty parameters to be free to vary. Under M2, 11 parameters were estimated, 3 a_j parameter, 6 b_j parameters, 1 μ, and 1 σ. The L^2 for M2 was 3.1 with 3 degrees of freedom, providing a good fit for the data ($p > .10$). M1 is hierarchically related to M2. Model comparisons for DIF are shown on Table 49. The difference L^2 for the comparison of M1 and M2 was .4 with 2 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not

observed in the discrimination parameters among females for the Self-Evaluation procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 3 skills to be equal across groups. M3 estimated 8 parameters, 3 a_j, 3 b_j, 1 μ, and 1 σ. The L^2 for M3 was 5.4 with 6 degrees of freedom, offering a good fit for the data ($p > .10$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 2.3 with 3 degrees of freedom ($p > .10$). M2 failed to significantly improve on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data over M3, M3 was selected as the preferred model. M3, the preferred model, indicated that DIF was not observed in the discrimination and difficulty parameters among females for the Self-Evaluation procedure.

Table 50 presents the hierarchical models for Self-Evaluation for male preschoolers. The first model (M1) was the unrestricted two parameter model. The L^2 for M1 was 7 with 1 degrees of freedom, providing an unacceptable fit for the data ($p < .01$).

The second model (M2) constrained the discrimination parameters for all 3 skills to be equal across groups and allowed the difficulty parameters to be free to vary. The L^2 for M2 was 7.9 with 3 degrees of freedom, providing a poor fit for the data ($p < .05$). M1 is hierarchically related to

M2. Model comparisons for DIF are shown on Table 51. The difference L^2 for the comparison of M1 and M2 was .9 with 2 degrees of freedom ($p > .10$), indicating that M1 failed to significantly improve on the fit of the data afforded by M2. Since M2 was more parsimonious than M1 and M1 did not improve on the fit of the data over M2, M2 was selected as the preferred model. M2, the preferred model, indicated that DIF was not observed in the discrimination parameters among males for the Self-Evaluation procedure.

The third model (M3) restricted the discrimination and difficulty parameters for all 3 skills to be equal across groups. The L^2 for M3 was 12 with 6 degrees of freedom, offering a good fit for the data ($p > .05$). M2 is hierarchically related to M3. The difference L^2 for the comparison of M2 and M3 was 4.1 with 3 degrees of freedom ($p > .10$). M2 failed to significantly improve on the fit of the data over M3. Since M3 was more parsimonious than M2 and M2 did not improve on the fit of the data over M3, M3 was selected as the preferred model. M3, the preferred model, indicated that DIF was not observed in the discrimination and difficulty parameters among males for the Self-Evaluation procedure.

DISCUSSION

The present study was a systematic investigation of the early development of male and female preschoolers' self-regulated learning strategies -- self-evaluation, help seeking, and goal setting and planning. In general, results supported the hypothesis that the skills within each learning strategy represent a developmental sequence of capabilities ordered by difficulty. Confirmatory factor analyses verified that the skills within each learning strategy reflect a single ability dimension. Thus, results from this study supported the notion that learning and development evolve from sequential changes in ability representing higher levels of cognitive functioning (Piaget, 1962; Gagne, 1962).

Two demand attributes were studied -- adult assistance and task complexity. Adult assistance and task complexity represent important beginning demand attributes that impose requirements on the cognitive functioning for preschoolers' self-evaluation, help seeking, and goal setting and planning. One striking result that emerged was that variation in adult assistance (i.e., presence or absence) related to preschoolers' difficulties performing learning strategies. As hypothesized, asking for help, setting goals and planning, and self-evaluating were less difficult to perform when adult guidance was provided. For example, checking completed work independently was more difficult than checking completed work with adult

guidance. Seeking social assistance without adult encouragement was more difficult than seeking adult help with adult encouragement. Moreover, setting goals and planning independently was more difficult than setting goals and planning with adult help. These results suggest that adult help is a vital attribute to preschoolers' difficulties to accomplish tasks and serves as an important mechanism to foster skills to regulated their learning. Consistent with this notion, research has shown that children involved in collaborative learning with adults exhibit more sophisticated and efficient problem solving than children who problem solved alone (e.g., Gauvain & Rogoff, 1989; Vygotsky, 1978; Wood & Middleton, 1975).

Another important finding from the present study was that variations in adult assistance and task complexity related to preschoolers' difficulties in setting goals and planning and self-evaluating. This study found that the complexity of the goal and planning method, planning ahead versus not planning ahead was related to preschoolers' difficulties in setting goals and planning. Specifically, setting complex goals without planning ahead in the absence of adult assistance was found to be less difficult than setting complex goals and planning ahead with adult assistance. This finding underscored the important role adult help may play in facilitating preschoolers' advance planning skills. Consistent with this, Radziszewska and Rogoff (1988; 1991) reported that children who completed imaginary

errands with adults rather than with trained peers displayed longer planning sequences, greater awareness of resources and constraints in the planning process, and more effective use of materials in their independent planning. In a similar fashion, adult assistance may promote preschoolers' abilities to make simple evaluations (i.e., checking if his/her name is on a picture) as well as complex evaluations which require checking in parts (i.e., checking each chapter of a picture book). It was found that the complexity of the checking method, checking a completed activity versus checking an activity in parts was related to preschooler's difficulty in self-evaluating. Results showed that evaluating an activity in parts with adult assistance was more difficult than evaluating a completed activity independently. It is possible that preschoolers have less opportunity to evaluate long activities in parts than older children and thus, may find it more challenging to evaluate activities which require checking in segments. In sum, these findings demonstrated that preschoolers who are only partially capable of planning ahead to attain a goal or evaluating an activity in parts can successfully accomplish these tasks with adult help. The results in this study are supported by literature that documents how adult assistance can facilitate the development of preschoolers' abilities to perform complex functions and accomplish challenging tasks (e.g., Vygotsky, 1978; Gauvain & Rogoff, 1989).

Findings did not support the hypothesis that variations in task complexity (i.e., asking for help at appropriate times versus asking for help in appropriate ways) are related to preschoolers' difficulties in seeking social assistance in the classroom. Preschool teachers in this study perceived asking for help at appropriate times and asking for help in appropriate ways as related capabilities rather than separate skills. That preschool teachers perceive these capabilities as related reflect their greater concern about their students' awareness of the need for help during learning rather than the timing and way in which they seek help. It is possible that the time and manner in which help is sought becomes more of a factor as environmental demands require children to become sensitive to the thoughts and feelings of potential helpers in the classroom. Thus, it is speculated that teachers may perceive the timing and way help is sought as more salient for older school-aged children.

The present study also investigated the extent to which developmental differences exist in male and female preschoolers' abilities to self-evaluate, seek help, and set goals and plan. In general, within each learning strategy the order of the skills according to discrimination and difficulty were similar for females and males. However, differential item functioning (DIF) analyses revealed gender differences in males' and females' difficulties to self-evaluate. It was found that the difficulty for male and

female preschoolers' to evaluate learning activities was related to variations in adult assistance and task complexity. For example, females had more difficulty checking completed work with adult help than males. It was easier for males to check completed work independently than females. In addition, females had more difficulty checking a long activity in parts with adult assistance than males. The fact females in this study consistently had more difficulty evaluating their work than males suggests that females may be less efficacious and more reluctant to appraise their own work. In support of this, research has found school-aged females less efficacious (Zimmerman & Martinez-Pons, 1990) and less inclined to rely on their own appraisals and more concerned with being evaluated by adults than males (Block, 1983).

Differences between males' and females' abilities to self-evaluate were also found in the difficulty parameters within gender groups. For example, the difficulty parameters for the skills of checks completed work independently and checks a long activity in parts with adult assistance were found to be more similar for females (i.e., $b_{F,2} = .50$ and $b_{F,3} = .51$) than males (i.e., $b_{R,2} = .42$ and $b_{R,3} = .47$). This finding points out that the skills within the self-evaluation strategy in this study were more hierarchical in terms of difficulty for males than females. In addition, it is possible that

males are influenced more by the presence of adult help than females when evaluating activities which required more complex checking methods (i.e., checking in parts).

Gender differences were not found in preschoolers' difficulty in seeking help and setting goals and planning. Thus, DIF analyses revealed that the skills within the help seeking and goal setting and planning strategies represented one rather than two scales. Although gender differences were not found in these two learning strategies, additional analyses were conducted to determine whether males or females were more skilled in asking for help and setting goals and planning. This was accomplished by comparing two models, one model which set the population parameters to be free to vary in both gender groups compared to another model which constrained the population parameters to be equal across gender groups. Gender differences were found only in the population parameters for help seeking. Teachers in this study observed females as more competent than males in seeking social assistance. This finding is consistent with literature that has shown females actively seek out and obtain resources and knowledgeable persons more often and more effectively than males (e.g., McMullen & Gross, 1983; Eccles & Blumenfeld, 1985). With regard to goal setting and planning, teachers observed males as skilled as females in setting goals and planning in the classroom.

Research has yet to examine patterns of development for males' and females' goal setting and planning skills. Studies focused on investigating gender differences in goal setting and planning are important and should be researched further.

The gender differences found in preschoolers' self-evaluation and help seeking in this study can be explained from social learning and cognitive perspectives. From a social learning viewpoint, the processes of reinforcement and imitation may have profound affects on the development of gender-typed learning strategies. For example, it has been shown that teachers and parents reinforce females more often for being dependent and reliant on help from others, while males are encouraged more frequently to be more assertive, autonomous, and competitive in their learning (e.g., Levitin & Chananie, 1972; Maccoby & Jacklin, 1974). Besides reinforcements children receive from adults, their own perceptions of social norms can influence their decisions to use learning strategies to problem solve. As children become aware of sex-role stereotypes, they are likely to strive to emulate them, especially if they identify with the "adult model" (Bandura, 1986). Fisher and Troney (1976) reported that the tendency for females and males to model help seeking behavior is consistent with sex-role norms.

On the other hand, differences in teachers' observations of males' and females' self-evaluation and help seeking found in this study may reflect shared cultural schemas which ascribe greater self-initiated learning to males than females. From a cognitive perspective, self-evaluation and help-seeking behavior on the part of males and females may be interpreted differently. For example, consistent with the male gender schema, teachers may attend to males self-evaluation behavior more readily and even recall more incidents of self-evaluation behavior in males than females. The cognitive perspective also offers a possible explanation for why males were observed as less competent in seeking social assistance than females. To the extent that males' help seeking behavior is "out of role", inconsistent with the male gender schema, males asking for help might have been more salient to teachers and better remembered. Research has shown that schema-inconsistent information can operate in a similar fashion to schema-consistent information in shaping social perceptions (Hamilton & Troiler, 1986).

The gender results presented in this study were verified through additional analyses. To accomplish this, one sample of females was compared to another sample of females to determine whether DIF existed in the skills within each learning strategy. In addition, two samples of males were also compared. No differences were found in the discrimination and

difficulty parameters between matched gender groups for self-evaluation and help seeking. These results provide substantial support for the findings that revealed differences in males' and females' abilities to self-evaluate and seek help. For the goal setting and planning strategy, DIF was not found in the discrimination and difficulty parameters between matched male samples, but was found in the discrimination parameters between matched female samples. This finding provides some evidence that the skills in goal setting and planning in this study did not fully measure the underlying ability. It is also possible that measurement error contributed to not supporting the hypothesis that gender differences exist in goal setting and planning. Hence, caution must be used when interpreting the results for the goal setting and planning strategy.

Implications

In sum, the present study increased understanding of the early development of children's self-regulated learning strategies by identifying two important demand attributes (i.e., adult assistance, task complexity) involved in the development of self-evaluation, help seeking, and goal setting and planning in preschoolers. The findings in regard to adult assistance underscore the important role child and adult interactions play in promoting preschoolers' self-regulated learning. That this study identified specific skill sequences is important because parents, teachers, and psychologists can

use this information in planning developmentally appropriate learning opportunities for children.

The identification of gender differences in children's self-regulated learning is another important contribution of this study. Increased understanding of the social influences on the development of children's learning strategies can help enhance the learning for all children. Information from this study could be of potential use to educators and administrators in challenging certain attitudes regarding males' and females' self-initiated learning.

The fruitfulness of using continuous observational methods in studying the early development of self-regulated learning strategies was also demonstrated in this study. Continuous observation of children's capabilities over a 2 month time period, across a wide variety of learning contexts, appears to have enhanced the accuracy of recordings and increased sensitivity to social and cultural factors involved in learning and development.

Finally, the present study illustrated how latent trait models can be used to study patterns of development for preschoolers' self-regulated learning strategies (Thissen, 1991). An important contribution of this study

is that it demonstrated how latent trait models can be used to test hypotheses regarding differences between males' and females' difficulties in self-evaluating, seeking help, and setting goals and planning.

Future Research Directions

There are several different directions in which future research might proceed. First, future research might examine how the development of learning strategies varies in relation to different academic content areas. In particular, it would be beneficial to further examine how males and females acquire learning strategies in relation to the academic content areas of reading, math, and language. Prior research (Nelson-Le Gall & Glor-Scheib, 1985) has found that females ask for help more often than males in solving math problems while males ask for help more frequently when working on reading than females. As females age, they develop a relatively low expectancy for success, a low utility value, and a high degree of anxiety regarding mathematics (Wigfield & Eccles, 1989). Second, research might examine the development of self-evaluating, goal setting and planning, and help seeking among male and female elementary school students. It is possible that gender differences may be more entrenched in school-aged children. Third, it would be interesting to further study how teachers' beliefs and expectations for males' and females' self-initiated learning influence teacher and student interactions and the academic demands

imposed in the classroom. Fourth, investigations could also be conducted on how ethnically diverse children acquire self-regulated learning strategies. Acculturalization may have profound affects on how young children regulate their learning.

APPENDIX A: HUMAN/ANIMAL SUBJECTS APPROVAL

Human Subjects Committee

THE UNIVERSITY OF
ARIZONA
HEALTH SCIENCES CENTER

1690 N. Warren (Bldg. 526B)
Tucson, Arizona 85724
(602) 626-6721 or 626-7373

November 16, 1992

John Bergan, Ph.D.
Linda Reddy, M.A.
Department of Educational Psychology
College of Education
Main Campus

RE: NAVAJO NATION TRANSITION PROJECT

Dear Investigators:

We received documents concerning your above cited project. Regulations published by the U.S. Department of Health and Human Services [45 CFR Part 46.101(b)(4)] exempt this type of research from review by our Committee.

Thank you for informing us of your work. If you have any questions concerning the above, please contact this office.

Sincerely yours,

William F. Denny, M.D.
Chairman,
Human Subjects Committee

WFD:sj

cc: Departmental/College Review Committee

APPENDIX B: TABLES

Table 1

Age Distribution of Sample

Age Range	Number of Children	Percentage
2 yrs - 2 yrs 11 months	28	< 1
3 yrs - 3 yrs 11 months	1,653	16
4 yrs - 4 yrs 11 months	5,455	53
5 yrs - 5 yrs 11 months	979	10
6 yrs - 6 yrs 11 months	18	< 1
Missing data	2,158	21
Total	10,291	100

Table 2

Gender Distribution of Sample

Gender Group	Number of Children	Percentage
Males	5019	49
Females	4897	48
Missing Data	375	3
Total	10,291	100

Table 3

Ethnic Distribution of Sample

Ethnic Group	Number of Children	Percentage
African American	1140	11
Caucasian	3390	33
Mexican American	1365	13
Hispanic Other	780	7
Asian	208	2
Native American	2825	28
Other	192	2
Missing Data	391	4
Total	10,291	100

Table 4

Cognitive Procedure of Help Seeking

Skills	Demand Attributes	
	Adult Assistance	Task Complexity
1. Asks for help when encouraged by an adult.	Yes	No
2. Recognizes when he or she needs help.	No	No
3. Asks for help at appropriate times.	No	Yes
4. Asks for help in appropriate ways.	No	Yes
5. Asks help appropriately without being encouraged.	No	Yes

Table 5

Cognitive Procedure of Goal Setting and Planning

Skills	Demand Attributes	
	Adult Assistance	Goal and Planning Complexity
1. Sets simple goals with help.	Yes	No
2. Sets simple goals independently.	No	No
3. Sets a complex goal without planning ahead.	No	Yes / without plans
4. Sets a complex goal and plans ahead with help.	Yes	Yes / plans ahead

Table 6

Cognitive Procedure of Self-Evaluation

Skills	Demand Attributes	
	Adult Assistance	Checking Complexity
1. Checks completed work when asked.	Yes	after completing work
2. Checks completed work independently.	No	after completing work
3. Checks a long activity in parts when asked.	Yes	in parts

Table 7

Confirmatory Factor Analysis of Each Learning Strategy

Cognitive Procedure	Estimated Parameters	df	χ^2	p
Help Seeking	$\delta_{2,1}$	4	.8	.9
Goal Setting and Planning	$\delta_{4,2}$	1	1.10	.3
Self-Evaluation	$\delta_{2,2} = \delta_{3,3}$	1	.02	.8

Table 8

Factor Loadings for Help Seeking

Skill	λ_i	s.e.(λ_i)
1	1.00	not estimated
2	1.11	.05
3	1.23	.07
4	1.18	.06
5	1.21	.07

Note: weighted least squares

Table 9

Factor Loadings for Goal Setting and Planning

Skill	λ_i	s.e.(λ_i)
1	1.00	not estimated
2	1.13	.07
3	1.13	.05
4	1.13	.06

Note: weighted least squares

Table 10

Factor Loadings for Self-Evaluation

Skill	λ_i	s.e.(λ_i)
1	1.00	not estimated
2	1.09	.05
3	1.09	.04

Note: weighted least squares

Table 11

Parameter Estimates for Help Seeking

	Discrimination Parameters				
Model	a1	a2	a3	a4	a5
M1	2.72	4.53	4.36	4.78	3.70
M2	3.74	3.74	3.74	3.74	3.74
M3	3.08	3.08	3.08	3.08	3.08
M4	2.72	4.53	4.55	4.55	3.70
M5	2.65	3.91	3.59	3.59	3.61
	Difficulty Parameters				
Model	b1	b2	b3	b4	b5
M1	-1.28	-.89	-.43	-.41	-.11
M2	-1.18	-.94	-.42	-.40	-.10
M3	-.57	-.57	-.57	-.57	-.57
M4	-1.28	-.89	-.42	-.42	-.11
M5	-1.16	-.80	-.27	.00	.09

Table 12

Hierarchical Models for Help Seeking

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	21	467.6	<.01
M2	a_j parameters constrained	25	636.9	<.01
M3	a_j and b_j parameters constrained	29	7734.6	<.01
M4	a_3, a_4, b_3, and b_4 parameters constrained to be equal	23	472.4	<.01
M5	a_3 and a_4 parameters constrained to be equal	22	1621.3	<.01

Table 13

Models Comparisons for Help Seeking

Model	df	L^2	p
M1, M2	4	169.3	<.01
M1, M3	8	7267	<.01
M1, M4	2	4.8	>.05
M4*, M5	1	1148.9	<.01

Note: * indicates the preferred model.

Table 14

Parameter Estimates for Goal Setting and Planning

	Discrimination Parameters			
Model	a1	a2	a3	a4
M1	2.60	3.79	8.77	4.45
M2	3.62	3.62	3.62	3.62
M3	2.02	2.02	2.02	2.02
M4	2.57	3.63	9.19	9.19
M5	2.57	3.66	8.60	8.60
M6	2.73	3.03	8.14	3.03
M7	2.60	3.99	8.11	3.99
	Difficulty Parameters			
Model	b1	b2	b3	b4
M1	-.47	.21	.63	.68
M2	-.47	.17	.76	.69
M3	.20	.20	.20	.20
M4	-.48	.20	.61	.61
M5	-.47	.21	.64	.60
M6	-.48	.46	.64	.46
M7	-.47	.21	.65	.70

Table 15

Hierarchical Models for Goal Setting and Planning

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	7	637.9	<.01
M2	a_j parameters constrained to be equal	10	904.8	<.01
M3	a_j and b_j constrained to be equal	13	9725.9	<.01
M4	a_3, a_4, b_3, and b_4 constrained to be equal	9	685.4	<.01
M5	a_3 and a_4 constrained to be equal	8	647	<.01
M6	a_2, a_4, b_2, and b_4 constrained to be equal	9	2256.9	<.01
M7	a_2 and a_4 constrained to be equal	8	641.7	<.01

Table 16

Models Comparisons for Goal Setting and Planning

Model	df	L^2	p
M1, M2	3	266.9	<.01
M1, M3	3	9088	<.01
M1, M4	2	47.5	<.01
M1, M5	1	9.1	<.01
M1, M6	2	13.2	<.01
M1, M7*	1	3.8	>.05

Note: * indicates the preferred model.

Table 17

Parameter Estimates for Self-Evaluation

	Discrimination Parameters		
Model	a1	a2	a3
M1	2.52	8.38	7.75
M2	3.67	3.67	3.67
M3	2.41	2.41	2.41
M4	2.52	9.00	9.00
M5	2.53	7.67	7.67
	Difficulty Parameters		
Model	b1	b2	b3
M1	-.38	.44	.47
M2	-.38	.38	.45
M3	.18	.18	.18
M4	-.38	.46	.46
M5	-.38	.43	.47

Table 18

Hierarchical Models for Self Evaluation

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	1	32.5	<.01
M2	a_j parameters constrained to be equal	3	232.1	<.01
M3	a_j and b_j parameters constrained to be equal	5	4437.4	<.01
M4	a_2, a_3, b_2, and b3 constrained to be equal	3	66.1	<.01
M5	a_2 and a_3 constrained to be equal	2	32.9	<.01

Table 19

Model Comparisons for Self-Evaluation

Model	df	L^2	p
M1, M2	2	199.6	<.01
M1, M3	4	4404.9	<.01
M1, M4	2	33.6	<.01
M1, M5*	1	.4	>.10

Note: * indicates the preferred model.

Table 20

Parameter Estimates for Help Seeking Set Free Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Asks for help when encouraged by an adult.	1	2.68	-1.25	2.75	-1.22
Recognizes when he or she needs help.	2	4.79	-.84	9.56	-.68
Asks for help at appropriate times.	3	4.58	-.42	3.89	-.38
Asks for help in appropriate ways.	4	4.40	-.37	4.55	-.38
Asks for help appropriately without encouragement.	5	3.45	-.06	3.66	-.05

Note: μ_F = .16 and σ_F = 1.00

Table 21

Parameter Estimates for Help Seeking Constrained Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Asks for help when encouraged by an adult.	1	2.71	-1.24	2.71	-1.24
Recognizes when he or she needs help.	2	5.05	-.83	5.05	-.83
Asks for help at appropriate times.	3	4.15	-.40	4.15	-.40
Asks for help in appropriate ways.	4	4.47	-.38	4.47	-.38
Asks for help appropriately without encouragement.	5	3.55	-.06	3.55	-.06

Note: μ_F = .16 and σ_F = 1.01

Table 22

Hierarchical Models for Help Seeking by Gender

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	40	429.6	<.01
M2	a_j parameters constrained	45	433.2	<.01
M3	a_j and b_j parameters constrained	50	438.7	<.01

Table 23

Model Comparisons of DIF for Help Seeking by Gender

Model	df	L^2	p
M1, M2	5	3.6	>.10
M2, M3*	5	5.5	>.10

Note: * indicates the preferred model.

Table 24

Hierarchical Models of Population Parameter Estimates (μ) for Help Seeking by Gender

Model	Model Description	Parameter Estimates	df	L^2	p
M1	μ parameters set free	$\mu_F = .18$ $\sigma_F = 1.01$ $\mu_R = .05$ $\sigma_R = 1.00$	49	432.2	<.01
M2	μ parameters constrained to be equal	$\mu_F = .10$ $\sigma_F = .96$ $\mu_R = .10$ $\sigma_R = 1.00$	50	462.2	<.01

Note: M1 is the preferred model for the Help Seeking Procedure, reflecting a_i and b_i parameter estimates constrained across gender.

Table 25

Model Comparisons of Parameter Estimates (μ) for Help Seeking by Gender

Model	df	L^2	p
M1*, M2	1	30	<.01

Note: * indicates the preferred model.

Table 26

Parameter Estimates for Goal Setting and Planning

Set Free Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Sets simple goals with help.	1	2.47	-.41	2.96	-.30
Sets simple goals independently.	2	3.75	.25	10.46	.43
Sets a complex goal without plans.	3	9.34	.66	9.62	.67
Sets a complex goal and plans ahead with help.	4	4.13	.73	3.40	.84

Note: μ_F = .32 and σ_F = 1.01

Table 27

Parameter Estimates for Goal Setting and Planning

Constrained Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Sets simple goals with help.	1	2.62	-.39	2.62	-.39
Sets simple goals independently.	2	4.15	.28	4.15	.28
Sets a complex goal without plans.	3	9.74	.66	9.74	.66
Sets a complex goal and plans ahead with help.	4	3.53	.79	3.53	.79

Note: μ_F = .26 and σ_F = 1.08

Table 28

Hierarchical Models for Goal Setting and Planning by Gender

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	12	386	<.01
M2	a_j parameters constrained	16	413.1	<.01
M3	a_j and b_j parameters constrained	20	418.9	<.01

Table 29

Model Comparisons of DIF for Goal Setting and Planning by Gender

Model	df	L^2	p
M1*, M2	4	27.1	<.01
M2, M3	4	5.8	>.10

Note: * indicates the preferred model.

Table 30

Hierarchical Models DIF of a_j Parameter Estimates for Goal Setting and Planning by Gender

Model	Studied Item	Parameter Estimates	df	L^2	p
M4	1	$a_{F,1}=2.67$ $a_{R,1}=2.67$; $\mu_F=.30$ $\sigma_F=1.05$	13	393.7	<.01
		$a_2=3.66$ $a_3=10.03$ $a_4=4.11$			
		$b_1=-.40$ $b_2=.25$ $b_3=.65$ $b_4=.73$			
		$a_6=9.30$ $a_7=9.36$ $a_8=3.32$			
		$b_5=-.35$ $b_6=.41$ $b_7=.68$ $b_8=.83$			
M5	2	$a_{F,2}=4.42$ $a_{R,2}=4.42$; $\mu_F=.32$ $\sigma_F=1.04$	13	398.3	<.01
		$a_1=2.42$ $a_3=9.73$ $a_4=4.07$			
		$b_1=-.40$ $b_2=.28$ $b_3=.65$ $b_4=.74$			
		$a_5=2.97$ $a_7=9.80$ $a_8=3.24$			
		$b_5=-.31$ $b_6=.34$ $b_7=.68$ $b_8=.86$			
M6	3	$a_{F,3}=11.69$ $a_{R,3}=11.69$; $\mu_F=.32$ $\sigma_F=1.01$	13	385.6	<.01
		$a_1=2.47$ $a_2=3.75$ $a_4=4.12$			
		$b_1=-.41$ $b_2=.25$ $b_3=.63$ $b_4=.73$			
		$a_5=2.98$ $a_6=10.67$ $a_8=3.41$			
		$b_5=-.30$ $b_6=.43$ $b_7=.64$ $b_8=.84$			
M7	4	$a_{F,4}=3.72$ $a_{R,4}=3.72$; $\mu_F=.31$ $\sigma_F=1.00$	13	388.9	<.01
		$a_1=2.47$ $a_2=3.77$ $a_3=8.78$			
		$b_1=-.41$ $b_2=.25$ $b_3=.67$ $b_4=.75$			
		$a_5=2.98$ $a_6=10.14$ $a_7=9.10$			
		$b_5=-.30$ $b_6=.42$ $b_7=.67$ $b_8=.81$			

Table 31

Model Comparisons of DIF for a_j Parameter Estimates for Goal Setting and Planning by Gender

Model	df	L^2	p
M1*, M4	1	7.7	<.01
M1*, M5	1	12.3	<.01
M1, M6*	1	.4	>.10
M1, M7*	1	2.9	>.05

Note: * indicates the preferred models.

Table 32

Hierarchical Models of μ Parameter Estimates for Goal Setting and Planning by Gender

Model	Model Description	Parameter Estimates	df	L^2	p
M1	μ parameters set free	$\mu_F = .32$ $\sigma_F = 1.01$ $\mu_R = .27$ $\sigma_R = 1.00$	11	243.7	$< .01$
M2	μ parameters constrained to be equal	$\mu_F = .29$ $\sigma_F = .96$ $\mu_R = .29$ $\sigma_R = 1.00$	12	246.4	$< .01$

Note: M1 is the preferred model for the Goal Setting and Planning Procedure, reflecting a_j and b_j parameter estimates constrained across gender.

Table 33

Model Comparisons of μ Parameter Estimates for Goal Setting and Planning by Gender

Model	df	L^2	p
M1, M2*	1	2.7	$> .10$

Note: * indicates the preferred model.

Table 34

Parameter Estimates for Self-Evaluation

Set Free Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Checks completed work when asked.	1	2.41	-.31	2.41	-.47
Checks completed work independently.	2	9.62	.50	11.54	.42
Checks a long activity in parts when asked.	3	11.34	.51	9.03	.46

Note: μ_F = -.05 σ_F = 1.12

Table 35

Parameter Estimates for Self-Evaluation with a_j Parameters

Constrained Across Gender

		Focal Group (females)		Reference Group (males)	
Skills	Items	aj	bj	aj	bj
Checks completed work when asked.	1	2.41	-.30	2.41	-.47
Checks completed work independently.	2	11.64	.50	11.64	.42
Checks a long activity in parts when asked.	3	12.74	.51	12.74	.47

Note: μ_F = -.05 σ_F = 1.12

Table 36

Hierarchical Models for Self-Evaluation by Gender

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	1	18.2	<.01
M2	a_j parameters constrained	3	18.2	<.01
M3	a_j and b_j parameters constrained	6	50.1	<.01

Table 37

Model Comparisons of DIF for Self-Evaluation by Gender

Model	df	L^2	p
M1, M2	2	0.0	>.10
M2*, M3	3	31.9	<.01

Table 38

Hierarchical Models of DIF for b_j Parameter Estimates for Self-Evaluation by Gender

Model	Item	Parameter Estimates	df	L^2	p
M4	1	$b_{F,1}$=-.34 $b_{R,1}$=-.34; μ_F=.10 σ_F=1.24	2	34.4	<.01
		$a_{F,1}$=2.39 $a_{R,1}$=2.39			
		a_2=9.31 a_3=8.90; b_2=.49 b_3=.51			
		a_5=9.04 a_6=9.26; b_5=.48 b_6=.54			
M5	2	$b_{F,2}$=.49 $b_{R,2}$=.49; μ_F=.08 σ_F=1.28	2	31.1	<.01
		$a_{F,2}$=12.06 $a_{R,2}$=12.06			
		a_1=2.38 a_3=9.39; b_1=-.32 b_3=.51			
		a_4=2.31 a_6=9.34; b_4=-.39 b_6=.54			
M6	3	$b_{F,3}$=.51 $b_{R,3}$=.51; μ_F=.00 σ_F=1.25	2	22.3	<.01
		$a_{F,3}$=10.17 $a_{R,3}$=10.17			
		a_1=2.39 a_2=9.03; a_4=2.28 a_5=8.75			
		b_1=-.31 b_2=.49; b_4=-.46 b_5=.44			

Table 39

Model Comparisons of DIF for Self-Evaluation by Gender

Model	df	L^2	p
M1*, M4	1	16.2	<.01
M1*, M5	1	12.9	<.01
M1*, M6	1	4.1	<.05

Note: * indicates the preferred model.

Table 40

Hierarchical Models for Help Seeking for Females

Model	Model Description	df	L^2	p
M1	a_i and b_i parameters free	40	193.2	<.01
M2	a_i parameters constrained	45	196.3	<.01
M3	a_i and b_i parameters constrained	50	200.5	<.01

Table 41

Model Comparisons of DIF for Help Seeking for Females

Model	df	L^2	p
M1, M2	5	3.1	>.10
M2, M3*	5	4.2	>.10

Table 42

Hierarchical Models for Help Seeking for Males

Model	Model Description	df	L^2	p
M1	a_i and b_i parameters free	40	195.8	<.01
M2	a_i parameters constrained	45	200.1	<.01
M3	a_i and b_i parameters constrained	50	203.1	<.01

Table 43

Model Comparisons of DIF for Help Seeking for Males

Model	df	L^2	p
M1, M2	5	4.3	>.10
M2, M3*	5	3.0	>.10

Table 44

Hierarchical Models for Goal Setting and Planning for Females

Model	Model Description	df	L^2	p
M1	a_i and b_i parameters free	12	189.8	<.01
M2	a_i parameters constrained	16	198.4	<.01
M3	a_i and b_i parameters constrained	20	236.2	<.01

Table 45

Model Comparisons of DIF for Goal Setting and Planning for Females

Model	df	L^2	p
M1, M2	4	8.6	>.05
M2*, M3	4	37.8	<.01

Table 46

Hierarchical Models for Goal Setting and Planning for Males

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	12	92.1	<.01
M2	a_j parameters constrained	16	99.1	<.01
M3	a_j and b_j parameters constrained	20	106.1	<.01

Table 47

Model Comparisons of DIF for Goal Setting and Planning for Males

Model	df	L^2	p
M1, M2	4	7.0	>.10
M2, M3*	4	7.0	>.10

Table 48

Hierarchical Models for Self-Evaluation for Females

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	1	3.5	>.05
M2	a_j parameters constrained	3	3.1	>.10
M3	a_j and b_j parameters constrained	6	5.4	>.10

Table 49

Model Comparisons of DIF for Self-Evaluation for Females

Model	df	L^2	p
M1, M2	2	.4	>.10
M2, M3*	3	2.3	>.10

Table 50

Hierarchical Models for Self-Evaluation for Males

Model	Model Description	df	L^2	p
M1	a_j and b_j parameters free	1	7.0	<.01
M2	a_j parameters constrained	3	7.9	<.05
M3	a_j and b_j parameters constrained	6	12.0	>.05

Table 51

Model Comparisons of DIF for Self-Evaluation for Males

Model	df	L^2	p
M1, M2	2	.9	>.10
M2, M3*	3	4.1	>.10

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