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ABSTRACT

This study investigated the kinds of self-regulated learning strategies used by kindergarten children related to effective problem-solving and examined their awareness of self-regulated behaviors. Participating in the study were 40 kindergarten children attending a primary school in the southeastern United States. Twenty-one high self-regulated learners (HSRLs) and 19 low self-regulated learners (LSRLs) were selected, based on the teachers' and researcher's classifications. A self-directed learning (SDL) task was used to test the quality of SDL learning. Children were asked to talk aloud and verbally explain to the researcher what they were thinking and how they were doing while involved in the SDL task and were probed to examine their knowledge of their SDL. At task completion, children were asked to evaluate their work. Findings indicated that 19 HSRL and 5 LSRL completed the SDL task successfully. There were significant group differences in time spent on planning, monitoring, and performing between successful and unsuccessful children. Unsuccessful children spent most of their time performing. Successful children spent a great deal of time planning and monitoring. Their performance was based on their understanding of the nature of each item and the relationship among items. They used integrated process of self-regulated learning toward completing the task related to their understanding of the whole task. Unsuccessful children's statements revealed that they performed the task with temporary goals, using some self-regulated learning strategies but in a limited and disconnected way. (Contains 25 references.) (KB)

Problem-Solving Performance and Understanding of High and Low Self-Regulated Kindergarten Children

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This study investigated kindergarten children's self-regulated learning under certain conditions. The first purpose of this study was to investigate the kinds of self-regulated learning strategies forty kindergarten children used related to effective problem-solving. The second purpose was to gain insight into these children's awareness of self-regulated behaviors.

This study is theoretically important for two reasons. First, recently many papers and articles related to active and meaningful learning focusing on personal responsibility have yielded significant research and theorizing concerning self-regulated learning (Gorrell, Hwang, & Chung, 1996; Zimmerman, 1990). Broadly defined, self-regulated learning refers to the process through which individuals direct and integrate their awareness, behaviors, and motivation to optimize their learning or to reach their goals (Zimmerman, 1990). A considerable body of research makes evident that self-regulated learning is highly related to the quality of learning, performance, successful adaptation to school, and academic achievement (Deci, 1996; Waters, 1982). However, compared to the numerous studies on self-regulated learning in older students and adults, there has been little research on young children's self-regulated learning and their knowledge of self-regulation (Hoard & Clark III, 1992; Kopp, 1982; Mischel & Patterson, 1979). Therefore, our understanding of kindergarten children's self-regulated learning is still largely based on research concerning self-regulated learning with older students and adults (Hoard & Clark III, 1992). To truly understand what it means to become a self-regulated learner, studies need to examine beyond young adults, including young children's self-regulated learning.

Secondly, there is some disagreement about the extent to which young children can be aware of what they do and the extent to which they exhibit the important components of self-regulation. Some studies (Kreutzer, Leonard & Flavell, 1975; Masur, McIntyre, & Flavell, 1973;

Piaget, 1970) have suggested that young children are limited in their abilities to distinguish between awareness and actual use of learning strategies. In contrast, other studies (Mohanty & Hejamadi, 1992; Wellman, 1977; Wellman, 1992; Wellman & Johnson, 1979) suggest that children as young as four years understand causal relations between beliefs and actions. Since these studies typically investigate average kindergarten children, the range of self-regulated behaviors in kindergarten children may be too narrowly represented. Thus, studies need to go beyond simply looking at average children in average settings. This study helps us have a clearer understanding of kindergarten children's self-regulated learning by investigating high and low self-regulated children's performance on a task and their awareness of factors that enabled them to be successful on the task.

The need for interviews and observations for this study. In order to have a better understanding of young children's self-regulated learning, I interviewed children at varied settings. A number of recent studies have used interview techniques in order to obtain rich information about young children. Interviewing is one of the best ways to use specially when the researcher cannot directly observe behavior, feelings, thoughts, and perceptions (Merriam, 1998; Patton, 1990). Since one of the characteristics of self-regulated learning is cognition about one's own cognitive status, using an interviewing technique was necessary for providing children the opportunity to talk about their own thinking, ideas and strategies.

There are many different forms of interviewing, such as descriptive questions, structural questions, and contrast questions (Spradley, 1980). Depending on the research questions, the type of interview forms should be selected. However, the majority of the study was dependent on responses to a checklist containing various physical, cognitive, emotional, and interpersonal traits

(Sanders & Graham, 1995). Kreutzer, Leonard, and Flavell (1975) interviewed children giving them choices for their responses wherein the children did not reveal their individual thinking processes. Another study (Gorrell, Hwang, & Chung, 1996) presented hypothetical situations and asked children to indicate one of two possible courses of action and their reasons for choosing it. A limitation of the Gorrell, Hwang, and Chung study is that it used limited hypothetical situations to probe kindergarten children's knowledge of self-regulation. Frey and Ruble (1987) mention the limitation of closed-ended questions that give the children limited choices and few opportunities to respond further to questions. According to Merriam (1998), less structure and more open-ended interviewing allow researcher to access participants' perspectives and understandings of the world. Since this study included an explorative character to investigate kindergarten children's self-regulated learning, I used open-ended and less structured interview technique.

Methods

Participants

Forty kindergarten children were selected as participants in this study. All forty children attend a primary school (764 children in grades K-1) located in the Southeastern United States. There were 22 boys and 18 girls. The participants, representing the largest concentration of low or middle class, was 92.5% Caucasian and 7.5% African American. Descriptive information about the 40 children interviewed is presented in Table 1.

To select the participants, ten kindergarten classroom teachers were given the information about what self-regulated learners are and then identified high (HSR) and low self-regulated (LSR) students in their classroom. According to recent literature, the accuracy of teacher's rating of children's abilities has been found to be reliable (Henderson & Hall, 1982; Keogh, Sugden,

Reynard, & Calking, 1979; Weiss & Horn, 1990). I observed all children identified by the teachers without knowing who had been designated as low or high in self-regulation, and also classified them high or low self-regulated based upon extensive observations (about fifteen hours per a child over a 3-month period) in the classroom. I matched the teachers' nominations with my classification and then chose forty children (21 high and 19 low self-regulated learners) from those about whom the teachers and I agreed.

Instrumentation

A Self-Directed Learning (SDL) Task. This instrument was designed by Glaubman (1977) to test the quality of kindergarten children's self-directed learning. The SDL apparatus consists of 9 screws, 9 bolts and 9 matching holes in increasing sizes, from 6/32" to 3/4" in diameter on a specially prepared wooden stand for the purpose of eliciting self-direction behaviors. The holes are set in two lines, the smaller 5 as upper line from the smaller on the left to the larger to the right, and 4 bigger ones on the lower line, also arranged form left to right. The smallest hole is at the upper line left, and the largest hole is at the lower line right. The bottom of the wooden stand is 5" on 8", 3/4" thick, and the upright board, 6" height on 8" width, 3/4" thick, sunk into the middle of the bottom, to an upside down T shape.

Interviews. While the children were conducting the SDL task, I asked them the reasons for their performances. The children were asked to talk aloud and verbally explain to the researcher what they were thinking and how they were doing while in action, and were probed to examine their knowledge of their self-regulated learning. Examples of the interview are as follows:"Why did you put this in here? Can you tell me why?", "Why makes you put this one here?", and "How did you know that is the right place?" After the children finished their

performances, I asked them to evaluate their work ("What do you think what you did?). When children asked for help, they were encouraged and probed to try and carry on completing the task in spite of difficulties, but did not receive any intervention or explanations of how things should be done, for example, "Keep on trying or you can do it. Don't give up".

Procedure

The items of the SDL apparatus were arranged on a table in a quiet room at the school. The wooden stand with 9 holes of various sizes punched into it, and the 9 screws and nuts disassembled to fit into the holes were lying in a mixed arrangement near the board, all lying slightly apart from each other, but in a position that allowed the child to check, handle, and play with the materials freely.

Children were invited individually to enter the room and approach the table and were allowed to arrange these objects for touching, checking and playing. I stayed a distance from the child, to observe his or her curiosity and activities with the objects. After about two minutes, I came to the table and asked the child to put all things together in the right places on the wooden board. However, in order to investigate the children's own initiation of the task, I was careful not to tell them exactly what they had to do ("Can you put all things together in the right places on the wooden board?"). Children were observed, interviewed and video taped while performing this task. All of their behaviors and interviews were transcribed, and described by the experimenter. The interviews and children's performances lasted approximately 15 minutes.

Results

Forty children participated in the SDL task: twenty one were judged to be HSRLs (High Self-Regulated Learners) and nineteen were judged to be LSRLs (Low Self-Regulated Learners). Twenty four children (19 HSRLs and 5 LSRLs) completed the SDL task successfully. They put a proper size bolt in each of the nine holes on a wooden board and screwed a proper size nut onto each bolt.

The Characteristics of the Children's Performances

From observation of children's performing the SDL task, several themes emerged that tended to center around the following issues: planning, monitoring, and performing. I watched each child's video tape in the SDL task, transcribed their comments, described their behaviors, and measured their time spent on planning, monitoring, and performance.

Planning by successful problem solvers. The most common activity for the successful problem solvers was spending much more time (27% of the total time) on planning their problem-solving actions, such as examining items on the table, looking, touching, sorting items as a kind, and thinking than unsuccessful children (4%). Both successful HSRLs and LSRLs spent 27% of the total time for planning. The unsuccessful HSRLs spent 13% of the total time on planning, whereas the unsuccessful LSRLs spent 3%.

The successful children spent most of their time planning before starting performance. During their planning time, the children seemed to figure out what the task was about, the character of the problems, and set goals to master the task through the planning processes. As they understood their goals for the task, children planned the best way to reach their goals.

For example, before starting to perform the task, Jimmy was researching the items on the

table, looking and touching each bolt, the nut, and the hole "to see where each one has to go."

> He propped his head in his hand to think and looked at each item carefully. He put the nuts in the order by size form the smallest to the biggest. He held his head with one hand in order to think, counted the nuts three times, and looked at the nuts, the bolts, and the holes in turns.

After figuring out the relationship among items, Jimmy started to perform the task based upon his strategy ("small to big") for reaching his goal ("put them together in the right places by the order.").

In another example, before carrying out the task, Terry touched every each item on the table to figure out what to do. She discovered that each bolt had a particular hole ("that [#9 bolt] was biggest one and that [#9 hole] was biggest hole"); there was order in each item size ("this [#2 nut] is the bigger one that this [#1 nut]."). She started to put the bolts into the holes from the largest to the smallest and then screwed the nuts onto the bolts from the largest to the smallest (C16, 1-130). Each step of her performance contributed to building up the whole task according to her planning. Just like Terry, successful children combined the small parts of their activities to make a whole related to their goals.

The planning processes seemed to play an important role in effective problem solving processes related with other processes such as evaluation and monitoring processes. For example, Alan approached the task by putting bolts into holes and screwing the nuts onto the bolts at the same time from the largest to the smallest. He seemed to understand the relationship among the bolts, nuts, and holes and to have a clear understanding of the overall task ("each hole has a particular size of nut and bolt that fit with it.") His understanding of the character of the task and

overall goal became the criteria which gave him clear directions when he was involved in evaluation and monitoring processes. Because of an initial mistake, he kept making other mistakes. He picked up the last nut (#2) to screw it onto the #3 bolt and figured out that he had a problem ("It didn't go in"). Without a clear overall goal for the task, just like other unsuccessful children, he might blame his mistakes to the lack of bolt or nut and did not spend to examine his problems. However, he kept looking and thinking in order to figure out what his problems were. He used monitoring processes to connect what he had done to his overall goal (put them together in the right places). He took out the #3 nut from the #2 bolt and screwed the nut onto the #3 bolt and kept revising the arrangement of nuts and bolts until he completed the task.

The successful children seemed to figure out what the task was about and how they were going to reach their goals effectively during this planning period. Their understanding of the nature of the task and their knowledgements of clear whole goals supplied them with standards for guidance of their effective problem-solving through the entire time, related to other self-regulatory processes such as monitoring and evaluation processes.

Monitoring by successful problem solvers. Successful problem solvers made sure what they were doing was the right step for their whole plans. In order to perform the task successfully, they kept checking each individual right step against their plans or goals and used their knowledge and understanding of the task as a basis for this monitoring process. Their performances were built up gradually toward their goals through careful and effective monitoring processes. Successful children used monitoring process more frequently and spent much more time on this process than unsuccessful children. The successful HSRLs spent 15% of the total time for monitoring; the successful LSRLs spent 9%. Compared to the successful groups, the unsuccessful

children spent statistical and significant less time on monitoring (HSRLs = 2 % of the total time, LSRLs = 5 %) than the successful children. This monitoring process occurred with various types of behavior at different time during the entire process of problem-solving. .

When they had problems, successful children stopped doing their performances to investigate their problems using monitoring process. They checked what they had done related to their understanding of the nature of the task. Sometimes they reflected their whole task plans to check what they did.

> After John put the #3 bolt into the #4 hole, he put the #2 bolt into the #3 hole and put the #1 bolt into the #2 hole. He tried to find the bolt for the #1 hole and picked up the remaining bolt (#4) to try to put it into the #1 hole and said, "it's not good. Not fit. Where's another one?" He started to check each bolt on the wooden board from the biggest to the smallest and self-talked, "Big, big, medium, little, little, little, little, little". He took the #3 bolt out from the #4 hole and put the #4 bolt into the hole (#4).

Although he could have blamed his problem on the lack of items like some unsuccessful children did, John was aware of that he had a problem ("it's not good. Not fit."). Active interaction among various different components of self-regulated learning process such as self-evaluation, monitoring, understanding of the whole task leaded John to understand his problem. Accurate and sophisticated self-evaluation process occurred in based upon John's understanding of the relationship between present problem condition and his understanding of the whole task. Like John, the most successful children were aware of their problems and used monitoring processes concerning the whole task to solve their problem.

Sometimes they stopped trying to solve the problem, moved to the next step, and came

back to the previous problem after finishing an easier one first. In order to solve the problems, children chose their best strategy through their monitoring process. The following example is part of Dino's performance.

> Dino screwed the #2 nut onto the #1 bolt in the #1 hole, then picked up the #3 nut, and screwed that nut onto the 2 bolt. Then he picked up the #1 nut to try it on the # 3 bolt in the #3 hole but the nut was too small for the bolt. He screwed the #1 nut onto the #1 bolt so the #1 bolt then had two nuts (the #2 nut and the #1). When he became aware of his problem, he said, "Oh! Two. I didn't know here's two." Dino took two nuts out from the #1 bolt and compared them to see which one was bigger. He picked up the bigger nut (#2) and started to screw it onto the # 3 bolt. As the nut did not fit on the bolt, he stopped what he was doing and moved to a new step. He picked up the 4 nut, screwed the nut onto the #4 bolt saying, "I will try this one." Then he picked up the #5 nut, screwed it onto the #5 bolt in the #5 hole, and came back to the previous problem he had with the 2 nut. He picked up the two nuts that were left (#2 and #1), and then compared their sizes. Then he compared the size of the #2 nut to that of the #3 nut on the #2 bolt. He took the #3 nut from the #2 bolt and screwed the nut onto the #3 bolt in the #3 hole. He was aware of his problem, saying, "This (the #3 nut) is too big for this one (#2 bolt)." He, then, screwed the #1 nut onto the #1 bolt and #2 nut onto the #2 bolt. When he completed the whole task, he turned the board around to check the nuts and the bolts on the wooden board.

When they were not sure, the successful children also used a review or checking strategy.

They went back to previous work to check what they did right. They used a monitoring process to connect what they did and what they were going to do.

> Jimmy looked carefully over the remaining items and then picked up the #6 bolt and was about to put it into the #6 hole. But he looked at his previous work (the #5 bolt on the #5 hole) and then took the #5 bolt out from the #5 hole and compared the #5 bolt to the #6 by holding them both up together and staring at them. Then he put the #5 bolt back into the #5 hole and put the #6 bolt into the #6 hole. ("Why did you take it (5b) out?") "To see which one is the skinniest."

Jimmy made sure that his performance was sure that his performance was leading to his goal. By monitoring his progress based upon his understanding of the sequence for each item, he was able to solve his problem. Like Jimmy, Bob also used a comparing strategy as an effective and accurate way of problem-solving. He also used his understanding of the nature of the task (same size among items) to monitor his performance.

> Bob compared the two nuts' sizes (#3 and #2). (What are you doing?) "Take it out to see they are the same size." Then he screwed the #3 nut onto the #3 bolt and screwed the #2 nut onto the #2 bolt.

Children also used monitoring processes before proceeding from one step to the next in solving the problem. At this time, children wanted to check if the connection between what they were going to do and their understanding of the nature of the task was right. For example, before taking a new action, Jimmy each time looked at a particular item and compared it to other items on the table to see whether it was "the right size." He figured out that the holes, the bolts, and the nuts had "to be same sizes." "To put them in the right places," Jimmy "looked for the size (of the

each bolt) to the same as the hole."

Sometimes children used monitoring strategies after carrying out their performances. After performing, some of the children turned the wooden board around and inspected the bolts and nuts by spinning them to make sure they were the correct bolts and nuts. They used monitoring processes to be sure what they did was right related to the whole task. Children were continuously assessing their performances based upon their understanding of the whole task. They made decisions about whether their performances were right or not through this evaluation process. Monitoring process kept working with evaluation and planning processes until reaching their goals.

The characters of the unsuccessful problem solvers. Generally, unsuccessful children spent most of their time on performing rather than on planning, monitoring, evaluation. The successful children (60% of the total time) spent much less time on performance than the unsuccessful children (91%). Without any consideration of the characteristic of the task, the unsuccessful children jumped immediately into the task and tried many different ways to put items on the wooden board. Their performances were conducted by trial and error. Although they seemed to figure out that they had to put the bolt into the hole and to screw the nut onto the bolt, they did not have understandings of the overall goal of task. Their performances were not connected to each other but were separate elements. While successful children's actions were driven by being aware of the relationship between the conditions and goals of the whole task, unsuccessful children's performances were based upon the conditions of the present problem.

As soon as he sat down, Bruce started to put the bolts into the holes and kept making mistakes. As the #8 bolt did not fit into the #7 hole, he put the bolt down on the table,

picked up other bolt (#5), and put it into the #7 hole. He randomly picked up bolts to put them into the holes. He seemed to understand that bolts had to be into the holes. However, he did not figure out that each hole has one bolt of the right size and one nut of the right size, and that there was an orderly sequence of size differences. Therefore, each of his actions were directed by disconnected sub-goal ("fit it in here") rather than by overall goal. When he had a problem putting the #3 bolt into the #2 hole, he started to hit the head of the bolt with the #9 bolt. He tried really hard to complete each of his sub-goals ("to fit") without planning or monitoring.

In another example, Rachel was remarkably consistent and persistent in putting the bolts and the nuts together without understanding the whole task. Sometime she got it right, but soon changed her performance, and made a mistake. She understood that she had to find out the right hole for each bolt and nut. However, because she did not figure out the whole relationship among the items, each of her performances was not related to the whole task. She did not reflect on what she did but spent a lot of time and lost her direction.

Rachel put the #3 bolt into the #5 hole, tried to put the #5 bolt into the #4 hole and put the bolt down, put the #1 bolt into the #4 hole, put the #2 bolt into the #3 hole, tried to screw the #3 nut onto the #3 bolt but took the nut out, put the #4 nut on the #3 bolt, tried to put the #7 bolt into the several holes and put it into the #8 hole. (How did you find out?) "I found it was right hole and it fits right there." She kept making mistakes.

Most of the children seemed not to be aware of their mistakes. They blamed their mistakes on the lack of holes or bolts ("I need a little bitty one."; "None of these didn't match with that." "You should've made this hole bigger."). These response indicate that they did not understand the

character of the task and did not have a clear overall goal for the task, focusing on separating elements, instead. They simply proceeded one step at a time. Each time they picked up a new item, they seemed to start over. They did not seem to see a connection between what they just did and the next part of the task. Their performances did not link to each other. Their evaluation and monitoring processes were based upon disconnected temporary goal rather than the whole of the task and the understanding the relationship among bolts, nuts, and holes. As a result, they dug themselves into a deeper and deeper hole, without standing back to see if what they were doing made sense. This kind of behavior occurs very frequently.

The unsuccessful children's distractions. In general, the unsuccessful children did not focus well on the task while they were performing. They seemed to be distracted by other things which they experienced or reminded them the items of the task.

> While Lynda was screwing the nut onto the bolt, she brought up a different topic: "I went to my friend's house. My mom went to work." After little while, she talked to me again while trying to screw another nut onto the another bolt: "Do you know what is my belt? (I don't know.) I have a blue belt. I'm taking karate. I will be a red belt soon and then black belt."

They were interested in other things while they were working on the task. While the successful children concentrated on their performances or the task, the unsuccessful children asked me many questions which were not related to the task:"Where is Mrs. Brown? Where is she? (I don't know)... What are you doing?"

> Dennis picked up the #1 nut and tried to screw it on the several bolts (#5, #4, and #3). While he was trying to screw the nut on the bolts, Dennis started to talk to me, "where

this things came from?" (I made it.) Your daddy? (My husband and I made it together?) Whose are these? Tools. Your daddy? (This is mine.)." He then picked up the #3 nut and tried to screw it onto the #2 bolt.

Just like Dennis, many unsuccessful children were easily distracted by other stimuli in the room and this curiosity or stimuli seemed to lead them away from focusing on his performance, making them difficult to figure out the whole task.

Interviews about Their Own Performances

The successful child's awareness of size. One of the major themes about the reasons of the successful children's performances was their awareness of the size differences. Their understanding of the same sizes among items helped them solve their problems and reach their goals. Their awareness of size included not only their understanding of the relationship among items but also their awareness of a whole picture of the task. The children's statements indicated that they created a whole picture of the task and these understandings led them to solve their problems effectively. When I asked him how to find out the nut (#7) for the bolt (#7), John was pointing at each bolt and the nut from the biggest to the smallest, saying the following.

"Because I know big, big, big. Now this one (#6 nut) goes here. This is medium." John screwed the #6 nut onto the #6 bolt, started to point at all bolts from the biggest to the smallest, saying, "big, big, medium, medium, medium, small, small, small, little."

John seemed to understand the whole task and use these awareness for the next step of his performance. Although he did not use accurate words for each size of the bolt, John seemed to understand and have concepts of size and order in each item and to connect this knowledgements with solving problems. His statements also indicated that he used reflective cognition on what he

did before related to his understanding of the whole task.

Like John, most of the successful children utilized all of their understandings, such as size differences, size order, and sameness among the items, in order to reach their goals. Their awareness of the character of the task became the fundamental resource for them to solve their problems effectively and accurately.

The unsuccessful children's statements about their performances. The unsuccessful children's statements were very simple, indicating that they understood the size difference in each item and that their performances were based upon their understanding of the size differences among the items. However, where the successful children integrated their awareness of the size differences with the whole task, unsuccessful children were aware of the size relationship among items without considering the whole task. While Dennis screwed the #6 nut onto the #5 bolt, I gave him a question.

Interviewer : Why did you put this one here?

Dennis : It matches.

Interviewer : How did you know it matched?

Dennis : Because of size.

When Dennis picked up the #3 nut and put it into the #6 hole, I gave him another question.

Interviewer : Why did you put this one (#2 nut) here (#6 hole)?

Dennis : Because none of these didn't match with that (#6 hole).

Dennis was conducting his performances based upon considering matching size. However, most of the time, he did not recognize that he had problems. After he tried putting different sizes

of the bolts into the # 6 hole, he picked up the #2 nut to put into the #6 hole. He kept using a trial and error approach to perform the task without considering the whole task and assessed his problems to the problems of the task ("those two are missing"), indicating that his evaluation was based upon a disconnected temporary goal from the whole task.

In a similar manner, Charles seemed to understand the same size between items. However, he showed a lack of the awareness of the characteristics of the whole task. He seemed not to analyze the task so his performance became isolated from his whole concept of the task.

I: Why did you put this one here?

Charles: Because this (4n) small and that one (1b) small.

Because that one (9n) big and that one (6b) looked like big.

The majority of the unsuccessful children understood that they had to consider the size to complete the task. However, their descriptions expressed only one-to-one correspondences, considering two dimensions (the bolts and the holes, or the bolts and the nuts) rather than three dimensions (the bolts, the nuts, and the holes). Even though few children were aware of the same size among items, they did not state the whole task, not being aware of their problems.

I did a good job. One common pattern to both the successful and the unsuccessful children's evaluations about their performances was that they thought they "did a good job" or "did right." However, there were differences in the reasons for their evaluation about their works.

Successful children typically assessed their activities in terms of their awareness of their cognitive strategies while none of unsuccessful children showed reflection on their strategies. The successful children' reasons indicated that they used metacognitive strategies to complete the task successfully. For example, Stephanie checked the bolts and the nuts on the wooden board to

assess her work.

Interviewer : How do you think you did?

Stephanie : I got it right because I put them from small to large.

When evaluating her performance, Stephanie reflected how she completed her task. She attributed her successful work to her strategy of arranging items according to size. She used a metacognitive process to think about her thinking of how to complete the task for evaluating her work.

Children's reasons for their actions showed that each child used different strategies to complete the task. While Dino carried the task "from littlest to the biggest," Jerald "put all things together in the right place from big to little." In Jerald's case, he showed the interactive influence of his own evaluation and awareness of the cognitive nature of his performance: "I did right....because I was thinking." In a similar vein, Jerry showed his reflection about his cognitive process: "I put them (bolts and nuts) in the right places because I was thinking about what I was doing."

Successful children also mentioned their understanding of the character of the task. Scott was aware of the whole task to complete his task and this awareness became the criterion for his evaluation of his work.

"I did a good job because I did all the screws are the same sizes as those (nuts). Holes are the same sizes as these."

In contrast, unsuccessful children tended to resort to external explanations or to justifications for not quite completing the task. One child, for example, attributed her "good job" to her association of it with a limited prior experience rather than to the internal conditions of the

current task ("because I saw my dad working on the car."). Two others attributed their incomplete performances to "you should've made this hole bigger" and "we can make one more hole for this (left over bolt)."

Conclusion

Kindergarten children's self-regulated learning often has been thought of as being limited because young children overestimate their knowledge and engage in relatively little monitoring of their own cognitive processes (Flavell, Friedrichs, & Hoyt, 1970; Stipek & Tannatt, 1984; Paris & Newman, 1990; Zimmerman, 1990). In keeping with the findings of studies conducted with older students, this study found that the successful children tended to use various self-regulated learning strategies such as planning, monitoring, metacogntion, self-evaluation more frequently than did the unsuccessful children.

Overall, there were significant differences in time spent on planning, monitoring, and performance between the successful and the unsuccessful children. While the unsuccessful children spent most of their time performing, the successful children spent a great portion of time planning and monitoring rather than just trying to put items together. The successful children's performances were based upon their understanding of not only the nature of each item but also the relationship among items (bolts, holes, and nuts). They used the integrated processes of the elements of self-regulated learning toward solving or completing the task related to their understanding of the whole task. On the other hand, the unsuccessful children's statements depict that they performed the task with temporary goals. They used some of self-regulated learning progresses in a limited and disconnected way based upon this present subgoal while successful children worked with a clear goal. Even though sometimes showing planning, monitoring, self-

evaluation, and interest, the unsuccessful children could not complete their performance successfully because of a lack of integrating all elements of self-regulated learning toward to the ultimate goals.

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Table 1

Descriptive Data for 40 Children

Alias	Gender	Race	SRL Level	Performance on Task
1 Jimmy	M	W	High	S
2 Jerald	M	W	High	S
3 Scott	M	W	High	S
4 John	M	W	High	S
5 Alan	M	W	High	S
6 Shannon	M	W	High	S
7 Mark	M	W	High	S
8 Kop	M	W	High	U
9 Cris	M	W	High	S
10 Dino	M	W	High	S
11 Jill	F	W	High	S
12 Carol	F	W	High	S
13 Beth	F	W	High	S
14 Stephani	F	W	High	S
15 Kelly	F	W	High	S
16 Terry	F	W	High	S
17 Don	F	W	High	S
18 Nansey	F	W	High	U
19 Christal	F	W	High	S
20 Candy	F	W	High	S
21 Mallissa	F	W	High	S
22 Dannis	M	W	Low	U
23 Robert	M	W	Low	U
24 Bruce	M	B	Low	U
25 Tommy	M	W	Low	S
26 Mick	M	W	Low	U
27 Erick	M	W	Low	U
28 Chen	M	W	Low	U
29 Tony	M	W	Low	S
30 Jerry	M	W	Low	S
31 Sam	M	W	Low	S
32 Lorri	F	B	Low	U
33 Rodney	M	W	Low	U
34 Bob	M	W	Low	S
35 Emma	F	W	Low	U
36 Ann	F	W	Low	U
37 Rachel	F	B	Low	U
38 Lynnda	F	W	Low	U
39 Sharon	F	W	Low	U
40 Ammy	F	W	Low	U

Note. S = Successful; U= Unsuccessful.

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