Kindergarten Children's Metacognitive Self-Regulated Learning During and After Watching Other Child's Problem-Solving Behaviors

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Abstract: This study invested 24 effective and 16 ineffective problem-solving kindergarten children's awareness of metacognitive self-regulated learning (MSRL) while watching other child's problem-solving behaviors. The model in a video performed a task with a trial-and-error approach and finally asked for help. After watching the video, children were asked how they could help the model. All interviews were transcribed and analyzed using a content analysis method. The research findings indicate that there were several differences between the effective and ineffective children in their awareness of other child's MSRL. Effective children considered monitoring processes related to their understanding of the task goal and nature of a task and using cognitive state as important elements of the model's successful work, whereas ineffective children described separate elements unrelated to a task goal.

Keywords: Metacognitive self-regulated learning, Kindergarten children's metacognition, Young children's problem-solving

Introduction

Recently, much research related to active and meaningful learning has yielded significant insights and has led to theories concerning metacognitive self-regulated learning (MSRL) (Garcia, Falkner, & Vivian, 2018; Kizilcec, Pérez-Sanagustín, & Maldonado, 2017; Winne, 1995; Zimmerman, 1990, 2000). Broadly defined, metacognitive self-regulated learning refers to the active learning process through which individuals direct and

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sustain their cognition, behaviors, and motivation to optimize their learning or to reach goals (Pintrich, 2000; Zimmerman, 2008; Zimmerman & Schunk, 2011). As active participants in all phases of learning, MSRL learners engage in such processes as goal setting, planning pre-task, self-monitoring, self-awareness, and self-evaluation (Lee, Watson, & Watson, 2019; Pintrich 2000; Winne, 1995; Winne & Perry, 2000; Zimmerman, 2001). The MSRL phases of planning, monitoring, and evaluation are thought to be cyclical and interrelated.
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Planning process involves setting goals, identifying a current problem to be solved, deciding which strategies to use toward goals, what order to follow, and how much time to give to the task and so on (Pintrich 2000; Zepeda, Richey, Ronevich, & Nokes-Malach, 2015; Zimmerman, 2000). Monitoring involves checking on one's current state and progress toward goals and selecting appropriate repair strategies when originally selected strategies are not working (Chou, & Zou, 2020; Hattie & Timperley, 2007; Greene & Azevedo, 2007; Griffin, Wiley, & Salas, 2013; Winne, 2001). Evaluation involves determining one's level of understanding, making judgments about the process and outcomes of thinking and learning towards goals (Zepeda et al., 2015), and need for cognition (Cazan & Indreica, 2014; Cacioppo, Petty, Feinstein, & Jarvis, 1996).

Compared to extensive research on metacognitive self-regulated learning (MSRL) in upper elementary grades through college (Bryce & Whitebread, 2012; De la Fuente & Lozano 2010; Metallidou & Vlachou, 2010), there has been little research on young children's MSRL. Therefore, more extensive examinations of young children's MSRL were deemed warranted. As a first step, the present study explored potential components of 40 kindergarten children's MSRL in a particular context. More specifically, the similarities and differences between effective and ineffective problem kindergarten children in their perception of other's MSRL were investigated during and after watching a model's mathematical problem-solving behaviors that requires MSRL strategies.

Methods

Participants

From a pool of children who gave a written participating consent form for this study and whose parents gave written permission for their children to participate, 40 kindergarten children (22 boys and 18 girls) were randomly selected.

Data Collection and Data Analysis

Before watching the model's performance, children participated in the Self-Directed Learning (SDL) task composed by Glaubman, Glaubman, and Ofir (1997) to elicit children's self-directed behaviors. The SDL apparatus consists of 9 nuts, 9 bolts, and 9 matching holes in increasing sizes on a wooden stand. Twenty-four children were identified as effective problem-solvers because they put the proper sized bolt in each of the nine holes in the wooden board and screwed the proper size nut onto each bolt. Sixteen children could not complete

the task. The model in a video performed the SDL task with a trial-and-error approach and finally asked for help. During and after watching the video, children were asked how they could help the model. Whole sessions were video-taped, transcribed, and analyzed using a content analysis (Strauss and Corbin, 2008). The 24 effective and 16 ineffective problem-solving children's statements and behaviors were analyzed separately, yet in a similar manner. Themes or patterns were developed from the narrative descriptions.

Results and Findings

There were several differences between 24 effective and 16 ineffective problem-solving children in their awareness of metacognitive self-regulated learning (MSRL) processes related to the model's problem-solving behaviors.

Effective Children's Awareness

There were two major themes emerged around the effective children's responses regarding to the model's needs to complete the task successfully: (a) awareness of the critical roles of the monitoring process towards task goals, and (b) recognition of the importance of MSRL cognitive process.

The interview data indicated that effective problem-solving children were awareness of the critical role of monitoring process related to planning process. They evaluated that the model needed to monitor his performances toward the SDL task goal ("to put all things together in the right places") and related to the characteristics of the SDL task such as same sizes among items (bolts, nuts, and holes) ["He has to see how big they are. These (bolts and the nuts) are the same as the holes. And putting things in the holes"]. Their understanding of evaluation and monitoring processes were tied with planning process such as task goals and the nature of the SDL task such as sequential order among each item ("from the smallest to the largest").

"Thinking" was another major theme in the effective problem-solvers' interviews concerning about what the ineffective model needed to solve his problems. They recognized that MSRL process was one function of the brain and thinking toward a task goal was a necessary process for problem-solving ["to find out the right place, he (the model) needs to think. He has to think in his head to put them in the order"]. The effective children suggested the model to use thinking strategy to check on his current problems, reevaluate his progress (outcome), and modify their performances toward the task goal ["he (the model) needs to think which one is right for the hole… He needs to take this one out and put it in right there... He has to stop and think to figure it out… He's sort of thinking, but he is not thinking right because he thinks fast. He maybe gets dizzy. He can't think right"].

Ineffective Children's Awareness

There were two major themes emerged in unsuccessful children's responses regarding to the ineffective model's

needs to complete the SDL task successfully: (a) lack of understanding of MSRL process and (b) a trial-and-error approach with demonstration and simple verbal suggestions.

The ineffective problem-solving children's statements indicated they were also aware of the model's ineffective problem-solving behaviors but did not address any constructs of MSRL when evaluating the model's performance. Some children understood there were size differences among items. However, none of the ineffective children mentioned the relationship among the SDL task items (9 holes, 9 bolts, and 9 nuts), sequential order within each item, and matching all three items toward the task goal.

Another common theme of the ineffective children's responses was to use a trial-and-error approach with demonstration and simple verbal suggestions. Most of the ineffective problem-solving children demonstrated how to solve the model's problems by manipulating the SDL items and showing them to the model on the TV screen with simple statements.

Discussion and Conclusion

The findings of the study indicated that both effective and ineffective problem-solving children were able to identify the problems of the model's problem-solving behaviors. However, the effective children are the only ones who recognized the constructs of MSRL related to problem solving. Their evaluation and monitoring processes were coupled with planning process such as understanding the essential characteristics of tasks and task goals and selecting effective strategies toward goals (Pintrich 2000; Zepeda, Richey, Ronevich, & Nokes-Malach, 2015; Zimmerman, 2000) when evaluating the model's ineffective performances. They were also understood cognitive state (Cazan & Indreica, 2014; Cacioppo, Petty, Feinstein, & Jarvis, 1996) as important components in the model's successful work. Understanding the nature and goal of tasks, monitoring, and self-awareness seems critical in order for kindergarten children to perform certain tasks successfully, as may be seen in other studies (Pintrich, 2000; Zimmerman, 2008; Zimmerman & Schunk, 2011) related to the role that MSRL plays in older children and adults.

However, the ineffective children in this study showed a limitation in integrating separate constructs of MSRL into the SDL task goal. They evaluated the needs of the model's monitoring. However, no one was able to make a connection between monitoring and planning processes. Their responses were based upon a trial-and-error approach with simple verbal statements unrelated to a task goal. This indicate that kindergarten children's evaluation, monitoring, and understanding of the whole task may not be separate elements of MSRL but work as integrated closely toward a main goal (Lee, Watson, & Watson, 2019; Pintrich 2000; Winne, 1995; Winne & Perry, 2000; Zimmerman, 1990, 2001).

The present study suggests that even kindergarten children use MSRL process under certain conditions. However, in order to gain a better understanding of kindergarten children's MSRL, much more remains to be learned. It is crucial to have more models of other kindergarten children's MSRL, including children at different

schools and from different cultures.

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