Supporting Metacognition in a Collaborative Environment via Solving Mathematics Word Problem Solving

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1. Background and purpose of study

The goal of training metacognitive skill is to help leaners to be comfortable with applying meta-level thinking on their cognitive process and become self-regulated learners who can automatically monitor and regulate their learning processes and be aware of their self-difficulties to achieve their tasks. In our research, we adopt a computer-supported learning environment to support reflective learning, which we call computer-supported multi-reflective learning environment (CSMRLE), which is composed of three reflective learning components: an interactive Q/A environment, observable representations of thinking processes and a collaborative discussion platform. Then, we propose a framwork to facilitate learners' metacognitive skill using CSMRLE, named CIRCLE, acronym for "Collaborative discussion, Interactive environment and Representation of thinking process for Computer-supported Learning Environment". To see how the framework works, we implement it on the Mathematical Word Problem (MWP) solving domain. Then, we designed activities, which satisfy our selected domain and framework. Therefore, in this paper, we would like to observe that how our proposed activities can differentiate a MWP solver who apply metacognitive skill and a MWP solver without metacognitive skill?

2. Research content

The MathReflect system is a case study of the CIRCLE implementation to train metacognitive skills in solving MWP. In MathReflect, we plan that students are encouraged to reflect on their problem solving process by interactive metacognitive questioning environment, and then their problem solving processes are captured as Q/A sequences and Inferential Diagrams (InDi). Finally, Q/A sequences and InDi are used as discussion materials in peer's inspection and collaborative discussion process. In this study, 18 students who have been classified by their teacher on their performance of solving MWP were tasked to use our proposed activities (constructing Q/A and InDi) then their behavior of constructing Q/A and InDi were observed and analyzed.

3. Summary

Not all students who are classified as good at solving MWP can construct Q/A sequence and InDi. Some of them have difficulty because of thinking about MWP solving strategy, they have learned before. The students who could perform well on constructing Q/A sequence and InDi had good interactive and response with the instructor in the way that they could ask useful question to the instructor to complete their task of constructing Q/A sequence and InDi. This evidence could separate students who could solve problems by following problem solving step and students who could solve problems by reflecting on their problem solving process or the students who apply metacognitive skill during solving MWP.