MAKING THINKING VISIBLE: PROCESS DATA ANALYSIS TO UNDERSTAND THE REASONS FOR BEING SUCCESSFUL IN PROBLEM-SOLVING

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Technology offers new opportunities in educational assessment and research. Research endeavors examining only the final score are not enough, because these cannot establish principles about how learners think, how they solve a problem (Angeli & Valanides, 2013). Process data can provide direct insights into how the results were produced (Greiff et al., 2015). The aim of the present paper was to analyze process data (e.g., time on task, number of clicking) to understand the reasons for being successful in problem-solving. Participants of the sample (N=1844, age mean=19.8; SD=1.74) were students starting their studies at one of the largest and highest ranked Hungarian universities. Data collection was carried out using the eDia platform in a large computer room at the university's learning and information center in the first four weeks of the semester. For the purpose of assessing students' problem-solving performance and their ability to acquire and subsequently apply knowledge in uncertain situations, we used the widely applied and validated computer-based MicroDYN approach (20 items; alpha=.88). Beyond the traditional scoring of the answers and logdata referring to the manipulation strategy of students, logdata indicating time on task and number of clicks were also analyzed. Participants were grouped according to their exploration behavior (see Molnár & Csapó, 2018) and performance in both respective phases, resulting in eight groups of students. Participants who succeeded in the exploration phase could either complete the model building phase (knowledge acquisition) successfully, or fail in the model building phase. Participants who succeeded in the model building phase could either complete the application phase successfully, or fail in the application phase. In contrast, someone who failed in the exploration phase could either succeed or fail in the model building phase, or someone who failed in the model building phase could either succeed or fail in the knowledge application phase. Results showed that many participants were unable to transition their knowledge from the exploration to the model building phase (knowledge acquisition) and from the acquisition to the application phase, respectively, which might be due to an inefficient mental model transfer. There were almost no students who managed to solve both the model building and the application phase without proper exploration. The likelihood of students being "lost in one or both of the transitions" was higher in more complex items. There were large mean differences detectable in time on task and number of clicking of the groups being more successful or being lost in transition. Different time on task and number of clicking profiles indicated the reasons for being successful in problem-solving. Implications are discussed in light of process data analysis with regard to the factors to be taken into account by problem-solving training programs.

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