

Closing the loop: Automated data-driven cognitive model discoveries lead to improved instruction and learning gains

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ABSTRACT

As the use of educational technology becomes more ubiquitous, an enormous amount of learning process data is being produced. Educational data mining seeks to analyze and model these data, with the ultimate goal of improving learning outcomes. The most firmly grounded and rigorous evaluation of an educational data mining discovery is whether it yields better student learning when applied. Such an evaluation has been referred to as "closing the loop", as it completes cycle of system design, deployment, data analysis, and discovery leading back to design. Here, we present an instance of "closing the loop" on an automated cognitive modeling improvement discovered by Learning Factors Analysis (Cen, Koedinger, & Junker, 2006). We discuss our findings from a process in which we interpret the automated improvements yielded by the best-fitting cognitive model, validate the interpretation on novel data, use it to make changes to classroom-deployed educational technology, and show that the changes lead to significant learning gains relative to a control condition.