

UC Merced

Proceedings of the Annual Meeting of the Cognitive Science Society

Title

Detecting Students Problem Solving Strategies Using Sankey Diagrams

Permalink

<https://escholarship.org/uc/item/499166q4>

Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 41(0)

Authors

Gong, Tao

Agard, Christopher

Feng, Gary

et al.

Publication Date

2019

Peer reviewed

Detecting Students Problem Solving Strategies Using Sankey Diagrams

Tao Gong

Educational Testing Service, Princeton, New Jersey, United States

Christopher Agard

Educational Testing Service, Princeton, New Jersey, United States

Gary Feng

Educational Testing Service, Princeton, New Jersey, United States

Gabrielle Cayton-Hodges

Educational Testing Service, Princeton, New Jersey, United States

Luis Saldivia

Educational Testing Service, Princeton, New Jersey, United States

Abstract

Process data (e.g., logs of actions, keystrokes, times, or eye tracks) recording students interactions with digital assessments are available in many digital educational assessments. They have become the primary focus of cognitive scientists to detect and analyze students strategies during problem solving. This study developed a Sankey diagram-based method to visualize process data of multiple-choice items. Such diagram has been widely adopted in industry and ecology to trace flow of information, energy, or resource. Using released items from the 2017 National Assessment of Educational Progress Mathematics Tests, we illustrated how to use such a diagram to elucidate frequent answer formulation patterns of students, their common mistakes, and estimated probabilities of reaching correct/wrong answers at various answering stages. These help reveal the problem solving strategies adopted by students and their underlying cognitive processes. Assessment developers, teachers, and students could use such insights to improve assessments and learning outcomes for confusing concepts.