Motivation
Students tend to:
- perform poorly on unfamiliar problems, despite demonstrating conceptual understanding
- apply intuitive reasoning to unfamiliar problems
- use the first available mental model (“gut reaction”), leading to incorrect answers

An understanding of why students resort to using intuition, despite having formal knowledge, would lend itself to developing tools to prompt students to use this formal knowledge more readily.

Theoretical framework
![Diagram of dual process theory]

Research question #1
Do metacognitive interventions engage the analytical system presented by the dual process theory?

Metacognitive intervention
What answer do you think people who applied intuitive thinking [...] would give? Have you applied intuitive reasoning/knowledge or formal reasoning/knowledge? Explain.

Conclusions
There is no difference in student performance with or without metacognitive intervention.

Method 1: Metacognition
Reasoning is investigated by combining two data streams:
- Heat maps generated by eye tracker during problem solving
- Verbal interviews following the problem session

Method 2: Eye tracking
![Heatmap and interview diagram]

Research question #2
Are the data generated by the eye tracker consistent with the dual process theory framework?

Preliminary findings
Both verbal explanations and heat maps suggest that the first available mental model cues what the question is “about” for the individual, and guides their reasoning. In these cases:
- Fig 4: connection to lightbulb
- Fig 5: completeness of circuit
- Fig 6: direction of batteries

Future directions
Build on the present findings to design and test different modes of metacognitive interventions
Identify strategies for engaging the analytical system more productively while solving physics problems
Replicate eye tracking methodology on a larger scale

References

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