Reasoning: Intuitive *vs.* Formal

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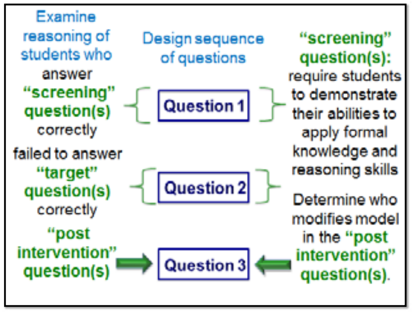
1. INTRODUCTION

Even though students may possess formal knowledge of physics concepts, some may still rely on intuitive reasoning instead of formal reasoning to answer conceptual physics problems. We asked students in an introductory physics course a series of conceptual physics problems to determine which students have formal knowledge but use intuitive reasoning to answer problems.



2. METHODOLOGY

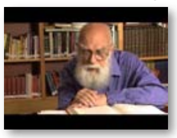
- Probe discrepancies in reasoning approaches by analyzing (1) individual responses to written question and (2) products of students' group work.
- Examine socially mediated metacognitive activities influencing student reasoning approaches using video of group work in Introductory Physics lab.

3. GOALS AND MOTIVES

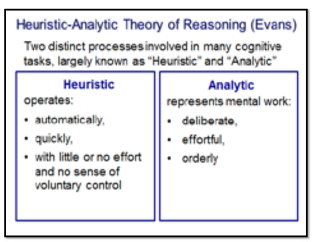
- Probe the nature of inconsistent reasoning approaches
- Determine circumstances where intuitive and formal reasoning strategies may be enhanced or repressed

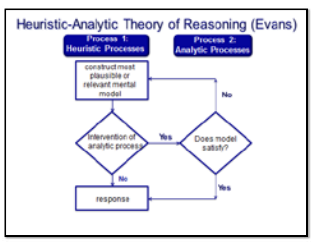
Intuitive processing

Formal processing

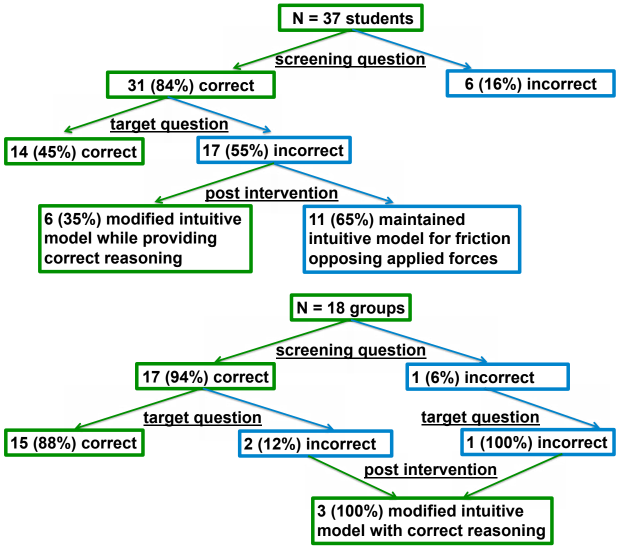


4. THEORETICAL FRAMEWORK

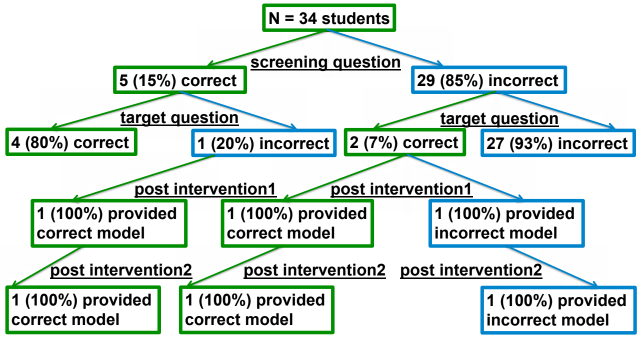




5A. RESULTS: FRICTION



5B. RESULTS: CENTER OF MASS



- We found that 25% of students providing intuitive reasoning on the "target" question provided a different type of intuitive reasoning in "post intervention2". This finding further illustrates how students are prone to maintain intuitive models for their reasoning in conceptual physics problems.

6. CONCLUSIONS

- Students are prone to preserving intuitive models
- Utilizing metacognitive skills are an effective method for facilitating revisions in initial intuitive models.
- Socially mediated metacognitive activities with formal and structured guidance seems to mitigate inconsistencies in student reasoning
- Students are more likely to switch to different intuitive models (instead of applying formal knowledge and reasoning) when multiple strong intuitive models are present.
- Further inquiry including interviews are necessary to determine with higher precision and accuracy if and when students apply metacognitive skills. This information will provide a stronger foundation in developing intervention methods and other techniques to lessen incorrect intuitive disturbances.

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8. REFERENCES

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