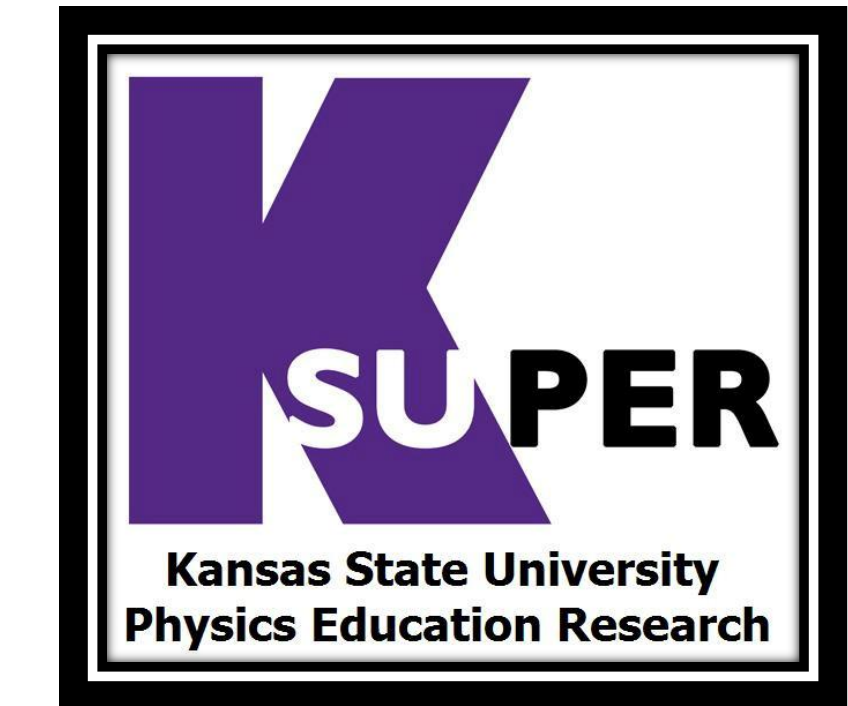


# Comparing Engineering Students' Kinds of Mental Representations Across Contexts



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## Research Question

Do students operate at the same level of mental representation when completing tasks with different external representational format across different topics?

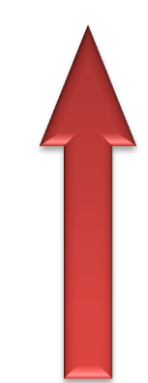
## Johnson-Laird<sup>1</sup> Cognitive Framework

Propositional representations



Interpretation and understanding

Mental models



Simplification and application

Mental images

## Research Method

1. Non-directed tasks on kinematics and work completed individually followed by individual interviews.
2. Profiles constructed based on students' problem solving strategies and reasons underlying their actions.
3. Profiles related to cognitive framework to infer about the kinds of mental representations.
4. Compare same student's kinds of mental representations across the two topics.

## Application of Cognitive Framework in Physics Context

**Propositional representation:** prioritize manipulation of equations, rote memorization, pattern matching of information

**Mental image:** recognize importance of qualitative reasoning and visual representations but prefer manipulating equations

**Mental model:** use qualitative approach and reasoning with visual representations playing a key role for problem solving

## Comparison of Same Student Kinds of Mental Representations across Contexts

Mental representations across contexts	Total
<b>Propositional</b> in kinematics and work	11 (58%)
<b>Mental image</b> in kinematics and <b>propositional</b> in work	4 (21%)
<b>Mental image</b> in kinematics and <b>mental model</b> in work	4 (21%)
Total	19 (100%)

## Conclusion

- ❖ Construction of **mental image** and **propositional** representation: most students have a poor understanding of the various concepts presented.
- ❖ Students' strategies tend to change with topic and representation.

## Reference

1. P. Johnson-Laird, *Mental Models*, Cambridge: Harvard University Press, 1983.