

Facilitating Student Understanding of Motors in an Everyday Context

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Learning Goals: Understanding

Supported in part by NSF Grant REC-0133621



Motivation

- Enhance learning experience for college students in introductory physics classes.
- Broaden appeal of physics through real-life applications and devices.

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Research Questions

- What are students' ideas about how the blender works?
- What instructional strategies can help students construct their understanding of how the blender works?

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Research Plan (1 of 2)

Blender chosen because...

- Motors already covered in class
- Most students familiar with blender
- Concept applicable to many devices



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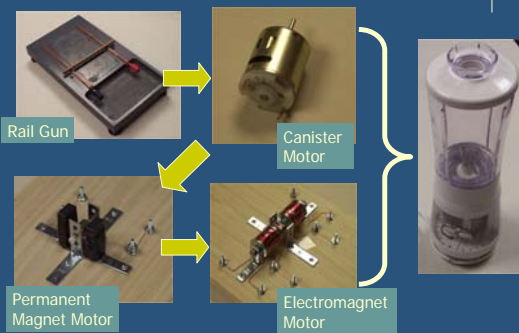
Research Plan (2 of 2)

- Teaching interviews (Summer 2005)
 - N=15 enrolled in algebra-based physics
 - Six (6): had covered motors in class
 - Nine (9): had not covered motors in class
 - Phenomenographic Analysis¹
- Focus of Investigation
 - Students' initial understanding of blender
 - How students' understanding changed by interacting with demos

¹ Marton, (1986)

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Sequence of Demos



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Emergent Themes

(1 of 2)



- Epistemic mode
 - Knowledge is 'self-constructed'²
- Intuition-based Reasoning
 - 'Phenomenological primitives'³
 - Reversing input will reverse output
 - Closer is stronger
 - Canceling out
 - 'Attunement to Affordances'⁴
 - Use similarities between demos and blender e.g. attaching battery to the motor

² Hammer & Elby, (2002) ³ diSessa, (1988) ⁴ Greeno, *et. al.*, (1993) ⁷

Emergent Themes

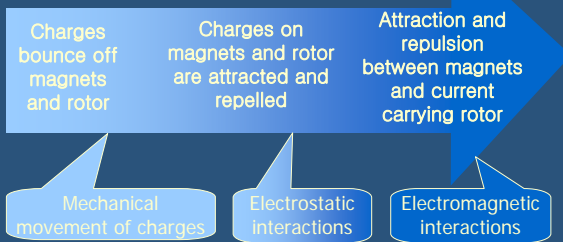
(2 of 2)



- Structure over Function
 - Focus on structural similarities not function⁵
- Confusing charges & magnets
 - Described magnets as being charged⁶
 - Combining ideas of magnets and charges⁷
- Lack of variance
 - No significant differences between students who had material in class and those who had not.

⁵ Mestre, (1994) ⁶ Maloney *et. al.*, (2001) ⁷ Hrepic *et. al.*, (2005) ⁸

Spectrum of Ideas



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Future Work



- Conduct interviews with more students
- Curriculum Development
 - Develop a curriculum that teaches **in context**
- Curriculum Implementation

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Thank you!

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