IMPROVING HIGH SCHOOL STUDENTS' CONCEPTIONS OF FORCE AND MOTION THROUGH LABATORIALS AND REFLECTIVE WRITING

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BACKGROUND

- Conventional instruction fails to improve students' ideas and attitudes
- Reflective writing: metacognitive examination of textual material before coming to class
- Labatorials: activities that target misconceptions, promoting inquiry and small group discussions with the instructor in the lab; no lab reports

QUESTIONS

- Is the combination of reflective writing and labatorials effective in high school physics?
- How do students learn (or fail to learn) the Newtonian concepts of force and motion?

METHODS

- Study spanning 3 years:
  - 2016-2017: N = 63, 1 school
  - 2017-2018: N = 113, 3 schools
  - 2018-2019: continuation 2017-18 study
- Quantitative: concept maps, pre- and post- tests, labatorials, reflective writings
- Qualitative: pre- and post- interviews

KEY FINDING

High school students develop a more coherent understanding of forces and motion through a combination of reflective writing and labatorials

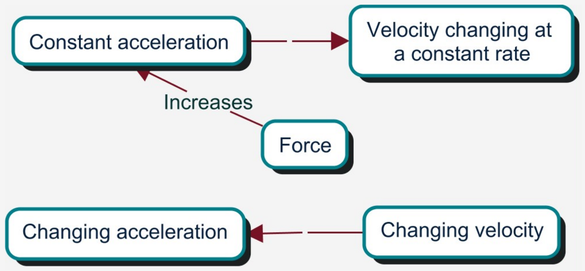


Fig. 1: A student's pre- concept map; its structure is simplistic

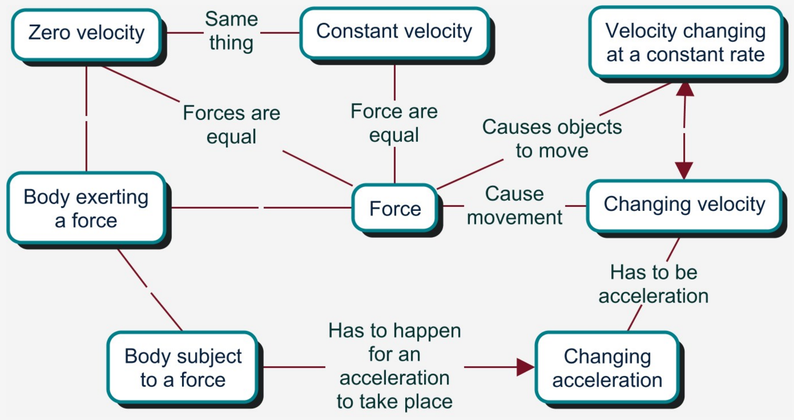
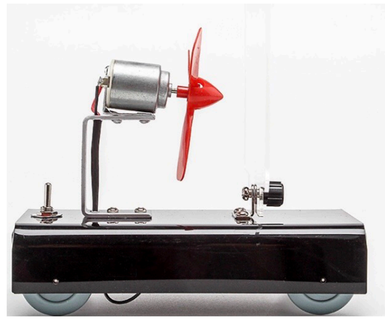


Fig. 2: A student's post- concept map; its structure is richer, more complex.

> *"Taking this course is allowing me to take a more scientific perspective, making my ideas clearer and putting them in better context."*



CONCLUSIONS

- Modeling activities with fan carts promotes understanding of Newton's laws
- Blend of reflective writing and labatorials can:
  - Change students' attitudes toward learning physics
  - Change their conceptual knowledge of forces and motion

REFERENCES

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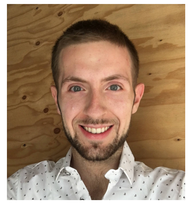

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