

Scaffolding the Transition to Higher- level Physics at the University of Virginia

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CSAAPT Semi-Virtual Meeting

1 April 2023

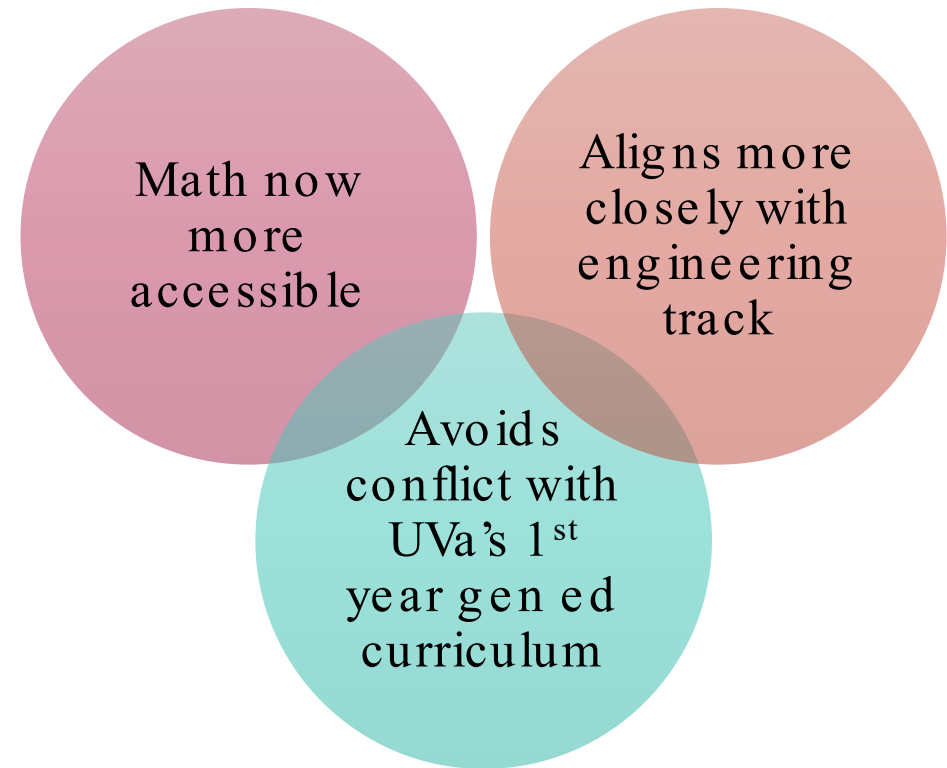


Overview

- Evolution of the intro physics curriculum at UvA
- PHYS 2720: Problem Solving and Special Topics in Classical Physics
 - Motivation behind the course
 - Current implementation
- Early results and lessons learned
- Future goals and outlook

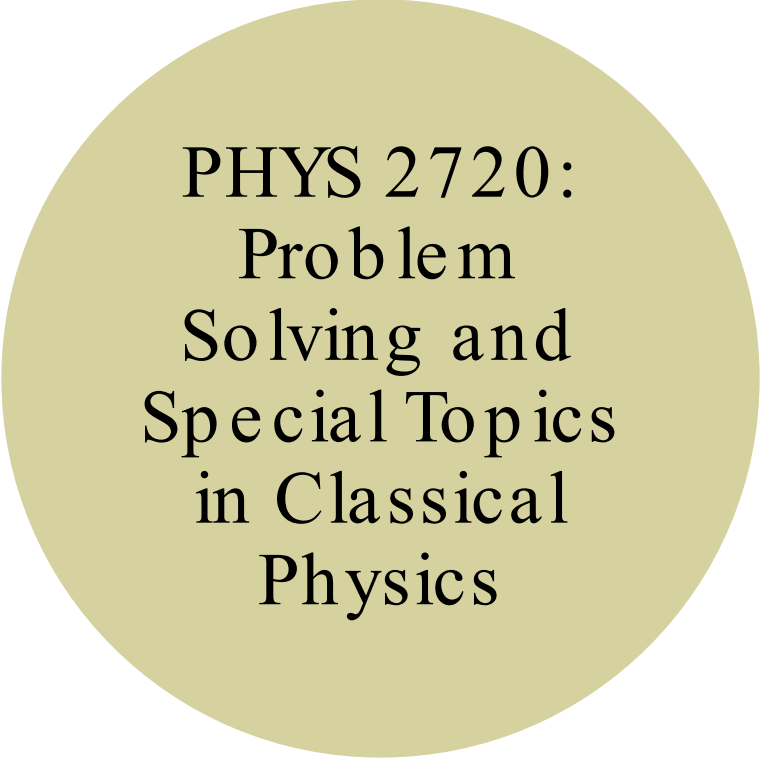
Evolution of Intro Physics Curriculum

- 2015-2021
 - Physics starts in fall of 1st year
 - 2 semesters of intro lecture, 5 credits each
 - Calc I pre-requisite for fall of 1st year
- 2022-Present
 - Physics starts in spring of 1st year
 - 2 semesters of intro lecture + labs, 3 + 1 credits each
 - Calc I pre-requisite for spring of 1st year



Evolution of Intro Physics Curriculum

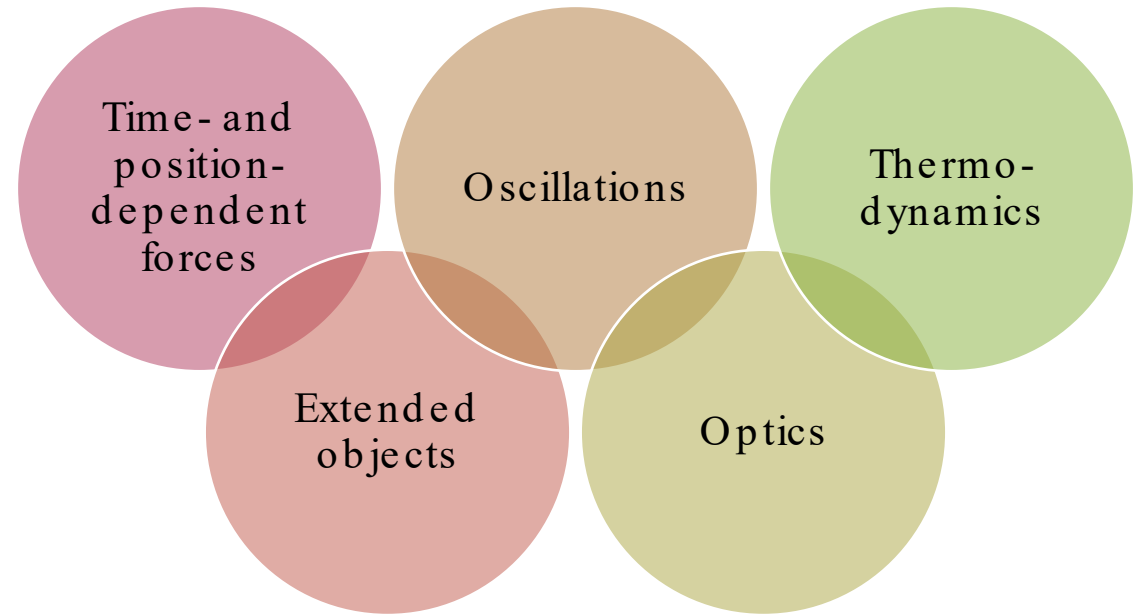
- Lecture credit hours reduced by 40%
- Later start → more urgency to prepare students for research
- Higher-level curriculum largely unchanged
- Solution: new course to “fill in the gaps” and help students transition to higher-level physics courses



PHYS 2720:
Problem
Solving and
Special Topics
in Classical
Physics

PHYS 2720: Problem Solving and Special Topics in Classical Physics

- 2-credit course
- Taken in spring of 2nd year
 - Spring of 1st year for students with AP credit
- After 2-semester intro sequence
- Meets 2x weekly for 75 minutes
- Active learning and group problem-solving
- Extensive reliance on calc I-III, basic ODEs



PHYS 2720: Problem Solving and Special Topics in Classical Physics

Weekly Assignments:

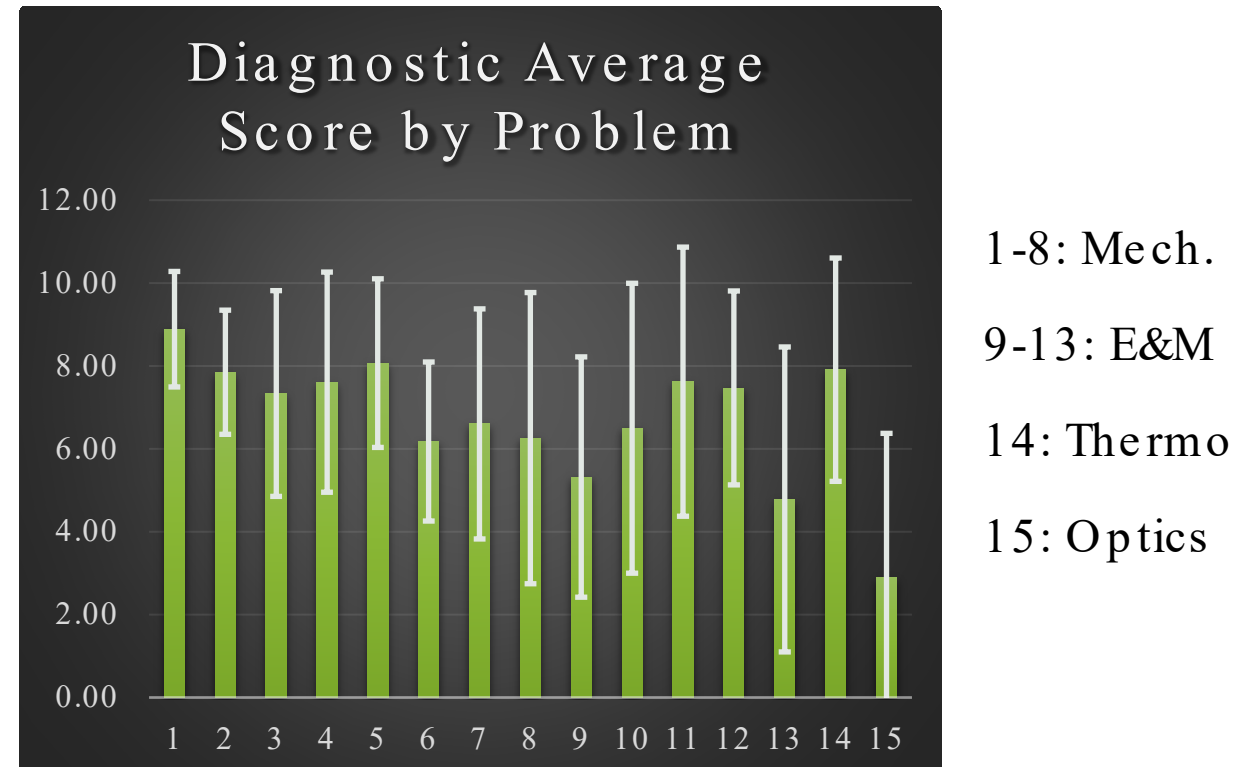
- Pre-class reading
- Pre-workshop exercises (45% of grade)
- Group written homework (50% of grade)
- Self- and peer-evaluations (5% of grade)

Points of Emphasis:

- Group work – signed contracts of expectations for team members
- Applying math to physics – more reliance on calculus than in intro sequence
- Graphing – establish good habits of labeling axes, scaling appropriately, etc.
- Long, multi-step problems – more closely aligned with 3000+ level courses
- Connecting physics topics – e.g., resonance in mechanical oscillators and LRC circuits

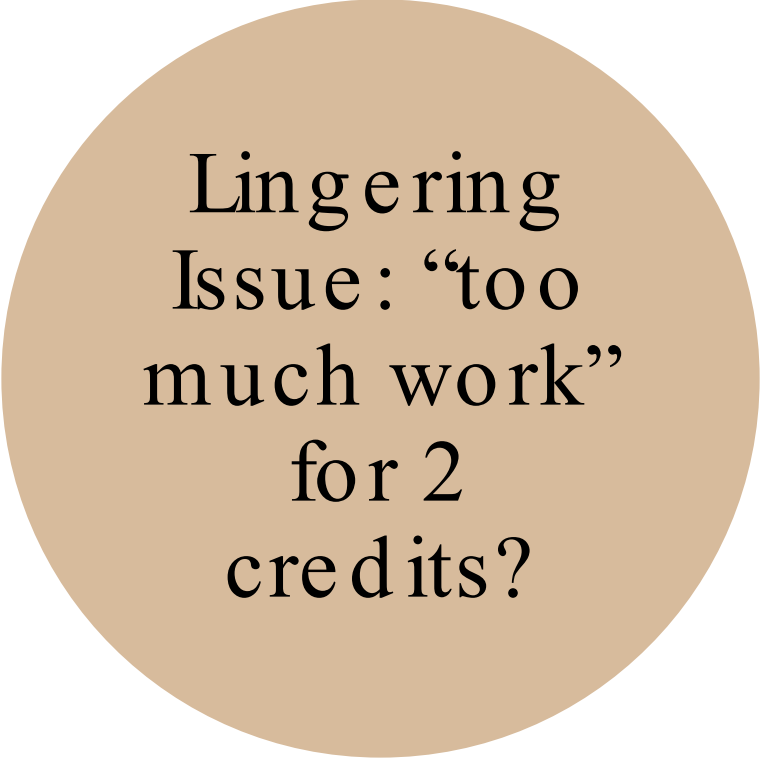
Early Results

- Pre-class diagnostic provided insights into students' strengths and weaknesses
- Students' fluency with graphing was poor initially, but rapidly improving
- Group dynamics are very good
- Students need more repetition/practice than we realize on key topics/techniques



Future Goals and Outlook

- Preserve focus on skill development rather than assessment
- Introduce students to numerical methods
- Expand course offering to summer session
 - Will make scheduling easier for transfer students
 - Could also be taken by Physics Bridge students in graduate program



Lingering
Issue: “too
much work”
for 2
credits?