Linking Gains in Physics Affinity to Pedagogy in Introductory Physics for Life Sciences (IPLS)

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Research Question

What pedagogical moves are responsible for gains in Physics Affinity in IPLS courses?

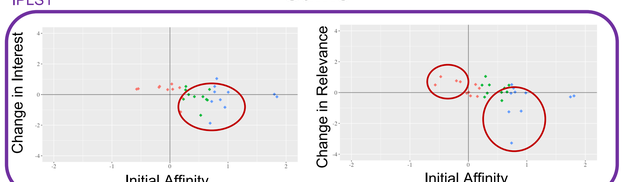
Background

IPLS Courses at Swarthmore lead to **durable gains** in **quantitative skills** and **attitudes towards physics** [1]

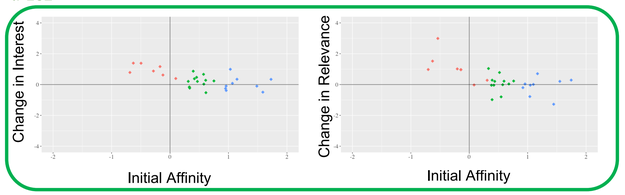
Precise mechanism responsible for gains is **unknown** [2]

Different **Instructors** produced different **Affinity Gains**

IPLS1



IPLS2



Medium-High Initial Affinity students lose **Interest** in IPLS1 but retain it in IPLS2

Students **generally** have higher gains in **Relevance** in IPLS2 compared to IPLS1

Methodology

Quantitative

Anonymous survey before and after each semester

Measures **Interest**, **Relevance** of Physics to Biology, and **Self Efficacy**

Collectively termed **Physics Affinity**

Qualitative

Written Reflections throughout each Semester

Semi-Structured Interviews with Student Volunteers

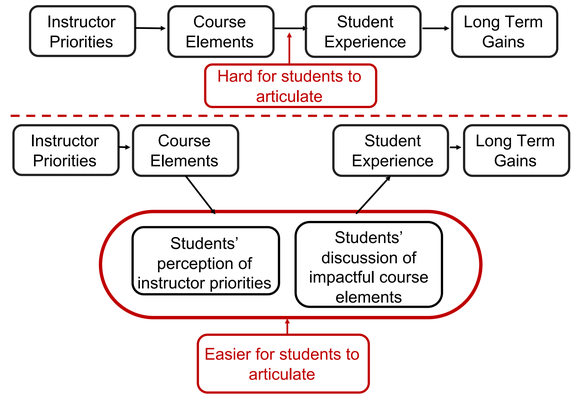
Varied Prompts relating **Course Elements** to **Learning Experiences**

There is coherence between instructor priorities, student perception of instructor priorities, and student-identified impactful course elements in Swarthmore’s IPLS courses

This coherence may help us understand the link between instructor priorities and physics affinity gains

	Instructor Priority	Students’ Perceived Instructor Priority	Student-Identified Impactful Course Element
IPLS1	Emphasis on the *process of physical modelling*	Conveying excitement about physics as a science	**Modeling Projects** *“We chose to focus on other factors that **limit the validity of the models** and saw how **combining the two models** could help with the deficits… I am gaining an overall more comprehensive and complex understanding of some of **the important pillars of physics**.”*
IPLS2	Emphasis on *highlighting physical models of biological systems*	Conveying excitement about the connections between physics and other sciences	**Models in Lectures** *“The teaching method of [the IPLS2 Instructor]... **connects all these new concepts** into building our understanding of how the **cell membrane** works through a **physics perspective**.”*

Learning Framework



Coherence between Instructor Priorities, Impactful Course Elements, and Student Perception suggests **Buy-In** from students, increasing the likelihood of **Achieving Learning Outcomes**

Shared IPLS Priorities

Conveying excitement about connections between physics and biology

Telling coherent story that centers biological models

Provides opportunity to problem solve in a biological context (quantitatively and qualitatively)

Comfortable learning environment

Support in meeting high expectations

[3]

References

[1] B. D. Geller, et al., (2022a, 2022b)
Rak, et al. (2019) AAPT Talk

[2] C. H. Crouch, et al. (2018)

[3] C. H. Crouch and K. Heller (2014)
B. D. Geller, C. Turpen, C. H. Crouch (2018)

Acknowledgements

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