

# Characterizing “Physics Affinity” in Introductory Physics for Life Sciences at Three Institutions



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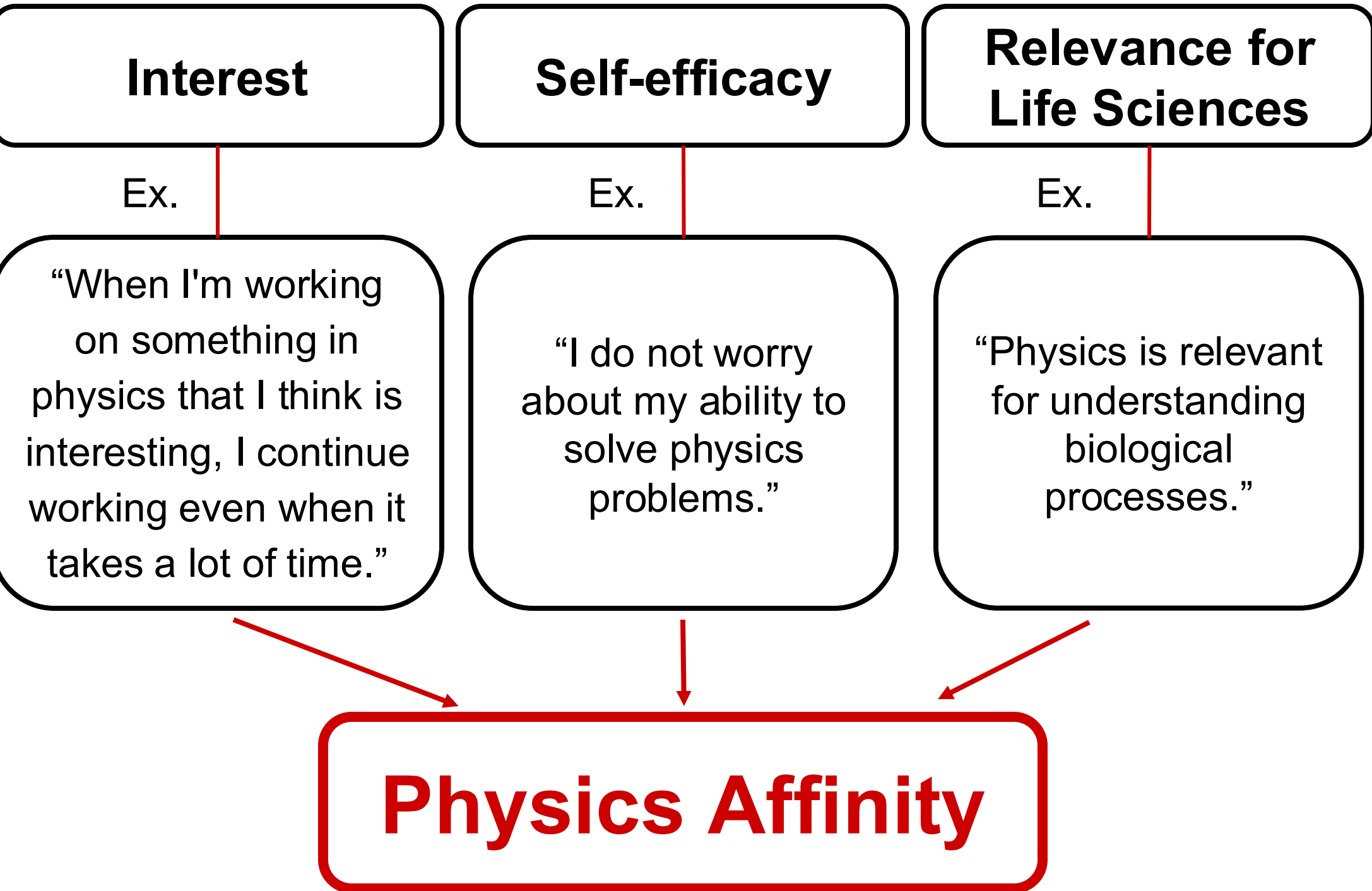
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## Prior Findings & Motivation

**Student attitudes** about the **relevance of physics** to the life sciences, as well as certain **physical and quantitative skills**, have been shown to **improve during the Introductory Physics for Life Sciences (IPLS) sequence at Swarthmore**, and these **gains persist for at least a year or more (1)**. To begin to better understand the source of these longitudinal gains, and the pedagogical factors influencing them, we assessed the development of “Physics Affinity” across several instructional contexts.

## Physics Affinity Survey

Our physics affinity metric combines three dimensions that have been shown to affect learning and motivation. Items measuring interest (8), self-efficacy (8) and relevance (4) were drawn from validated instruments (2).



## Research Question

How do “Physics Affinity” scores vary across different instructional and pedagogical environments?

## Instructional Contexts

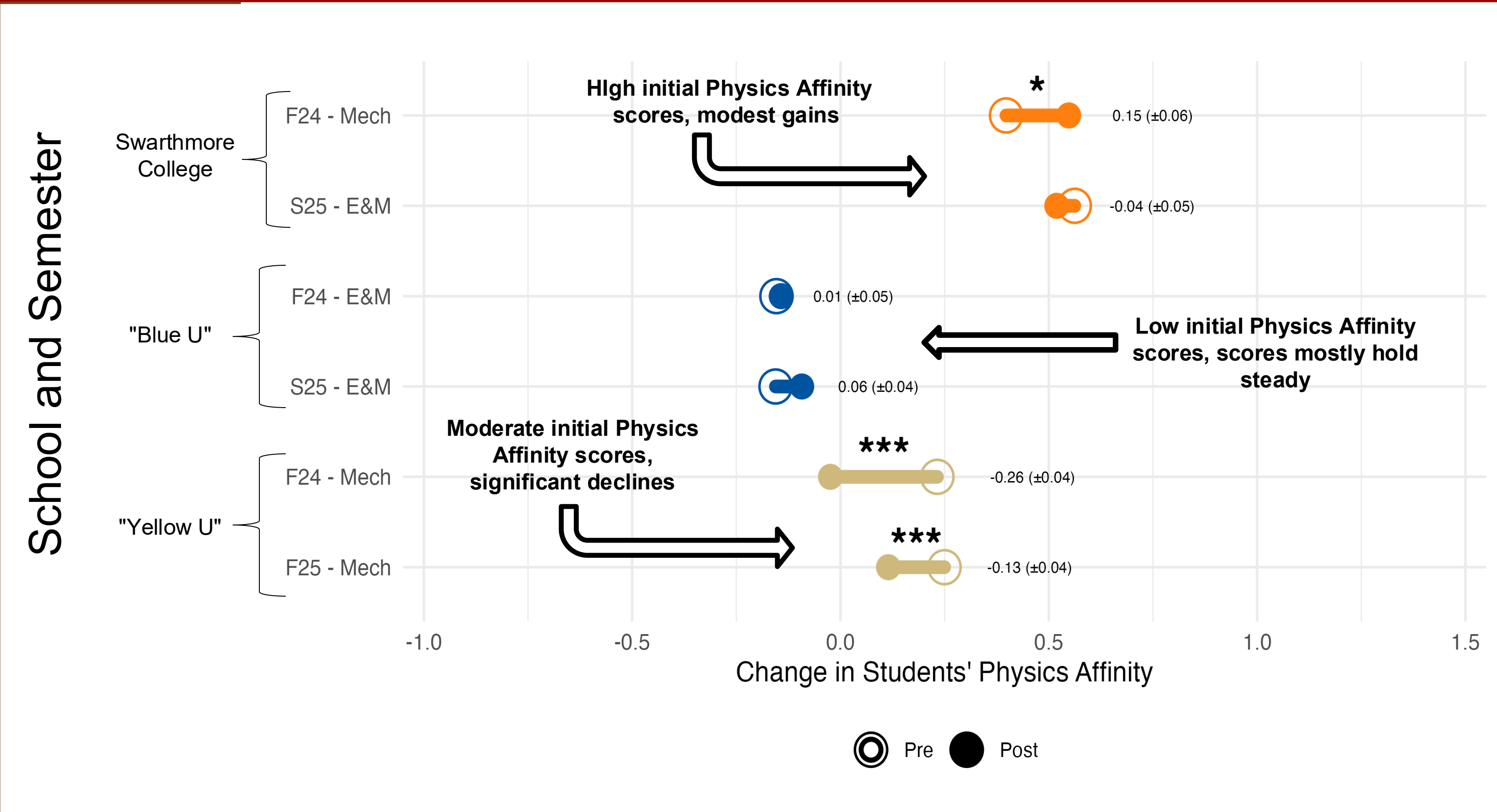
We partnered with 2 large public institutions:

| "Blue U"                                                                                                                                                                                                                                                                                                                                                                                                 | "Yellow U"                                                                                                                                                                                                                                                                                                                                                                                 | Swarthmore College                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Large public institution</li><li>• ~ 20,000 undergraduate students</li><li>• 69% acceptance rate</li><li>• Courses taught by an instructor with many years of experience teaching IPLS material to life science students, but only in his second year at the institution</li><li>• Students in the study a mix of pre-health and life science students</li></ul> | <ul style="list-style-type: none"><li>• Large public institution</li><li>• ~ 33000 undergraduate students</li><li>• 76% acceptance rate</li><li>• Courses taught by an experienced instructor with a long history of teaching life science students, but who had not reformed the course to be IPLS.</li><li>• Students in the study a mix of pre-health and life science majors</li></ul> | <ul style="list-style-type: none"><li>• Small liberal arts college</li><li>• ~ 1600 students</li><li>• 7% acceptance rate</li><li>• Courses taught by an experienced IPLS instructor who had taught the same population for many years</li><li>• Students in the study a mix of pre-health and life science majors</li></ul> |

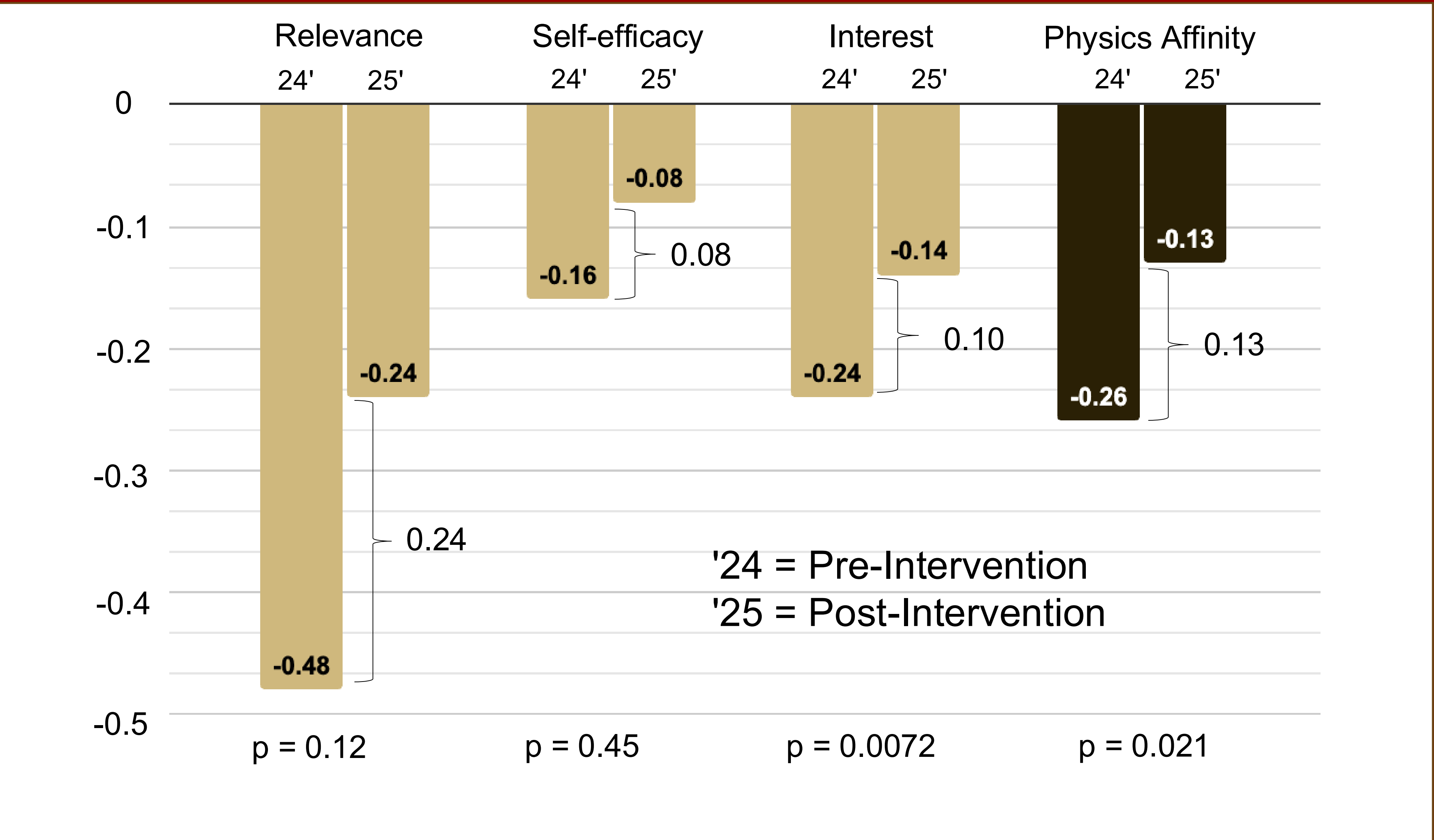
## Survey Analysis

- Matched data across each semester
- Converted 5-point Strongly Disagree to Agree responses to a -2 to +2 scale

## Initial physics affinity scores and changes in those scores depend on institutional context and pedagogical structure.



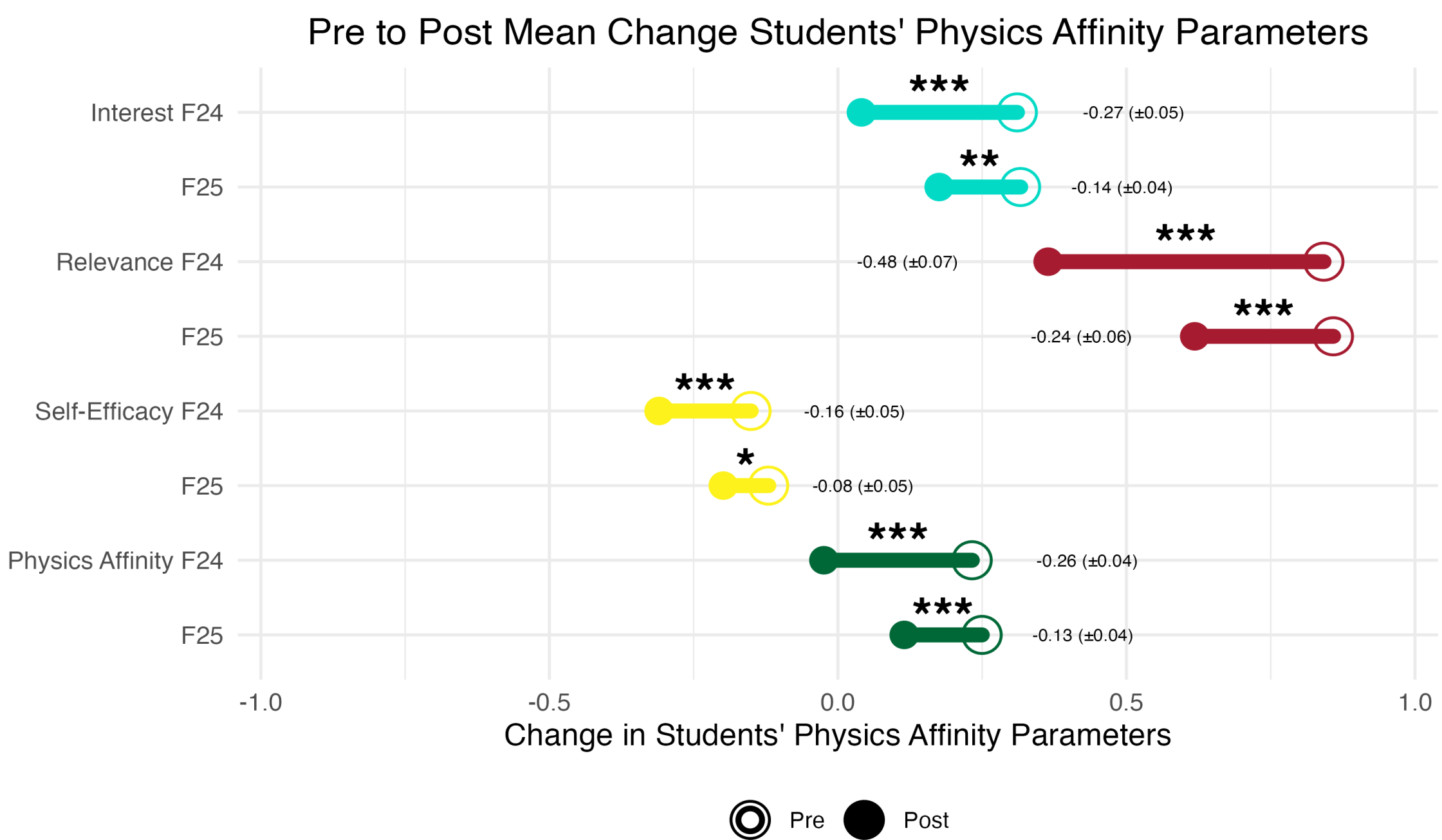
## Students' affinity scores improved at Yellow U after the course incorporated more life science examples and messaging, driven primarily by an increase in students' sense of physics as being relevant.



## The Intervention at Yellow U

The intervention at Yellow U involved the instructor integrating life-science examples and explicit framing about the applicability of physics to the life sciences into the course. Connections to biology and medicine were regularly highlighted in an effort to increase student motivation and interest, and to emphasize that physics is relevant to students' other academic interests.

The following data represent student scores on each of the Physics Affinity dimensions (Interest, Relevance, and Self Efficacy) and in overall Physics Affinity both before (Fall 2024) and after (Fall 2025) the intervention.



After the intervention, there were still declines in student scores on all dimensions of Physics Affinity, and in the overall Physics Affinity score, but those declines were reduced in every case.

## References

- (1) Geller & Tipton *et al.*, PR-PER (2022), Geller & Rubien *et al.*, PR-PER (2022), Rak *et al.*, AAPT Talk (2020).
- (2) Michaelis and Nathan (2015), Four-Phase Interest Development in Engineering Survey, FIDES 2.0; Fendl and Scheel (2004), Physics Self-Efficacy Survey, PSES; K. Hall thesis (2012), MBEX Interdisciplinary Cluster items

## Acknowledgements

Thank you to our advisory board: Andrew Boudreaux, Eric Brewe, Eric Kuo, Tim Nokes-Malach, and Laura Ríos.  
This research was funded by NSF DUE-2142074 and Swarthmore College.