

The Journey of Quantitative Literacy Development: Insights from Physics Majors

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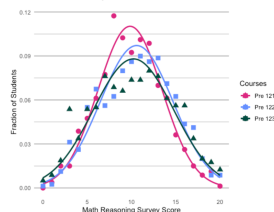
INTRODUCTION

What is

- ★ **Quantitative Literacy (QL)**: the ability to understand, interpret, and apply numerical and mathematical information across various contexts.
- ★ **Physics Quantitative Literacy (PQL)**: the blending of conceptual and procedural mathematics to generate and apply quantitative models of physical phenomena.
- ★ **Physics Inventory for Quantitative Literacy (PIQL)**: a multiple-choice test designed to assess PQL in everyday and abstract contexts.

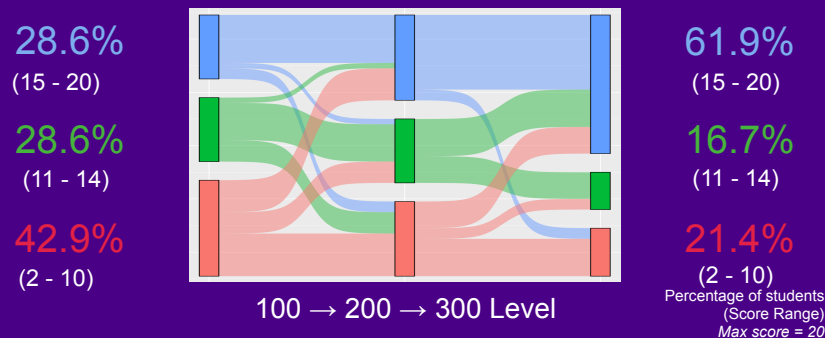
METHOD

- ★ Where: University of Washington
- ★ When: between 2020 - 2023
- ★ Who: Matched groups of physics majors (anonymized by code) from 3 levels of courses
 - * Number of people in each matched set:
 - 100 - 200 Level: 198
 - 200 - 300 Level: 60
 - All Three Levels: 42
- ★ How:
 - * Quantitative: We group students by thirds according to their pretest scores and use the same breakdown for posttest.
 - * Qualitative: Free response survey collected from 102 students after they took the PIQL.

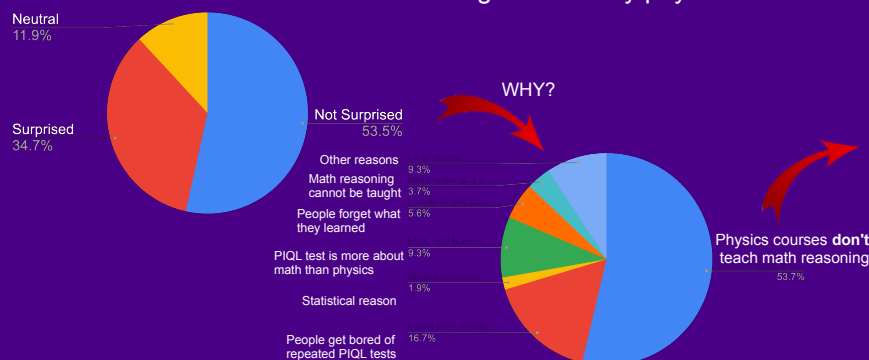


Physics majors develop *algebraic reasoning* but they don't perceive it as "*doing physics*"

Students' transitions between low, medium, and high scoring groups.



Are physics majors surprised that students don't typically reason math better after taking introductory physics?

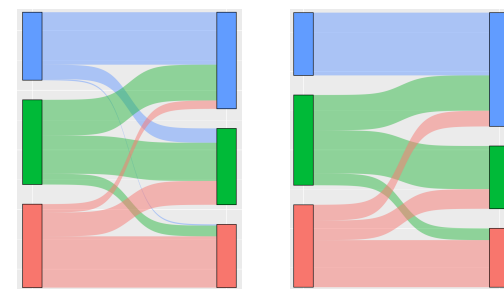


DUE-2214765 DUE-1832880
DUE-2214283 DUE-1833050
DUE-1832836 DGE-1762114

For more information and list of references, check out the QR code! →



MORE RESULTS



100 → 200 Level

200 → 300 Level

100-200	Number of People	Average Score	Percentage	Number of People	Average Score	Percentage
Low (2 - 10)	73	7.43	36.1	57	8.59	28.2
Medium (11 - 14)	71	12.5	35.1	64	13.9	31.7
High (15 - 20)	58	16.7	20.8	81	17.9	40.1

200-300	Number of People	Average Score	Percentage	Number of People	Average Score	Percentage
Low (4 - 12)	21	8.48	35	15	7.93	25
Medium (13 - 15)	23	13.8	38.3	16	13.9	26.7
High (16 - 20)	16	17.1	26.7	29	17.6	48.3

100-300	Number of People	Average Score	Percentage	Number of People	Average Score	Percentage	Number of People	Average Score	Percentage
Low (3 - 12)	18	9.33	42.9	14	9	33.3	9	8.44	21.4
Medium (13 - 14)	12	13.4	28.6	12	13.5	33.4	7	13.7	16.7
High (15 - 20)	12	16.3	28.6	16	16.6	38.1	26	17.1	61.9

Why do they think so?

Max score = 20

- * "...in my experience UW physics does not teach math reasoning skills"
- * "...the intro physics courses are more about learning the details of the physics rather than broader math reasoning skills"
- * "...intro physics is too dense with memorizing equations, it does not introduce mathematical creativity very much for better or worse"
- * "...the intro series of physics courses is also pretty poor at building up mathematical reasoning skills, ... with the math consistently being the most difficult part as well as the most glossed over part of these courses"

DISCUSSION

What are we doing next:

- ★ Collect more data and look more closely into students who change their groups and who stay in the same groups
- ★ Compare students' PIQL scores with their course grade and see if there is a connection