

Values

- Critical reasoning, problem-solving, and scientific literacy skills are valuable to students both in school and in life beyond school.
- One does not need to "get" physics concepts right away in order to succeed in physics, and students benefit from being taught how to approach challenging material for deep learning. Start by assuming best intent.

Student Learning Outcomes

Given TA education about the ability to improve at the skills necessary to succeed as a physics student and communication of that learning to students, and specific focused group work helping students to develop physical intuition and a methodical approach to new physical scenarios, students will be able to apply their conceptual understanding of topics to solve problems and evaluate whether their work has resulted in a "reasonable solution".

Instructional Strategy - Pedagogy

- Re-oriented classroom architecture to facilitate cooperative learning in small groups.
- 2. Utilized think-pair-share, structured problemsolving, group discussions, and studentteaching to engage students in

References

- CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from <u>http://udlguidelines.cast.org</u>
- Dweck, C. S. (2006). *Mindset: The new Psychology of Success*. Random House.
- Columbia CTL (2020). Guide for Inclusive Teaching at Columbia.
- Spatz, V., & Goldhorn, L. (2021). When It's More Difficult, I Just Cram More! An Exploratory Interview Study on Students' Mindsets in Physics. *European Journal of Science and* Mathematics Education, 9(3), 92-109. https://doi.org/10.30935/scimath/10948

Developing Physics Problem-solving Intuition Skills in a Physics Discussion Section

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- **UDL:** Perception
- 5. UDL: Language and Symbols



- into AL discussion.
- and the instructor.

Mindset Survey <u>Concept</u>: By practicing their problem-solving intuition, students will shift towards viewing physics with more of a growth mindset, as suggested by Spatz & Goldhorn (2021). <u>Reality</u>: Growth mindsets in physics and in general started and remained equally high in both AL and "traditional" classes.



Teach as Instructor of Record for a summer astronomy course, and better align assessments with learning outcomes and curriculum design/pedagogy.

Assessment

Students requested to switch from "traditional"

By the end of the semester, students were much more confident in narrating their problemsolving approach and evaluating the reasonableness of their solutions to their peers

Students in AL discussion were less likely to leave problems blank and received more partial credit on final exam by utilizing and explaining problem-solving intuition.

Future Directions