CSAAPT/NCS-AAPT F24

DESMOND VILLALBA

PHYSCHATS:

AN ONGOING ATTEMPT TO NORMALIZE PHYSICS

University of Mary Washington

OUTLINE

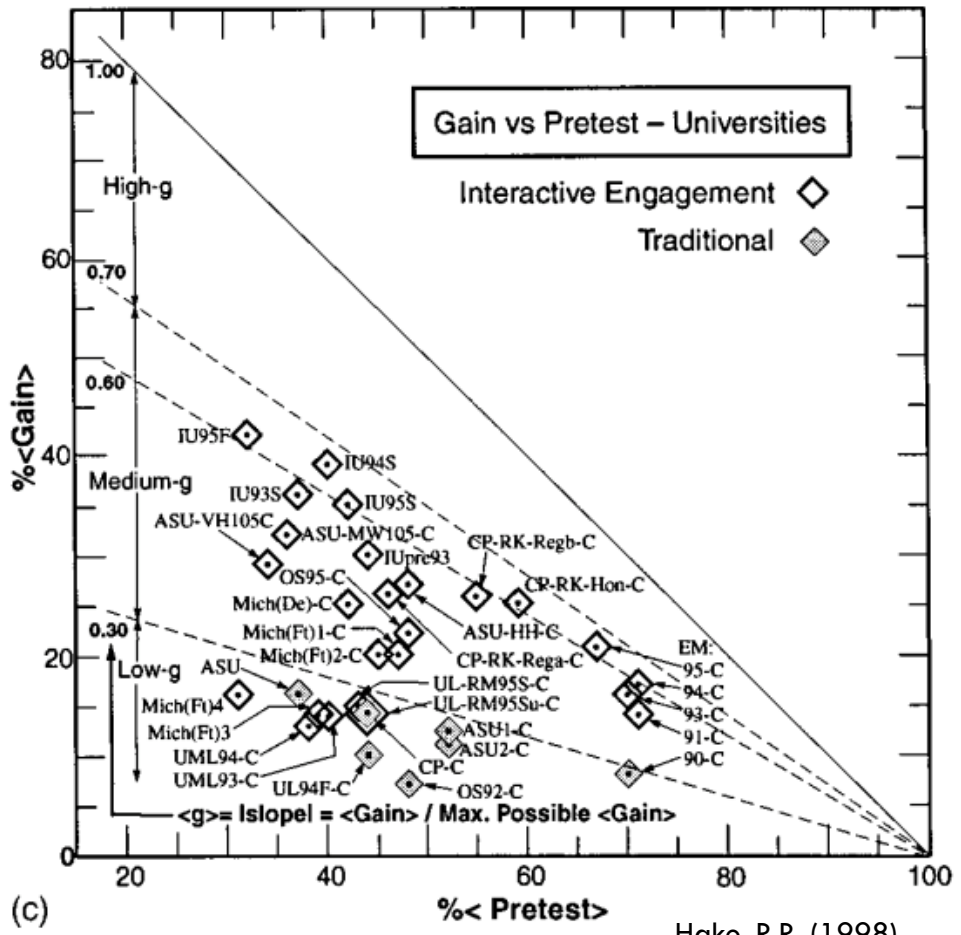
- Why?
- What is it?
- Progress so far
- Conclusions and Discussions

W H Y


I HAVE ATTEMPTED SCIENCE
PLEASE EXPLAIN
I FORMED AN IDEA AND THEN DISCOVERED I WAS WRONG.
THERE ARE NUMEROUS DIAGRAMS
I WAS WRONG IN NUMEROUS WAYS
I PRODUCED A DETAILED TRIBUTE TO MY WRONGNESS
THAT IS SCIENCE
NATHANWPYLE

W H Y

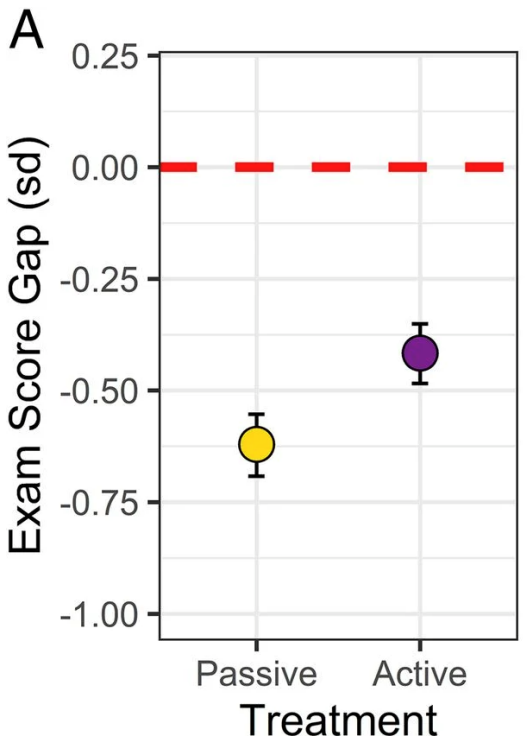
- Active learning in physics results in better gains in understanding

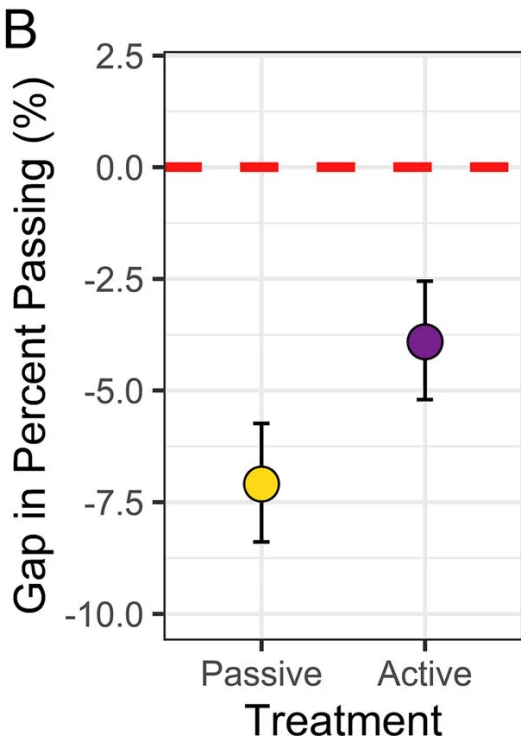


Hake, R.R. (1998)

W H Y

- Active learning in physics results in better gains in understanding
- Active learning helps reduce achievement gaps for underrepresented students in STEM fields





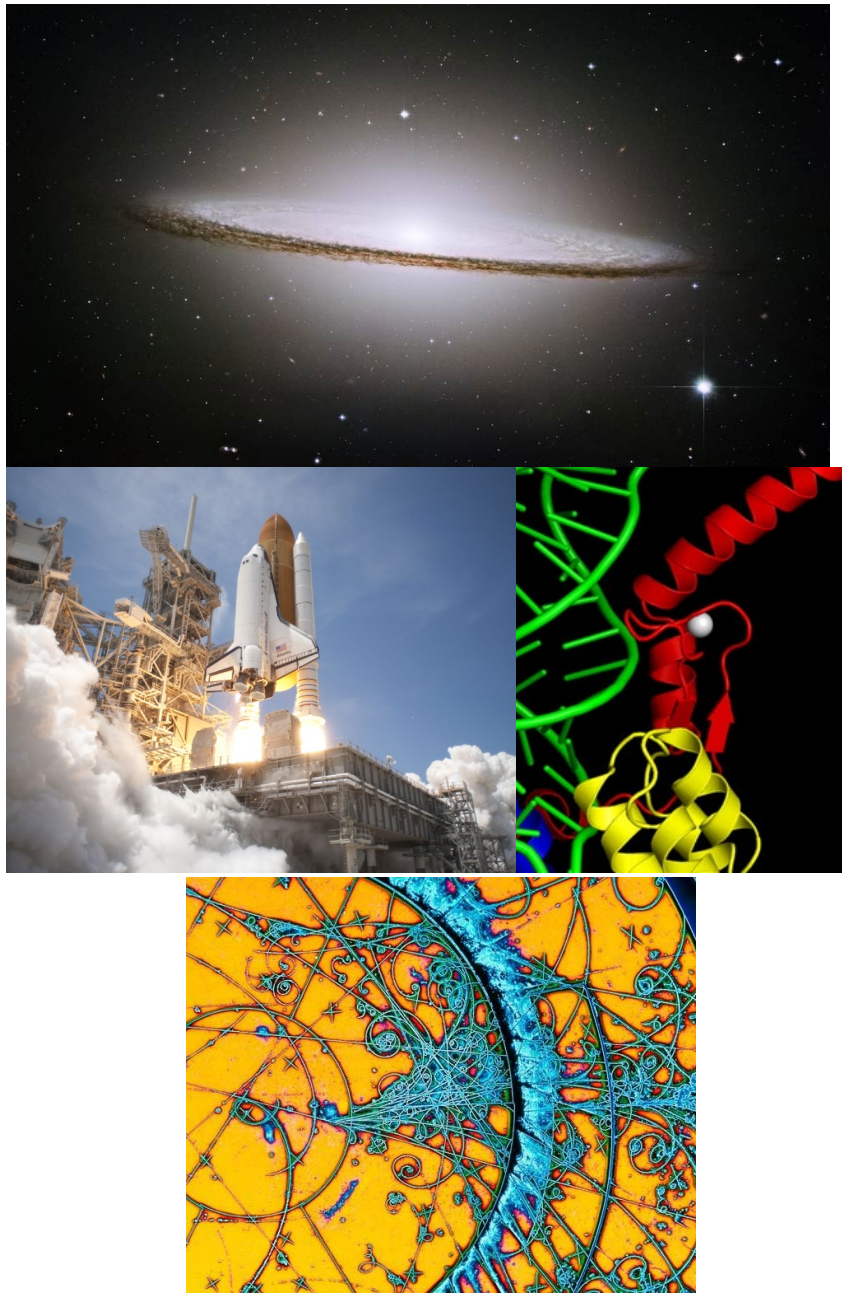
Theobald, Hill, et al. (2020)

Traditional

Active

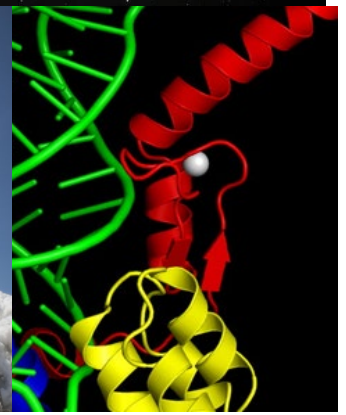
W H Y

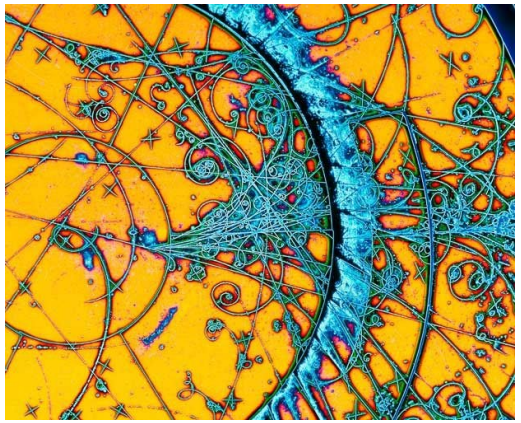
- Active learning in physics results in better gains in understanding
- Active learning helps reduce achievement gaps for underrepresented students in STEM fields
- Physics is cool!



WHY

- Active learning in physics results in better gains in understanding
- Active learning helps reduce achievement gaps for underrepresented students in STEM fields
- Physics is cool!
- Other disciplines do something like this already (Foreign Language, Literature, etc.)





WHAT IS IT?

- Student Participation Grade (12%)
  - Activity sheets (group) completed in class

General Physics 101

Activity Sheet Example (group)

2.1 For this problem decide what you want to lay out in **2D** on the floor or a wall. You will need a meter stick to record the location of your object.

A) Convert your 2D scenario to a coordinate system in the space provided below. This doesn't need to be to scale, but it should roughly indicate relative to your origin where the object is.

B) Place your object at **two separate locations** away from the origin and not just along an axis, then record the position vectors below. Make sure to write them as 2D vectors like $\vec{r} = r_x\hat{i} + r_y\hat{j}$ or like $\vec{r} = \begin{bmatrix} r_x \\ r_y \end{bmatrix}$.

WHAT IS IT?

- Student Participation Grade (12%)
  - Activity sheets (group) completed in class
  - PhysChat (solo) completed out of class that student schedules with me

General Physics 101

Activity Sheet Example (group)

2.1 For this problem decide what you want to lay out in **2D** on the floor or a wall. You will need a meter stick to record the location of your object.

A) Convert your 2D scenario to a coordinate system in the space provided below. This doesn't need to be to scale, but it should roughly indicate relative to your origin where the object is.

B) Place your object at **two separate locations** away from the origin and not just along an axis, then record the position vectors below. Make sure to write them as 2D vectors like $\vec{r} = r_x\hat{i} + r_y\hat{j}$ or like $\vec{r} = \begin{bmatrix} r_x \\ r_y \end{bmatrix}$.

WHAT IS IT?

- Student Participation Grade (12%)
  - Activity sheets (group) completed in class
  - PhysChat (solo) completed out of class that student schedules with me
  - Every student must complete two PhysChat sessions with me over the semester

General Physics 101

Activity Sheet Example (group)

2.1 For this problem decide what you want to lay out in **2D** on the floor or a wall. You will need a meter stick to record the location of your object.

A) Convert your 2D scenario to a coordinate system in the space provided below. This doesn't need to be to scale, but it should roughly indicate relative to your origin where the object is.

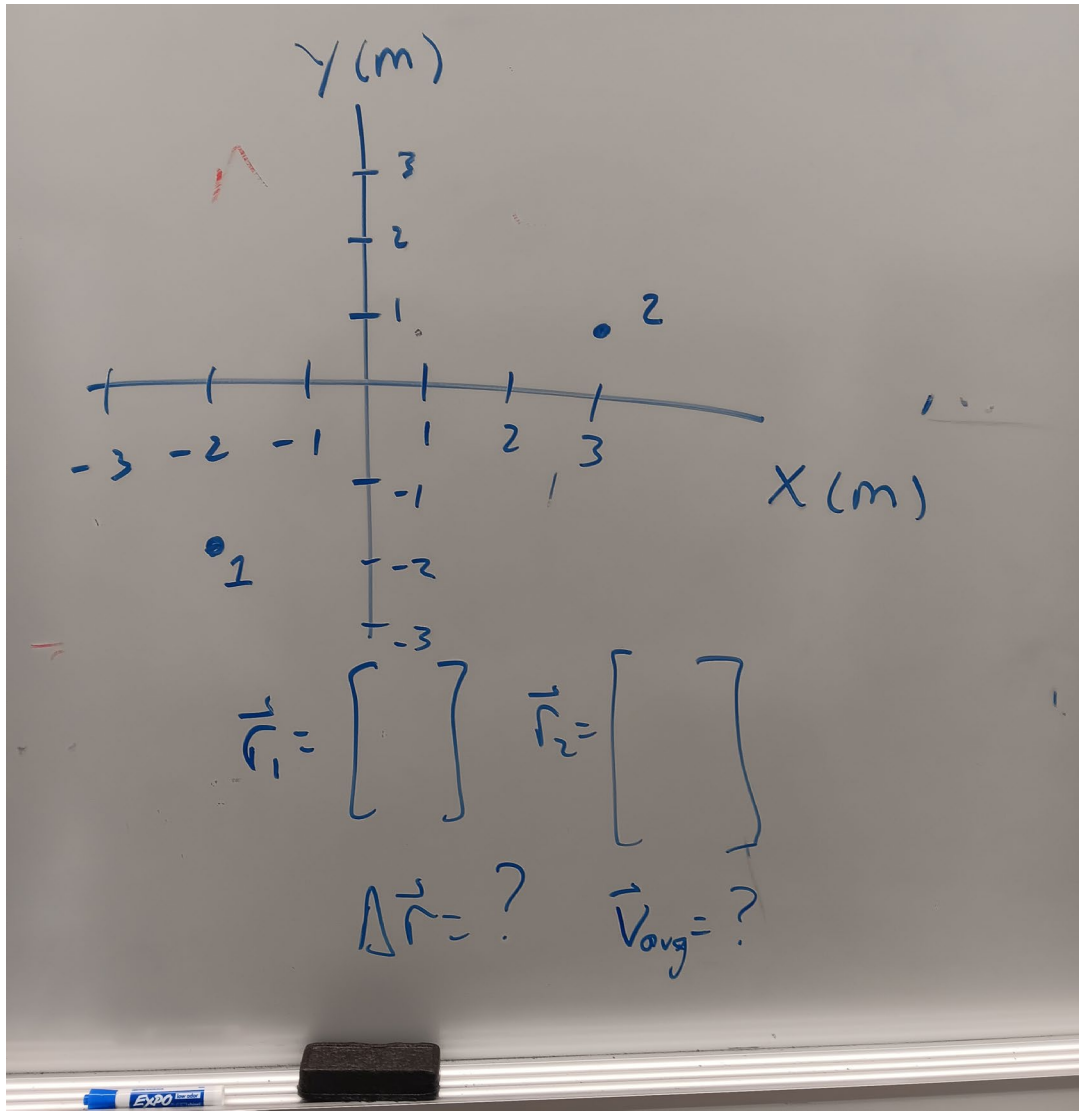
B) Place your object at **two separate locations** away from the origin and not just along an axis, then record the position vectors below. Make sure to write them as 2D vectors like $\vec{r} = r_x\hat{i} + r_y\hat{j}$ or like $\vec{r} = \begin{bmatrix} r_x \\ r_y \end{bmatrix}$.

General Physics 101

WHAT IS IT?

- PhysChat- Organic Informal Discussion
    1. Walkthrough similar aspects of group assignment

PhysChat Example (solo)

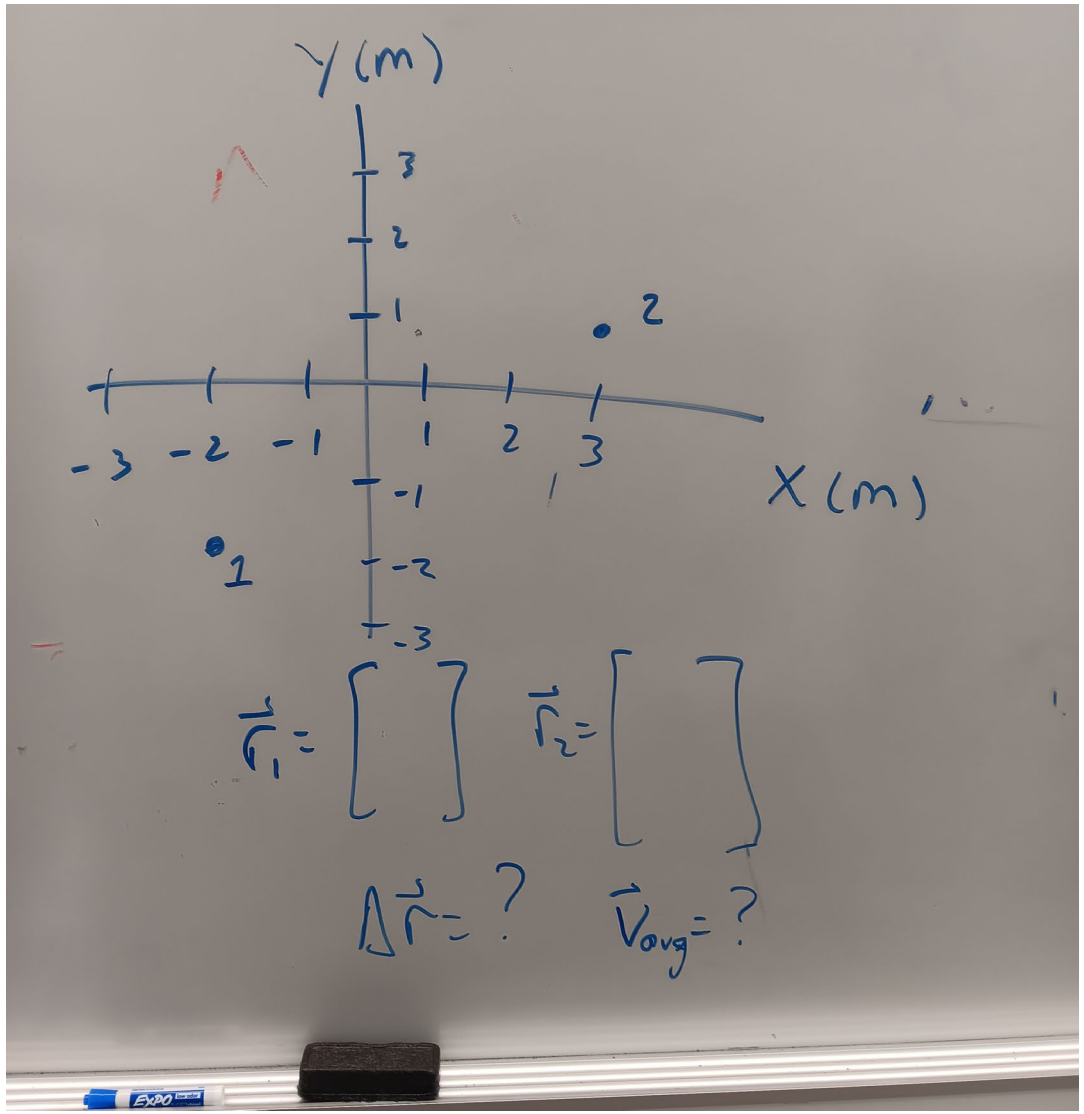


General Physics 101

WHAT IS IT?

- PhysChat- Organic Informal Discussion
    1. Walkthrough similar aspects of group assignment
    2. Ask them to verbalize reasons/assumptions for choices

PhysChat Example (solo)

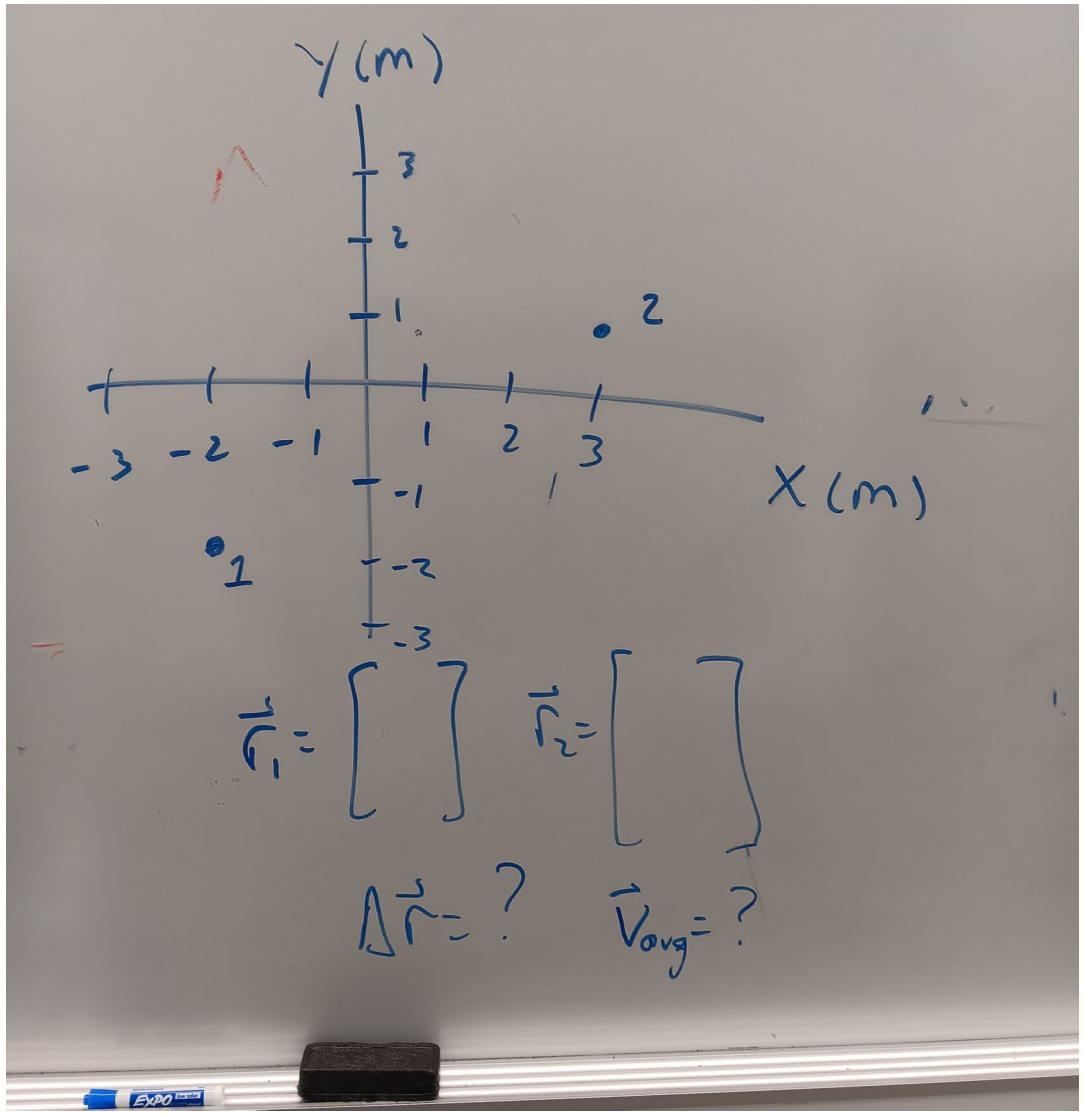


General Physics 101

WHAT IS IT?

- PhysChat- Organic Informal Discussion
    1. Walkthrough similar aspects of group assignment
    2. Ask them to verbalize reasons/assumptions for choices
    3. Wrap up and see if they have questions

PhysChat Example (solo)

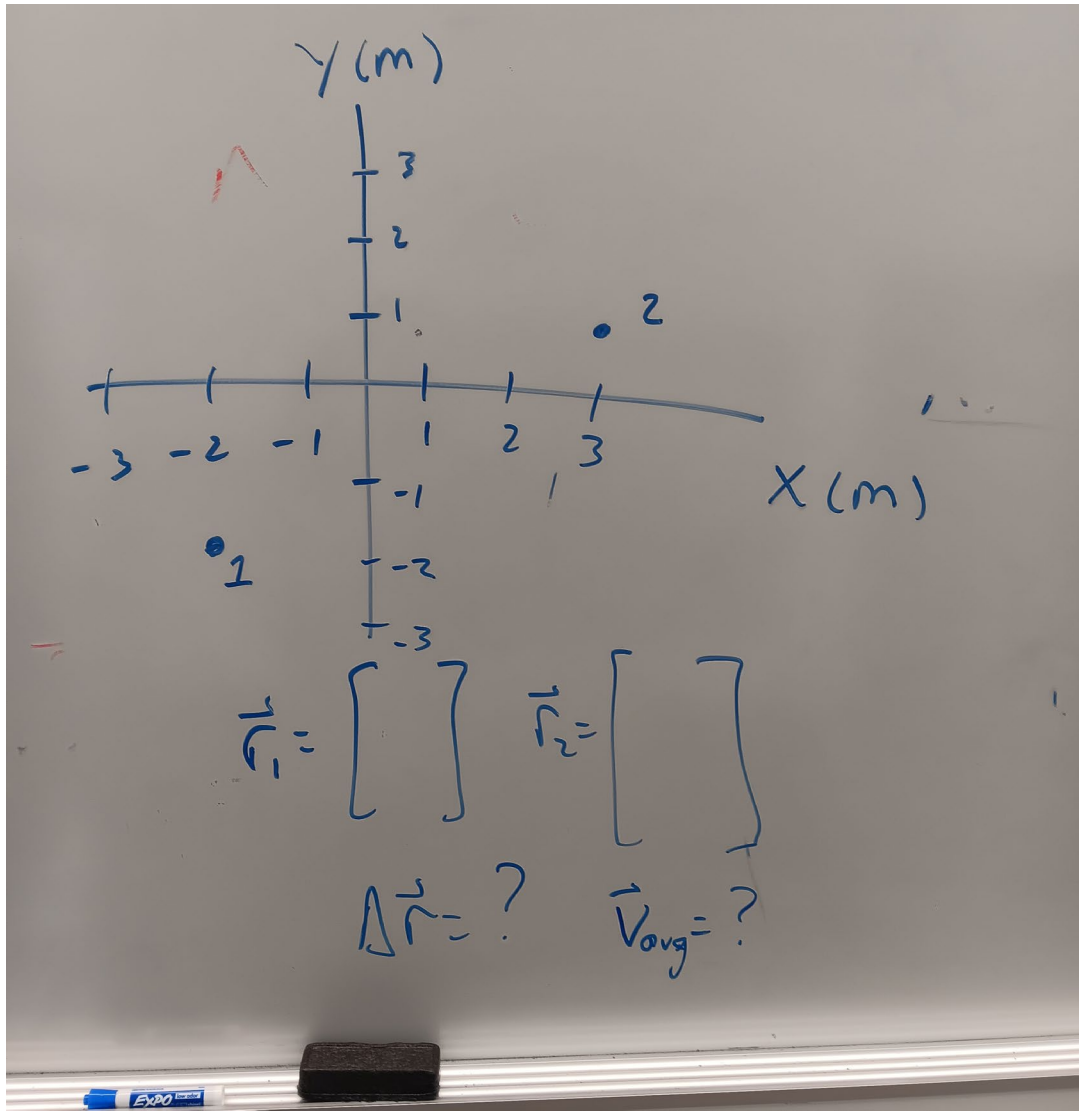


General Physics 101

WHAT IS IT?

- PhysChat- Organic Informal Discussion
    1. Walkthrough similar aspects of group assignment
    2. Ask them to verbalize reasons/assumptions for choices
    3. Wrap up and see if they have questions
    4. Grade with my basic rubric based on three categories: **Qualitative, Quantitative,** and **Logical Reasoning**

PhysChat Example (solo)



PROGRESS SO FAR

- Carried out in 2.5 intro classes so far (101,102)
- Good conversations with students and segue to material

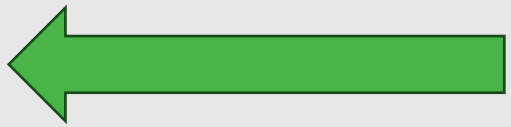
Class	PhysChat Average
101 F23	94
102 F24	95

PROGRESS SO FAR

Successes	Challenges
Of students that have completed, they've done well	Need to increase compliance
Opened the door to further conversations and help desk (physics is hard, BUT...)	Want to streamline sign up/scheduling
Assesses students' comprehension individually	Logistic issues with large classes (N>20)
I learn about how they learn and process physics topics and problem solving	

PROGRESS SO FAR

Successes	Challenges
Of students that have completed, they've done well	Need to increase compliance
Opened the door to further conversations and help desk (physics is hard, BUT...)	Want to streamline sign up/scheduling
Assesses students' comprehension individually	Logistic issues with large classes (N>20)
I learn about how they learn and process physics topics and problem solving	



CONCLUSIONS AND DISCUSSIONS

- A fun and enlightening process (ongoing!)
- Provided me another way to assess in a more informal setting
- Successes and Challenges
- I plan on piloting in 106 (Calculus based) spring semester
- Thank you!

REFERENCES

1. Hake, R. R. (1998). Interactive-engagement versus traditional methods: A six-thousand-student survey of mechanics test data for introductory physics courses. American Journal of Physics, 66(1), 64–74. doi:10.1119/1.18809

2. Active learning narrows achievement gaps for underrepresented students in undergraduate science, technology, engineering, and math Elli J. Theobald ellij@uw.edu, Mariah J. Hill, Elisa Tran, +29, and Scott Freeman https://orcid.org/0000-0003-0988-1900 ellij@uw.eduAuthors Info & Affiliations