

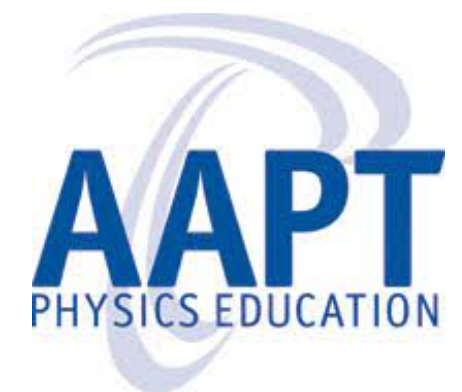
"The Art and Science of Teaching"

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2023 American Association of Physics Teachers Intern

University of Texas at El Paso

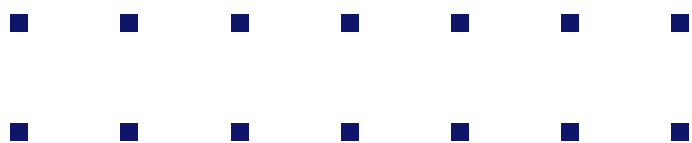
Mentor: Justine Harren



Teaching Physics

Physics is a fundamental science that explores the nature of matter, energy, space, and time.

Effective teaching in physics requires a balance between the art of engaging students and the science of conveying complex concepts.

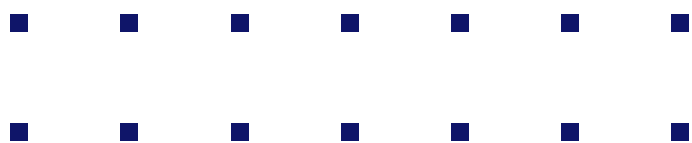


The Art of Teaching Physics

Engaging Pedagogy: Captivate students' interest with demonstrations, hands-on experiments, and interactive activities.

Effective Communication: Master a clear explanation and adapt teaching techniques to match diverse learning needs.

Cultivate Curiosity: Encourage students to ask questions, explore concepts, and develop a genuine interest in physics.

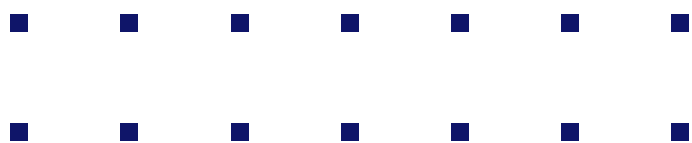


The Science of Teaching Physics

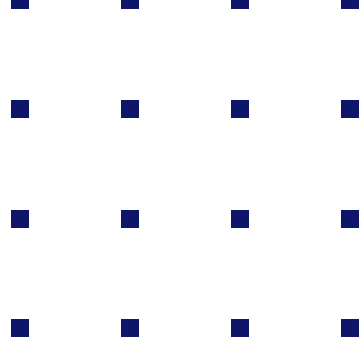
Cognitive Science and Learning Theories: Applying insights from learning theories to enhance lessons.

Formative Assessment: Implement assessments during instruction to gauge student understanding and make timely adjustments.

Physics Education Research (PER): Use research to inform evidence-based teaching practices.



PER (*Physics Education Research*)



PER

The scientific study of how students learn physics and how teachers can effectively teach physics concepts.

MISSION

This research focuses on understanding the best ways to help students grasp challenging physics topics and improve their overall learning experience.

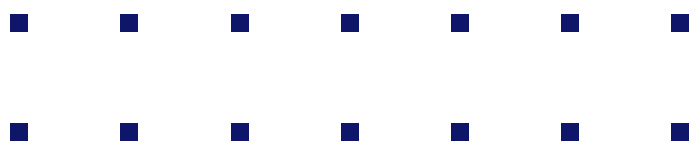


Integrating PER in Undergraduate Studies

Curriculum Design: Align course content with research-based best practices.

Active Learning Techniques: Incorporate group activities, peer instruction, and problem-solving exercises to engage students actively.

Conceptual Understanding: Focus on deep conceptual understanding rather than rote memorization.



Overcoming Challenges in PER Integration

Faculty Training: Providing professional development for educators to familiarize them with pedagogy strategies.

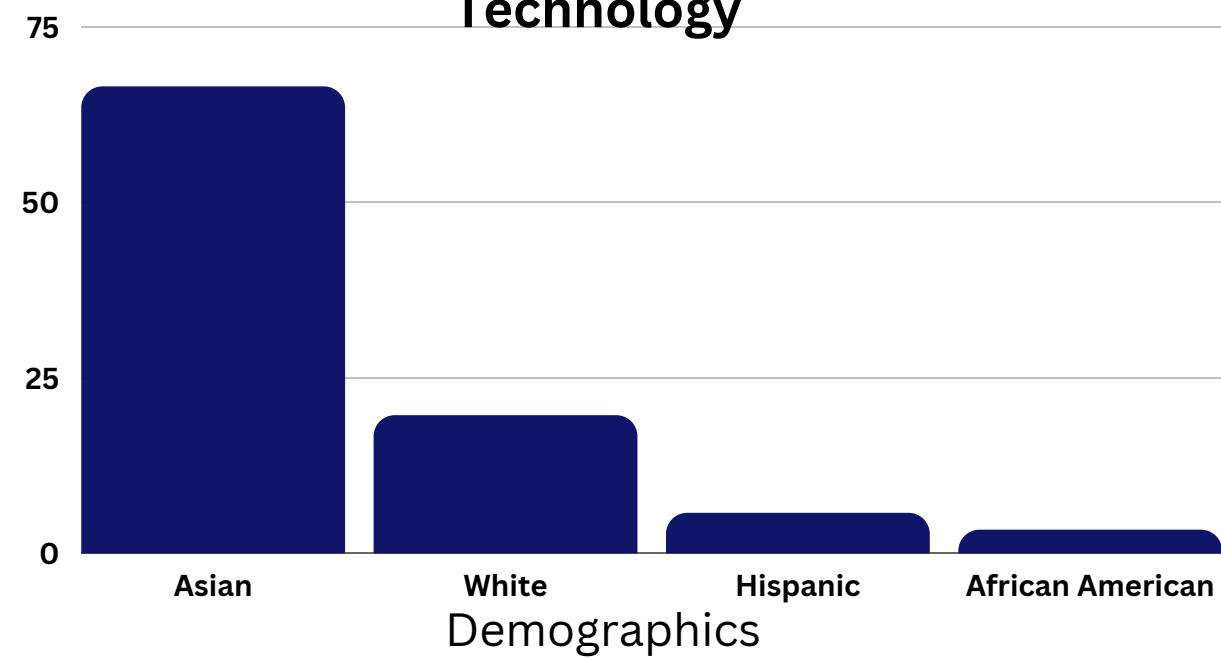
Institutional Support: Encouraging institutions to value and prioritize PER integration in their physics departments.

Student Resistance: Addressing student concerns and misconceptions about physics concepts and shift away from traditional physics lectures.

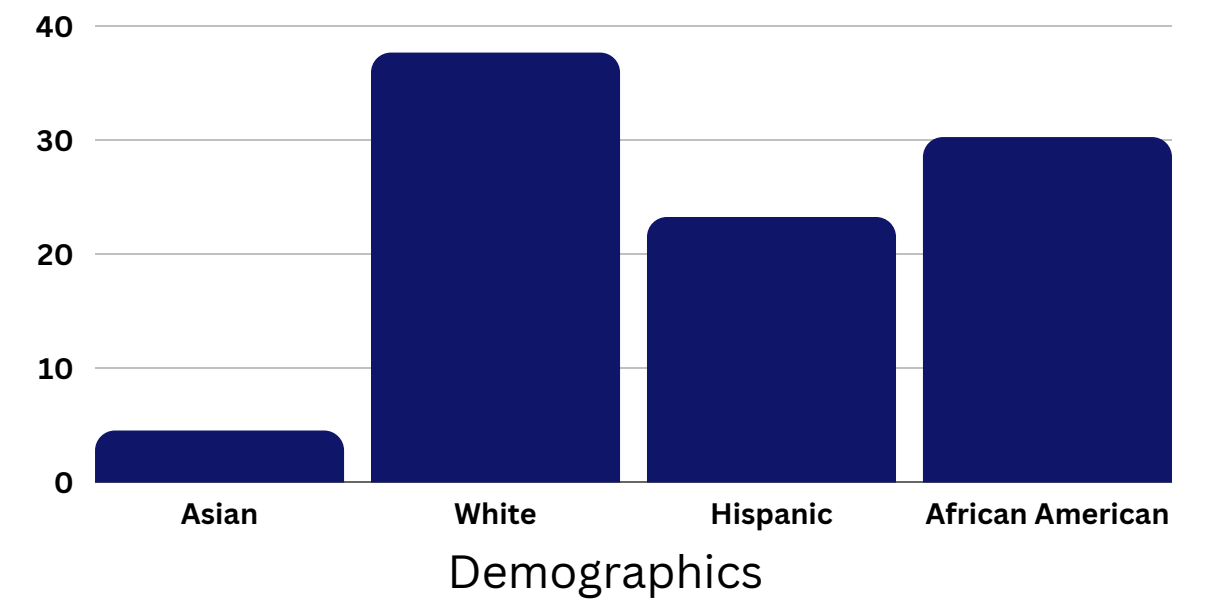
Visiting Schools in D.C.



Thomas Jefferson High School for Science and Technology

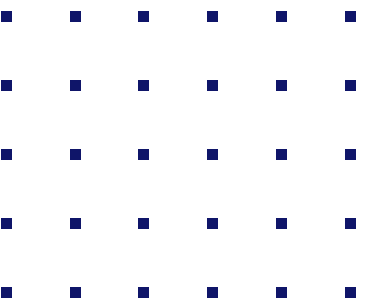


Jackson-Reed High School



2023 AAPT Summer Meeting: Sacramento, California

- Explored new ways to bridge the gap between Physics Education Research (PER) and the classroom, as well as fostering a stronger connection between theory and practice in the field of physics education.
- Workshops that gave valuable insights into the challenges and successes faced by physics teachers in their classrooms today.
- Physics high school teachers face the same teaching challenges under graduate Physics educators face.



“STEM Activities
Grade 7-12th”

EGG DROP

How can we slow the fall of the egg once it is released and how might we be able to protect the egg once it hits the ground?

MATERIALS

- EGG
- COTTON
- CARDBOARD TUBES
- CARDBOARD BOXES
- PLASTIC CONTAINERS
- PACKING PEANUTS
- RUBBERBANDS
- PLASTIC CUPS
- ZIP LOCK BAGS
- STRAWS
- STRING
- TAPE

FORCES/VOCABULARY

- GRAVITY
- VELOCITY
- MOMENTUM
- COLLISION
- NEWTONS 3RD LAW
- POTENTIAL ENERGY
- KINETIC ENERGY

MAGNETS

A MAGNET IS USUALLY MADE OF A MATERIAL CALLED IRON. IRON HAS SPECIAL PROPERTIES THAT MAKE IT MAGNETIC. A MAGNET HAS TWO ENDS CALLED POLES.

- YOU HAVE TWO CARS WITH A MAGNET ATTACHED ON EACH END AND YOU CAN SEE HOW THEY ATTRACT AND REPELL
- ANOTHER SIMPLE PROJECT IS TO GATHER SOME METAL FILINGS AND PLACE THEM IN A BOTTLE. USING A MAGNET OR MAGNET WAND. DRAG IT AROUND THE OUTSIDE OF THE BOTTLE AND SEE WHAT HAPPENS TO THE FILINGS.

FORCES/VOCABULARY

- MAGNET
- ATTRACTION
- REPULSION
- NORTH/SOUTH POLE

ROCKET LAUNCHER

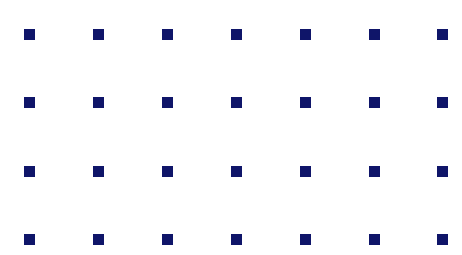
PERSONALIZE YOUR ROCKET WITH SPRAY PAINT, STICKERS, MARKERS. BOTTOM END OF ROCKET MUST REMAIN CLEAR OF ANY PAINT OR DECORATION. FINS CANNOT EXTEND BELOW THE BOTTOM SECTION.

MATERIALS

- 2L EMPTY BOTTLE
- TAPE
- ROCKET FINS
- NOZZLE
- WATER
- NEWSPAPER

FORCES/VOCABULARY

- GRAVITY
- VELOCITY
- ACCELERATION
- AIR RESISTANCE



Impact and Rewards of Teaching Physics

Inspiring Future Scientists: Nurture students interest in science and shape future physicists.

Lifelong Learning: Continually explore the wonders of physics alongside students.

Making a Difference: The impact of physics education in addressing global challenges as well as advancing society.



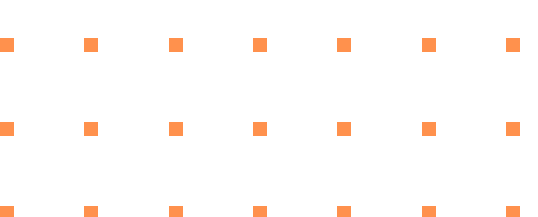
"Students will perhaps forget what you said, what you did, but they will never forget how you made them feel." ~Maya Angelou



Final thoughts...

- Teaching physics is both an art and a science, requiring passion, creativity, and dedication.
- By combining the art of engaging teaching methods with the science of evidence-based practices, we can create a transformative learning experience for our students.

Let us work together to inspire a new generation of physicists !



References/Acknowledgements

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Thank YOU!

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