Physics First: Teaching Physics to Freshman Regardless of Prerequisites

CSAAPPT Fall 2026

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AI Disclaimer

This presentation was developed entirely by myself with no help from artificial intelligence in any way. However, I am unaware of the level of AI used in producing any figures or information from ACPS.

Overview

1. Background
2. Why Physics?
3. Challenges
4. Our Implementation

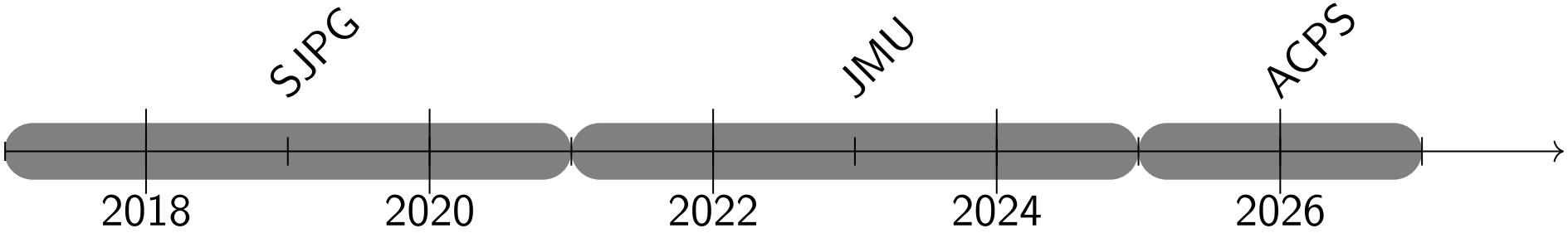
Section 1

Background

About Me



2nd Year Teacher
B.S. From JMU in Physics and Mathematics
Physics teacher in Albemarle, VA
Taught at Albemarle High School and ACE Academy

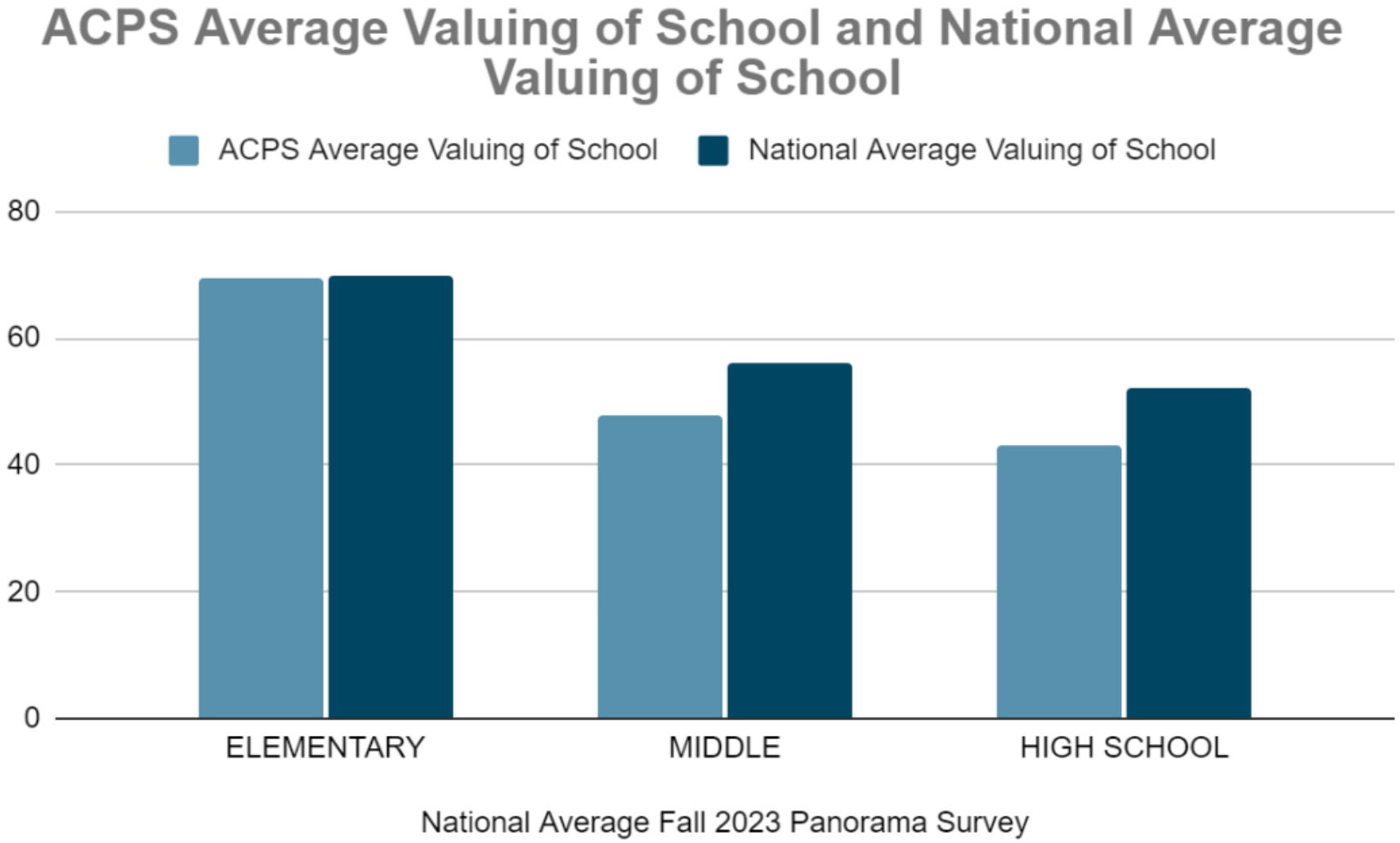


High School Redesign

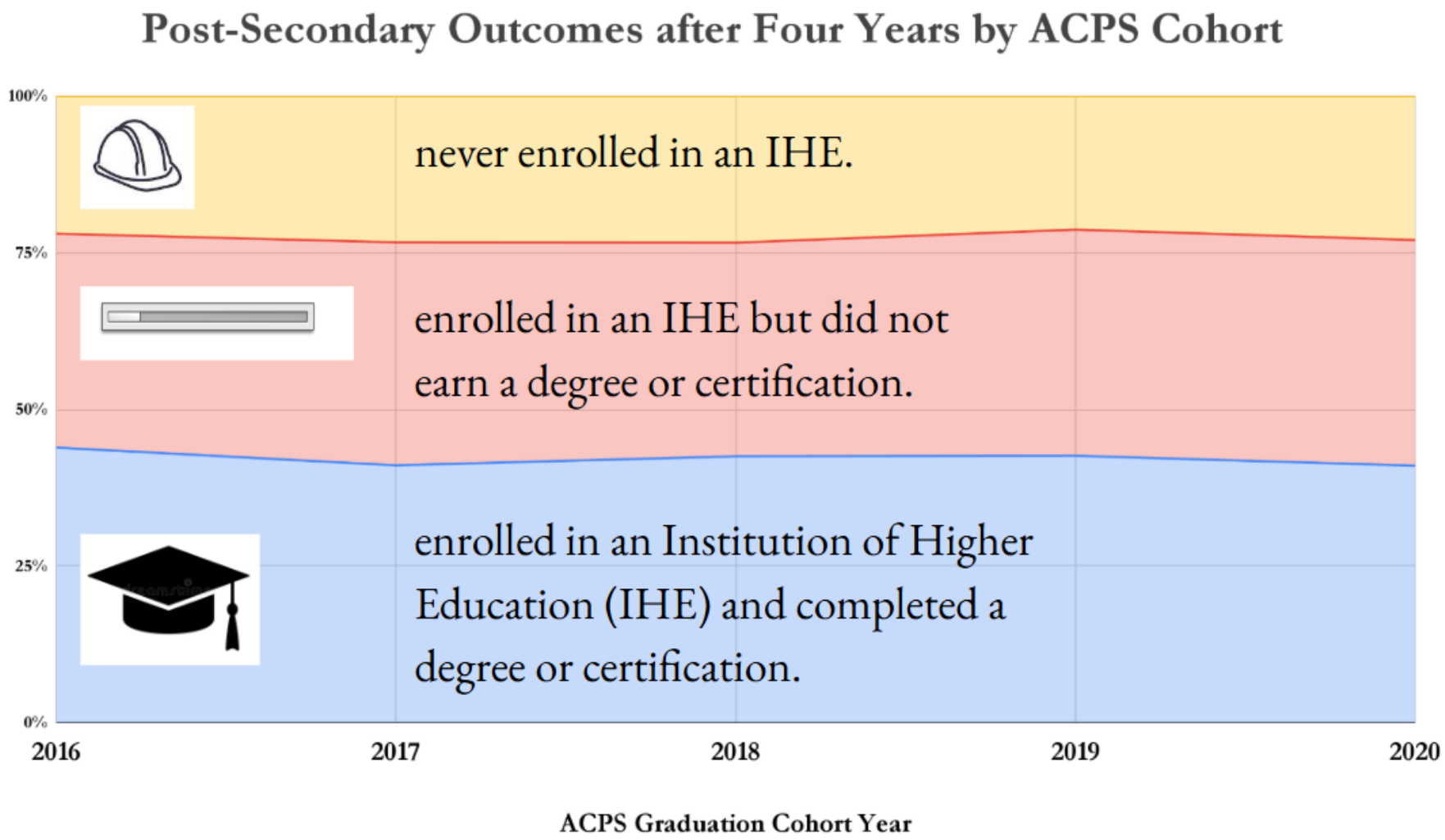
Recently ACPS looked at some data

High School Redesign

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High School Redesign



High School Redesign

In the 24-25 School year ACPS launched the Scholars studios

Scholars

DESIGN YOUR FUTURE

- **Blueprint Studio** — Architecture, Urban Design & Building Construction
- **Savor Studio** — Hospitality, Eateries & Recreation
- **Encore Studio** — Performing Arts
- **Solve Studio** — Science, Technology, Engineering & Math
- **Impact Studio** — Global Leadership, Law & Social Justice
- **Terra Studio** — Environmental Studies
- **Link Studio** — Information & Communication Technologies
- **Thrive Studio** — Education & Human Development
- **Nexus Studio** — Transportation, Robotics, Analytics, Information & Logistics
- **Venture Studio** — Entrepreneurship, Business & Innovation
- **Pulse Studio** — Health & Medicine
- **Vivid Studio** — Visual Arts

High School Redesign

Scholars Studios at a Glance

Scholars Studios gives you the chance to dive deep into a topic that matches your interests, along with the flexibility to make it your own.

All ACPS high schools students are eligible

It is a 4 year program, starting in the 9th grade

The program offers 12 studios, giving students an opportunity to pursue a specific area of interest

Each studio is focused on an interest area; there is flexibility to modify through specific Pathways in each

Students can connect to work-based learning and earn industry credentials

Section 2

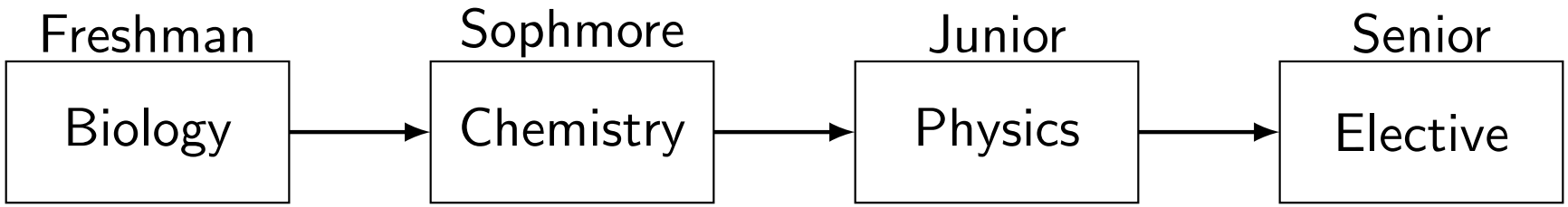
Why Physics?

The Classic Model

The classic high school scientific progression is as follows:

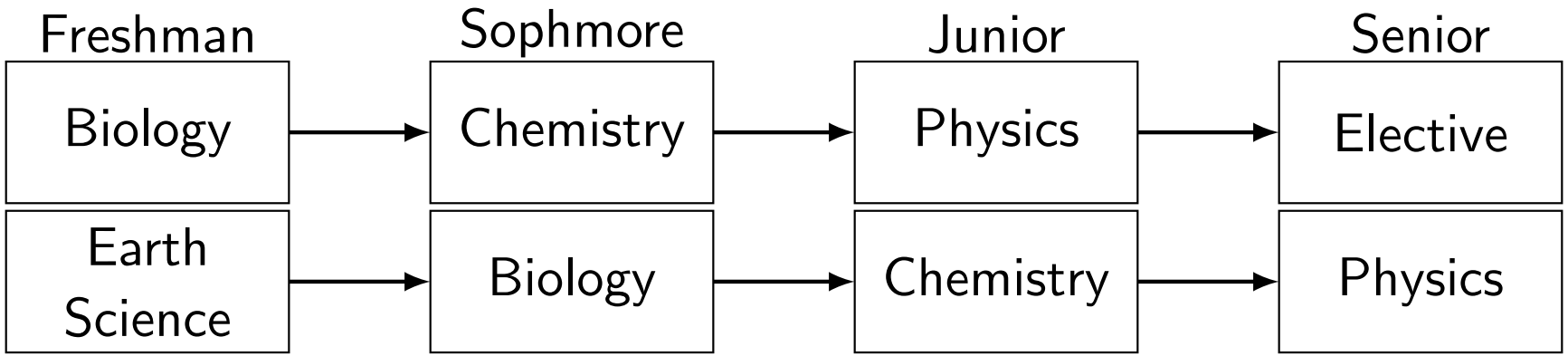
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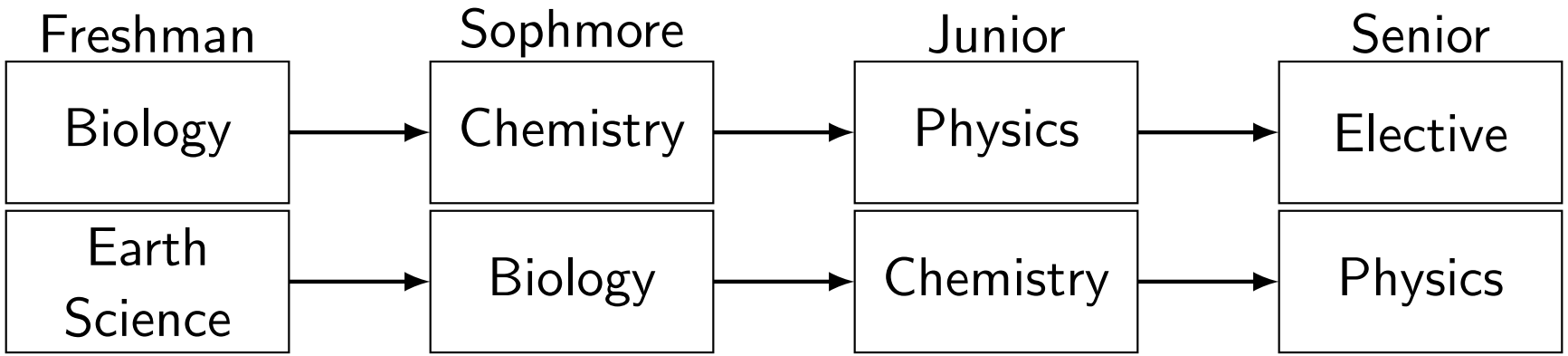
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This often doesn't happen.

In Virginia

Science requirements to graduate:

- complete at least three courses out of at least two of the following disciplines: biology, chemistry, physics, or earth science

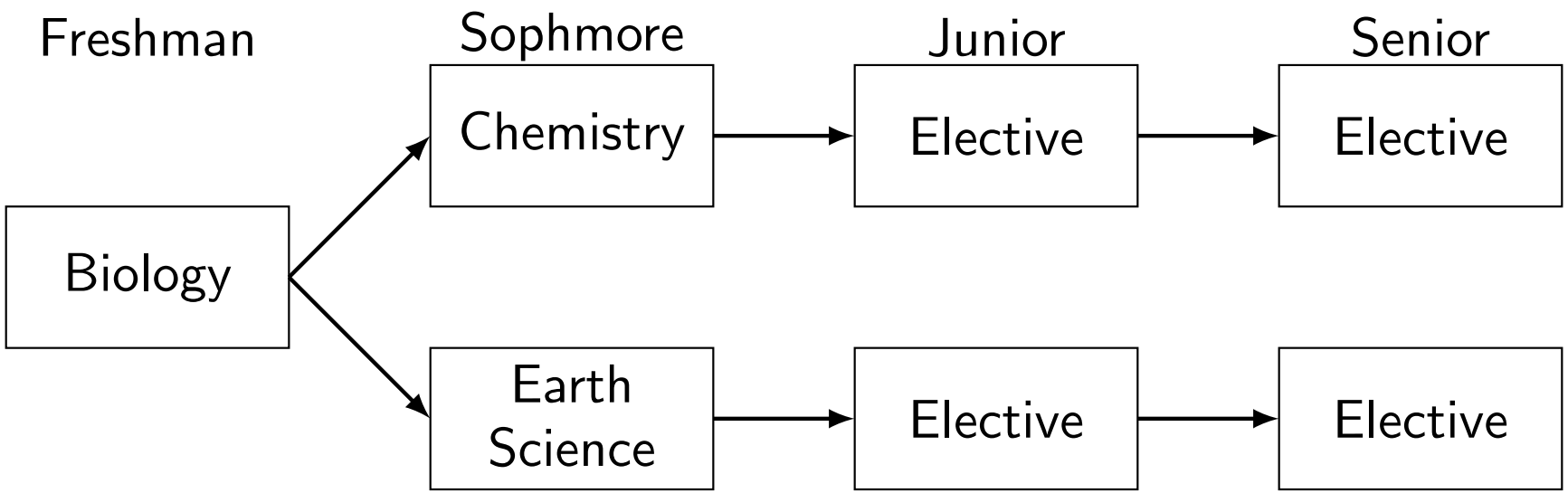
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For a typical student to take physics they must first:

1. Pass Biology and the Biology SOL
2. Pass Chemistry
3. Meet any mathematics prerequisite

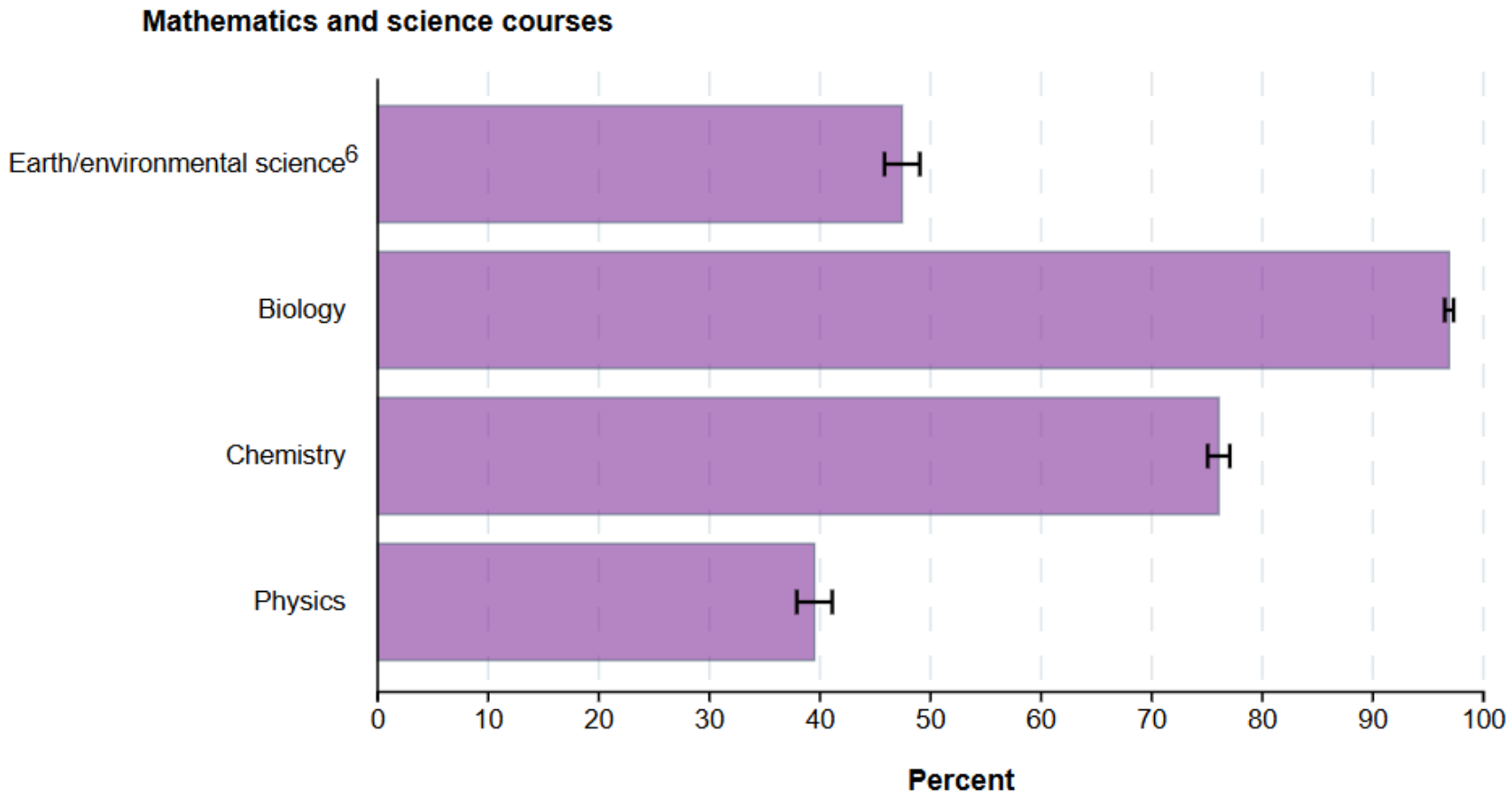
Exclusivity

For a typical student to take physics they must first:

1. Pass Biology and the Biology SOL
2. Pass Chemistry
3. Meet any mathematics prerequisite
4. Want to take physics despite the reputation physics tends to have as a "difficult course"

Exclusivity

Percentage of high school graduates who have completed science courses:



Data from The National Center for Education Statistics (NCES) (2019)

Physics First

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Goals of Physics First in ACPS:

- Get more students in a physics course in high school
- Physics can provide necessary connections for kids learning algebra and geometry
- Let students engage with science without the pressure of a state test in their first year

Section 3

Challenges

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typical class breakdown:

- 0-5 students taking precalculus
- 5-10 students taking algebra II
- 5-10 students taking algebra I
- 0-5 students taking algebra I part I (failed prealgebra)

Lesson engagement

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- not loose students with low math ability

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Physics First Students:

- Freshmen (14-15)
- wide range of mathematical ability
- are in physics because they joined a program
- have no clue how to high school

What we can't do

There are many topics and things in regular high school physics that are not accessible for all students.

- box on a ramp
- solving for things like velocity in $KE = \frac{1}{2}mv^2$ or time in kinematics
- Systems of equations

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$$\text{Physics First} \neq \text{Typical Physics Class}$$

Section 4

Our Implementation

Our Curriculum

Activate Learning®

Active Physics®

Active physics is a progress based curriculum designed to work for all grades and levels



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We strive for every class period to have some sort of lab/experiment/investigation/measurement happening.

Energy First

This year we are trying an energy first approach to physics as opposed to the tradition starting point of kinematics.
Energy conservation is generally more intuitive than kinematics, and is less mathematically rigorous.
Not starting with vectors provides a softer start to the school year.

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   - Waves
4. Unit 4: Electricity for Everyone
   - Electricity and basic circuits

Current Actions

We are looking at moving toward a more conceptual textbook and curriculum.

We will soon be investigating if there is any correlation between math level and success in this course, and the extent.

Results

Too early to tell

Questions?