

Advanced Biology PLUS



ASMSA
STEM PATHWAYS

Dr. Whitney Holden and Dr. Patrycja Krakowiak



DESCRIPTION

- Outreach program designed to improve teacher quality and student outcomes in Advanced Placement (AP®) Biology
- Supported by Arkansas Department of Education (ADE) Grant since 2017
- UNIT materials
 - MINIMUM (required) vs. MAXIMUM (available)
 - STANDARD (optimal) vs. CONDENSED (alternative)
- HANDBOOK: <https://tinyurl.com/AdvancedBioPlusHandbook>
- Co-directed by Dr. Holden and Dr. Krakowiak

Co-Directors

**Advanced Biology PLUS
and**

Arkansas Summer Research Institute (ASRI)



Dr. Whitney Holden

- B.S. in Biochemistry
- Ph.D. in Microbiology & Immunology
- Certificate in College Teaching from Vanderbilt Univ. Center for Teaching
- Life Science Specialist at ASMSA
- Co-Director of Adv. Bio PLUS + ASRI
- YouTube Channel: *Biology Professor*



Dr. Patrycja Krakowiak

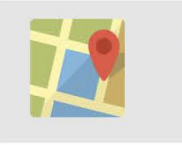
- B.S. in Chemistry with emphasis in Molecular Biology
- Ph.D. in Human Genetics
- Post-doctoral fellowship at NIH
- Assistant Professor at UAMS
- Life Science Specialist at ASMSA
- Nationally Board Certified+PAEMST finalist



DETAILS



- **WHAT**
 - Yearlong pacing, materials, tools, assessments, labs, equipment



- **WHERE**
 - ASMSA (Arkansas School for Math, Sciences and Arts)



- **WHEN (virtual for now)**
 - Summer Boot Camp + Semester Workshops (2)



- **WHO**
 - Any Arkansas AP Biology teacher with at least 1 student



- **COST**
 - \$100 registration fee per teacher (NO student tuition)



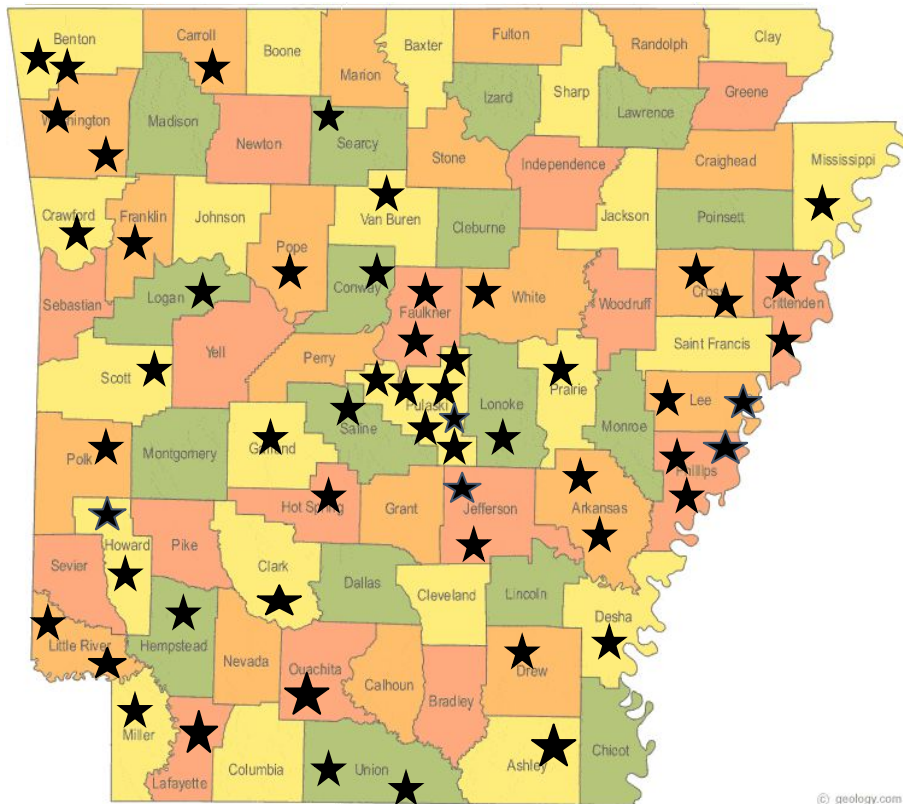
PARTICIPANTS

- **Program**

- 5 years

- **Participants**

- 57 schools
- 68 teachers
- >1000 students





Benefits to Teachers

● Materials and training

- Pear Decks, Quizlet + Blooket
- Labster + Lab Training
- Canvas + Videos
- Content + Assessments
- Weekly Pacing Calendar



- **Biotechnology Expansion Packs: electrophoresis, probes, models**
- **Networking with biology teachers and experts**
- **Up to 36 PD hours: training in content, labs, technology platforms**



Benefits to Teachers

● MINIMUMS (requirements)

- Interactive Notes (students answer application questions as you teach)
- Questions of the Week (AP© style practice questions)
- Scientific Skills (at least 1 per Unit feature Science Practices)
- Golden Sheets (reviews of entire Units on 1 - 2 cardstock pages)
- Laboratory (1 per Unit, hands-on/inquiry guided and/or digital)
- Assessments (pre/post and 1 per Unit, include previous AP© questions) w/ reviews

● MAXIMUMS (optional)

- Google slides (once per unit a Pear deck) with videos of all of them on Canvas
- POGILs, Labsters (digital labs), Science News (FREE), Projects
- Quizzes (Quizlets/Blookets practice), Homework (interactive vocab),



Benefits to Students

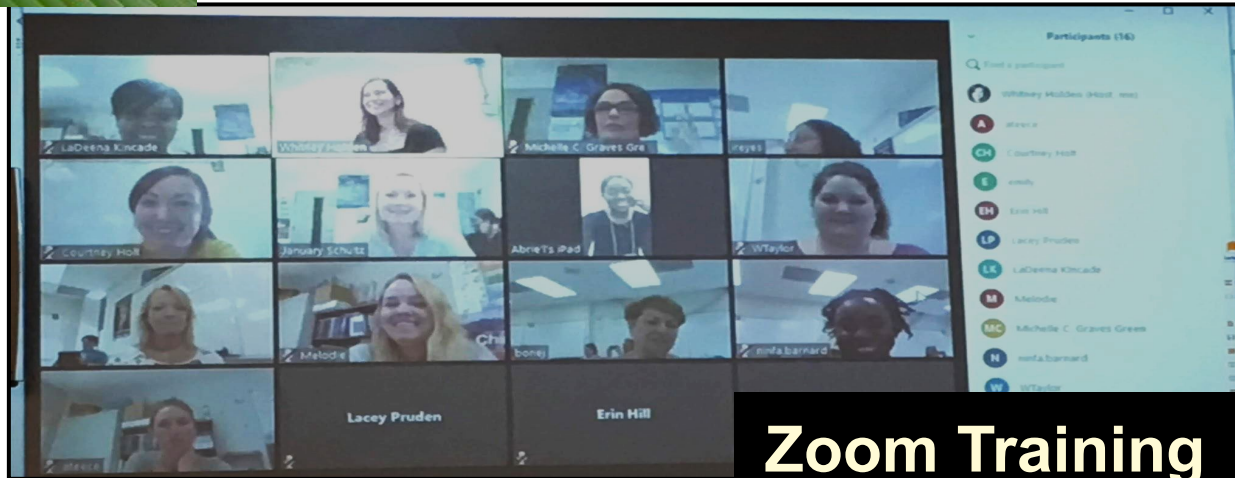
- Access to experts at ASMSA
- Opportunity to earn college credit (AP® exam)
- Improve written/verbal communication skills
- Experience in digital learning
 - use a learning management system
 - introductory experience with an online class



canvas



Content Delivery: Teachers



Zoom Training



Peer Teaching



Boot Camp Lab



Content Workshop

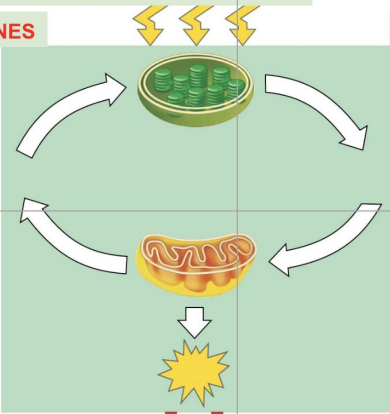


Pedagogy Example: Pear Decks

DRAW LINES TO CONNECT TERMS
WITH CORRECT SPOTS ON FIGURE

RED LINES

CO₂
ATP
glucose
H₂O
O₂



BLUE LINES

sunlight
cellular
respiration
photosynthesis
cellular work +
heat

Students, draw anywhere on this slide!

Pear Deck Interactive Slide
Do not remove this bar

QUESTION: what is the
complementary mRNA
sequence of

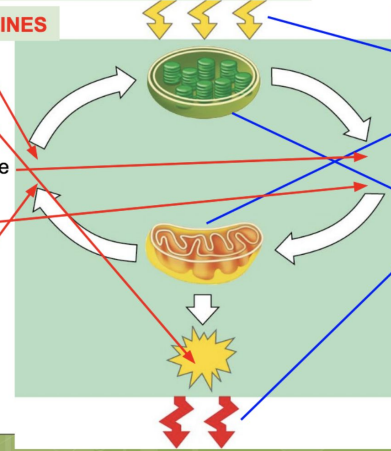
5'-AGTTACAG-3'



DRAW LINES TO CONNECT TERMS
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RED LINES

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BLUE LINES

sunlight
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3'-UCAAUGUC-5'

3'-UCAAUGUC-5'

3'-CUGUAACU-5'

Madelyn Talb...

Victoria Hwang

Nnume Nwan...

Answer Here

3' - UCAAUGUC - 5'

3' -UCAAUGUC- 5'

3'-uccaauuguc-5'

Minola Lee

Ian Bell

Alexx Weaver

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3'-UCAAUGUC-5'

3'-UCAAUGUC-5'

Premium Subscription INCLUDED and Already Made For Every UNIT!!!

Pedagogy Example: Quizlets + Blookets

Quizlet **TEACHER** Home Your library ▾ Create ▾

Blooket

News

My Sets

- My Sets
- Favorites
- Homework
- History

My Sets

Blooket

85 Questions

A&P Study First

85 Plays
Edited a month ago

Solo Host

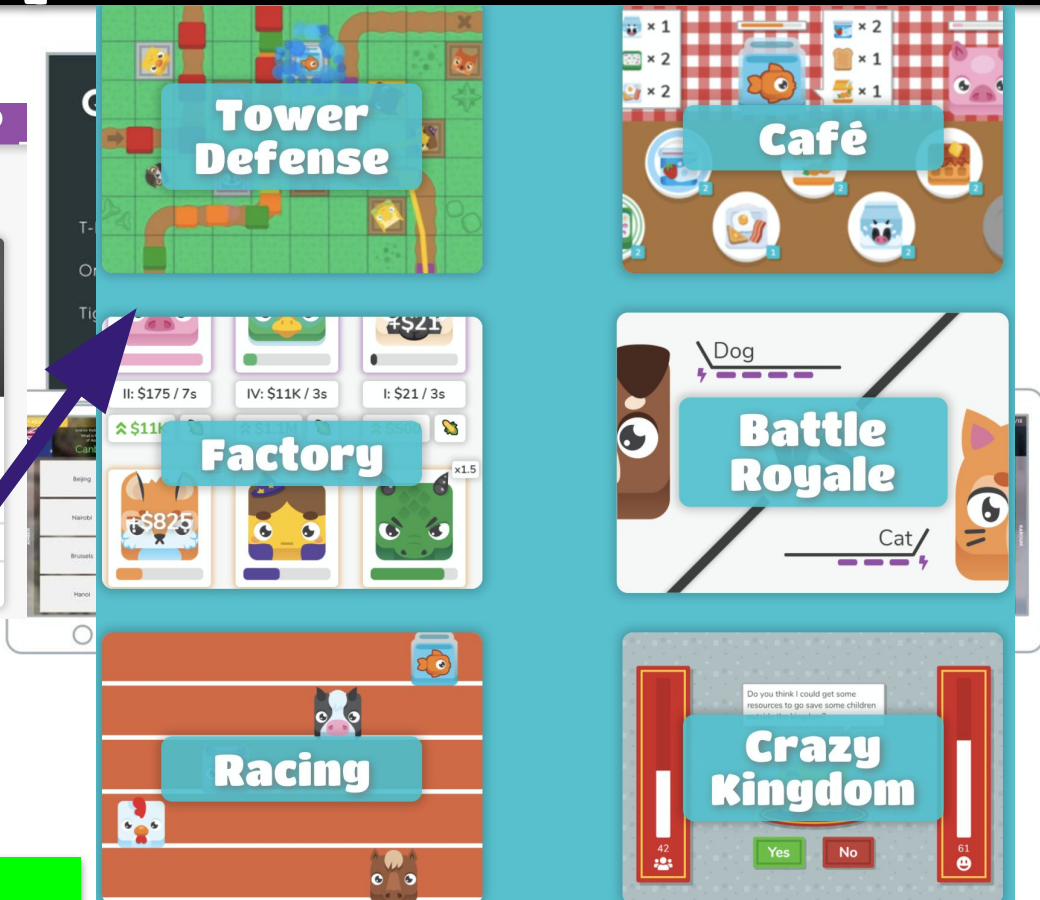
166 Questions

A&P roots - study 2nd

33 Plays
Edited 18 days ago

Solo Host

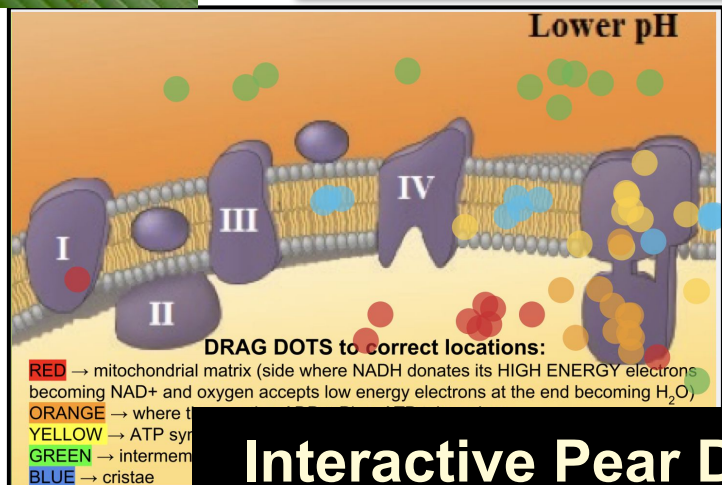
Created by
Patrycja_Krakowiak TEACHER



Already Made For Every CHAPTER!!!



Content Delivery: Students



Interactive Pear Decks

ORGANELLE (picture # and/or letter)	FUNCTION
Cell Wall (1)	Protects and gives shape to cell
Cell Membrane (j + 2)	Made of phospholipid bilayer, barrier
Chromosome(s) (p + 8)	Inherited material that contains genes
Nucleus (a + 9)	A membrane-enclosed organelle that houses DNA
Nucleolus (b + 14)	Site of rRNA synthesis
Ribosomes (n + 11)	Site of protein synthesis
Mitochondria (k + 5)	Site of energy conversion (ATP synthesis)
Chloroplasts (10)	Site of photosynthesis
Centrioles (m)	Involved in forming the mitotic spindle during cell division
Lysosomes (e)	Site of chemical digestion
Vacuole (4)	Liquid-filled and membrane-enclosed compartment of the cell
Cytoplasm (f + 12)	Gelatinous filling of a cell
Rough ER (c + 7)	Site of protein synthesis for other organelles and for secretion
Golgi Apparatus (h + 6)	Site of modification, packaging, and transport of proteins + lipids
Vesicles (d + 15)	Membrane-enclosed sac that stores or transports substances
Smooth ER (i + 13)	Site of lipid synthesis
Cytoskeleton (l/g + 3)	Structure of cells, separation of sister chromatids, cellular motion

OSMOSIS

Hypertonic solution: Water moves out of the cell. Animal cell shrinks (crenates). Plant cell becomes flaccid.

Isotonic solution: No net movement of water. Animal cell is normal. Plant cell is turgid.

Hypotonic solution: Water moves into the cell. Animal cell swells (lyses). Plant cell becomes turgid.

ANABOLIC: dehydration/condensation

ENDERGONIC REACTION: $\Delta G > 0$

Reaction is not spontaneous

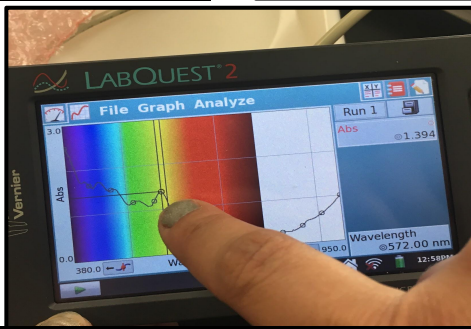
CATABOLIC: hydrolysis

EXERGONIC REACTION: $\Delta G < 0$

Reaction is spontaneous



Labs @ ASMSA



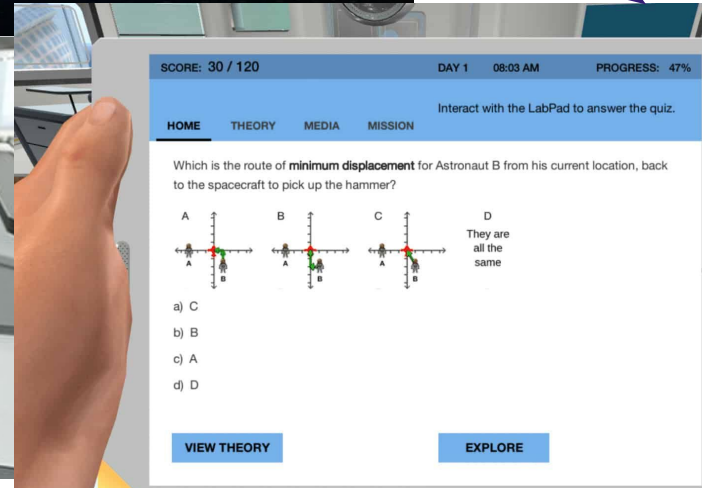
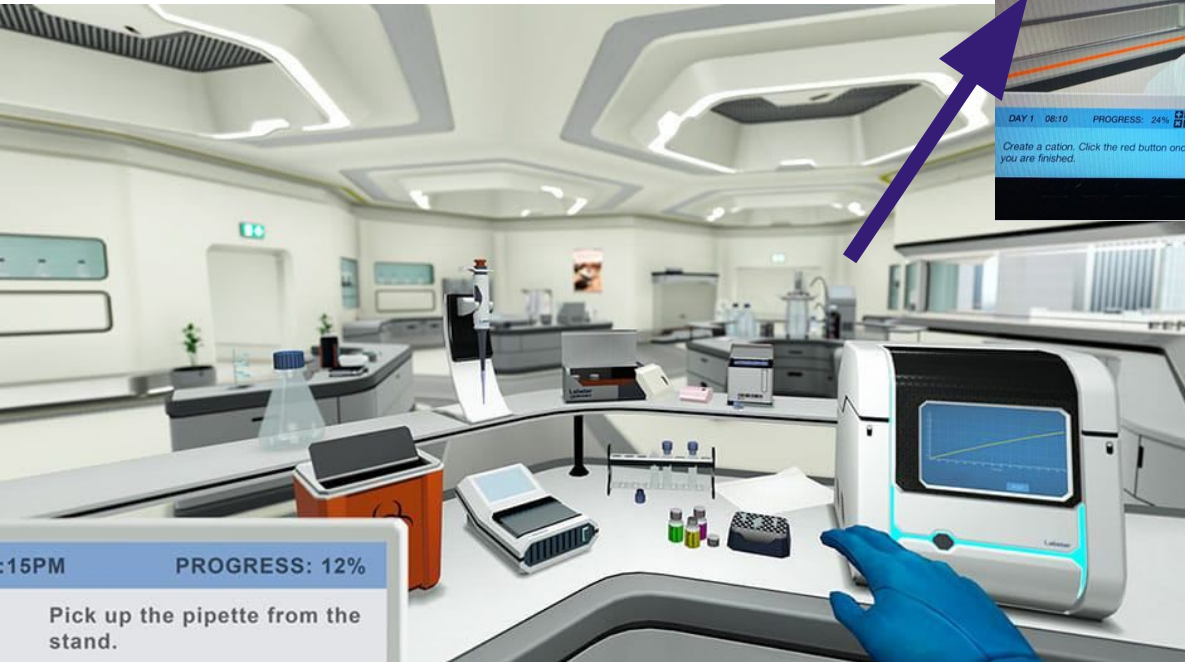
Biotechnology



Labs @ Schools



Content Example: Labsters



Subscription INCLUDED for all your AP Biology Students and Already Chosen for each Unit!



Biotechnology Lab Field Trips

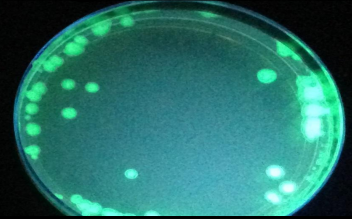
- **Learn biotechnology skills**
 - insert gene from a jellyfish into E. coli to make them glow
 - use DNA fingerprinting with electrophoresis to identify culprit of a crime
- **Test hypotheses**
 - guided inquiry allows students to choose variables to test
 - statistical analyses

@ASMSA

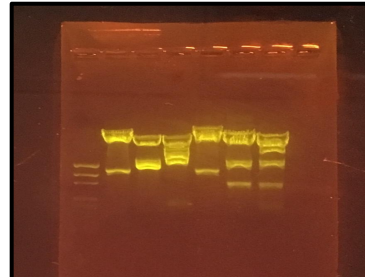


micropipettes

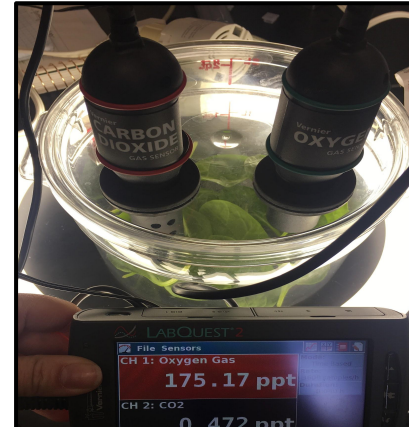
@Schools



transformation



electrophoresis



gas sensors



Program Expansion

- **Pilot Year:** 14 schools
- **Year 2:** 24 schools
- **Year 3:** 27 schools
- **Year 4:** 36 schools + 3 grads
- **Year 5:** 40 schools + 10 grads



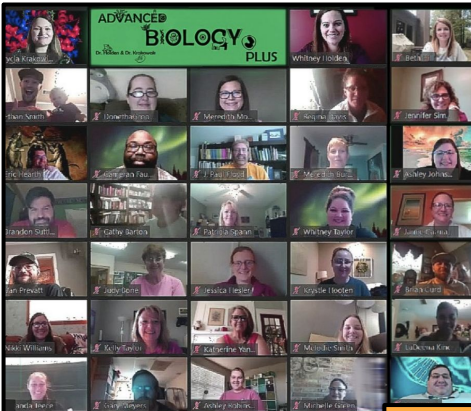
Year #1



Year #2



Year #3



Year #4



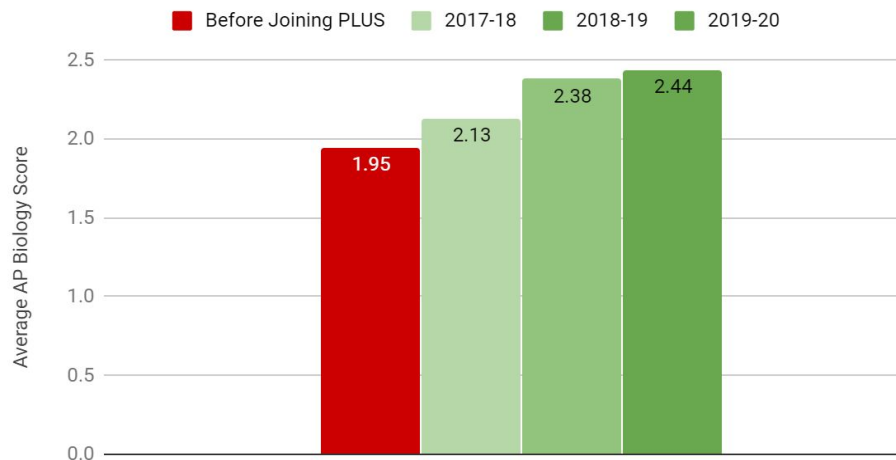
Year #5



RESULTS

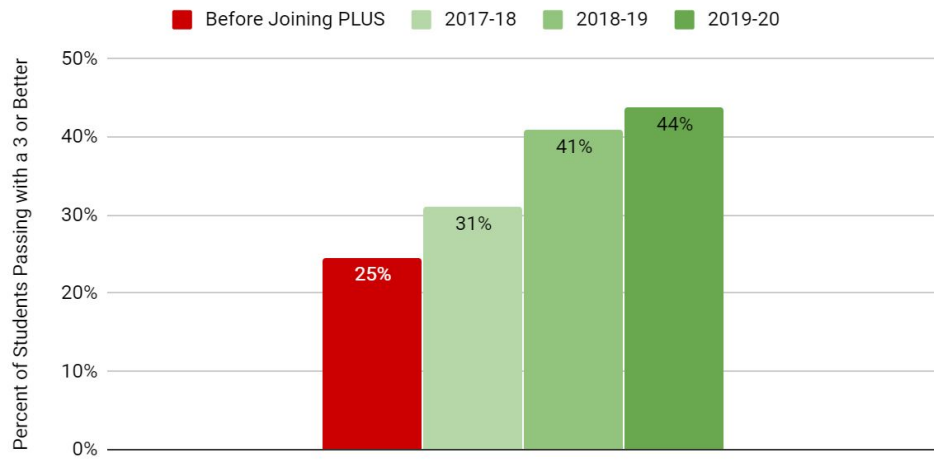
Impact of Advanced Biology PLUS on AP Biology Scores

Average Scores of Participating Schools Before Joining PLUS and for Each Cohort



Impact of Advanced Biology PLUS on AP Biology Passing Rate

Percent of Students Passing with a 3 or Better Before Joining PLUS and for Each Cohort



For registration and more information, visit:

<https://tinyurl.com/2022APBioPLUSRegistration>