Program Guide for Mississippi Science

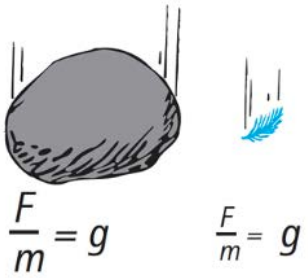
Conceptual Academy for
Foundations of Biology, Biology, Chemistry, Earth and Space Science, Physics, Physical Science

PocketLab
BY MYRIAD SENSORS, INC.

Table of Contents

What is Conceptual Academy and PocketLab?

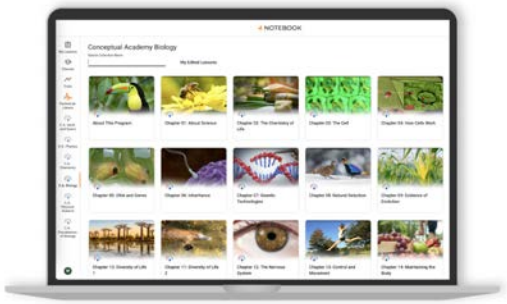
Conceptual Academy started with Paul Hewitt and his seminal textbook *Conceptual Physics,* which pioneered a conceptual, phenomena-based approach to science teaching. The diagrams and drawings used throughout the books became famous for distilling complex science equations to the most fundamental concepts.



Conceptual Academy and PocketLab have expanded the conceptual approach to courses for Foundations of Biology, Biology, Chemistry, Earth and Space Science, Physics, and Physical Science for a complete Mississippi high school science program.

All of the Conceptual Academy programs are on PocketLab Notebook, the leading platform for hands-on science, to provide students and teachers an interactive digital platform. AI features include:

- Auto-grade student work and provide formative feedback
- Create differentiated resources
- Adjust the reading-level of passages
- Translate lessons into 50+ languages



How are Conceptual Academy and PocketLab Different from other Publishers?

Conceptual Academy for Mississippi is the first science program that is authored by human experts and is 100% customizable through generative AI.

100% Customizable by the Teacher with Built-in AI

Simplify your tasks and save yourself time

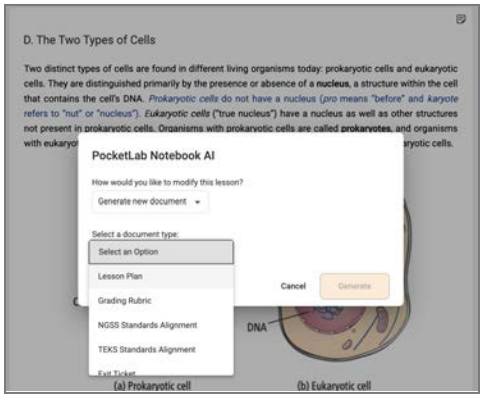
- Simple to Use: Integrated into the textbook content so you don't need to copy/paste to ChatGPT or any other AI tool
- All-In-One Tool: Plan lessons, give feedback, create activities, and more.
- Automates Busywork: Handle repetitive tasks like grading, giving feedback, creating resources, building sub plans, and more.

Increase your teaching impact

- 100% Aligned to MCCRS for Science
- AI teaching assistant: help students with an AI chatbot trained on the instructional materials
- Instant Feedback: Generate quick, targeted feedback for students within the same class period.
- Personalized Resources: Quickly make multiple versions of materials for different student needs.

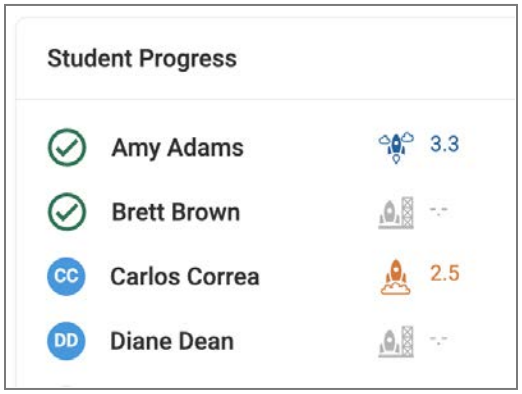
How PocketLab Notebook AI Works

Create



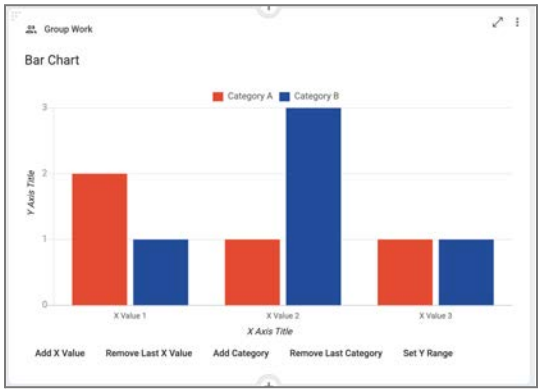
Create any educational resource you need based off the existing lesson

Grade and Give Feedback



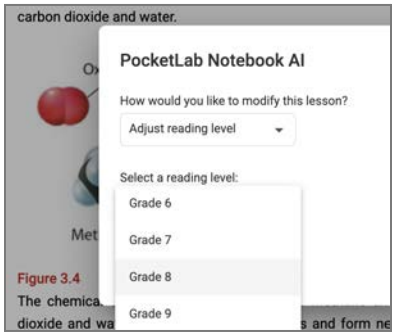
Deliver personalized feedback and grade on student free responses

Deter Cheating



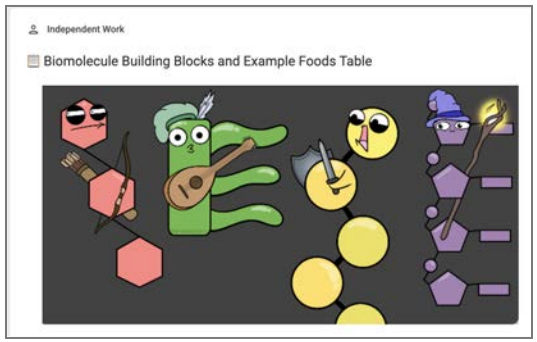
Custom interactives like bar charts and deter copy/paste cheating

Change Reading Level



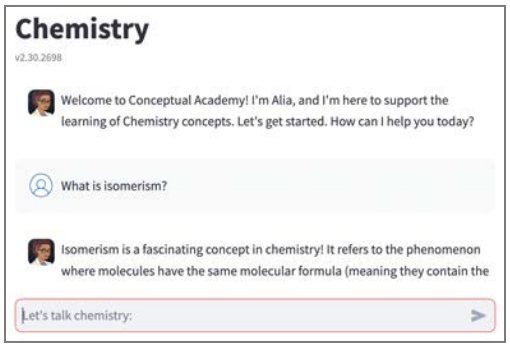
Change the reading level and translate any text to 50+ languages

Extend Student Activities



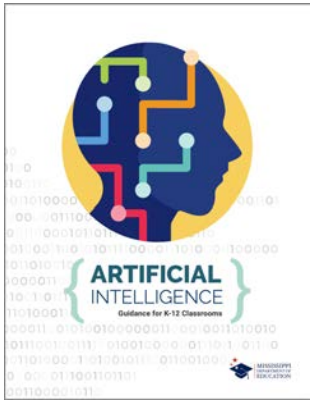
Extend any activity with additional practice, exit tickets, or discussions

AI Teaching Assistant



A personalized AI teaching assistant helps explain complex topics

Notebook AI supports the Mississippi Guidance on AI for the K-12 Classroom



Mississippi is on the forefront of leveraging AI in the classroom and was one of the first states to develop guidance for AI in the K-12 classroom.

Notebook AI tools promote the five key areas outlined for AI usage in Mississippi:

1. Digital Citizenship including strategies to deter cheating and plagiarism
2. Standards-Aligned Content
3. Active Learning and Engagement
4. Formative Assessment and Feedback
5. Accessibility

Digital Citizenship	• Hands-on activities are designed to be AI cheating resistant • Automated detection of large chunks of copy/pasted text
Standards-Aligned Content	• Core instructional materials are 100% aligned to MCCRS for Science • Supplemental materials are based on three-dimensional teaching approach that combines SEPs, CCCs, and DCIs
Active Learning and Engagement	• Create extension activities for a text • Create personalized learning paths tailored to individual needs • Workshops, training, and online resources to help understand how to effectively integrate AI tools
Formative Assessment and Feedback	• Interactive learning assistants that can offer support for complex topics • Assessment tools that provide real-time feedback to students based on their answers
Accessibility	• Use speech-to-text or dictation to assist with typing • Translate text, images, and speech for students and families

Supplemental Curriculum for High School Science

In addition to the core curriculum, PocketLab Notebook has hundreds of supplemental resources from world-class creators and science authors like the Amoeba Sisters, Startalk with Neil deGrasse Tyson, and many more.

Prepare for the Biology MAAP assessment with end of chapter video review lessons from the Amoeba Sisters	Engage in hands-on lessons with Neil deGrasse Tyson to explore physical science topics on exo-planets and what causes the seasons.	Learn about biology through nature documentaries Chasing the Tide and Deep in the Heart
Start a design challenge that uses biomimicry to solve real-world problems	Learn how physics and biology play a role in the crash safety of vehicles and how engineers design cars to be safer	Explore science phenomena on the International Space Station through hands-on activities

PocketLab Technology Builds Relevant 21st Century Hands-On Science Skills

Unleash Phenomenon-Based Learning

- Empower students to collect real-world data
- Ignite critical thinking with hands-on experiments
- Align seamlessly with widely-adopted science standards

Supercharge Teacher Efficiency

- Slash prep time with seamlessly integrated sensors and lessons
- Streamline instruction using our vast library of customizable content
- Elevate student assessment through instant data visualization

Maximize Your STEM Budget

- Invest in one versatile, long-lasting system replacing multiple tools
- Eliminate material cost through digital experimentation
- Secure potential grant funding with our STEM-aligned solution

Amplify Student Engagement

- Spark curiosity with student-designed experiments
- Transform learning into exciting self-driven adventures
- Foster STEM passion through creative, fun experiences
- Drive improved performance on standardized tests

High School Course Coverage

The *Conceptual Academy* materials cover six Mississippi approved secondary science courses with the corresponding program title in the table below.

Approved Courses for the Secondary Schools of Mississippi	Conceptual Academy Program Name
Foundations of Biology	*Conceptual Academy Biology*
Biology	*Conceptual Academy Biology*
Chemistry	*Conceptual Academy Chemistry*
Earth and Space Science	*Conceptual Academy Earth and Space Science*
Physical Science	*Conceptual Academy Physics and Chemistry Integrated*
Physics	*Conceptual Academy Physics*

High School Course Progression

The Conceptual Academy High School scope and sequence can ideally progress through the Mississippi Best Practices for CCR Sequencing in Science.

Grade	9	10	11	12
Course	Biology (260131)	Chemistry 1 (400519)	Physics (400820) or Earth and Space (260629)	Physics (400820) or Earth and Space (260629)

Additionally, the Foundations of Biology program is available for students to gain the basic knowledge needed prior to attempting the rigorous Biology course required for graduation. Combined with the Biology program at 10th grade and the Physical Science program at 11th grade, this sequence would give students the breadth of knowledge across the three core science disciplines in a three-year sequence. If students opted for a fourth year of science they could go into more depth with the Chemistry of Physics programs or gain further breadth with Earth and Space Science.

Grade	9	10	11	12
Course	Foundations of Biology (260628)	Biology (260131)	Physical Science (400700)	Chemistry 1 (400519) or Physics (400820) or Earth and Space (260629)

The order of the standards within each program reflects a purposeful consideration of how to build disciplinary core ideas (DCIs), science and engineering practices (SEPs), and crosscutting concepts (CCCs) through three-dimensional learning, while also maintaining a logical progression through the core content knowledge and covering 100% of the MCCRS for Science.

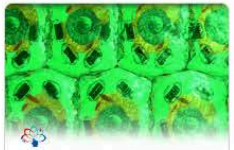
Scope and Sequence: Foundations of Biology and Biology

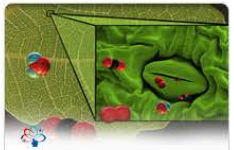
Conceptual Academy Biology applies to courses for Foundations of Biology and Biology, with different MCCRS Alignment for each course.Beginning with the chemistry essential to life at the molecular level, we build toward cells, genetics, and inheritance—laying the groundwork for evolution and the remarkable diversity of life. From there, the journey moves into human anatomy and physiology, culminating in an exploration of populations, communities, and ecosystems of which we are an integral part. Throughout, biological concepts connect to real-world examples from medicine, nutrition, health, and biotechnology.


About This Program


Chapter 01: About Science

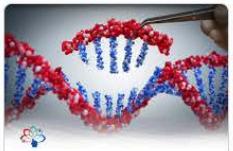

Chapter 02: The Chemistry of Life


Chapter 03: The Cell


Chapter 04: How Cells Work


Chapter 05: DNA and Genes


Chapter 06: Inheritance


Chapter 07: Genetic Technologies


Chapter 08: Natural Selection


Chapter 09: Evidence of Evolution

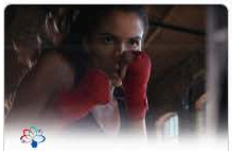

Chapter 10: Diversity of Life 1


Chapter 11: Diversity of Life 2


Chapter 12: The Nervous System


Chapter 13: Control and Movement


Chapter 14: Maintaining the Body


Chapter 15: Protecting Health


Chapter 16: Populations


Chapter 17: Communities


Chapter 18: Ecosystems

Scope and Sequence: Chemistry

Conceptual Academy Chemistry emphasizes the interconnected ideas that make the molecular world understandable. Beginning with the submicroscopic world of atoms, we explore atomic structure and the periodic table and lay the groundwork for understanding how atoms bond to form molecules. From there, the journey moves into solutions, chemical reactions, and the behavior of acids, bases, and electrons, culminating in the diverse world of organic compounds and polymers. Throughout, chemical concepts connect to real-world examples from materials science, medicine, environmental protection, and energy.


About this Program

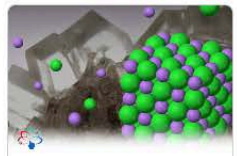

Chapter 01: About Science


Chapter 02: Particles of Matter


Chapter 03: Elements of Chemistry


Chapter 04: Subatomic Particles


Chapter 05: The Atomic Nucleus


Chapter 06: How Atoms Bond


Chapter 07: How Molecules Mix


Chapter 08: How Water Behaves


Chapter 09: Chemical Reactions


Chapter 10: Acids and Bases

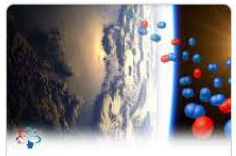

Chapter 11: Oxidations and Reductions

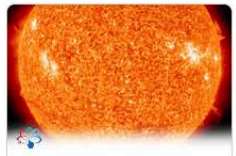

Chapter 12: Organic Compounds


Chapter 13: Nutrients of Life


Chapter 14: Medicinal Chemistry


Chapter 15: Optimizing Food Production


Chapter 16: Water and Air Resources


Chapter 17: Capturing Energy

Scope and Sequence: Earth and Space Science

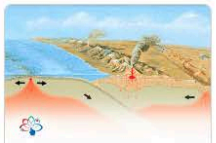
Conceptual Academy Earth and Space Science begins with Earth's deep history and interior structure, we explore plate tectonics, minerals, rocks, and the surface processes that shape our world. From there, the journey moves through oceans, atmosphere, weather, and climate before venturing outward to the solar system, stellar life cycles, galaxies, and cosmology. Foundational physics—from Newton's laws to relativity—is woven throughout.


About this Program


ESS 1: The Scientific Perspective


ESS 2: Earth's History


ESS 3: Earth's Structure


ESS 4: Plate Tectonics


ESS 5: Minerals


ESS 6: Rocks


ESS 7: Landforms


ESS 8: Earth's Waters


ESS 9: Surface Processes (Part 1)


ESS 10: Surface Processes (Part 2)


ESS 11: The Atmosphere


ESS 12: Understanding Weather and Climate: Moving Air and Water


ESS 13: Environmental Geology


ESS 14: Climate Dynamics


ESS 15: The Solar System


ESS 16: The Inner Solar System


ESS 17: The Outer Solar System


ESS 18: Newton's Laws of Motion


ESS 19: Gravity

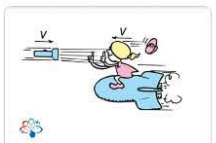

ESS 20: Atoms, Heat, and Light

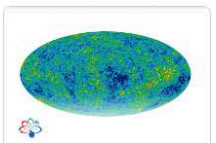

ESS 21: Nuclear Energy


ESS 22: Stars


ESS 23: Superstars

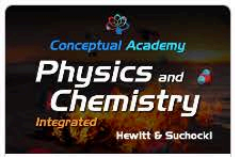

ESS 24: Galaxies


ESS 25: Relativity


ESS 26: Cosmology

Scope and Sequence: Physical Science

Conceptual Academy Physics and Chemistry Integrated is designed as an introductory-level program for a comprehensive course in physical science. Beginning with Newton's laws of motion, we explore momentum, energy, and heat then progress to electricity, magnetism, and waves. From there, the journey moves into the submicroscopic world of atoms, the periodic table, and how atoms bond to form molecules. We then examine solutions and chemical reactions, culminating in environmental science applications such as water quality, air pollution, climate, and sustainable energy.



About This Program


Chapter 01: About Science


Chapter 02: Newton's First Law


Chapter 03: Newton's Second Law


Chapter 04: Newton's Third Law


Chapter 05: Momentum


Chapter 06: Energy


Chapter 07: Heat


Chapter 08: Electricity


Chapter 09: Magnetism


Chapter 10: Waves and Sound

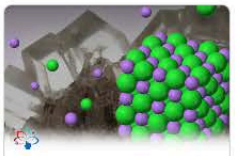

Chapter 11: Light and Color


Chapter 12: Particles of Matter


Chapter 13: Elements of Chemistry


Chapter 14: Subatomic Particles

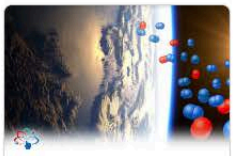

Chapter 15: The Atomic Nucleus


Chapter 16: How Atoms Bond


Chapter 17: How Molecules Mix


Chapter 18: Chemical Reactions


Chapter 19: Acid/Base and Redox


Chapter 20: Environmental Science

Scope and Sequence: Physics

This program takes a conceptual approach to physics at an introductory level, building on the legacy of Paul Hewitt's acclaimed Conceptual Physics curriculum now tailored specifically for high school students. Beginning with Newton's laws of motion, we explore momentum, energy, and gravity—laying the groundwork for understanding fluid mechanics and heat. From there, the journey moves into electricity and magnetism, waves and sound, and the fascinating behavior of light, culminating in atomic structure and nuclear energy. Physics concepts connect to real-world phenomena and everyday experiences.


About this Program


Chapter 00: About Science - Introduction


Chapter 01: Newton's First Law


Chapter 02: Newton's Second Law


Chapter 03: Newton's Third Law


Chapter 04: Momentum


Chapter 05: Energy


Chapter 06: Gravity


Chapter 07: Fluid Mechanics


Chapter 08: Heat


Chapter 09: Electricity


Chapter 10: Magnetism


Chapter 11: Waves and Sound


Chapter 12: Light and Color

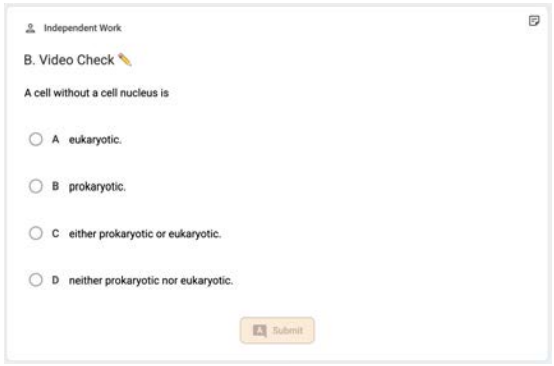

Chapter 13: Light Properties

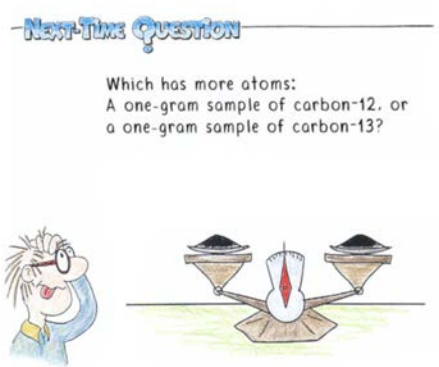

Chapter 14: The Atom

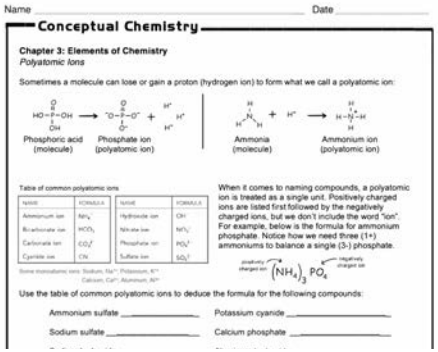

Chapter 15: Nuclear Energy

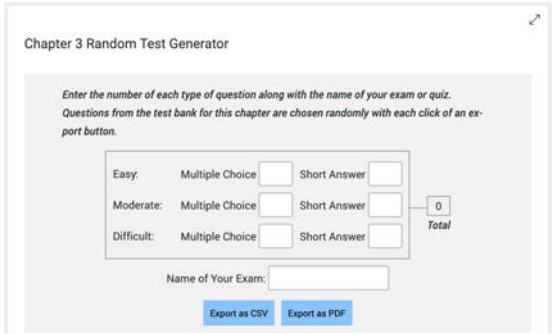
Assessment

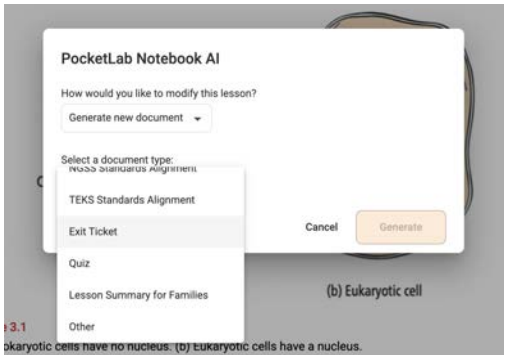
Every subchapter has embedded formative assessments that provide checks for understanding throughout the lesson. Exit Tickets in the form of a front of class project Next Time Question are available to conclude each topic. All practice worksheets and homework are available digitally and as printable PDFs. For summative assessment, each program includes a text bank with thousands of multiple choice and free response questions. In addition, a Random Test Generator in each chapter can generate a test with Teach inputs on how many questions and the level of difficulty for each question. Finally, if more resources are needed, teachers can use Notebook AI to generate formative or summative assessments with answer keys and exemplar student responses based off of the lesson material.







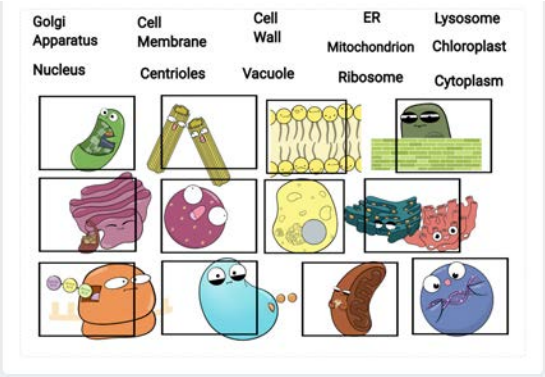




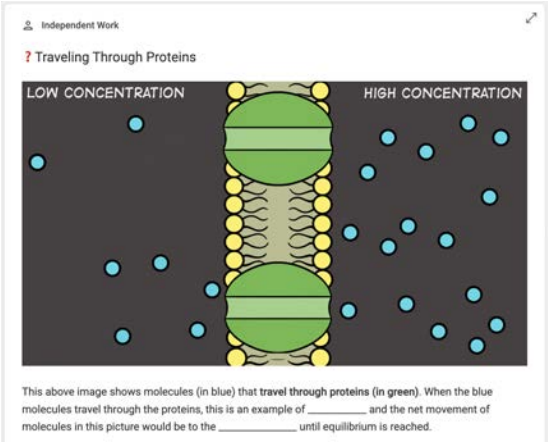
MAAP Biology Exam Preparation

Prepare for the MAAP Biology exam with customized Amoeba Sisters lessons that target each of the five Mississippi Content Strands. The review lessons conclude each chapter of Conceptual Academy Biology program and target Depth of Knowledge across Levels 1, 2, and 3.

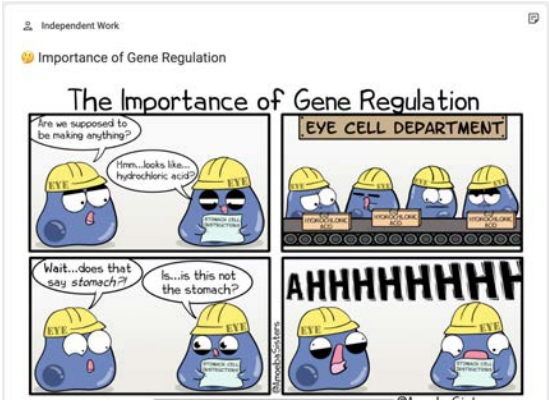
Cells and Energy - Cells as a System



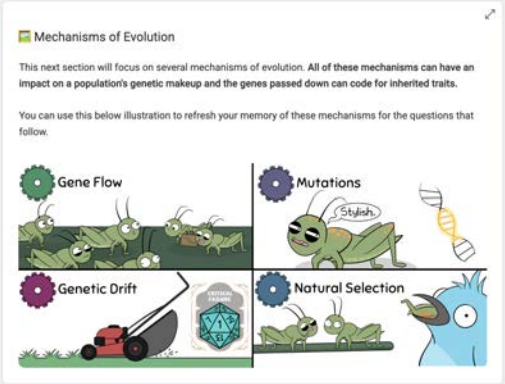
Cells and Energy - Energy Transfer



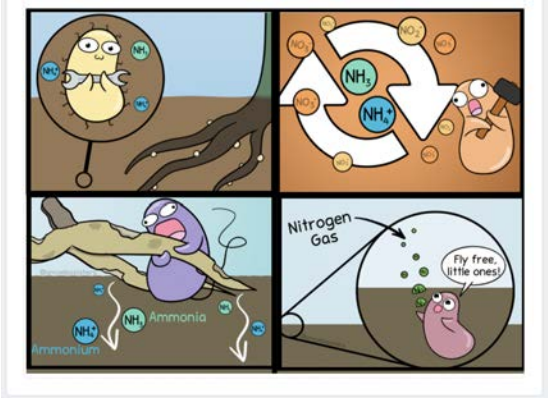
Heredity and Evolution - Reproduction and Heredity



Heredity and Evolution - Adaptations and Evolution



Interdependence of Organisms and their Environments



Question types include:

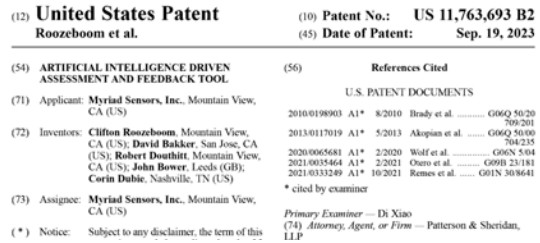
- Multiple Choice
- Drag and drop
- Hotspot
- Bar graphs
- Data displays
- Matching interactions
- Text entry

Professional Learning with the largest Science Teacher Community in the World: Science is Cool

We're on a mission to inspire science teachers through unforgettable professional development experiences and by removing barriers to a more engaged science classroom. The spirit of our work as an "unconference" is to provide everyone with valuable resources as well as giving participants a voice for what's next.

Research and Effectiveness

Patent on AI technology for Formative Assessment



(12) **United States Patent**
Roozeboom et al.

(10) **Patent No.: US 11,763,693 B2**
(45) **Date of Patent: Sep. 19, 2023**

(54) **ARTIFICIAL INTELLIGENCE DRIVEN ASSESSMENT AND FEEDBACK TOOL**

(71) Applicant: **Myriad Sensors, Inc.**, Mountain View, CA (US)

(72) Inventors: **Clifton Roozeboom**, Mountain View, CA (US); **David Bakker**, San Jose, CA (US); **Robert Douthitt**, Mountain View, CA (US); **John Bower**, Leeds (GB); **Corin Dubie**, Nashville, TN (US)

(73) Assignee: **Myriad Sensors, Inc.**, Mountain View, CA (US)

(*) Notice: Subject to any disclaimer, the term of this

(56) **References Cited**

U.S. PATENT DOCUMENTS

2010/0198903 A1* 8/2010 Brady et al. G06Q 50/20 709/201
2013/0117019 A1* 5/2013 Akopian et al. G06Q 50/00 704/235
2020/0065681 A1* 2/2020 Wolf et al. G06N 5/04
2021/0035464 A1* 2/2021 Otero et al. G09B 23/181
2021/0333249 A1* 10/2021 Remes et al. G01N 30/8641

* cited by examiner

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Smithsonian Education Summit

Teaching fellows showcased how PocketLabs and Guided Inquiry Design (GID) work in harmony to create powerful science learning experiences. The approach helped to shift students' perspectives on scientific knowledge, address misconceptions and empower them to think of science as an evolving field.

Teaching AP Science Evaluation

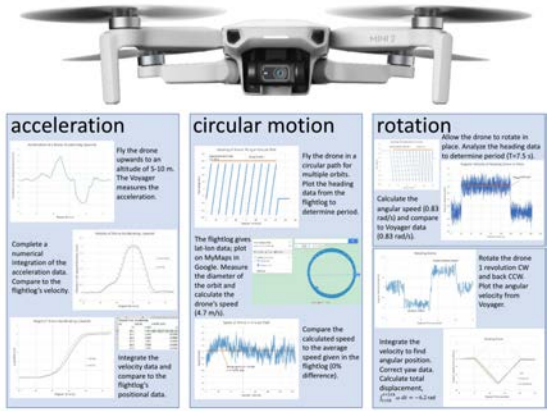
"The PocketLab Air device is a powerful tool that connects to a computer, tablet or phone app, allowing us to monitor air quality factors. By incorporating hands-on activities and real-time data analysis, students can enhance their comprehension of these crucial concepts within the field of environmental science."

Using PocketLab for Hands-on Physical Science Labs

Participants: 1,538 students.
Assessment: 10-question pretest and posttest scores.
Results: Students' science gain scores were significant (t = 3.34, df = 1536, p < .001), for the PocketLab group vs. the non-PocketLab control group

Utilizing Drones and PocketLab in a First-year Physics Lab

Researchers at Nicholls State University combined drones and PocketLab data to introduce students to drone flight mechanics



Georgia Tech and Spelman College Heat Island Research

Atmospheric science researchers and citizen scientists used PocketLab to map heat islands in a cross-disciplinary collaboration with students and Atlanta community members.