Stockton Unified School District

SUPERINTENDENT
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Meeting Minutes

Stockton Unified School District; Career & Technical Education Advisory Committee
May 14, 2019

Attendees: Frank Ferral, Committee Chair; Ward Andrus, Committee Secretary, Mario Supnet, Maxine Areida, Raul Hernandez (designee)

Purpose:
The Stockton Unified School District (SUSD) CTE Advisory Committee seeks to provide feedback and suggestions for the programs and direction of the district's career pathways. This committee is a Perkins Grant requirement, chaired by a non-educator, and meets annually. Mr. Frank Ferral is our committee chair for this annual meeting.

Agenda

1. An overview of all Career Pathways, and feeder STEM programs in the district

Dr. Andrus provided an updated on all funding sources, programs, including the LCAP related projects. He also provided an update on STEM activities and Pathways. See the attachments that were provided at the meeting

2. A review of the CALPADS data on course completion and participation

CALPADS data is not accurate. Due to technical challenges the data was under reported. Corrections are being made in the Student Information System. An update will be provided to the committee in the Fall.

3. An overview of the Business Education Alliance activities

Mr. Supnet reported out on behalf of the BEA. For the first time, services were provided to elementary schools for career fairs, and guest speakers. This was well-received. The BEA annual contract is pending renewal by the Governing Board.

4. A general discussion of program quality and direction from partners regarding the career pathways offered in Stockton Unified schools.
    - Asked to have the CTE Pathway brochure that has contact information posted to the webpage and kept current at positions change.
    - Discussed the WIN program and who will be the point of contact at each school. It is a good program, but needs to work better to register student and match to internships. The chamber committed to hosting one in the office.
    - Briefly discussed the need for HVAC workers. This became a discussion about high school apprenticeship programs.
        - Division of Apprenticeship Standards are working with WorkNet and Delta College
        - SUSD had 5 programs identified and has meet with DAS
        - Mrs. Areida and former Director Leon had travelled to Colorado and saw the Career Wise program in action and described how it worked.
        - Mr. Supnet stated that the funding to lead the effort had been given to Delta College to lead out the next steps.

Meeting Adjourned at 3:00PM

To learn more about the Career Pathways in Stockton Unified School District, go to:
www.stocktonusd.net/CTE

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Career Technical Education Update for the CTE Advisory Committee

May 14, 2019

Funding

Perkins

We receive between $400K and $500K annual. This is distributed to all CTE pathways for CTSOs, equipment, certification tests, and materials. This cannot cover general classroom supplies, furniture, or non-CTE credential staff. We choose to not use much for career counseling since we have a large counseling departmental and LCAP funded career centers.

CTEIG I (July 1, 2015-2018 ends June 30, 2019)

This was $4,350,000 over three years and is ending June 30, 2019. We funded:

- 4 CTE teaching positions, (now in LCAP)
- launched the Stockton Public Safety Academy
- launched the AG Pathway at Stagg and built the facility ($1.5M)
- launched Construction and Welding at Franklin
- passenger vans at Stagg, Merlo, Weber, HCA and a truck for Franklin
- a tractor for Stagg's Ag program
- ramped up the engineering programs by incorporating PLTW at the high schools
- launched Computer Science (PLTW)
- and many more conferences, training and materials across the district pathways.

We paid for the architectural and engineering plans for Franklin's Welding lab and is still not complete. There have been many challenges with the building designed and DSA additional requirements. This will note be built at this time. It is estimated to cost $1.8M to renovate one welding lab.

CTEIG II (July 1, 2018- June 30, 2020 the funds have not been distributed yet)

This is only $825K to be spent in 19-20 school year.

Estimated projects:

- $100K Complete two small Ag contractor packages at Stagg
- $225K Dust Collection system at Franklin Construction
- $225K Anatomage Tables (Digital touch screen anatomy devise) for HCA, Weber and Chavez
- $175K Computer Lab replacement at Edison, Chavez, Franklin, Weber, Merlo
- $75K Professional Development for all CTE teachers on the CTE Model Standards
- $25K Compensation for teachers earning a CTE credential from 2015-2020.

If funds still remain:

- *$50K Truck for Ag pathway at Stagg*
- *$100K New Classroom furniture for Education Pathways that teach collaborative ways of teaching*

Strong Workforce Program (California Community College program) $0

We applied for and did not get the $350K requested to fund the Work-based learning Coordinator position for 2 years.

Programs

Pathways

We have gone from 3-4 formal CTE pathways to nearly 30 between 2014 and 2019. We are adding Education and Operations (Supply Chain) this next year.

We have added a field in our Student Information System that appears on the transcript that is called "Achievements." This is a place to record Industry Certificates and other recognitions such as OSHA 10, First Aid/CPR, ASE Brakes and Suspension, etc.

Internships and Apprenticeships

We have connected with the Division of Apprenticeship Standards (DAS) to work on registering 5 career pathways as "pre-apprenticeship" programs that are linked to a Post-Secondary program and employer. They are:

- Auto Repair
- Supply Chain Management
- Paralegals
- Health Care
- Computer Science technicians/programmers/database

We have 7 Work Experience Coordinators (teachers in STA) that cover all our schools. That is up from 4 during the recession. They teache and manage Work Experience (general) that goes toward electives, provide work permits and provide career preparation training to students. They also develop jobsites and internship opportunities for district career pathways. Their names and assigned schools are on the CTE web page and the Work Experience Education link.

We have approved a Work-Based Learning Coordinator, but the grant to fund it was not awarded to us. This person would lead this effort and supervise the Work Experience Coordinators that are loosely supervised by the site principals.

Business Education Alliance (BEA)

Since 2003, the BEA is a partnership with SUSD and the Greater Stockton Chamber of Commerce. They provide services such as mock interviews, the BEA Symposium, assist in career fairs, provide guest speaker and tours. Mr. Frank Ferral (Director) is our CTE Advisory Committee Chair. In 18-19 they developed an online repository of Internships from their members for our students: the Workforce Internship Network (WIN).

Career Technical Education LCAP Projects

Goal	Description	Project Budget
SA11.6	CTE teachers for the Education Pathway	$212K (Salary and benefits)
SA11.7	MESA (a STEM program)	$100K
SA11.8	Stockton Public Safety Assistant Principal	$185K (Salary and benefits)
SA11.9	STEM Initiatives (PLTW)	$750K*
	*This is currently proposed to $500K for SY19-20 even though we are expanding to more schools	
SA11.10	JROTC teacher	$74K (Salary and benefits)
SA11.13	Partnership with Greater Stockton Chamber of C.	$100K
SA11.14	Career Exploration software tool	$75K*
MP4.1	Student Clubs (CTSOs) and Activities related to Careers	$100K

STEM

Though we have a STEM Specialist and other Science and Math Specialists in curriculum, this effort is broader and looks at larger projects initiatives, specifically LCAP SA 11.7 and SA11.9.

Project Lead the Way (PLTW)

PLTW started at HCA with Biomedical and they did it on their own. We expanded from 1 school to 30+ in SY19-20. We offer all levels from K-12: Launch, Gateway and all three STEM pathways; engineering, biomedical and computer science.

MESA

UOP is our affiliate. They provide the program, training and more. 15-20 schools participate.

Magnitude.io

This program provide curriculum and activities to schools in grades 6-8. In SY19-20 we will expand to high school programs.

They have Can-Satellites where we launch satellite into low earth orbit and ExoLab with classroom chambers of plants that have a companion experiment on the International Space Station.

CAREER & TECHNICAL EDUCATION

- Program Homepage
- Career Pathways in Stockton Unified School District
- California's Industry Sectors
- Career Exploration
- Career & Technical Student Organizations
- Project Lead the Way
- Work Experience Education
- STEM

CAREER & TECHNICAL EDUCATION

Stockton Unified School District's (SUSD) Career & Technical Education (CTE) program prepares students to be College and Career Ready through three main activities: **Career Awareness, Career Exploration and Career Preparation**. Once known as "Shop Class," Career and Technical Education (CTE) was once called Vocational Education and School to Career. Today's CTE is very demanding due to changes in the modern industry and a global economy. Simple hands-on skills are no longer enough to get a living-wage job. Today's workforce must have strong academic skills coupled with in-demand technical skills that go beyond just a high school diploma. This training includes continued learning at trade schools, apprenticeship programs, community colleges, and universities.

- *Career Awareness* begins in preschool through the primary grades (Preschool-5) and beyond. This is simply recognizing that there are jobs all around in our community and what those people do.
- *Career Exploration* begins in the Intermediate Grades (6-9) and continues for many years. This is where young people learn about their interests and abilities and explore careers related to the things they like to do. They develop an educational plan that will take them through a career pathway from school to the workplace.
- *Career Preparation* overlaps Career Exploration and begins in the 9th grade when students begin to select their courses in high school. The academic and "elective" courses they choose start to shape their college and career preparation. All schools offer the courses to graduate high school and most schools offer at least one formal career pathway. Follow the links here to find see what our schools offer. English | Spanish

CONTACTS

Ward Andrus, Ed. D.
Director, Educational Services Career Technical Education, and STEM

Committees & Minutes

- 2015 Perkins Core Indicator Report
- 2015 Perkins Advisory Committee Meeting Minutes
- 2016 Perkins Advisory Committee Meeting Minutes
- 2016 Perkins Core Indicator Report
- 2017 Perkins Advisory Committee Meeting Minutes
- 2017 CTSO Student Advisory Meeting Minutes
- 2018 Perkins Advisory Committee Meeting Minutes

Pathway Brochures

2019-2020 Pathways Brochure Eng

2019-2020 Pathways Brochure Span

SUCCESS IN THE NEW ECONOMY

Must watch videos for parents, students and all educators about the new economy and what the traditional university degree no longer does for graduates. **Technical skills coupled with strong well rounded academic knowledge is the key to success in today's and the future's economy**

Click here: Success in the New Economy by Kevin Flemming at Citrus College.

Click here: 4 Skills and 4 Steps to a Successful Career by Kevin Flemming at Citrus College.

Industries of the Future! Watch this quick video clip from MSNBC with author Alec Ross to see where the future jobs will be and how to get there. Click here for Industries of the Future

STEM

Courses & Curriculum

PROJECT LEAD THE WAY

PLTW

Magnitude.io

Powered by Curiosity™

MESA Mathematics Engineering Science Achievement

PROJECT LEAD THE WAY
PLTW

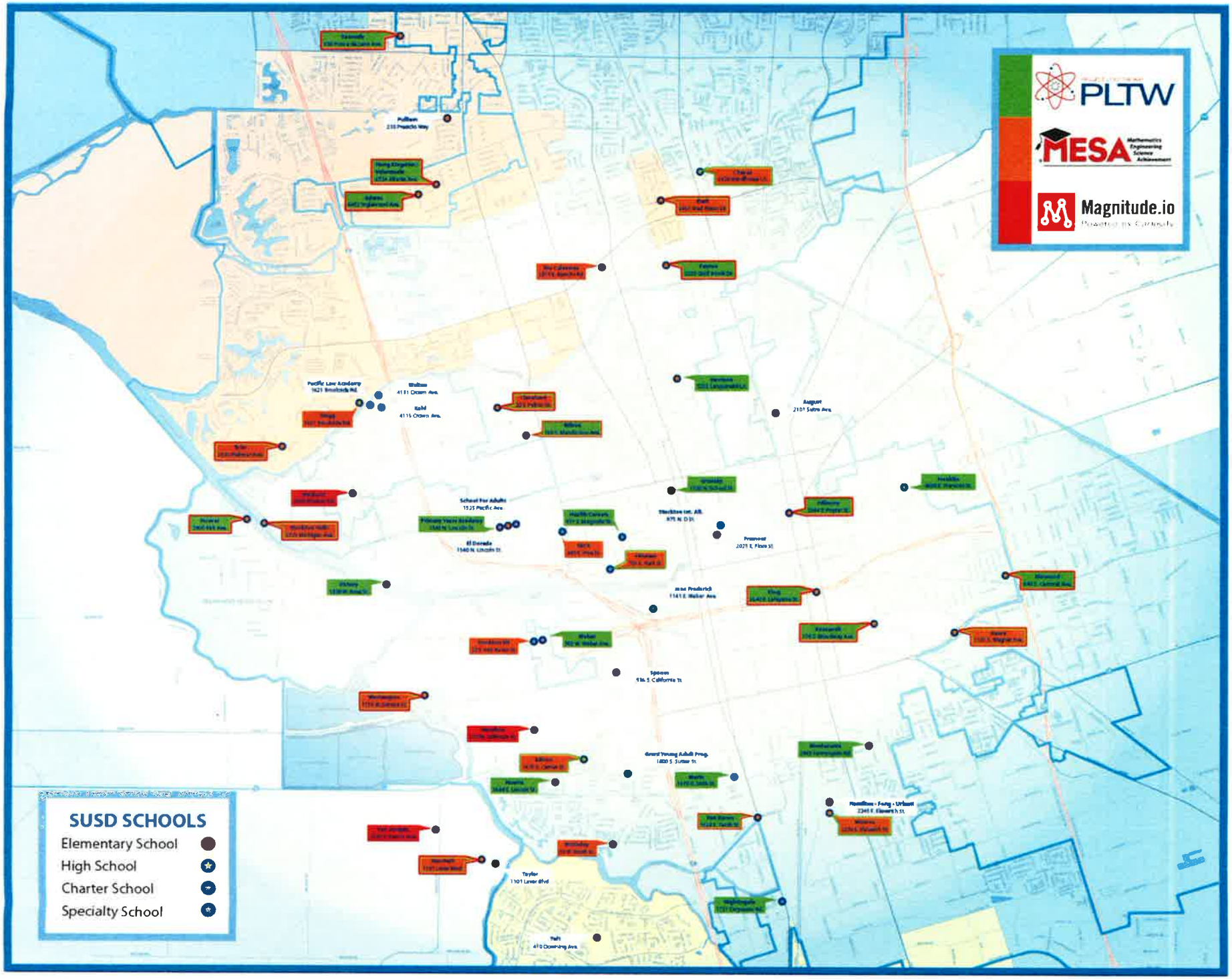
- PLTW is a robust K-12 STEM curriculum aligned to the Next Generation Science Standards (NGSS) endorsed by companies such as Chevron, John Deere, Lockheed Martin, and Verizon.
- PLTW offers a hands on, problem based approach to acquiring scientific knowledge and problem solving using the engineering design process.
- PLTW focuses on problem solving, critical and creative thinking, communication, collaboration, and perseverance.
- Rigorous teacher training
    - Launch Curriculum (K-5): 2 days teacher training
    - Gateway Curriculum (6-8): 3-5 days teacher training depending on course
    - High School Engineering, Biomedical Science, and Computer Science: 10 days training per course
- The Launch (K-5) curriculum currently offers 4 modules per grade level. Grades 3-5 will be a full NGSS curriculum by Fall 2021.
- Chevron is paying for the PLTW curriculum to be translated and made available in Spanish
- 32 SUSD schools will offer PLTW at different levels of implementation in 2019-2020

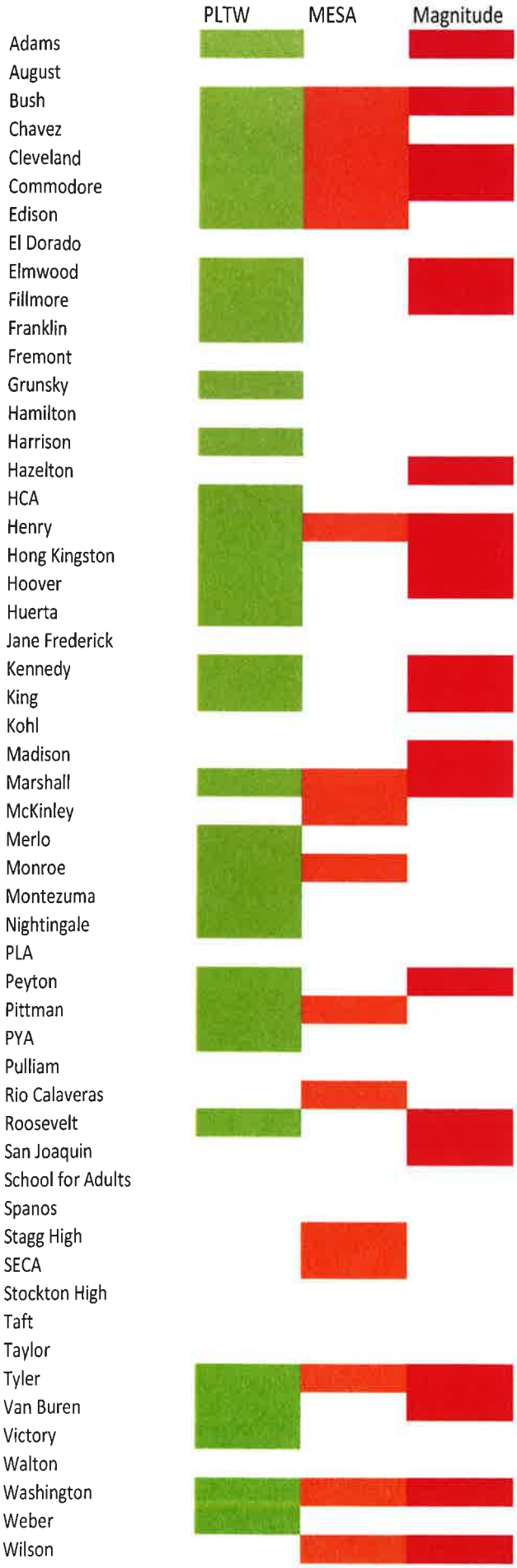
MESA Mathematics Engineering Science Achievement

- MESA is a nationally recognized STEM program.
- Participating schools offer as an elective course or an after school club.
- Students compete in engineering challenges at the local, state, and national level.
- Monthly teacher training meetings online or in person run through UOP.
- Major Events: Pacific STEM Day, Science Bowl, MESA Day, Field Trips
- 17 SUSD schools are currently offering MESA

Magnitude.io
Powered by Curiosity™

- Magnitude offers the real time experiments Exolab and CanSats
- Teachers receive training and support to successfully run experiments.
- Weather balloon launches
- 21 SUSD school have classrooms that offer either Exolab or CanSats


PLTW
MESA
Mathematics Engineering Science Achievement
Magnitude.io
SUSD SCHOOLS
Elementary School
High School
Charter School
Specialty School


PLTW
MESA
Magnitude
Adams
August
Bush
Chavez
Cleveland
Commodore
Edison
El Dorado
Elmwood
Fillmore
Franklin
Fremont
Grunsky
Hamilton
Harrison
Hazelton
HCA
Henry
Hong Kingston
Hoover
Huerta
Jane Frederick
Kennedy
King
Kohl
Madison
Marshall
McKinley
Merlo
Monroe
Montezuma
Nightingale
PLA
Peyton
Pittman
PYA
Pulliam
Rio Calaveras
Roosevelt
San Joaquin
School for Adults
Spanos
Stagg High
SECA
Stockton High
Taft
Taylor
Tyler
Van Buren
Victory
Walton
Washington
Weber
Wilson

PLTW Launch Module Descriptions

Aligned to Pre-Kindergarten Standards*

- **Life Science: Living and Nonliving Things –** Students explore characteristics of living and nonliving things. By examining habitats, students develop an understanding of what living things need in order to survive. They use the design process to sketch, build, and test an animal's shelter, then reflect on their design.
- **Matter: Floating and Sinking –** Students develop an understanding of matter by examining solids and liquids through hands-on activities. They explore floating and sinking as they predict and observe what effect liquids have on different materials. Using the design process, students rely on their knowledge and skills of matter to sketch, build, test, and reflect on a design they have created that will float on water and keep items within the design dry.
- **Healthy Habits –** Students develop an understanding of healthy habits and learn how food affects growth, gross motor skills (muscles), the heart, teeth, and eyes. They discover career connections as they learn about wellness checkups at the pediatrician, dentist, and optometrist. Students investigate how germs are spread and explore healthy habits to prevent the spread of germs. Using the knowledge and skills they've gained from the activities and project, students create a multimedia product to share what they've learned with others.
- **Spatial Sense and Coding –** Students develop spatial sense as they engage in activities that exploredirectional movement – over, under, through, and around. They begin to develop coding skills as they plan a path, create wearable code, and code an interactive robotic device. Using the engineering design process, students create code that will lead them to the location of a hidden item.

* PreK modules are available beginning July 2019.

Aligned to Kindergarten Standards

- **Structure and Function: Exploring Design –** Students discover the design process and how engineers influence their lives. They explore the elements of structure and function by identifying products around them designed by engineers and asking questions engineers might ask. They are introduced to a design problem through a story in which Angelina wants to design a paintbrush. Students apply their knowledge from the module to design their own paintbrushes.
- **Pushes and Pulls –** Students investigate pushes and pulls on the motion of an object and develop knowledge and skills related to forces of differing strengths and directions. Their explorations include pushes and pulls found in their everyday world, such as pushing a friend on a swing or pulling a wagon. In this module's design problem, Mylo needs to move rocks from his yard so he can install a swing set. Students work through the problem by applying what they learn about forces.
- **Structure and Function: Human Body –** Students explore the relationship between structure and function in the human body. They examine major organs within the body and investigate how the structure of each is related to its function. Students are introduced to the design problem through a story in which Angelina falls off the monkey bars and breaks her arm. Students learn about the diagnosis and treatment of her injury and then work to design and build a cast for Angelina.
- **Animals and Algorithms –** Students explore the nature of computers and the ways humans control and use technology. Starting with an unplugged activity, students learn about the sequential nature of computer programs. Students are inspired by a story in which Angelina, Mylo, and Suzi make animations to teach preschoolers about animals in their habitats. Then, students work in small groups to design and program a simple digital animation about an animal in its habitat.

Aligned to First Grade Standards

- **Light and Sound –** Students investigate the properties of light and sound, including vibration from sound waves and the effect of different materials on the path of a beam of light. After students develop an understanding of light and sound, they are challenged to solve a design problem Mylo, Suzi, and Angelina face. In the story, the characters are lost and must use only the materials in their backpack to communicate over a distance by using light and/or sound. Students use the design process to sketch, build, test, and reflect on a device that solves this design problem.
- **Light: Observing the Sun, Moon, and Stars –** After observing the sun, moon, and stars, students identify and describe patterns in their recorded data. Angelina, Mylo, and Suzi introduce the design problem, which challenges students to create a playground structure designed to protect students from ultraviolet radiation. Students utilize their knowledge of light to design, build, and test structures created to solve this problem. Students then evaluate their designs, share their findings, and explore ideas to improve their structures based on the testing data.

Aligned to First Grade Standards, *Continued*

- **Animal Adaptations –** Students explore animal adaptations for protection, camouflage, food obtainment, and locomotion. Students learn what it means for an organism to be adapted to its environment and how different adaptations can be categorized. Students are introduced to the design challenge when Suzi announces she is visiting the Sahara and needs to get prepared for her trip. Students are challenged to design the ideal shoe for travelers to wear in extreme environments, applying what they have learned and looking to plant and animal adaptations to guide their designs.
- **Animated Storytelling –** Students explore the sequential nature of computer programs through hands-on activities, both with and without a computer. They examine key aspects of storytelling and devise how to transition a narrative from page to screen. Students discover the design problem through a story about Angelina, Mylo, and Suzi, who wish they could find a way to create a story with characters who move and interact with each other. Combining fundamental principles of computer science with story-building skills, students develop animations that showcase characters, settings, actions, and events from short stories of their own creation.

Aligned to Second Grade Standards

- **Materials Science: Properties of Matter –** Students investigate and classify different kinds of materials by their observable properties, including color and texture. They learn about states of matter and properties of materials, including insulators and conductors. In the design problem, Angelina, Mylo, and Suzi are challenged to keep ice pops cold during a soccer game – without a cooler. Students apply their knowledge and skills to determine the best material to solve this design problem and then evaluate how their designs might be improved.
- **Materials Science: Form and Function –** Students research the variety of ways animals disperse seeds and pollinate plants. They expand their understanding of properties of matter as they consider the form and function involved in seed dispersal and pollination. Students are introduced to the design problem when Angelina, Mylo, and Suzi are tasked with starting a wildflower garden on an expansive plot outside of their school. To solve the design problem, students apply their knowledge and skills to design, build, test, and reflect on a device that mimics a way in which animals disperse seeds or pollinate plants.
- **The Changing Earth –** Students explore how the surface of the Earth is always changing. They are introduced to different types of maps and explore how these maps convey different information about the world in which we live, including where water is found on Earth. Angelina, Mylo, and Suzi introduce the design problem when faced with the challenge of helping a community threatened by a potential landslide. Students investigate the different forces that shape the surface of the Earth and design solutions to limit the impact of erosion on this fictional community, which is located at the bottom of a hill that was recently destabilized by a fire.
- **Grids and Games –** Students investigate numerical relationships while learning about the sequence and structure required in computer programs. Starting with computer-free activities and moving to digital challenges, students apply addition and subtraction strategies to make characters move on a grid. Angelina presents the design problem when she expresses her desire to design a game she can play on her device. Using skills and knowledge gained from these activities, students work together in groups to design and develop a game in which a player interacts with objects on a screen.

Aligned to Third Grade Standards

- **Stability and Motion: Science of Flight –** In this module, students learn about the forces involved in flight as well as Newton's Laws of Motion. They design, build, and test an experimental model glider to find out how air and other forces affect its flight. Students discover aeronautics alongside Angelina, Mylo, and Suzi and are inspired by the characters' desire to use their skills to help those in need. Students apply the design process to the problem of delivering aid to an area where supplies must be airlifted in and dropped to the ground from an aircraft.
- **Stability and Motion: Forces and Interactions –** Students explore simple machines, including the wheel and axle, inclined plane, lever, pulley, and more, as well as compound machines. They investigate forces, such as magnetism, as they work to help Angelina, Mylo, and Suzi rescue a trapped tiger during their field trip to the zoo. Students apply their knowledge of machines and forces to devise a way to rescue a heavy zoo animal while keeping it safe throughout the process.
- **Variation of Traits (Available currently) –** Students investigate the differences between inherited genetic traits and traits learned or influenced by the environment. They explore the phenomena that offspring may express different traits than parents as they learn about dominant and recessive genes and also investigate how predicted outcomes compare to experimental results. Angelina, Mylo, and Suzi introduce the design problem when challenged to examine different traits found in three sets of seeds. Students then model how the gene for stem color is passed on and expressed among sample sets.
- **Variation of Traits (Available July 2019) –** Students compare and contrast inherited traits and traits influenced by the environment. They explore the relationship between the traits of parents and offspring by creating different combinations of dominant and recessive alleles. Students use the design process to create fictional animal parents with a variety of traits. They use data to investigate the traits passed from the parents to the offspring.
- **Programming Patterns –** Students explore control structures, such as events, loops, and conditionals. These structures specify the sequence in which instructions are executed within a program. Starting with computer-free activities and progressing to programming in a block-based language on a device, students learn how to think computationally about a program. In the design problem, Angelina, Mylo, and Suzi are challenged to use computer programming to write a story with different endings. Combining their writing and programming skills, students develop interactive stories on a device with multiple plot lines.

Aligned to Third Grade Standards, *Continued*

- **Weather: Factors and Hazards (Available July 2020) –** Students explore, collect, and classify data related to three factors that affect weather: precipitation, temperature, and wind. They contrast weather and climate, relying on the three factors in their descriptions. Students explore different types of weather hazards, including those in their region. They design a solution that reduces the impact of a weather-related hazard.
- **Animal Groups** (Available July 2020) –** Students discover how the life cycles of organisms form a pattern of birth, growth, reproduction, and death. They also learn that during different stages of life, some animals form groups to help with their survival.
- **Environmental Changes** (Available July 2020) –** Students explore how environmental changes affect the habitats of living organisms. They discover that environmental changes affect organisms' survival because they are suited to particular habitats. The students also investigate fossilized remains of organisms and the evidence those remains provide about their environments.

** Working title

Aligned to Fourth Grade Standards

- **Energy: Collisions –** Students explore the properties of mechanisms and how they change energy by transferring direction, speed, type of movement, and force. Students discover a variety of ways potential energy can be stored and released as kinetic energy. They explain the relationship between the speed of an object and the energy of that object, as well as predict the transfer of energy as a result of a collision between two objects. The design problem is introduced by Angelina, Mylo, and Suzi watching amusement park bumper cars collide. As students solve the problem for this module, they apply their knowledge and skills to develop a vehicle restraint system.
- **Energy: Conversion –** Students identify the conversion of energy between forms and the energy transfer required to move energy from place to place. They also identify and explain how energy can be converted to meet a human need or want. The design problem is introduced through Angelina, Mylo, and Suzi, who need to move donated food from a truck to a food pantry. Students then apply scientific ideas about the conversion of energy to solve this design problem.
- **Input/Output: Computer Systems –** In this exploration of how computers work, students are encouraged to make analogies between the parts of the human body and parts that make up a computer. Students investigate reaction time as a measure of nervous system function. After Mylo suffers a concussion, his friends become interested in how to diagnose concussions and create a reaction-time computer program to assess a baseline before a concussion occurs. Students apply what they have learned to build their own reaction-time measurement tools. This module has strong connections to the fourth grade Human Brain module.
- **Input/Output: Human Brain –** Students discover how signals passing from cell to cell allow us to receive stimuli from the outside world, transmit this information to the brain for processing, and then send out a signal to generate a response. When Mylo experiences a concussion after falling off a skateboard while not wearing a helmet, he and his friends are motivated to raise awareness about concussions. Inspired by this design problem, students work as part of a team to design, plan, and create a video or podcast to educate children on identifying and preventing concussions.

Aligned to Fifth Grade Standards

- **Robotics and Automation –** Students explore the ways robots are used in today's world and their impact on society and the environment. Students learn about a variety of robotic components as they build and test mobile robots that may be controlled remotely. Angelina, Mylo, and Suzi are tasked with designing a mobile robot that can remove hazardous materials from a disaster site. Students are then challenged to design, model, and test a mobile robot that solves this design problem.
- **Robotics and Automation: Challenge –** Students expand their understanding of robotics as they explore mechanical design and computer programming. This module focuses on developing skills needed to build and program autonomous robots. Angelina, Mylo, and Suzi are tasked with designing an automatic-guided vehicle to deliver supplies to a specific area in a hospital without being remotely controlled by a person. Inspired by this design problem, students work with a group to apply their knowledge to design, build, test, and refine a mobile robot that meets a set of design constraints.
- **Infection: Detection –** Students explore transmission of infection, agents of disease, and mechanisms the body uses to stay healthy. Through a simulation, they compare communicable and non-communicable diseases. In the design problem, Suzi comes down with a fever and sore throat, and her friends wonder how this illness might have spread across the school. Students tackle the design problem by examining evidence to deduce the agent of infection, the likely source of the outbreak, and the path of transmission through a school. They design and run an experiment related to limiting the spread of germs and apply results to propose appropriate prevention methods.
- **Infection: Modeling and Simulation –** In this module, students investigate models and simulations and discover powerful ideas about computing. The design problem – related to the Infection: Detection module – is introduced as Mylo and Angelina look to model an infectious disease to simulate how an illness spread through their class. Applying their new understandings, students program their own models and collect data by running simulations with different parameters.

PLTW Gateway Unit Descriptions

Design and Modeling
Students apply the design process to solve problems and understand the influence of creativity and innovation in their lives. Using design software, students create a virtual image of their designs and produce a portfolio to showcase their innovative solutions.

Automation and Robotics
Students trace the history, development, and influence of automation and robotics as they learn about mechanical systems, energy transfer, machine automation, and computer control systems. Students use the VEX Robotics® platform to design, build, and program real-world objects such as traffic lights, toll booths, and robotic arms.

App Creators
This unit exposes students to computer science as a means of computationally analyzing and developing solutions to authentic problems through mobile app development, and conveys the positive impact of the application of computer science to other disciplines and to society.

Computer Science for Innovators and Makers
Throughout the unit, students learn about programming for the physical world by blending hardware design and software development, allowing students to discover computer science concepts and skills by creating personally relevant, tangible, and shareable projects.

Energy and the Environment
Students are challenged to think big and toward the future as they explore sustainable solutions to our energy needs and investigate the impact of energy on our lives and the world. They design and model alternative energy sources and evaluate options for reducing energy consumption.

Flight and Space
The exciting world of aerospace comes alive through Flight and Space. Students explore the science behind aeronautics and use their knowledge to design, build, and test an airfoil. Custom-built simulation software allows students to experience space travel.

Science of Technology
Science impacts the technology of yesterday, today, and the future. Students apply the concepts of physics, chemistry, and nanotechnology to STEM activities and projects, including making ice cream, cleaning up an oil spill, and discovering the properties of nano-materials.

Magic of Electrons
Through hands-on projects, students explore electricity, the behavior and parts of atoms, and sensing devices. They learn knowledge and skills in basic circuitry design, and examine the impact of electricity on the world around them.

Green Architecture
Today's students have grown up in an age of "green" choices. In this unit, students learn how to apply this concept to the fields of architecture and construction by exploring dimensioning, measuring, and architectural sustainability as they design affordable housing units using Autodesk's® 3D architectural design software.

Medical Detectives
Students play the role of real-life medical detectives as they analyze genetic testing results to diagnose disease and study DNA evidence found at a "crime scene." They solve medical mysteries through hands-on projects and labs, investigate how to measure and interpret vital signs, and learn how the systems of the human body work together to maintain health.

PLTW Engineering Course Descriptions

Introduction to Engineering Design *(1 year)*
Students dig deep into the engineering design process, applying math, science, and engineering standards to hands-on projects. They work both individually and in teams to design solutions to a variety of problems using 3D modeling software, and use an engineering notebook to document their work.

Principles of Engineering *(1 year)*
Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students develop skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentation.

Aerospace Engineering *(1 year)*
This course propels students' learning in the fundamentals of atmospheric and space flight. As they explore the physics of flight, students bring the concepts to life by designing an airfoil, propulsion system, and rockets. They learn basic orbital mechanics using industry-standard software. They also explore robot systems through projects such as remotely operated vehicles.

Civil Engineering and Architecture *(1 year)*
Students learn important aspects of building and site design and development. They apply math, science, and standard engineering practices to design both residential and commercial projects and document their work using 3D architecture design software.

Computer Integrated Manufacturing *(1 year)*
Manufactured items are part of everyday life, yet most students have not been introduced to the high-tech, innovative nature of modern manufacturing. This course illuminates the opportunities related to understanding manufacturing. At the same time, it teaches students about manufacturing processes, product design, robotics, and automation. Students can earn a virtual manufacturing badge recognized by the National Manufacturing Badge system.

Computer Science Principles *(1 year)*
Using Python® as a primary tool and incorporating multiple platforms and languages for computation, this course aims to develop computational thinking, generate excitement about career paths that utilize computing, and introduce professional tools that foster creativity and collaboration. While this course can be a student's first in computer science, students without prior computing experience are encouraged to start with Introduction to Computer Science. Computer Science Principles helps students develop programming expertise and explore the workings of the Internet. Projects and problems include app development, visualization of data, cybersecurity, and simulation. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science Principles (AP CSP). This endorsement affirms that all components of PLTW CSP's offerings are aligned to the AP Curriculum Framework standards and the AP CSP assessment.

Digital Electronics *(1 year)*
From smartphones to appliances, digital circuits are all around us. This course provides a foundation for students who are interested in electrical engineering, electronics, or circuit design. Students study topics such as combinational and sequential logic and are exposed to circuit design tools used in industry, including logic gates, integrated circuits, and programmable logic devices.

Environmental Sustainability *(1 year)*
In Environmental Sustainability, students investigate and design solutions in response to real-world challenges related to clean and abundant drinking water, food supply issues, and renewable energy. Applying their knowledge through hands-on activities and simulations, students research and design potential solutions to these true-to-life challenges.

Engineering Design and Development *(1 year)*
The knowledge and skills students acquire throughout PLTW Engineering come together in Engineering Design and Development as they identify an issue and then research, design, and test a solution, ultimately presenting their solution to a panel of engineers. Students apply the professional skills they have developed to document a design process to standards, completing Engineering Design and Development ready to take on any post-secondary program or career.

PLTW Biomedical Science Course Descriptions

Principles of Biomedical Science *(1 year)*
In the introductory course of the PLTW Biomedical Science program, students explore concepts of biology and medicine to determine factors that led to the death of a fictional person. While investigating the case, students examine autopsy reports, investigate medical history, and explore medical treatments that might have prolonged the person's life. The activities and projects introduce students to human physiology, basic biology, medicine, and research processes while allowing them to design their own experiments to solve problems.

Human Body Systems *(1 year)*
Students examine the interactions of human body systems as they explore identity, power, movement, protection, and homeostasis. Exploring science in action, students build organs and tissues on a skeletal Maniken®; use data acquisition software to monitor body functions such as muscle movement, reflex and voluntary action, and respiration; and take on the roles of biomedical professionals to solve real-world medical cases.

Medical Interventions *(1 year)*
Students follow the life of a fictitious family as they investigate how to prevent, diagnose, and treat disease. Students explore how to detect and fight infection; screen and evaluate the code in human DNA; evaluate cancer treatment options; and prevail when the organs of the body begin to fail. Through real-world cases, students are exposed to a range of interventions related to immunology, surgery, genetics, pharmacology, medical devices, and diagnostics.

Biomedical Innovation *(1 year)*
In the final course of the PLTW Biomedical Science sequence, students build on the knowledge and skills gained from previous courses to design innovative solutions for the most pressing health challenges of the 21st century. Students address topics ranging from public health and biomedical engineering to clinical medicine and physiology. They have the opportunity to work on an independent design project with a mentor or advisor from a university, medical facility, or research institution.

PLTW Computer Science Course Descriptions

Computer Science Essentials
Computer Science Essentials exposes students to a diverse set of computational thinking concepts, fundamentals, and tools, allowing them to gain understanding and build confidence. Students use visual, block-based programming and seamlessly transition to text-based programming with languages such as Python® to create apps and develop websites, and learn how to make computers work together to put their design into practice. They apply computational thinking practices, build their vocabulary, and collaborate just as computing professionals do to create products that address topics and problems important to them.

Computer Science Principles
Using Python® as a primary tool and incorporating multiple platforms and languages for computation, this course aims to develop computational thinking, generate excitement about career paths that utilize computing, and introduce professional tools that foster creativity and collaboration. While this course can be a student's first in computer science, students without prior computing experience are encouraged to start with Introduction to Computer Science. Computer Science Principles helps students develop programming expertise and explore the workings of the Internet. Projects and problems include app development, visualization of data, cybersecurity, and simulation. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science Principles (AP CSP). This endorsement affirms that all components of PLTW CSP's offerings are aligned to the AP Curriculum Framework standards and the AP CSP assessment.

Computer Science A
Computer Science A focuses on further developing computational thinking skills through the medium of Android™ App development for mobile platforms. The course utilizes industry-standard tools such as Android Studio, Java™ programming language, XML, and device emulators. Students collaborate to create original solutions to problems of their own choosing by designing and implementing user interfaces and Web-based databases. This course aligns with the AP CS A course.

Cybersecurity
Available 2018-19
Cybersecurity introduces the tools and concepts of cybersecurity and encourages students to create solutions that allow people to share computing resources while protecting privacy. Nationally, computational resources are vulnerable and frequently attacked; in Cybersecurity, students solve problems by understanding and closing these vulnerabilities. This course raises students' knowledge of and commitment to ethical computing behavior. It also aims to develop students' skills as consumers, friends, citizens, and employees who can effectively contribute to communities with a dependable cyber-infrastructure that moves and processes information safely.

The MESA Schools program serves mostly middle and senior high school students (some sites offer services to elementary schools) and is administered through local centers, located on university campuses, that partner with area school districts. The main program components of the MSP model include:

- MESA Day Academies where students follow MESA developed curriculum that reinforce California Math and Science Standards to build hands-on projects bringing lessons learned in the classroom to reality. Students enter these projects in rigorous local competitions; winners advance to regional, and in some instances, national competitions.
- MESA Periods which are classes, taught during the regular school day, dedicated to highlighting engineering, science, and mathematical theory and practice. MESA Advisors, school site teachers selected by the MESA Center, work with students in these classes to build academic attainment, peer groups, and confidence so that students graduate high school University of California eligible.
- SAT/PSAT training offering additional resources and support to prepare students for these important tests.
- Study Skills training offer students information about developing the most effective techniques for academic success.
- Career and college exploration to bring students in contact with guest speakers from university campuses and working in industry as well as field trips to various industry sites and college campuses.
- Incentive awards designed to acknowledge outstanding academic achievement and leadership.
- Parent leadership, training teaching parents about advocacy skills and leadership.
- Teacher training initiatives developed for school sites teachers that expand and improve learning not just for MESA students, but also across schools.

MESA students perform well when compared with non-MESA students. 77% complete Algebra by the 10th grade, allowing more time to take college preparatory classes. 54% of MESA graduates fulfilled the "A-G" requirements for University of California and California State University admission, compared with 34% of California seniors. Of MESA graduates, 60% go on to attend postsecondary institutions and major in math, science, or engineering. Of high school seniors who are African American, Latino, and American Indian, 41% are eligible for admission to a UC campus. This eligibility rate is much higher than the statewide rate of 6% for these groups.

Pacific MESA Center

Established in 1993, and located within the University of the Pacific School of Engineering and Computer Science, Pacific MESA Center's MSP program serves eight hundred 4th - 12th grade students per year. Providing all of the MESA program components, Pacific MESA Center also offers students a Saturday Academy where students attend math and science workshops, from October through February, utilizing the School of Engineering's facilities. Additionally, the Center offers students an opportunity to compete in *Quiz Bowl*, a *Jeopardy* type event, focused on math, science, and engineering concepts as well as test themselves via the *Go Figure* Math Challenge in collaboration with Sandia National Laboratories. Other unique services include, Shadow Day, where high school seniors attend the university and "shadow" an enrolled student in engineering; Senior Retreat, where both students and parents are given information as well as assistance filling out college applications and financial aid forms; and the Parent Conference designed to assist parents with understanding the importance of academic attainment within math-based fields. In 2000, Phi Delta Kappa recognized Pacific MESA Center for its "Outstanding Contribution of Education." In 2007, the Center was featured by PBS as an innovative solution to improving math and science education for pre-college students in, *The Inventors: Designing the Future*, a documentary that aired nationally.

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ExoLab

Aboard the International Space Station

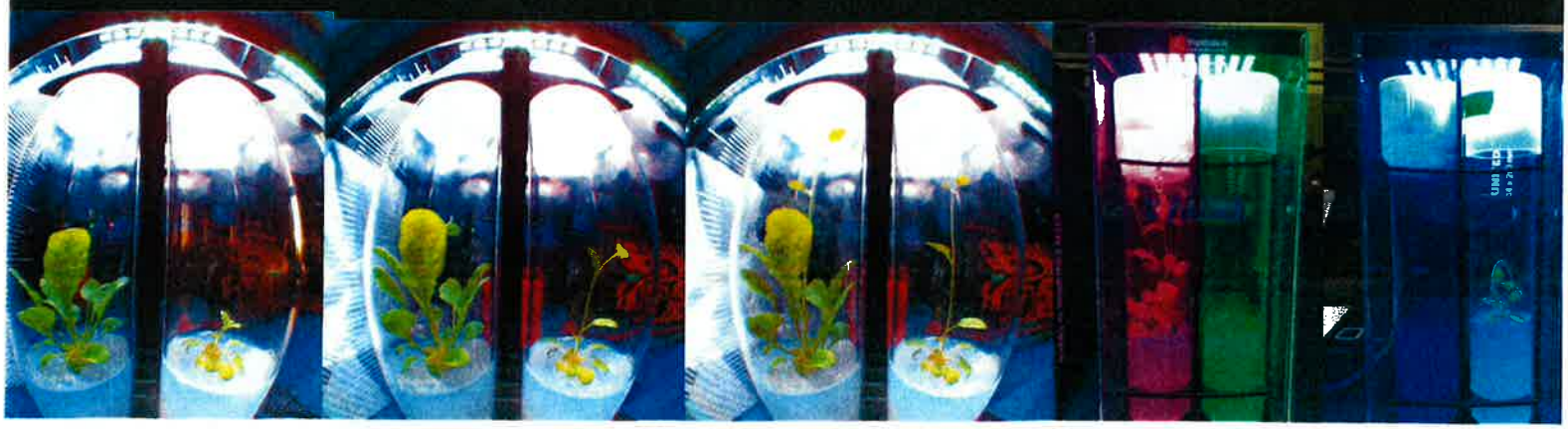
ExoLab is a 2U (10 cm x 10 cm x 20 cm) experiment platform that brings together classrooms and the International Space Station in a collaborative investigation of the effects of microgravity. Designed with curriculum for 6th – 8th grade based on the Next Generation Science Standards, one ExoLab is aboard the International Space Station while you host your own ExoLab with other teachers from around the world!

ExoLab can be used for many different types of research. From biology, to crystallography, entomology, or even microfluidics, students can investigate phenomena across the sciences.

For the 2018-19 school year, your **Growth of Assorted Plants in Microgravity** experiment studies the morphology and physiology of the germination of up to four different plant types within ExoLab. The seeds are placed under automatic growth lighting conditions to provide day and night lighting cycles that simulate successful terrestrial lighting. While imaging and numerous environmental sensors provide incremental evaluation of the plant growth on the International Space Station, your school and others run the terrestrial control experiments for comparison.

This experiment demonstrates modular, autonomous and retrievable crop research in space by contributing to the understanding of plant cultivation in service of food, oxygen and other habitat requirements on long term space missions. Your students will investigate plant grown under unusual conditions and learn about crop science, basic biology and horticultural applications on Earth.

Join us: **https://exolab.space**



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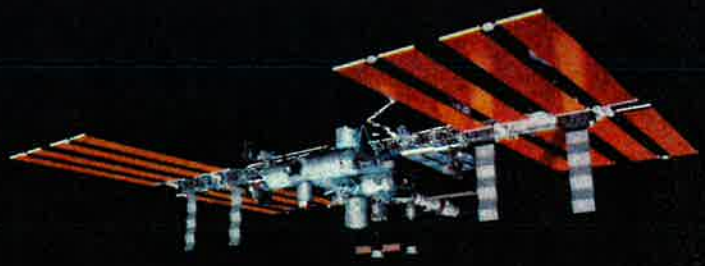
ExoLab

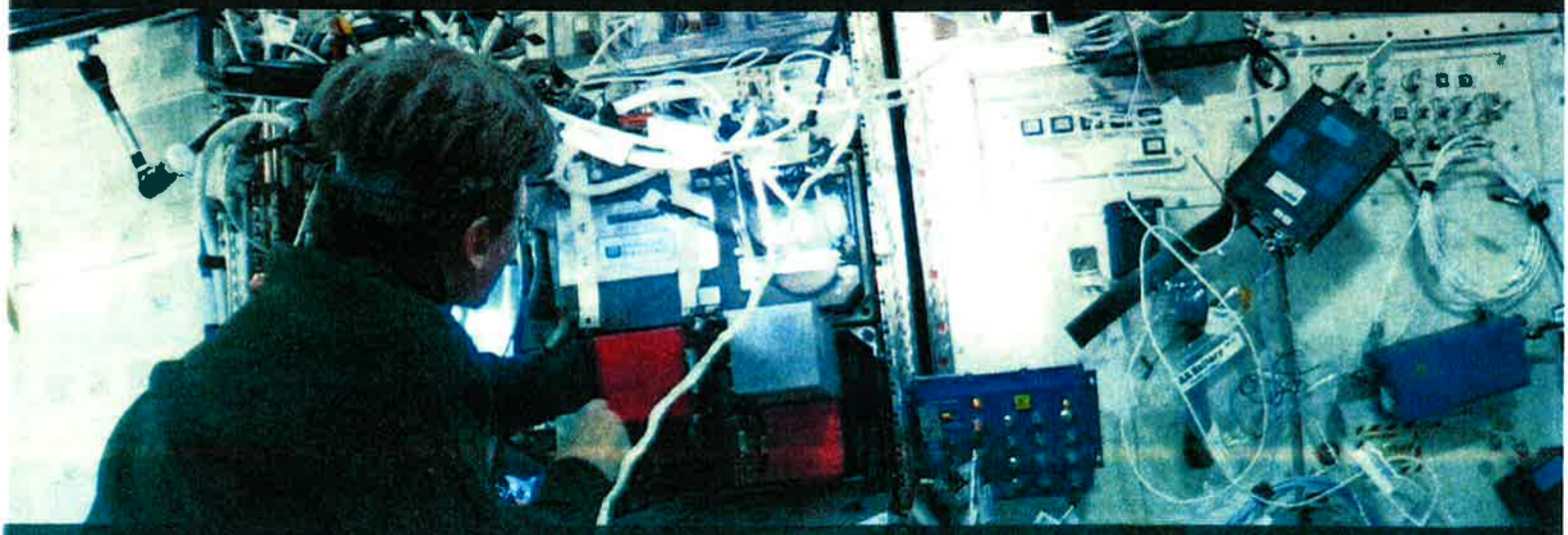
Investigating the effects of gravity on living things



- Classroom ExoLab
- Subscription to nutrients, seeds & supply
- 1-year classroom subscription to the learning management platform
- Lessons mapped to NGSS
- Access to the International Space Station experiment
- Data visualization and download
- Data storage on cloud server
- Network with students in the US and internationally
- Weekly Worldwide Teacher's Teleconference

The International Space Station (ISS) is Earth's largest artificial satellite. Larger than a football field and weighing more than 450 tons, the ISS is home to the only US National Laboratory not on Earth.

How does gravity, or the lack of it affect living things and/or materials? ExoLab is a series of experiments that will run in classrooms concurrently with sister experiments aboard the International Space Station.



Astronaut Peggy Whitson installed our 1st ExoLab experiment

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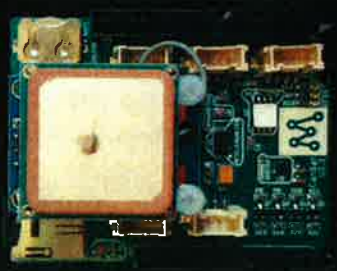
CanSat

Size of a regular soda can

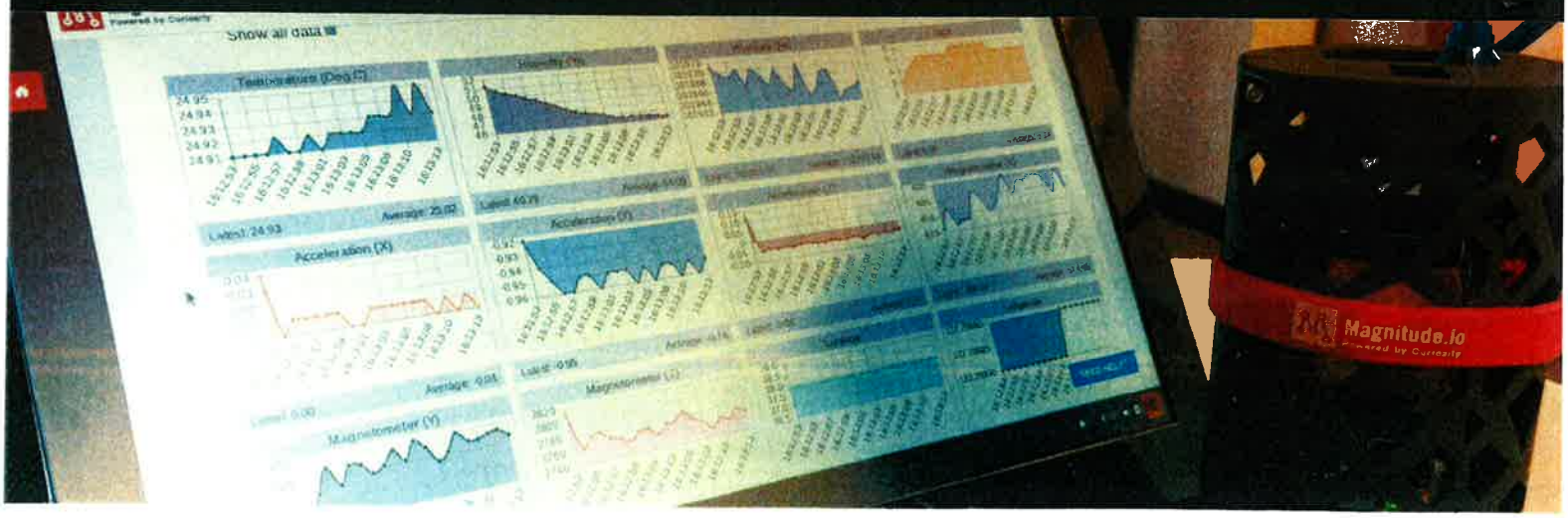


Magnitude.io CanSat experience is a complete hands-on curriculum mapped to Next Generation Science and Common Core State Standards by UC Davis School of Education and a team of education professionals.

The CanSat program is an in-class STEM experience that culminates your semester with a high-powered rocket launch blasting more than a mile up in just a few seconds, or high altitude balloon that travels more than three times higher than a commercial airliner. The curriculum comes with lesson plans and student labs in modular format covering acceleration, barometric pressure, temperature, humidity, magnetic fields, global positioning (GPS), mission hypothesis, data analysis, science writing and communication. More modules are being developed throughout the school year.

What is a CanSat?

A CanSat is a simulated satellite in the volume of a soda can. What is used around the world at the university level to teach science and engineering can now be brought to your middle school or high school.



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Magnitude Learning Platform

Beside the 8 CanSats you get a in the Classroom Kit along with a pair of radios and yagi antenna, as a teacher, you will have access to our classroom platform with a year subscription. The platform comes with...

- Lesson library, more than a dozen CanSat lessons
- Mapped to Next Generation Science Standards
- Mapped to Common Core State Standards
- Teacher assigned lesson with start and due date
- Guided lesson interface
- Quiz tool integrated as part of the lesson
- Data visualization tool
- Codes to operate the various sensors
- Code editor & compiler for Arduino in the browser
- Online note taking with images
- Each student have their own account
- Teachers dashboard monitoring student progress in **realtime**
- Formative and Summative Assessments

We recommend a compelling way to put student learning in action, measuring the world around them to culminate a year of learning about the CanSat.

(This is a separate service, not part of the CanSat Classroom Kit.)

A **high altitude balloon** carrying a payload with CanSats, cameras, and other experiments. Your launch can take place on your school campus creating a learning experiment for the entire school. Check out one of our high altitude balloon videos, https://www.youtube.com/watch?v=Cyus-nIhHvU

Coordinating with a local rocket club near you, a **high power rocket launch day** for your region or school district. The CanSat becomes the "satellite" payload. Record phenomena throughout the flight and review the data with post-flight analysis. Check out this video. https://www.youtube.com/watch?v=Tf36ieNcPcw

https://magnitude.io/cansat-stem-education/