

Hoboken Public Schools

**Project Lead The Way Curriculum
Grade 8**



Project Lead The Way

HOBOKEN PUBLIC SCHOOLS

Course Description

PLTW Gateway's 9 units empower students to lead their own discovery. The hands-on program boosts classroom engagement and excitement, drives collaboration, and inspires "aha! moments" and deep comprehension. And as students engage in PLTW's activities in computer science, engineering, and biomedical science, they see range of paths and possibilities they can look forward to in high school and beyond.

Course Resources

PLTW Materials
Samsung tablets
Chromebooks

Pacing Guide

Unit Titles	Time Frame
Unit 1: Automation and Robotics	3-4 Months
Unit 2: Medical Detectives	3 Months
Unit 3: Introduction to Computer Science	3-4 Months

Unit 1 – Automation and Robotics

3 – 4 Months

Unit 1

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.

Essential Questions

- What type of robot do you think makes the most significant contribution to our lives today and why?
- How is the greatest concern that should be considered before converting a factory from human workforce to robotic workforce defined in this unit?
- How is the impact described that robots will have on your life in 10 years and in 50 years?
- Which mechanism would be used to increase speed?
- Which mechanism would be used to increase torque or force?
- How do you change types of motion using mechanisms?
- How are mechanisms used in real-life applications and what is their purpose?

- How is the difference between an open-loop and closed-loop system defined? List examples of each.
- How are the advantages and disadvantages of automation described?
- How do you troubleshoot a malfunctioning system efficiently?
- How is good communication and teamwork important when solving technological problems explored in this unit?

Essential Learning Outcomes

- Students will know the seven technological resources and how they are integrated into an open and closed loop system.
- Students will describe the purpose of pseudocode and comments within a computer program.
- Students will know how to use ratio reasoning to solve mechanical advantage problems.
- Students will Design, build, wire, and program both open and closed loop systems.
- Students will Use motors and sensors appropriately to solve robotic problems.
- Students will troubleshoot a malfunctioning system using a methodical approach.
- Students will Experience fluid power by creating and troubleshooting a pneumatic device. (FT Version)
- Students will Design, build, wire and program a system operated by alternative energy. (FT Version)
- Students will explain the roles and responsibilities of mechanical, electrical, and computer engineers who solve robotic problems.
- Students will describe the purpose of automation and robotics and its effect on society.
- Students will summarize ways that robots are used in today’s world and the impact of their use on society.
- Students will describe positive and negative effects of automation and robotics on humans in terms of safety and economics.
- Students will provide examples of STEM careers and the need for these professionals in our society.
- Students will Use ratios to solve mechanical advantage problems.
- Students will Use numerical and algebraic expressions and equations to solve real-life problems, such as gear ratios.
- Students will Use the characteristics of a specific mechanism to evaluate its purpose and applications.
- Students will apply knowledge of mechanisms to solve a unique problem for speed, torque, force, or type of motion.

Technology Infusion

8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.2	Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
8.1.8.A.3	Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
8.1.8.A.4	Graph and calculate data within a spreadsheet and present a summary of the results

8.1.8.A.5	Create a database query, sort and create a report and describe the process, and explain the report results.
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Standard Addressed

RL.8.1; RL.8.2; RL.8.3; RL.8.4; RL.8.5; RL.8.6; RL.8.7; RL.8.8; RL.8.9

W.8.3; W.8.3A; W.8.3B; W.8.3C; W.8.3D; W.8.3E

Differentiation

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.

Assessments

- Class participation
- Completion of activity sheets
- Discussions demonstrating knowledge of subject matter
- Interactive journal responses
- Responses
- RST with Rubric Evaluation
- Academic Vocabulary

21st Century Learning Connection

"21st century skills" are the skills that today's students will need to be successful in this ever-changing world. The most recognizable of these skills are the 4C's: communication, collaboration, critical thinking and creativity. However, 21st century skills also include social and emotional intelligence, technological literacy and problem solving abilities. These skills emphasize "application of knowledge" and go beyond rote memorization.

Unit 2 Medical Detectives

3 Months

Unit 2

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.

Essential Questions

- How do medical detectives use to learn about a patient’s health?
- How can vital signs signal a decline in a patient’s health?
- How can epidemics be prevented?
- How is a mystery illness diagnosed?
- How does the human body use the five senses to interpret the outside world?
- How is the brain considered to be the control center of the human body?
- How does family medical history aid in the diagnosis of a patient?
- How can disruption at the cell level lead to death? How is time of death determined?
- How is cause of death determined?
- How can DNA be used to identify a person?

Essential Learning Outcomes

- Students will Measure vital signs including heart rate, blood pressure, and temperature.
- Students will demonstrate the use of technology as an important tool in the Biomedical Sciences.
- Students will explain the different ways a virus spreads through a population.
- Students will describe the spread of a viral illness after inoculation is introduced.
- Students will evaluate patient case files to diagnose the pathogen responsible for the patient’s mystery illness.
- Students will describe the steps that a medical professional will take to diagnose and treat a patient.
- Students will provide examples of how medical professionals contribute to the health and wellness of individuals. Describe how the brain collects and interprets input.
- Students will Compare and contrast the senses of hearing and sight, taste and smell, and describe how they are collected and processed by the human body.
- Students will identify major regions of the human brain.
- Students will dissect a sheep’s brain, accurately identifying and describing the function of the specified structures.
- Students will Compare and contrast the brains of a human and sheep.
- Students will evaluate patient family history as part of a medical exam and create a pedigree.
- Students will determine the probability of a child inheriting a genetic disease.
- Students will Use appropriate laboratory methods to isolate DNA from cheek cells.
- Students will analyze how changes in the huntingtin gene affect the resulting protein and nerve cell function.
- Students will know how to use patient and ambient temperature to identify the time of death.
- Students will know how to use the time of death information to identify suspects.
- Students will List the steps of an autopsy.
- Students will analyze a portion of an autopsy report to determine the cause of death for a murder victim.
- Students will Use DNA gel electrophoresis to compare DNA samples.

- Students will defend identification of suspect using physical evidence including time of death, cause of death, and DNA crime scene analysis.

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Unit 3 – Introduction to Computer Science

3- 4 Months

Unit 3

In each module, student teams create an Android® interface to solve a problem the team defines. Students learn fundamental computer science (CS) concepts using MIT App Inventor. The course aims to develop computational thinking and build student excitement. Several days in each module are targeted to build career awareness about computing skills in all fields and to improve students' cyber hygiene.

Essential Questions

- How has computing affected the world we live in?
- How do computers represent the data in words, numbers, pictures, and sound?
- How is a complex piece of software organized?
- How do teams plan and create complex solutions to a problem?
- How do I safely use the Internet?
- How do people collaborate to create software applications?

Essential Learning Outcomes

- Student will collaborate when programming
- Student will manipulate numeric data from input, for analysis, and for output
- Student will Implement and analyze algorithms using simple conditional logic
- Student will Implement and analyze algorithms using nested conditional logic
- Student will reduce the value of a variable resulting from execution of particular code
- Student will Identify and use helpful resources when programming
- Student will Use tools of a language and development environment to create original programming solutions
- Student will construct a user interface
- Student will Design a program by breaking a large plan into smaller modules
- Student will generalize a solution to an algorithmic problem
- Student will Create and modify audio and image data
- Student will Write and test modular code to incrementally create a program
- Student will encapsulate a set of related statements in a function or procedure
- Student will convert a given quantity among bases 2, 10, and 16
- Student will Implement and analyze algorithms using counted iteration
- Student will Describe how computing will affect areas you might pursue, including work, hobbies, or interests

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