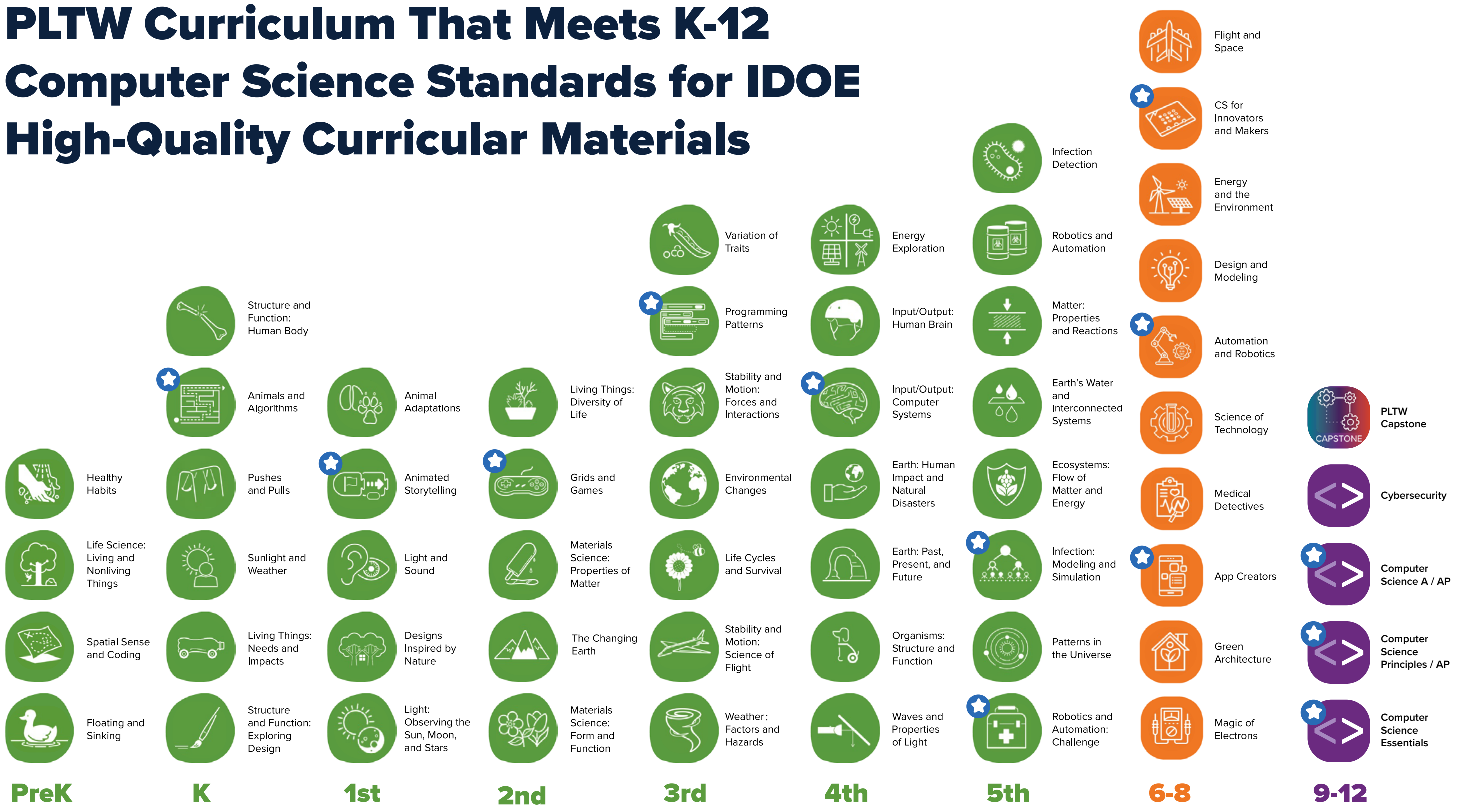
Indiana High-Quality Curricular Materials for K-12 Computer Science

PLTW

High-Quality Curricular Materials

The Indiana Dept. of Education (IDOE) has created an Indiana High-Quality Curricular Materials Advisory List for K-12 Computer Science, and PLTW is proud to have been selected to that list. Here are the descriptions of the PLTW curriculum that helps you meet the state's computer science standards.

PLTW Curriculum That Meets K-12 Computer Science Standards for IDOE High-Quality Curricular Materials



PreK
- Healthy Habits
- Life Science: Living and Nonliving Things
- Spatial Sense and Coding
- Floating and Sinking

K
- Structure and Function: Human Body
- ★ Animals and Algorithms
- Pushes and Pulls
- Sunlight and Weather
- Living Things: Needs and Impacts
- Structure and Function: Exploring Design

1st
- Animal Adaptations
- ★ Animated Storytelling
- Light and Sound
- Designs Inspired by Nature
- Light: Observing the Sun, Moon, and Stars

2nd
- Living Things: Diversity of Life
- ★ Grids and Games
- Materials Science: Properties of Matter
- The Changing Earth
- Materials Science: Form and Function

3rd
- Variation of Traits
- ★ Programming Patterns
- Stability and Motion: Forces and Interactions
- Environmental Changes
- Life Cycles and Survival
- Stability and Motion: Science of Flight
- Weather: Factors and Hazards

4th
- Energy Exploration
- Input/Output: Human Brain
- ★ Input/Output: Computer Systems
- Earth: Human Impact and Natural Disasters
- Earth: Past, Present, and Future
- Organisms: Structure and Function
- Waves and Properties of Light

5th
- Infection Detection
- Robotics and Automation
- Matter: Properties and Reactions
- Earth's Water and Interconnected Systems
- Ecosystems: Flow of Matter and Energy
- ★ Infection: Modeling and Simulation
- Patterns in the Universe
- ★ Robotics and Automation: Challenge

6-8
- Flight and Space
- ★ CS for Innovators and Makers
- Energy and the Environment
- Design and Modeling
- ★ Automation and Robotics
- Science of Technology
- Medical Detectives
- ★ App Creators
- Green Architecture
- Magic of Electrons

9-12
- PLTW Capstone
- Cybersecurity
- ★ Computer Science A / AP
- ★ Computer Science Principles / AP
- ★ Computer Science Essentials

★ Modules, Units, and Courses Supporting 2023 Indiana Academic Standards

PLTW
LAUNCH

Computer Science Modules

~12-14 hours/module

GRADE K
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 videos 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.

GRADE 1
Animated Storytelling

In this module, students explore the sequential nature of computer programs through hands-on activities, both with and without a digital device. They explore the basic fundamentals of programming using ScratchJr, a block-based programming language to create their own projects. The Use-Modify-Create framework strengthens programming skills as students use a practice program, modify the program, and then create their own program according to the constraints provided.

Applying skills and knowledge learned from the activities and project in this module, students work together to design and program a digital animated story to share with members of their community.

GRADE 2
Grids and Games

In this module, students explore the sequential nature of computer programs through hands-on activities, both with and without a digital device. In a life-size board game, students write a program using directional cards and repeat loops to program Rosie the Robotic Dog to move through a maze. Then, students develop an understanding of computer science, computer scientists, and the impacts of computing.

After building an understanding of computer science, students create programs using a block-based programming language. Students follow the Use-Modify-Create Framework to write programs with sequences, loops, and triggers. Applying skills and knowledge learned from the activities and project, students work together to design and program a game that can be played on a digital device.

GRADE 3
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 plots.

GRADE 4
Input/Output: Computer Systems

Students become computer scientists as they explore how computing systems process input to produce output. They apply their understanding of computing systems as they compare them to human body systems. Students learn how to use technology while maintaining digital privacy and engaging in positive, safe, and legal behavior. Then, they use the knowledge and skills they have gained as they create programs using a block-based coding language. In the design problem, students participate in a class hackathon to design a game using inputs and outputs for children to play on a digital device.

GRADE 5

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: Modeling and Simulation

Students explore how computer models can simulate the spread of communicable diseases. They learn that scientists use computer models to test predictions and develop explanations about the spread of these diseases, without infecting real people. Students investigate parameters, such as washing hands and staying home, that prevent the spread of a communicable disease. They apply what they have learned as they create programs using a block-based coding language. In the design problem, students design a computer model that simulates the spread of a communicable disease.

PLTW
GATEWAY

Computer Science Units

~36-45 hours/unit

GRADES 6-8

Computer Science for Innovators and Makers

Throughout the unit, students will 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.

App Creators

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

Automation and Robotics

Students learn about the history and impact of automation and robotics as they explore mechanical systems, energy transfer, machine automation, and computer control systems. Using the VEX Robotics® platform, students apply what they know to design and program traffic lights, robotic arms, and more.

PLTW
COMPUTER
SCIENCE

Computer Science Courses ~160-180 minutes/course

GRADES
9-12

Computer Science Essentials/7183 Principles of Computing

With emphasis on computational thinking and collaboration, this year-long course provides an excellent entry point for students to begin or continue the PLTW Computer Science PreK-12 experience. Computer Science Essentials will expose students to a diverse set of computational thinking concepts, fundamentals, and tools, allowing them to gain understanding and build confidence.

In Computer Science Essentials, students will start with visual, block-based programming and smoothly transition to text-based languages like Python®. They will apply computational thinking practices, enrich their vocabulary, and engage in collaborative projects, reflecting the methodologies of computing professionals. Ultimately, they'll develop products that tackle topics and challenges significant to them.

Computer Science Essentials helps students create a strong foundation to advance to Computer Science Principles, Computer Science A, and beyond.

Computer Science Principles/7351 Topics in Computer Science
AP Computer Science Principles

Using Python® as a primary tool, students learn the fundamentals of coding, data processing, data security, and task automation, while learning to contribute to an inclusive, safe, and ethical computing culture. The course promotes computational thinking and coding fundamentals and introduces computational tools that foster creativity. 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/7352 Computer Science
AP Computer Science A

Throughout the Computer Science A course experience, students cultivate their understanding of coding through analyzing, writing, and testing code as they explore concepts like modularity, variables, and control structures. Fundamental topics in this course include the design of solutions to problems, the use of data structures to organize large sets of data, the development and implementation of algorithms to process data and discover new information, the analysis of potential solutions, and the ethical and social implications of computing systems. The course emphasizes object-oriented programming and design using the Java programming language. PLTW is recognized by the College Board as an endorsed provider of curriculum and professional development for AP® Computer Science A (AP CSA). This endorsement affirms that all components of PLTW CSA's offerings are aligned to the AP Curriculum Framework standards and the AP CSA assessment.

We'd love to discuss your specific computer science needs, your current implementation, and how PLTW can further energize your curriculum.

Visit pltw.org/in-high-quality-curricular-materials, or contact our Solution Center - 877.335.7589 or solutioncenter@pltw.org - to schedule a conversation.