# Computational Thinking for Next Generation Science

A professional learning cohort for middle and high school science teachers

## Program Overview

This professional learning cohort highlights the specific affordances of computational thinking for science learning. Computational thinking provides all students (not just those in advanced computer science courses) with foundational skills to prepare for an increasingly technology-driven world and workforce. These computational thought processes will remain applicable to problem-solving and innovation even as computing tools change and evolve.

Through a series of four in-person workshops, a virtual professional learning cohort experience, and additional coaching by Digital Promise, participants will apply four practices of computational thinking to Next Generation Science. This workshop series can be completed as an intense one-year program or as a two-year progression. **Contact us at learning@digitalpromise.org to learn more.**

## Workshop 1: Working with Data

Participants will collect, analyze and visualize data that is meaningful to their students and communities to apply to science learning. Participants will take advantage of computational tools in order to collect data more often, more efficiently, and/or more accurately than a human can. They will interact with real-world problems by manipulating large data sets in order to make claims, find patterns, and evaluate missing information. Finally, they will visualize data in order to communicate an argument or idea to a particular audience. Participants will work together to apply data practices to science topics relevant to their curriculum.

## Workshop 2: Understanding Systems

Participants will use computational models to examine the relationships between components within a system and/or changes in the system over time. Additionally, they will evaluate how the computational model is related to the system in the real world. Participants will explore various computational models that illustrate scientific phenomena they cannot observe directly because of size, time, or visibility. They will work together to design learning activities that enhance student curiosity and agency in learning about science topics relevant to curriculum through computational models.

For more information on computational thinking visit:
digitalpromise.org/initiative/computational-thinking/

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## Workshop 3: Working with Algorithms

An algorithm is a description of how to do something in a precise and repeatable way. In this workshop, participants will apply algorithmic thinking, or the process of defining steps within an algorithm, in order to represent complex processes and/or systematically solve problems. For example, participants might sort or categorize relationships between plants and animals or troubleshoot an engineering design problem. Participants will constantly reflect on their design/process through debugging. Computational devices can be used to automate algorithms to make processes and problem-solving more efficient. If accessible to teachers and students, participants may use developmentally appropriate computational tools, such as block based code (e.g. Scratch), hybrid coding environments (e.g. MakeCode), or computational kits (e.g. hummingbird robots) to create algorithms.

## Workshop 4: Creating Computational Models

Computational models represent relationships and processes of systems with interrelated parts, such as plants and animals in a food web or parts of a machine. In this workshop, participants will apply the knowledge of algorithms and computational tools they developed in the previous workshop to create computational models of a scientific phenomenon relevant to their curriculum. Participants will work together to integrate computational modeling in their classroom in developmentally appropriate ways that enhance content learning.

## Coaching and PLC: Computational Thinking

Participants will receive ongoing support throughout the one or two-year progression. They will meet monthly online as a cohort to discuss how they have integrated computational thinking practices into instruction and receive feedback and support from both their fellow cohort members and their Digital Promise coach. They may also schedule additional time with their Digital Promise coach for individual support. The final cohort meeting, either an extended time online meeting or an additional in-person convening, will support participants in planning to scale the integration of computational thinking in subsequent years.

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## Earn Micro-credentials

This program supports educators to demonstrate their learning and receive recognition through earning the Computational Thinking: Practices stack of micro-credentials.


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