Overview

The Colorado School of Mines has offered FREE computer science (CS) professional development (PD) for the last three years, thanks to grant funding from the National Science Foundation. The following plans have been developed in response to the funding now available to districts from the Colorado Department of Education for CS teacher professional development: [http://www.cde.state.co.us/coscience/computerscience](http://www.cde.state.co.us/coscience/computerscience). Districts: apply!

The following plans have been organized to try and assist the following types of teachers:

1. Current K-12 teachers who are new to CS (e.g., want to add some CS into a class)
2. Current CS teachers who are looking to fine tune OR add new content
3. Experienced CS professionals currently teaching with little educational pedagogy training

The opportunities below attempt to list the teacher type and level (elementary/middle/high school) that the PD is targeted for, though any interested educator is welcome if room exists.

Cost for each workshop at the Colorado School of Mines is $200/day (for Colorado teachers). In most cases this fee includes all PD, materials, lunch, and parking. In addition, assistance as questions arise when deploying the material learned exists. College credit is also possible, as well as possibilities for travel scholarships and teacher stipends (for Colorado teachers only). Lastly, CS@Mines is willing to try and be flexible based on need; if a district wants several of their teachers to learn X and X is not listed below, contact Tracy Camp and we'll try to setup for summer 2019!

Cost for workshops NOT hosted at the Colorado School of Mines is listed below.

If you have any questions, please contact Tracy Camp, Department Head and Professor of Computer Science, Colorado School of Mines, tcamp@mines.edu

Plans for Summer 2018

**June 4-8th, 2018 or June 6-7th, 2018**

PiAcademy at mindSpark Learning (for Type #1, #2, and #3 Teachers at any level)
FREE for educators (may need $$ to purchase several Raspberry Pi units for classroom)
Apply through the Raspberry Pi Foundation.

**June 12-14, 2018**

Snap! at Colorado School of Mines (for Type #1 elementary/middle/high school Teachers)
Snap! is a visual, drag-and-drop programming language that is suitable for a serious introduction to computer science in K-12. If you would like to introduce students to programming, then come learn the basics of Snap! Also, if you are doing the BJC training and are new to programming, then this workshop is recommended; that is, this workshop will help you with some of the work you need to complete prior to the in-person week of professional development.

**June 18-22, 2018** (plus 4 quarterly workshops) FREE for educators
Code.org Discoveries and Principles Professional Learning at mindSpark Learning (for Type #1 and Type #2 middle/high school Teachers)
Bootstrap: Algebra (or "Bootstrap: 1") at Mines (for Type #1 middle/high Teachers)
Integrate computing into your mainstream Algebra class, or use your Computing class to give students a double-dose of math! Bootstrap: Algebra applies mathematical concepts and rigorous programming principles to creating a simple videogame. Students create a simple, 3-character game, design what each character looks like, and use algebraic concepts to detect collisions, handle keystrokes, and determine how they move and interact. In addition to teaching programming, Bootstrap: Algebra has been shown to significantly improve student performance on standard, pencil-and-paper algebra tasks (see www.BootstrapWorld.org/impact). Looking to grow your Bootstrap skills into AP-level CS? A Bootstrap: Reactive training is available at Pathfinders 2018 in July.

Beauty & Joy of Computing (BJC): an AP CS Principles course at Colorado School of Mines (mainly for Type #2 high school Teachers, though Type #1 high school Teachers welcome)
BJC emphasizes the joy and complexity of creating visual computer programs (in Snap!), while considering the potential benefits and harms of technology. BJC is AP compliant and will thoroughly prepare your students for the AP CS Principles exam; BJC PD can replace an AP Summer Institute. Type #1 teachers should do Snap! Workshop first.

Launch: Computational Thinking Integration course at Colorado School of Mines (mainly for Type #1 elementary school Teachers, though middle school Teachers welcome)
This course prepares teachers to integrate computational thinking, computer science, and programming (Scratch) into their classrooms. During the training, teachers learn about computational thinking content and pedagogy. An additional $200 required for teacher to take home the three physical computing devices used in the training: Ozobot, Makey Makey, and Micro:Bit.

AP Summer Institute by Colorado Education Initiative at Metro State University
AP CS A and AP CSP (best for Type #2 and Type #3 high school Teachers; possible for Type #1)

PathFinders in Indiana offers diverse PD opportunities: infyfoundation.typeform.com/to/YHThMF
50% of cost to attend needs to come from districts (or DonorsChoose)

Python at Colorado School of Mines (best for Type #1 middle/high school Teachers)
Python is a high-level general-purpose programming language that is easy to learn, making it suitable for an introductory programming course. This workshop will teach the fundamentals of programming as well as the advanced features on Python. Participants are encouraged to attend at least July 18-19th, with July 20th as an option for those who want to delve deeper.

Mobile CSP at Colorado School of Mines (best for Type #2 high school Teachers, though Type #1 can be included if we augment with extra online training). In this course teachers will learn CS by building socially useful mobile apps. In addition to CS principles, the course is project-based and emphasizes writing, communication, collaboration, and creativity. This course provides a broad and rigorous introduction to CS based on App Inventor, a mobile programming language for Android devices and iOS devices (coming fall 2018). During the AY, teachers will meet online monthly for support while teaching (or preparing to teach) the course. This PD can replace an APSI.
Beyond Theory – Proven Practices in EdTech at mindSpark Learning (for Type #1 & Type #2 elementary/middle/high school Teachers) $625
Anchored in computer science and EdTech, this institute will cover technology in many areas -- from Raspberry Pis to Google Classroom, to cutting edge robotics like Sphero and Dash and Dot, to QR Codes, to Osmo for iPhones and iPads to coding and tons of other tech -- and leverage expert facilitators, all while exploring how education technology can be integrated into learning environments to increase student engagement exponentially.

Plans for Summer 2019 (in many cases, specific dates to be set later)

June 11-13, 2019
Snap! at the Colorado School of Mines (for Type #1 Teachers) See prior description listed

June 17-21\textsuperscript{st}, 2019 (plus 4 days during the year AND 5 days in summer 2020 TBD)
Exploring Computer Science (ECS)
A high school introduction to the world of computer science and problem solving. This PD is for high school teachers planning to teach ECS (an Intro to CS course) during the 2019-20 academic year. This PD is a 2-year commitment and is especially valuable for current K-12 teachers who are new to CS (for Type #1 high school Teachers).

Bootstrap: Data Science at Colorado School of Mines (for Type #1/#2/#3 middle/high Teachers)
What factors make some people live longer than others? Are the schools in one part of your neighborhood better than schools in another part? How would you measure that? This curriculum teaches students to view programs as questions we ask of data, and can be integrated into a social studies, statistics, or computing course. Students form their own questions about the world around them, learn how to analyze data critically and carefully to find answers, and write a complete research paper about their findings.

CS Unplugged: at Colorado School of Mines (for Type #1 middle school Teachers; #2/#3 welcome)
A 3-day PD program designed to teach students computational thinking. CS Unplugged activities are a hands-on approach through games, puzzles, magic tricks, and competitions to teach computer science concepts without the use of a computer. The activities are designed to engage students and serve as a vehicle to learn the foundations of computing without the complication of using the computer. http://csunplugged.mines.edu

Introduction to Cryptography (mainly for Type #2/#3 high school Teachers)
This 4-day workshop aims to provide basic cryptography knowledge, concepts, and skills. High-school students will subsequently be able to (1) use cryptographic techniques for security and privacy protection and (2) be motivated to learn more about cryptography. The training includes lectures, hands-on lab exercises, and group discussions on the following example topics: secret-key cryptography, public-key cryptography, digital signature, and blockchain.

User Authentication Security (mainly for Type #2/#3 high school Teachers)
This 3-day workshop aims to provide important knowledge, concepts, and skills related to online user authentication security. High-school students will subsequently be able to (1) better protect their online activities and (2) be motivated to learn more about cybersecurity. The training includes lectures, hands-on lab exercises, and group discussions on topics such as phishing attack detection.
Java Programming (mainly for Type #1 high school Teachers, though others welcome)
This 5-day workshop will provide an introduction to the Java programming language, as general-purpose programming language (class-based and object-oriented).

Web Programming (mainly for Type #1 High School Teachers; though others welcome)
This 3-day workshop will cover a brief introduction to HTML and CSS, and then spend the bulk of the time on programming in JavaScript.

CS Pedagogy (mainly for Type #1 and #3 Teachers, though Type #2 welcome)
This 4-day workshop will concern CS pedagogy and how to broaden participation in computing.

Code.org Discoveries and Principles Professional Learning at mindSpark Learning. 5-day workshop FREE for educators (for Type #1 & Type #2 middle/high school Teachers)

Above visual shows the planned Computer Science Professional Development at Colorado School of Mines (in summer 2018 and summer 2019), categorized by what makes sense for the following three types of teachers:
Type #1: Current K-12 teachers who are new to CS (e.g., want to add some CS into a class)
Type #2: Current CS teachers who are looking to fine tune OR add new content
Type #3: Experienced CS professionals currently teaching with little educational pedagogy training
CS Courses at Mines (all are 3 credit hours)

For teachers looking to take college level courses to learn computer science, the following types of courses are often offered at Colorado School of Mines during the summer term and/or online.

CSCI-101 - Introduction to Computer Science
An introductory course to the building blocks of Computer Science. Topics include conventional computer hardware, data representation, the role of operating systems and networks in modern computing, algorithm design, relational databases, structured queries, and computer simulations. A popular procedural programming language will be learned by students and programming assignments will explore ideas from algorithm development, optimization, and computer simulation.

CSCI-250 - Python-Based Computing: Building a Sensor System
This course will teach students the skills needed for data collection, analysis, and visualization on a small embedded device (e.g., Raspberry Pi). Students will learn basic Linux, Python, and the programming skills needed to control the hardware and associated sensors. This hands-on course includes a baseline project, four introductory projects (e.g., acoustic, acceleration, magnetic field, optical), and a final Capstone project. The Capstone project will have students create their own application using the techniques learned during the first half of the semester: students will then present their Capstone project through a formal presentation, write-up, and demonstration.

CSCI-261 - Programming Concepts
This course introduces fundamental computer programming concepts using a high-level language and a modern development environment. Programming skills include sequential, selection, and repetition control structures, functions, input and output, primitive data types, basic data structures including arrays and pointers, objects, and classes. Software engineering skills include problem solving, program design, and debugging practices.

CSCI-262 - Data Structures
Defining and using data structures such as linked lists, stacks, queues, binary trees, binary heap, hash tables. Introduction to algorithm analysis, with emphasis on sorting and search routines. Language skills: abstract data types, templates and inheritance.

CSCI-303 - Introduction to Data Science
This course will teach students the core skills needed for gathering, cleaning, organizing, analyzing, interpreting, and visualizing data. Students will learn basic SQL for working with databases, basic Python programming for data manipulation, and the use and application of statistical and machine learning toolkits for data analysis. The course will be primarily focused on applications, with an emphasis on working with real (non-synthetic) datasets.