

Computer Science Discoveries & Chromebooks

Grades: 9, 10, 11, 12

Length: Full Year

Environment: Classroom-based

Honors: None

Subject: College-Preparatory Elective (G)

Discipline: Interdisciplinary

Institution: Alvord Unified School District

Course Overview:

Computer Science Discoveries (CS Discoveries) is an introductory computer science course that empowers students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. CS Discoveries provides students with opportunities to develop computational thinking practices of algorithm development, problem solving, and programming within the context of problems that are relevant to the lives of today's students. Students will learn through designing, collaborating, critical thinking, and communicating with others. Perseverance will be practiced by developing concepts and working through challenges to develop the ideas and understanding of how technology works through authentic projects. Students will be introduced to the central ideas of computer science, inviting students to develop the computational thinking skills vital for success across multiple disciplines, and giving everyone the chance to learn coding, a skill that provides limitless creative opportunity.

Unit 1 - Problem Solving, Computing, and Chromebooks

Problem Solving and Computing is a highly interactive and collaborative introduction to the field of computer science, as framed within the broader pursuit of solving problems. Students will practice using a problem solving process to address a series of puzzles, challenges, and real world scenarios. Next, students learn how computers input, output, store, and process information to help humans solve problems. The unit concludes with a project in which students design an application that helps solve a problem of their choosing.

Students will also provide basic tech support to the student population via the Chromebook Care Program. Students will troubleshoot, diagnose, and fix (or send to the next level in IT) when Chromebooks are brought in. Troubleshooting goes hand-in-hand with problem solving, thus students will develop and hone in on the skills they need for the Student Chromebook Care Program.

Unit 2 - Web Development

In Unit 2, students will learn how to create and share the content on your own web pages. After deciding what content students want to share with the world, students will learn how to structure and style their page(s) using HTML and CSS. Students will also practice valuable programming skills such as debugging, using resources, and teamwork. Students learn to create user-friendly websites. Students will apply fundamental notions of Human Computer Interaction (HCI) and ergonomics.

Unit 3 - Interactive Animations and Games

In Unit 3, students will build on their coding experience as they program animations, interactive art, and games in Game Lab. The unit starts with simple shapes and builds up to more sophisticated sprite-based games, using the same programming concepts and the design process computer scientists use daily. In the final project, students will develop a personalized, interactive program.

Unit 4 - The Design Process

Unit 4 introduces the broader social impacts of computing. Through a series of design challenges, you will learn how to better understand the needs of others while developing a solution to a problem. The second half of the unit consists of an iterative team project, during which teams have the opportunity to identify a need that they care about, prototype solutions both on paper and in App Lab, and test solutions with real users to get feedback and drive further iteration.

Unit 5 - Data and Society

Unit 5 is about the importance of data in solving problems and highlights how computers can help in this process. The first chapter explores different systems used to represent information in a computer and the challenges and tradeoffs posed by using them. In the second chapter, students will learn how collections of data are used to solve problems, and how computers help to automate the steps of this process. The chapter concludes by considering how the data problem solving process can be applied to an area of your choosing.

Unit 6 - Physical Computing

Unit 6 explores the role of hardware platforms in computing and how different sensors can provide more effective input and output than the traditional keyboard, mouse, and monitor. Using App Lab and Adafruit's Circuit Playground, students will develop programs that utilize the same hardware inputs and outputs that you see in the smart devices, looking at how a simple rough prototype can lead to a finished product. The unit concludes with a design challenge to use the Circuit Playground as the basis for an innovation of your own design.

Unit 7 - AI and Machine Learning

Unit 7 is a hands-on introduction to developing a machine-learning model with tabular data. Students explore how computers learn from data to make decisions, and then develop machine-learning projects around real-world data. The unit culminates in designing a machine-learning app to solve a personally relevant problem.

Exploring Computer Science lessons may be used to supplement or replace similar lessons. CodeHS may be utilized for other lessons and/or other tech platforms.

Learning & Social Skills:

Analyze, classify, evaluate, explain, problem solve, track cause and effect, brainstorm, create, design, innovating, problem solving, questioning, listen actively, read, speak, take turns, write, use technology, decision making, delegating, evaluating, goal setting, leading, manage time, team building, communication, relationship management, and respect.

<https://k12.thoughtfullearning.com/FAQ/what-are-learning-skills>

<https://www.indeed.com/career-advice/career-development/social-skills>

21st Century Skills:

Critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information, research skills and practices, creativity, curiosity, innovation, perseverance, self-direction, planning, adaptability, initiative, productivity, accountability, oral and written communication, leadership, teamwork, collaboration, cooperation, Information and communication technology (ICT) literacy, data interpretation and analysis, computer programming.

<https://www.edglossary.org/21st-century-skills/>

<http://www.battelleforkids.org/networks/p21/frameworks-resourcesResources>

Resources:

Title	Authors/Owners	Organization	Website
Code.org	Hadi Partovi, Ali Partovi	Code.org	code.org
CodeHS	Zach Galant & Jeremy Keeshin (co-owners)	CodeHS	codehs.com
Exploring Computer Science	Chapman, Gail & Goode, Joanna	University of Oregon	ExploringCS.org