Pacing Guide For Computer Science and Design Thinking Curriculum

Grade 6-8

Topic	Marking Period	Number of Days
Computing Systems	3	1
Networks and the Internet	3	1
Impacts of Computing	3	4
Data & Analysis	3	4
Algorithms & Programming	3/4	4
Engineering Design	4	4
Interaction of Technology and Human	4	2
Nature of Technology	4	2
Effects of Technology on the Natural World	4	2
Ethics & Culture	1,2,3,4	7

Written Aug 2022
Reapproved by Board Aug 2026

Alpha Public School
Computer Science and Design Thinking Curriculum Map

Grade: 6-8

Standard: 8.1.8	**Content Topic:** Computing Systems

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.1.8.CS.1	The study of human-computer interaction can improve the design of devices and extend the abilities of humans	Recommend improvements to computing devices in order to improve the ways users interact with the devices	Accessibility Features
8.1.8.CS.2	Software and hardware determine a computing system's capability to store and process information. The design or selection of a computing system involves multiple considerations and potential trade-offs	Design a system that combines hardware and software components to process data	Inside a Computer video Google Sheets Projects: HS Job Vacation Planner or Technology Usage
8.1.8.CS.3	Software and hardware determine a computing system's capability to store and process information. The design or selection of a computing system involves multiple considerations and potential trade-offs	Justify design decisions and explain potential system trade-offs	Global Problem Solvers Lesson
8.1.8.CS.4	Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem	Systematically apply troubleshooting strategies to identify and resolve hardware and software problems in computing systems.	Simple solutions to Common Problems

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Questions discussion	Google Sheets Project	GCF website Gps the series

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Websites chromebooks	ELA Math Science

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
-Modify work as needed -teacher will read aloud questions -allow more time if needed, preferential seating	-Modify work as needed -teacher will read aloud questions -allow more time if needed, preferential seating -Provide challenge activities for enrichment	-Provide additional work as needed -Provide challenge activities for enrichment

21st Century Education	Career Education
<u>THEMES:</u> Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <u>SKILLS:</u> Creativity and Innovation Critical Thinking and Problem Solving Communication and Collaboration Information Literacy Media Literacy ICT Literacy Life and Career Skills	Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study. CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP3. Attend to personal health and financial well-being. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.

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Computer Science and Design Thinking Curriculum Map

Standard: 8.1.8	**Content Topic:** Networks and the Internet

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.1.8.NI.1	Protocols, packets, and addressing are the key components for reliable delivery of information across networks	Model how information is broken down into smaller pieces, transmitted as addressed packets through multiple devices over networks and the Internet, and reassembled at the destination	Code.org video What is the Internet IP Addresses & DNS
8.1.8.NI.2	Protocols, packets, and addressing are the key components for reliable delivery of information	Model the role of protocols in transmitting data across networks and the Internet and how they enable secure and errorless communication	Create a Google Drawing to model the transmission of data on the internet.
8.1.8.NI.3	The information sent and received across networks can be protected from unauthorized access and modification in a variety of ways. The evolution of malware leads to understanding the key security measures and best practices needed to proactively address the threat to digital data	Explain how network security depends on a combination of hardware, software and practices that control access to data and systems	Code.org video Encryption & Public Keys
8.1.8.NI.4	The information sent and received across networks can be protected from unauthorized access and modification in a variety of ways. The evolution of malware leads to understanding the key security measures and best practices needed to proactively address the threat to digital data	Explain how new security measures have been created in response to key malware events	Code.org video Cybersecurity & Crime

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Worksheet from code.org	Google drawing for transmission of data	Cybersecurity videos Encryption video

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
https://youtu.be/5o8CwafCxnU https://youtu.be/ZghMPWGXexs https://youtu.be/AuYNXgO_f3Y	Social Studies ELA

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Standard: 8.1.8	**Content Topic:** Impacts of Computing

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.1.8.IC.1	Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings.	Compare the trade-offs associated with computing technologies that affect individual's everyday activities and career options	Research Project: My Career? Create an infographic including how technology plays a role. rubric
8.1.8.IC.2	Advancements in computing technology can change individuals' behaviors. Society is faced with trade-offs due to the increasing globalization and automation that computing brings	Describe issues of bias and accessibility in the design of existing technologies.	Code.org video Training Data & Bias

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Q & A of concepts	Career Infographic	Career Books Youtube videos

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
https://youtu.be/x2mRoFNm22g	Career Readiness ELA SS

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Standard: 8.1.8	**Content Topic:** Data and Analysis

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.1.8.DA.1	People use digital devices and tools to automate the collection, use and transformation of data. The manner in which data is collected and transformed is influenced by the type of digital devices available and the intended use of the data	Organize and transform data collected using computational tools to make it usable for a specific purpose	Google Sheets projects
8.1.8.DA.2	Data is represented in many formats. Software tools translate into the low-level representation of bits into a form understandable by individuals. Data is organized and accessible based on the application used to store it	Explain the differences between how the computer stores data as bits and how data is displayed	Code.org video Binary & Data
8.1.8.DA.3	Data is represented in many formats. Software tools translate into the low-level representation of bits into a form understandable by individuals. Data is organized and accessible based on the application used to store it	Identify the appropriate tool to access data on its file format	File Management Activity
8.1.8.DA.4	The purpose of cleaning data is to remove errors and make it easier for computers to process	Transform data to remove errors and improve the accuracy of the data for analysis	Google Sheets projects File Management Activity

8.1.8.DA.5	Computer models can be used to simulate events, examine theories and inferences, or make predictions	Test, analyze, and refine computational models	NASA-Climate Kids (website) How do we predict future climate? SciToons - YouTube Modeling Our Climate (Align lessons with Science Class)
8.1.8.DA.6	Computer models can be used to simulate events, examine theories and inferences, or make predictions	Analyze climate change computational models and propose refinements	NASA-Climate Kids (website) How do we predict future climate? SciToons - YouTube Modeling Our Climate (Align lessons with Science Class)

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Google sheets Projects	Google sheets projects	Science books

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
https://youtu.be/SuZHnqxltKo https://climatekids.nasa.gov/climate-model/ https://youtu.be/USCBCmwMCDA	Science-Earth Science & Layers of the Earth

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Standard: 8.1.8	**Content Topic:** Algorithms and Programming

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.1.8.AP.1	Individuals design algorithms that are reusable in many situations. Algorithms that are readable are easier to follow, test, and debug	Design and illustrate algorithms that solve complex problems using flowcharts and / or pseudocode	Flowchart studio
8.1.8.AP.2	Programmers create variables to store data values of different types and perform appropriate operations on their values	Create clearly names variables that represent different data types and perform operations on their values	Dash & Dot Robot: Blockly App Code Combat
8.1.8.AP.3	Control structures are selected and combined in programs to solve more complex problems	Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals	Various code.org lessons
8.1.8.AP.4	Programs use procedures to organize code and hide implementation details. Procedures can be repurposed in new programs. Defining parameters for procedures can generalize behavior and increase reusability	Decompose problems and sub-problems into parts to facilitate the design, implementation, and review of programs.	Various code.org lessons

8.1.8.AP.5	Programs use procedures to organize code and hide implementation details. Procedures can be repurposed in new programs. Defining parameters for procedures can generalize behavior and increase reusabiity.	Create procedures with parameters to organize code and made it easier to reuse	Code.org Express course: Lesson 20-22 (Functions) ~ Hour of Code with Minecraft
8.1.8.AP.6	Individuals design and test solutions to identify problems taking into consideration the diverse needs of the users and the community	Refine a solution that meets users' needs by incorporating feedback from team members and users	Code.org Express course: lesson 21 (Functions with Artist) Pair Programming w/ peer evaluation
8.1.8.AP.7	Individuals design and test solutions to identify problems taking into consideration the diverse needs of the users and the community	Design programs, incorporating existing code, media and libraries and give attribution	Various coding activities in SCRATCH
8.1.8.AP.8	Individuals design and test solutions to identify problems taking into consideration the diverse needs of the users and the community	Systematically test and refine programs using a range of test cases and users	Various coding activities in SCRATCH
8.1.8.AP.9	Individuals design and test solutions to identify problems taking into consideration the diverse needs of the users and the community	Document programs in order to make them easier to follow, test and debug	Code.org Think Spot Journals

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Coding activities	journals	Scratch Code.org

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Code.org lessons	ELA

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Standard: 8.2.8	**Content Topic:** Engineering Design

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.2.8.ED.1	Engineering design is a systematic, creative and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solutions, and making, testing, and redesigning models or prototypes.	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.	*Build a Better* _____ (fill in the blank, ie phone)
8.2.8.ED.2	Engineering design is a systematic, creative and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solutions, and making, testing, and redesigning models or prototypes.	Identify the steps in the design process that could be used to solve a problem	Global Problem Solvers Lesson

8.2.8.ED.3	Engineering design is a systematic, creative and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solutions, and making, testing, and redesigning models or prototypes.	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical / technical sketch)	3-D printing challenges with TinkerCad
8.2.8.ED.4	Engineering design is a systematic, creative and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solutions, and making, testing, and redesigning models or prototypes.	Investigate a malfunctioning system, identify its impact, and explain the step-by-step process used to troubleshoot, evaluate and test options to repair the product in a collaborative team	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.ED.5	Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features	Explain the need for optimization in a design process	TinkerCAD ~ design challenge
8.2.8.ED.6	Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features	Analyze how trade-offs can impact the design of a product	TinkerCAD ~ design challenge
8.2.8.ED.7	Engineering design requirements and specifications involve making trade-offs between competing requirements and desired design features	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g, annotated sketches)	TinkerCAD ~ design challenge

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Build a better…	Design challenge	Text; Science Fusion Holt Science TinkerCAD

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Tinker Cad Laser Cutter	Science

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Standard: 8.2.8	**Content Topic:** Interaction of Technology and Humans

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.2.8.ITH.1	Economic, political, social and cultural aspects of society drive development of new technological products, processes, and systems	Explain how the development and use of technology influences economic, political, social and cultural issues	Global Problem Solvers Lesson Global Goals

8.2.8.ITH.2	Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economics and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and / or more efficient	Compare how technologies have influenced society over time	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.ITH.3	Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economics and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and / or more efficient	Evaluate the impact of sustainability on the development of a designed product or system	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.ITH.4	Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economics and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and / or more efficient	Identify technologies that have been designed to reduce the negative consequences of other technologies and explain the change in impact	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.ITH.5	Technology interacts with society, sometimes bringing about changes in a society's economy, politics, and culture, and often leading to the creation of new needs and wants. New needs and wants may create strains on local economics and workforces. Improvements in technology are intended to make the completion of tasks easier, safer, and / or more efficient	Compare the impacts of a given technology on different societies, noting factors that may make a technology appropriate and sustainable in one society but not in another	STEM Project-Exploring Convection Fusion Science and Technology

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Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Global Problems Lesson assessment	Design challenge	Text; Science Fusion Holt Science TinkerCAD

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Internet Engineering design	Science

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
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Standard: 8.2.8	**Content Topic:** Nature of Technology

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.2.8.NT.1	Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientist use systematic investigations to understand the natural world	Examine a malfunctioning tool, product or system and propose solutions to the problem	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.NT.2	Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientist use systematic investigations to understand the natural world	Analyze an existing technological product that has been repurposed for a different function	STEM Project-Exploring Convection Fusion Science and Technology
8.2.8.NT.3	Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientist use systematic investigations to understand the natural world	Examine a system, consider how each part relates to the other parts, and redesign it for another purpose	STEM Project-Exploring Convection Fusion Science and Technology

8.2.8.NT.4	Technology advances through the processes of innovation and invention which relies upon the imaginative and inventive nature of people. Sometimes a technology developed for one purpose is adapted to serve other purposes. Engineers use a systematic process of creating or modifying technologies that is fueled and constrained by physical laws, cultural norms, and economic resources. Scientist use systematic investigations to understand the natural world	Explain how a product designed for a specific demand was modified to meet a new demand and led to a new product	STEM Project-Exploring Convection Fusion Science and Technology

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Questions Building Charts	Final Design Chart	Text: Holt Fusion

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Chromebooks Powerpoints	Science

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Standard: 8.2.8	**Content Topic:** Effects of Technology on the Natural World

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.2.8.ETW.1	Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve trade-offs between environmental and economic needs, while others have positive effects for both the economy and environment	Illustrate how a product is upcycled into a new product and analyze the short and long term benefits and cost	Circular Economy: Global Goals Don't Waste It!: Global Goals
8.2.8.ETW.2	Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve trade-offs between environmental and economic needs, while others have positive effects for both the economy and environment	Analyze the impact of modifying resources in a product or system (e.g., materials, energy, information, time, tools, people and capital)	Circular Economy: Global Goals
8.2.8.ETW.3	Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve trade-offs between environmental and economic needs, while others have positive effects for both the economy and environment	Analyze the design of a product that negatively impacts the environment or society and develop possible solutions to lessen its impact	Circular Economy: Global Goals

8.2.8.ETW.4	Resources need to be utilized wisely to have positive effects on the environment and society. Some technological decisions involve trade-offs between environmental and economic needs, while others have positive effects for both the economy and environment	Compare the environmental effects of two alternative technologies devised to address climate change issues and use data to justify which choice is best	Understanding Renewable Energy

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Projects WOrksheets	Design a product from repurposed materials.	World's Largest Lesson

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Chromebooks Youtube videos	ELA Science

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
-Modify work as needed -teacher will read aloud questions -allow more time if needed, preferential seating	-Modify work as needed -teacher will read aloud questions -allow more time if needed, preferential seating -Provide challenge activities for enrichment	-Provide additional work as needed -Provide challenge activities for enrichment

21st Century Education	Career Education
<u>THEMES:</u> Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Civic Literacy Health Literacy <u>SKILLS:</u> Creativity and Innovation Critical Thinking and Problem Solving Communication and Collaboration Information Literacy Media Literacy ICT Literacy Life and Career Skills	Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study. CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP3. Attend to personal health and financial well-being. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals.

	CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.

Standard: 8.2.8	**Content Topic:** Ethics and Culture

Strand	Disciplinary Core Ideas / Essential Statement	Objective / Performance Expectation	Practice, Skills & Lesson
8.2.8.EC.1	Technological disparities have consequences for public health and prosperity	Explain ethical issues that may arise from the use of new technologies	Global Problem Solvers Lesson
8.2.8.EC.2	Technological disparities have consequences for public health and prosperity	Examine the effects of ethical and unethical practices in product design and development.	Global Problem Solvers Lesson

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
Solving Problems WS	Info-graphic of a local problem & solution	Global Problems

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1) / Intercultural Statements
Youtube chromebooks	ELA Science

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
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Alpha Public School
Computer Science and Design Thinking Curriculum Map

21st Century Education	Career Education
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