



# Guide to Computer Science, Cyber skills, and AI with Minecraft Education

## INTRODUCTION

Are you ready to transform your classroom with an innovative approach to learning that encompasses Computer Science (CS), Cybersecurity, and Artificial Intelligence (AI)? Minecraft Education offers an exceptional platform for this with a comprehensive K-12 Computer Science Progression. This curriculum is more than just a learning tool; it's a gateway to the future of education, combining over 250 hours of high-quality, engaging lessons in CS, Cybersecurity, and AI, designed for all stages of a student's educational journey.

At the heart of this progression lies a solid foundation in **computer science**. As technology permeates every aspect of our lives, a robust understanding of CS is becoming increasingly essential. Minecraft Education leverages the immersive world of Minecraft to make learning CS both fun and effective, igniting a passion for technology among students.

In our digital age, an education in CS is incomplete without a deep understanding of **cyber**. As cyber threats evolve in sophistication, educating young minds about cyber safety and digital ethics is crucial. Our Cyber Skills Curriculum seamlessly integrates into the CS progression, providing students with vital skills in **digital citizenship**, cyber ethics, and crucial cybersecurity topics like phishing, password protection, encryption, and more.



Recognizing the significant impact of **Artificial Intelligence** (AI) on our world, we've woven a comprehensive AI curriculum into our educational tapestry. This curriculum demystifies AI, offering modules on machine learning, AI for Earth, and Responsible AI practices. It's designed to be accessible and engaging, helping students to understand the implications and ethics of AI. This Responsible AI section educates students about the importance of data privacy, understanding bias in AI, and the societal impacts of AI decisions.

Minecraft Education thus stands at the forefront of educational innovation, providing a platform where students don't just learn about CS—they experience it and build with it. This holistic approach ensures that students are not only equipped with technical skills but are also prepared to be responsible digital citizens in an increasingly AI-influenced world.

Educators, you have a unique opportunity with Minecraft Education. You don't need to be a Minecraft expert to start. What you need is the enthusiasm to guide your students through this exciting educational adventure. Together, we can shape a generation that is digitally literate, cyber-aware, and ready to harness the potential of AI. Dive in, explore, and join us in creating a future where technology education is immersive, comprehensive, and deeply interconnected.

## GETTING STARTED

### Students

There are no required prerequisites around computer science, coding, or tech skills for students. Students should have had some instruction and/or guidance around device usage and navigation (i.e., appropriate use of hardware, device login procedure/information, digital safety, etc.). There is a recommended grade level/age range for students as it relates to the developmentally-appropriateness and reading comprehension levels of the computer science units. Please refer to the Computer Science Progression on page 4.

### Teachers

Teachers do not need to have any prior computer science experience; however, they should familiarize themselves with a basic understanding of [Minecraft Education](#). Minecraft Education can be installed on Chromebook, PC, Mac, iPad, iPhone, and Android mobile devices. To ensure your experience with Minecraft Education is top-notch, make sure your devices meet the minimum system requirements. To check if your device supports Minecraft Education, see System Requirements.



If you have questions about setting up Minecraft Education, the following link will provide you with some frequently asked questions and additional information about set-up. On this page, you will find assistance for:

- Get Started
- Purchase Licenses
- Administration and License Management
- Installation
- Troubleshooting

<i>Hardware</i>	The teacher will need a laptop or tablet. Internet access will be required for a portion of the lessons and activities. Each student will need a device to complete the plugged-in coding activities. OPTIONAL: Some educators prefer students to use headphones during the independent work segment of the lessons, as there is noise within the game.
<i>Software</i>	<a href="#">Minecraft Education</a> needs to be deployed on the devices utilized within these lessons.
<i>Other Materials</i>	Certain lessons will call for basic supplies such as copies of handouts, pencils, markers, etc. Each individual lesson will specify if any additional materials are needed outside of the hardware and software.

## MINECRAFT COMPUTER SCIENCE PROGRESSION

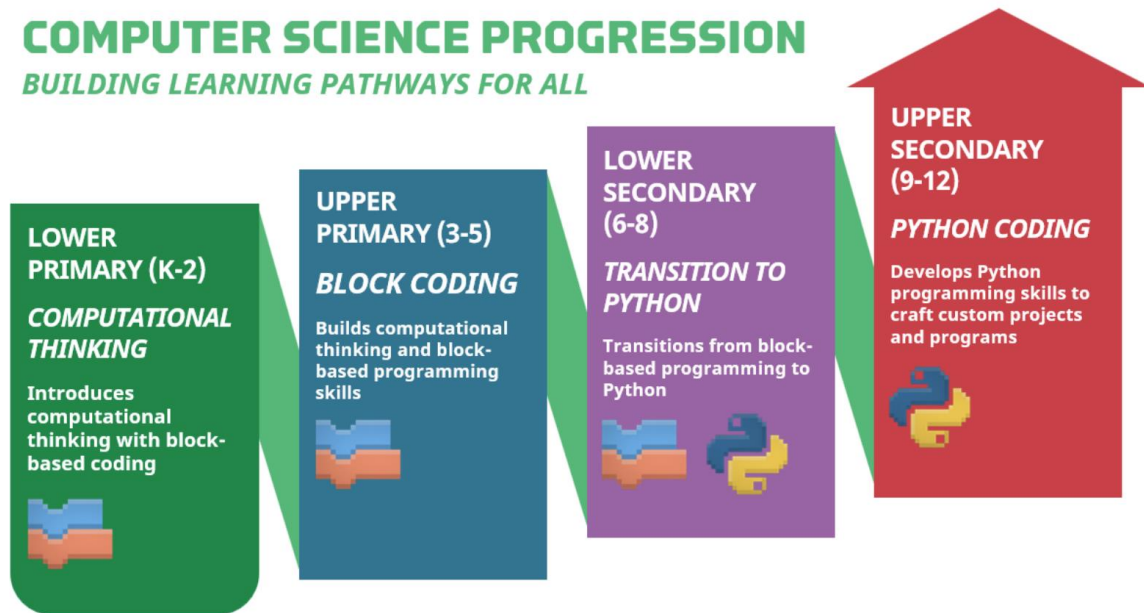
The Minecraft CS curriculum progression is specially designed content to address relevant academic standards in a logical, sequential progression. Students will learn, practice, and apply relevant CS skills and concepts in both unplugged and digital experiences. The lessons are designed to follow the gradual release methodology (refer to the Lesson Design section of this guide found below). Students should have multiple opportunities to practice and demonstrate mastery in any given skill/concept.

To provide teachers with a consistent and easy-to-follow format, the instructional materials for the Minecraft CS pathway are standardized. All units within the entire progression will follow the same instructional methodology and include the same resources to ensure a consistent, high-quality experience for teachers and students.



# COMPUTER SCIENCE PROGRESSION

BUILDING LEARNING PATHWAYS FOR ALL



## Unit Materials

<i>Curriculum Overview</i>	This computer science unit document will provide you with a complete overview of the content, skills, and learning outcomes intended to be taught. It will include the theme and/or focus of the unit, the relevant grade levels or age group, connection to the Minecraft Teaching and Learning framework, essential questions, objectives, academic standards, suggest lessons and pacing, assessments, and glossary.
<i>Educator's Guides (Lesson Plan)</i>	The educator's guide provides an overview of the theme: learning goals, standards addressed, required preparation for the activities, key vocabulary, the lesson plans for the activities, and any additional materials needed.
<i>Classroom Presentations</i>	Each lesson (educator's guide) is supported by its own PowerPoint presentation to provide structure and guide the educator through the activities for the lesson. This will support the lesson delivery for students.
<i>Formative Assessments</i>	These assessments are intended to provide a quick check for understanding based on the concepts and skills taught during the specific lesson. Each formative assessment is 2- 4 questions and should be completed at the end of the lesson. These are found within the educator's guides.
<i>Summative Assessment</i>	This is a culminating experience intended to assess students' learning of all the computer science concepts taught within the unit in an authentic and meaningful way.



<i>Minecraft World Files</i>	These are the specific world files needed to experience the instructional activities that have been linked directly within the Educator’s Guides. If there is no file listed within the lesson plan, then it is an open build. Students should use a Blocks of Grass template (or any other appropriate template) to complete the lesson.
------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## Lesson Design





Within the Minecraft Computer Science K-12 Progression, there are various curriculum units for students. Within each unit, there are multiple lessons (which are known as the Educator’s guides). All lesson activities within the Educator’s Guide will contain three parts correlating with the gradual release model:

<i>Direct Instruction— “I Do”</i>	In the first step, the teacher models the appropriate way of performing the skills included in the new concept being taught.
<i>Guided Instruction— “We Do”</i>	After the teacher models the correct way to understand or perform the new concept being taught, they partner with the students and work through some examples together (partner with teacher and/or classmates).
<i>Independent Practice— “You Do”</i>	This step is where students demonstrate their initial level of understanding of the new concept being taught through independent practice.

## Teaching & Learning Framework

This framework provides a larger perspective of how to support robust, comprehensive CS in the classroom.

**Our Goal:** Empower students with the skills and tools they need to thrive, as problem-solvers, innovators and leaders, to address the complex societal and ethical issues of today and the future.

			
<b>Lower Barriers for Teachers</b>	<b>Increase Sustainability</b>	<b>Increase Equity</b>	<b>Increase Relevance</b>
<b>CS Units of Study</b>	<b>Coding Mindset</b>	<b>Computational Thinking</b>	<b>Community</b>
<p>The units of study possess a conceptual lens to allow for depth and complexity to develop conceptual understanding—knowledge which transfers through time, across cultures, and across situations.</p> <p>DIGITAL CITIZENSHIP PROGRAMMING CYBERSECURITY IMPACTS OF COMPUTING</p>	<p>Minecraft Education fosters a distinctive set of attributes. These qualities prepare our students to make exceptional contributions both in school and outside of school.</p> <p>CURIOS COMMITTED COOPERATIVE CONSIDERATE CONFIDENT</p>	<p>Computational thinking provides a vital skill set which students must possess to fulfill the industry’s needs in the jobs of tomorrow.</p> <p>DECOMPOSITION PATTERN RECOGNITION ABSTRACTION ALGORITHMS</p>	<p>As students gain and possess new knowledge and skills, we strive for them to find a greater purpose of “why do I need to know this” or more importantly, “how can I use this information?” We aim to empower students develop confidence and self-efficacy into a commitment to serve the community in which we live in and beyond.</p>



There are four core elements that summarize the overall experience.

1. **Coding Mindset:** It is essential we teach and provide opportunities for students to exercise their social and emotional capacities as it relates to learning. Our goal is to instill a coding mindset in every student who works within our continuum of learning. We want students to be curious, committed, cooperative, considerate, and ultimately confident.
2. **Computational Thinking:** The Minecraft computer science experience affords students the opportunities to develop their computational thinking skills. These skills will provide a construct of how students can think critically and solve problems.
3. **Computer Science Units of Study:** This is the learning content centered around supporting mastery of the CS standards. It will provide meaningful and relevant learning experiences for students to engage in CS.
4. **Community:** As students gain and possess new knowledge and skills, we strive for them to find a greater purpose of “why do I need to know this” or more importantly, “how can I use this information?” CS can help us to solve the problems of today and in the future. We encourage students to use their newfound knowledge and skills for the greater good.



## CS Standards

This next section will provide you with an overview of the full CS curriculum and its corresponding academic standards. The curriculum sequence is presented in chronological order—we suggest working in order within the grade level bands, as the content will build upon skills presented in the previous unit. However, educators should feel empowered to modify and adapt the content and/or sequence to best meet the needs of their students.

<b>Grade Level</b>	<b>Curriculum Unit Name</b>	<b>Number of Lessons</b>	<b>Hours</b>	<b>CSTA Standards Addressed</b>
K-2	Responsible Technology Use	6 lessons	10 hours	1A-CS-02 1A-CS-03 1A-NI-04 1A-AP-11 1A-DA-06 1A-DA-07 1A-IC-17 1A-IC-18
K-2	Storytelling in Minecraft	12 lessons	22 hours	1A-IC-17 1A-AP-12
K-2	Computing with Minecraft	16 lessons	21 hours	1A-AP-10 1A-AP-11 1A-AP-12 1A-AP-14 1A-AP-15 1A-AP-17 1A-AP-18
3-5	Coding Fundamentals (Part 1)	10 lessons	16 hours	1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15 1B-AP-17
3-5	Coding Fundamentals (Part 2)	10 lessons	16 hours	1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15 1B-AP-17
3-5	Coding Fundamentals (Part 3)	6 lessons	12 hours	1B-AP-13 1B-AP-16 1B-AP-08 1B-AP-10 1B-AP-11 1B-AP-15 1B-AP-17



3-5	Artificial Intelligence	8 lessons	13 hours	1B-IC-18 1B-IC-20 1B-AP-08 1B-AP-11 1B-AP-15 1B-AP-17
6-8	Coding with Minecraft (Part 1)	17 lessons	21 hours	2-DA-08 2-AP-10 2-AP-11 2-AP-12 2-AP-13 2-AP-14 2-AP-18 2-AP-19
6-8	Coding with Minecraft (Part 2)	21 lessons	40 hours	2-AP-17 2-DA-08 2-AP-10 2-AP-11 2-AP-12 2-AP-13 2-AP-14 2-AP-18 2-AP-19
6-8	Seymour Island	1 lesson	3 hours	2-AP-11 2-AP-12 2-AP-14
9-12	Python 101 Python Islands Python Playgrounds	17 lessons	24 hours	3A-AP-13 3A-AP-14 3A-AP-15 3A-AP-16 3A-AP-17 3A-AP-18 3A-AP-21 3A-AP-22 3A-AP-23





## CS Concepts

This next section will provide you with an overview of the full computer science curriculum and the CS concepts covered within the unit.

3-5	Coding Fundamentals (Part 1)	10 lessons	16 hours	Credibility/Accuracy of Resources Public Domain/Creative Commons Copyright Intellectual Property Decomposition Sequencing Control Flow (structure) Events + Event Handlers Algorithms Pattern Recognition Loops (repeat loop, nested loop, conditional loop) Conditionals Debugging Program Development Collaboration
3-5	Coding Fundamentals (Part 2)	10 lessons	16 hours	Credibility/Accuracy of Resources Public Domain/Creative Commons Copyright Intellectual Property Decomposition Sequencing Control Flow (structure) Events + Event Handlers Algorithms Pattern Recognition Loops (repeat loop, nested loop, conditional loop) Conditionals Debugging Program Development Collaboration
3-5	Coding Fundamentals (Part 3)	6 lessons	12 hours	Decomposition Sequencing Control Flow (structure) Events + Event Handlers Algorithms Pattern Recognition Loops (repeat loop, nested loop, conditional loop) Conditionals Debugging Program Development Collaboration
				Collaboration Program Development Testing



3-12	Artificial Intelligence	9 lessons	14 hours	Impacts of Computing Feedback Decomposition Data Data Visualization Algorithms Debugging Program Development Iteration Computational Artifacts Responsible AI
------	-------------------------	-----------	----------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6-8	Coding with Minecraft (Part 1)	17 lessons	21 hours	Decomposition Data Collection Algorithms Events Event Handlers Documentation Control Flow (structure) Loops Variables Conditionals Debugging Program Development
6-8	Coding with Minecraft (Part 2)	21 lessons	40 hours	Decomposition Algorithms Control Flow (structure) Functions Iteration Debugging Arrays Artificial Intelligence Machine Learning Program Development
6-8	Seymour Island	1 lesson	3 hours	Decomposition Sequencing Nested Loops Compound Conditionals Algorithms Debugging Program Development Cryptography
9-12	Python 101 Python Islands Python Playgrounds	17 lessons	24 hours	Python commands Syntax structureString (text) Integers (numbers) Coordinates Positions Variables Lists Zero based numbering For loops Nested loops Conditionals (if   if else   elif) Boolean logic While loops Functions Decomposition Outputs Logic operators Debugging Using Reference Guide

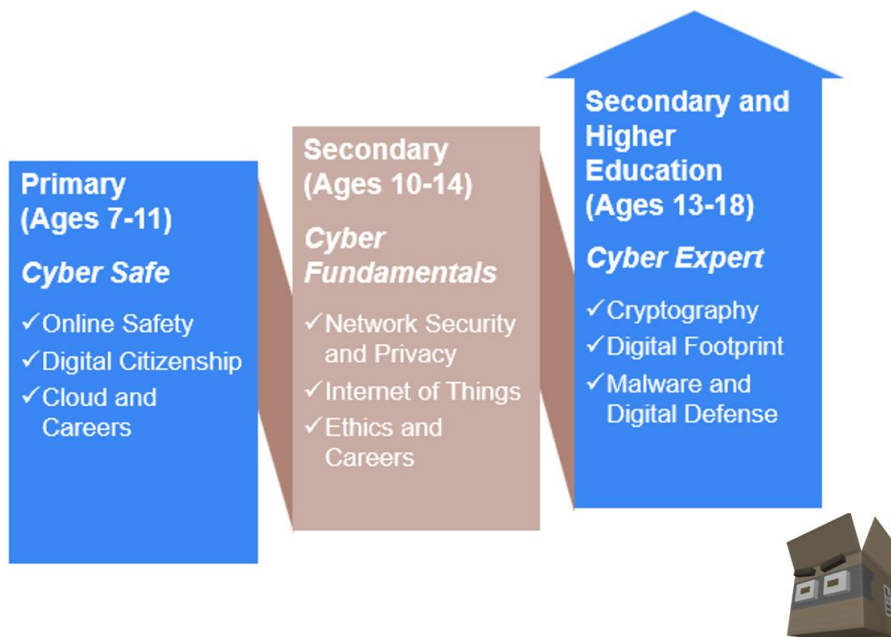


## K-12 CYBER SKILLS CURRICULUM

Cybersecurity continues to be a significant threat for governments, businesses, and individuals around the world. These challenges are compounded by a workforce shortage; there simply aren't enough people with the cybersecurity skills needed to fill open jobs.

The Minecraft Cyber Skills collection is specially designed cyber content to address relevant academic standards in a logical, sequential progression. Students will learn, practice, and apply relevant cyber skills and concepts in both unplugged and digital experiences. The lessons are designed to follow the gradual release methodology (refer to the Lesson Design section of this guide found below). Students should have multiple opportunities to practice and demonstrate mastery in any given skill/concept.

The curriculum consists of three collections, addressing students across primary, secondary, and upper secondary education. The curriculum helps learners of all ages become cyber heroes - protecting their data, using the Internet safely, and wobbling digital citizenship. These lessons are aligned with CYBER.org and CSTA curriculum standards. This progressive curriculum introduces concepts with easy on ramps for any educator. Each collection includes robust educator resources, lesson plans, and video tutorials to support learning. Central to this curriculum is foundational skill building with pathways to careers in cyber.



### Getting Started for Students



There are no required prerequisites around computer science, coding, or tech skills for students. Students should have had some instruction and/or guidance around device usage and navigation (i.e., appropriate use of hardware, device login procedure/information, digital safety, etc.). There is a recommended grade level/age range for students as it relates to the developmentally-appropriateness and reading comprehension levels of the computer science units.

### **Getting Started for Teachers**

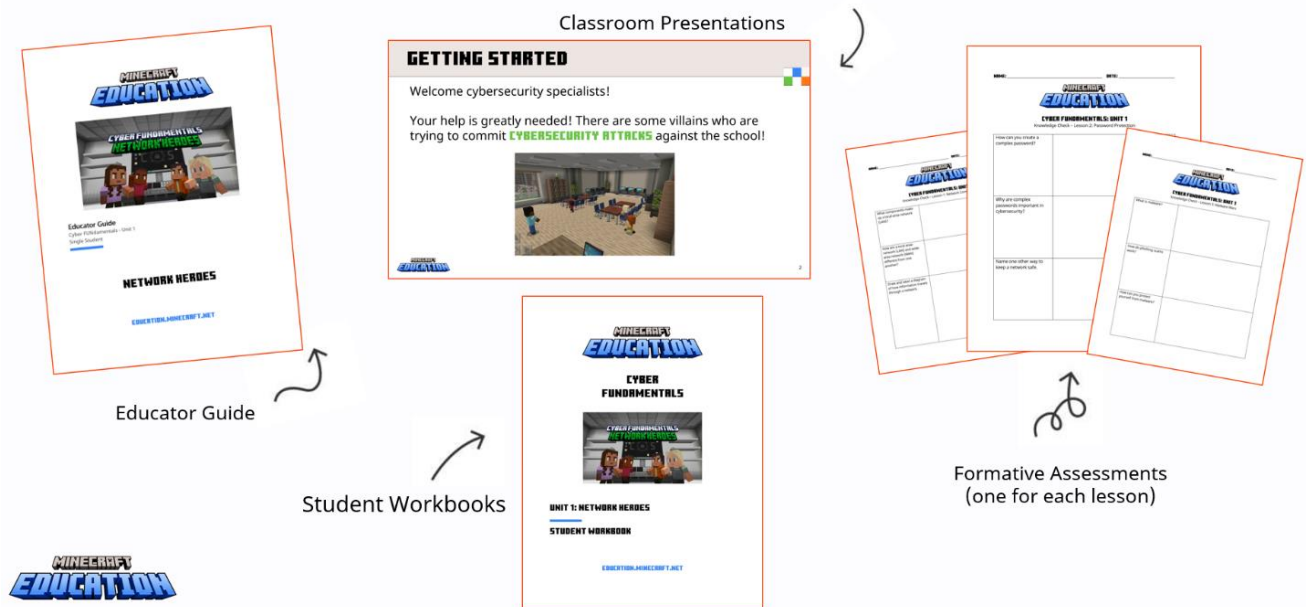
Teachers do not need to have any prior cyber or computer science experience; however, they should familiarize themselves with a basic understanding of Minecraft Education. Support for building out teacher knowledge can be found here:

- [Teach cybersecurity concepts with Minecraft Education - Training | Microsoft Learn](#)
- [Minecraft Education Cyber Teacher Academy](#)

### **Unit Materials**

The Minecraft Education cyber curriculum offers a comprehensive and structured approach to teaching cyber skills, providing educators with a range of resources to facilitate effective learning. The Educator Guide serves as a detailed guide, outlining the content, skills, learning outcomes, themes, relevant grade levels, and connections to the Minecraft Teaching and Learning framework. It includes overviews of themes, learning goals, standards, preparation instructions, key vocabulary, detailed lesson plans, and additional materials needed.

To aid in lesson delivery, Classroom Presentations are provided for each lesson, equipped with PowerPoint slides to structure the teaching process. Formative Assessments are integrated into these guides, offering 2-4 question checks for understanding to be completed at the end of each lesson. Additionally, Student Workbooks are designed to support students' comprehensive understanding of the cyber concepts taught in the unit.



## K-12 Cyber Standards

This next section will provide you with an overview of the full Cyber Skills curriculum and its corresponding academic standards. The curriculum sequence is presented in chronological order—we suggest working in order within the grade level bands, as the content will build upon skills presented in the previous unit.

However, educators should feel empowered to modify and adapt the content and/or sequence to best meet the needs of their students.

Grade Level	Curriculum Unit Name	Number of Lessons	Hours	Standards Addressed
K-5	CyberSafe: Home Sweet	1 lesson	1.5 hours	CSTA 1A-IC-18 1B-NI-05 1A-IC-17 2-NI-05
K-5	CyberSafe: Privacy Prodigy	1 lesson	1.5 hours	CSTA 1A-IC-18 1B-NI-05 1A-IC-17 2-NI-05
K-5	CyberSafe: Cloudcraft	1 lesson	1.5 hours	CSTA 3A-IC-27 1B-NI-05 2-NI-05 3A-NI-05



				3A-NI-06
6-8	Cyber Fundamentals (Part 1): Network Heroes	3 lessons	2 hours	CSTA Middle Grades 2-NI-04 2-NI-06 ISTE 1.2.b 1.2.d  CYBER.ORG 6-8.CS.COMP 6-8.CS.COMM.1 6-8.SEC.CRYP 6-8.SEC.COMP 6-8.SEC.CIA
6-8	Cyber Fundamentals (Part 2): The Interceptors	2 lessons	1.5 hours	CSTA Middle Grades (Level 2) 2-NI-05 ISTE 1.2.b 1.2.d CYBER.ORG 6-8.SEC.INFO 6-8.SEC.AUTH 6-8.SEC.NET
6-8	Cyber Fundamentals (Part 3): Cloud Champions	2 lessons	1.5 hours	CSTA Standards Middle Grades (Level 2) 2-NI-05 2-IC-23 ISTE 1.2.b 1.2.d CYBER.ORG 6-8.DC.ETH 6-8.SEC.NET 6-8.DC.FOOT.1 6-8.DC.FOOT.2 6-8.CS.IOT 6-8.CS.LOSS



9-12	Cyber Expert (Part 1): Cryptic Ciphers	3 lessons	1.5 hours	CSTA High School 3A-NI-05 3B-NI-04  CYBER.ORG 9-12.SEC.Cryp 9-12.SEC.PHYS
9-12	Cyber Expert (Part 2): Daring Defense	3 lessons	1.5 hours	CSTA High School 3A-NI-06 3B-NI-08  CYBER.ORG 9-12.CS.HARD 9-12.SEC.COMP 9-12.SEC.CTRL 9-12.SEC.ACC
9-12	Cyber Expert (Part 3): Malware Mayhem	3 lessons	1.5 hours	CSTA High School 3A-NI-06 3B-NI-08  CYBER.ORG 9-12.CS.HARD 9-12.SEC.COMP 9-12.SEC.CTRL 9-12.SEC.ACC
10-12	Cyber Defense	4 lessons	1-2 hours	Exam SC-900: Microsoft Security, Compliance, and Identity Fundamentals  CSTA 3A-NI-06 3A-NI-08  ISTE 1.2.b 1.2.d  Cyber.org 9-12.SEC.INFO 9-12.SEC.COMP



				9-12.SEC.NET 9-12.SEC.CTRL
--	--	--	--	-------------------------------

### Cyber and Computer Science Concepts

This next section will provide you with an overview of the full computer science curriculum and the CS concepts covered within the unit.

Grade Level	Curriculum Unit Name	Number of Lessons	Hours	CS Concepts Addressed
K-5	CyberSafe: Home Sweet	1 lesson	1.5 hours	Physical and digital security measures Logging on privately Logging off appropriately Data privacy Passwords Phishing Credible Website Online Scams Digital citizenship Applying safe online practices Safe online communication Reporting concerns
K-5	CyberSafe: Privacy Prodigy	1 lesson	1.5 hours	Physical and digital security measures Data privacy Digital Footprint Digital citizenship Applying safe online practices Safe online communication Reporting concerns
K-5	CyberSafe: Cloudcraft	1 lesson	1.5 hours	Collaboration tools Personal data Physical and digital security measures Malware Sustainable information systems Social Media and Safety Sharing data online Understanding the internet New ways to protect online privacy and identity Reporting safety concerns





6-8	Cyber Fundamentals (Part 1): Network Heroes	3 lessons	2 hours	<ul style="list-style-type: none"> <li>CIA Triad</li> <li>Network Defense Strategies</li> <li>Network Components and Topology</li> <li>Local-area network (LAN)</li> <li>Wide-area network (WAN)</li> <li>Data Packets</li> <li>Encryption</li> <li>Secure Data Transmissions</li> <li>Confidentiality</li> <li>Password protection</li> <li>Layered security practices</li> <li>Malware</li> <li>Collaboration</li> <li>Cyber Ethics</li> <li>Persona data protection</li> <li>Digital Footprint</li> </ul>
6-8	Cyber Fundamentals (Part 2): The Interceptors	2 lessons	1.5 hours	<ul style="list-style-type: none"> <li>Physical and digital security measures</li> <li>Cyber Ethics</li> <li>Digital Citizenship</li> <li>Digital Footprint</li> <li>Personal Data Protection</li> <li>Analyze threats and vulnerabilities</li> <li>Authentication methods</li> <li>Authorization methods</li> <li>Malware</li> <li>Network security layers</li> <li>Multi-factor authentication</li> <li>Strong passwords</li> <li>Phishing</li> <li>DOS/DDOS Attacks</li> </ul>
6-8	Cyber Fundamentals (Part 3): Cloud Champions	2 lessons	1.5 hours	<ul style="list-style-type: none"> <li>Physical and digital security measures</li> <li>Digital Citizenship</li> <li>Ethical and malicious hacking</li> <li>Digital Footprint</li> <li>Personal Data Protection</li> <li>Analyze threats and vulnerabilities</li> <li>Internet of Things</li> <li>Data Backups and Data Loss</li> </ul>
9-12	Cyber Expert (Part 1): Cryptic Ciphers	3 lessons	1.5 hours	<ul style="list-style-type: none"> <li>Encryption and Decryption</li> <li>Caesar Ciphers and Vigenère Ciphers</li> <li>Message integrity</li> <li>Social engineering</li> </ul>



9-12	Cyber Expert (Part 2): Daring Defense	3 lessons	1.5 hours	Firewalls DoS/DDoS Attacks Access Control Systems Firewalls Allow/Deny Rules Access control systems
9-12	Cyber Expert (Part 3): Malware Mayhem	3 lessons	1.5 hours	Malware, Virus, Trojan, Worm Cyber defense strategies Malware attacks DOS/DDOS attacks Backup software
10 - 12	Cyber Defender	4 lessons	1-2 hours	Defense-in-depth Network Security Physical Access Controls Malware attacks Phishing attacks Denial-of-service (DoS) and Distributed denial of service (DDoS) attacks Cyber ethics Data Privacy