Networks and the Internet

Competency

Educator applies their knowledge of networks and the internet through creating integrated learning experiences focused on communication between connected devices.

Key Method

The educator designs unit lessons or assessments to support determining students' understanding of essential vocabulary and key concepts in cybersecurity, networks, and the internet.

Method Components

What is Computer Science?

Computer science moves beyond using technology tools toward an understanding of how they work and ultimately designing new solutions to enduring human problems. Despite common misperceptions, computer science is not simply programming. Like any scientific discipline, computer science consists of a body of knowledge that informs how people understand and perceive the world around them, as well as practices for exploration, creation, and experimentation. Programming, defined as giving computers instructions to follow, is a practice used in computer science. The field itself is much broader, much as biology is not simply conducting lab experiments.

Why Should Students Learn Computer Science?

- Over 70% of jobs in STEM are actually computing jobs, and most of the others use computer science as a core part of the job.

- Many future jobs and opportunities will require knowledge and skills in the area of computer science. Therefore, students need multiple opportunities to use computer science to explore and understand the world.
- Even a student who does not end up programming in their job will still need to understand the central principles of how data, networking, the internet, and cybersecurity impact the lives of people in their families and communities.
- Students need to know that when they use a free social media platform, their data can be shared with anyone.
- All of the strands of computer science have drastic impacts on how we live our lives.
- Understanding the basic principles of computer science influences how students will interact with the world around them.

What are Networks?

Communication between computing devices follows specific protocols, enabling the efficient and reliable transmission of information. In order to achieve these goals, devices are networked and managed by a system of other connected devices with software that supports and protects this digital communication.

What is the Internet?

The internet is a distributed network of networks. Reliable communication through these networks depends on all sent information arriving at its destination, bypassing heavy traffic or damaged connections. In order to reliably communicate among networked computing devices, all the devices need to create and interpret these packets based on a universally agreed-upon set of rules that are scalable no matter how many devices are connected. Once these rules are in place, no one has to approve a new website or oversee additions to the network. Anyone can join at any time and successfully communicate with anyone else on the network without deciding on rules for communication in advance. The following terms apply to networks and the internet.

- DNS (Domain Name System)
- IP/TCP (Transmission Control Protocol/Internet Protocol)
- Protocol
- Network
- Router
- Server

What is Cybersecurity?

Cybersecurity is the protection of computer systems and the information they contain from digital attacks. While not everyone needs to become a cybersecurity professional, understanding digital threats and ways to keep yourself safe are essential skills(Code VA: Teachers Lounge, 2019). See resources for more information.

Types of Cyber Attacks

- Phishing
- Ransomware
- Malware
- Social Engineering

Supporting Rationale and Research

Burgstahler, Sheryl. "Differentiating for Diversity: Using Universal Design for Learning in Elementary Computer Science Education." Universal Design: Implications for Computing Education, ACM Transactions on Computing Education, Oct. 2011, https://staff.washington.edu/sherylb/ud_computing.html

Honey, Margaret, et al. "STEM Integration in K–12 Education: Status, Prospects, and an Agenda for Research." The National Academies Press, National Academy of Engineering and National Research Council of The National Academies, 7 Feb. 2014, http://www.nap.edu/catalog/18612/stem-integration-in-k-12-education-status-prospects-and-an

Lewis, Colleen, and Niral Shah. "How Equity and Inequity Can Emerge in Pair Programming." Association for Computing Machinery, ICER '15 Proceedings of the Eleventh Annual International Conference on International Computing Education Research, July 2015, http://blogs.hmc.edu/lewis/wp-content/uploads/sites/2/2013/07/LewisShah2015_EquitySpeed.pdf

Lewis, Colleen M. "Good (and Bad) Reasons to Teach All Students Computer Science." SpringerLink, Springer, Cham, 1 Jan. 2017, https://docs.google.com/document/d/1R57kol5El5B6jZQyZkmG4NY9MM4wwfJ13V13Yx4gWzw/edit#heading=h.gjdgxs

Resources

Bridging the Encouragement Gap in Computing | National Center for Women & Information Technology

Computing at School

Google Green (2012) Story of Send on Google Green

Guide to Inclusive Computer Science Education: How educators can encourage and engage all students in computer science | National Center for Women & Information Technology

How Equity and Inequity Can Emerge in Pair Programming

Internet Lesson from Code.org

Internet Simulator - Code.org

Standards | Computer Science Teachers Association

STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research | The National Academies Press

Widgets | Code.org | CS Principles

Code.org - Digital Citizenship for Elementary Students
Course A - Lesson 1: Going Places Safely
Course B - Lesson 1: Your Digital Footprint
Course C - Lesson 1: Screen Out the Mean
Course D - Lesson 1: Graph Paper Programming
Course E - Lesson 8: Private and Personal Information
Course F - The Power of Words
Course F - Lesson 19

Submission Guidelines & Evaluation Criteria

To earn the micro-credential, you must receive a passing score in Parts 1 and 3 and receive a proficient for all components in Part 2.

Part 1. Overview Questions (Provides Context)

(250–300 words)

Please answer the following contextual questions to help our assessor understand your current situation. Please do not include any information that will make you identifiable to your reviewers.

1. Help us understand the context of computer science in your school and classroom. Is there a state or local mandate to include computer science instruction?

2. Why did you select to earn the Networks and the Internet micro-credential, and what is your current level of comfort with incorporating computer science content and instruction into your core curriculum?

3. Describe the student population you serve (such as demographics, grade level, location, etc.) and how these students will benefit from your professional development through the Networks and the Internet micro-credential.

4. In the field of computer science, women and minorities are underrepresented. How will you intentionally engage and inspire underrepresented groups through the design of your unit?

Passing: Response provides reasonable and accurate information that justifies the reason for choosing this micro-credential to address specific needs of both the teacher and the student. Educator includes a learning goal that describes what they hope to gain from earning this micro-credential. Specific details about how you will engage and inspire underrepresented minorities and girls are included.

Part 2. Work Examples/Artifacts/Evidence

To earn this micro-credential, please submit the following **three artifacts** as evidence of your learning. *Please do not include any information that will make you or your students identifiable to your reviewers*.

Artifact 1: Networks and the Internet Unit
Write a unit of study that includes at least three Networks and the Internet lessons. One lesson should be on the internet, one on cybersecurity, and one on digital citizenship. Each lesson should include all of the following components:

- CSTA Standards and/or State CS Standards addressed
- Learning outcomes
- Description of the lesson
- Networks and the Internet key vocabulary
- How Bloom's Higher-Order Thinking or Computational Thinking skills are included
- How you will intentionally differentiate instruction to engage and inspire underrepresented minorities and females
- Description of how CS topic (Networks and the Internet) will be integrated
- How the learning will be evaluated/assessed

Artifact 2: Culminating Student Activity
Create a culminating activity to determine students' understanding of Networks and the Internet. Your activity needs to include:

- A student evaluation tool/rubric
- Computer science goals
- Content goals
- A description of the lesson (150–250 words)

Artifact 3: Student work samples
Upload two examples of student work from the activity above. You may choose from the following types of files to upload:

- Image
- Audio and/or video (30 sec–1 min clip)
- Document

Part 2. Rubric

	Proficient	**Basic**	**Developing**
Artifact 1: Networks and the Internet Unit	Unit of two or more lessons that incorporate *all of* the following elements: CSTA Standards and/or State CS Standards addressed Learning outcomes Description of the lesson Networks and the Internet key vocabulary How Bloom's Higher-Order Thinking or Computational Thinking skills are included	Lessons that incorporate *most of* the following elements: CSTA Standards and/or State CS Standards addressed Learning outcomes Description of the lesson Networks and the Internet key vocabulary How Bloom's Higher-Order Thinking or Computational Thinking skills are included Intentionally differentiated	Lessons that incorporate *a few of* the following elements: CSTA Standards and/or State CS Standards addressed Learning outcomes Description of the lesson Networks and the Internet key vocabulary How Bloom's Higher-Order Thinking or Computational Thinking skills are included Intentionally differentiated

	Intentionally differentiated instruction to engage and inspire underrepresented minorities and females Description of how CS topic will be integrated How the learning will be evaluated/ assessed	instruction to engage and inspire underrepresented minorities and females Description of how CS topic will be integrated How the learning will be evaluated/ assessed	instruction to engage and inspire underrepresented minorities and females Description of how CS topic will be integrated How the learning will be evaluated/ assessed
Artifact 2: Culminating Student Activity	Activity includes all of the following: -A student evaluation tool/rubric -Computer science goals -Content goals -A description of the lesson (150–250 words)	Activity includes some of the following: -A student evaluation tool/rubric -Computer science goals -Content goals -A description of the lesson (150–250 words)	Activity is missing most of the following: -A student evaluation tool/rubric -Computer science goals -Content goals -A description of the lesson (150–250 words)
Artifact 3: Student Work Samples	Two examples of student work are uploaded Student work is from the culminating activity	Two examples of student work are uploaded Student work is not from the culminating activity but may be from another computing systems lesson	One example of student work is uploaded Student work is not from a lesson on computing systems The student work does not show

	The student work shows understanding and application of the learning goals	The student work shows understanding and application of one of the learning goals	understanding or application of the learning goals

Part 3. Reflection

(250–500 words)
Use the word count as a guide to write a personal reflection about your work on this micro-credential. For tips on writing a good reflection review the following resource:

How Do I Write a Good Personal Reflection?

Please do not include any information that will make you identifiable to your reviewers.

1. How did this micro-credential influence how you make connections to the real world through teaching Networks and the Internet? What did you find rewarding or enjoyable?
2. What other standards might you have integrated with computing systems across the curriculum, and how can you connect your instruction to career readiness moving forward?
3. How did you address the needs of girls and underrepresented groups in your classroom, and how did they respond to your choices in the lesson?
4. In what ways did students engage with collaboration, communication, critical thinking, creativity, and citizenship through Networks and the Internet instruction?
5. What challenges, if any, did you encounter during this micro-credential process, and how did you overcome them?

Passing: Reflection provides evidence that this activity has had a positive impact on both educator practice and student success. Specific examples are cited directly from personal or work-related experiences to support claims. Also included are specific actionable steps that demonstrate how new learning will be integrated into future practice.