Explore the Computer Science Standards Network and The Internet
Introductions

Stephen King, PhD PMP is the Computer Science Education Program Consultant for the Kansas State Department of Education. With a doctorate in education and a masters in telecommunications management, he has over twenty years of experience leading and teaching IT and computer science to high school and college students.
What Will Our Takeaways Be Today?

- Understand each of the standards in the Network and Internet category (Network Communication & Organization and Cybersecurity)
- Become familiar with how the standards scaffold
- Know what each standard looks like in the classroom
- Share ideas for activities
- Share ideas for interdisciplinary activities and opportunities
NCO – Primary Grades

- PK.NI.NCO.01 Recognize that computing devices are connected via wired or wireless networks so that they can communicate with each other.
- K.NI.NCO.01 Recognize and use computing devices to connect with people or other devices using a network to communicate, access, and share information as a class (e.g. the internet, video conferencing, email, file transfer).
- 1.NI.NCO.01 Recognize that by connecting computing devices together they can share information using a network (e.g. wired or wireless network).
- 2.NI.NCO.01 Use computing devices to share information and communicate with others using a network.

- 3.NI.NCO.01 Model how a device on a network sends and receives information.
- 4.NI.NCO.01 Explain how information is sent and received across physical or wireless paths.
- 5.NI.NCO.01 Model how information is broken down into smaller pieces and transmitted through multiple devices over networks and the internet, and how these pieces are assembled at the destination.
• MG.NI.NCO.01 Explain protocols and their importance to data transmission; model how packets are broken down into smaller pieces and how they are delivered.
• L1.NI.NCO.01 Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
• L1.NI.NCO.02 Compare various security measures, considering tradeoffs between the usability and security of a computing system.
• L2.NI.NCO.01 Describe the issues that impact network functionality (e.g., bandwidth, load, delay, topology).
• L2.NI.NCO.02 Give examples to illustrate how sensitive data can be affected by malware and other attacks.
NCO - Practical application

• Early grades
  • Describe how computing devices are connected
  • Demonstrate connecting/disconnecting a device
  • Explain wired vs wireless connections in basic terms
  • Draw a model of a network packet
  • Use a device to program a drone

• Middle
  • Simulate network traffic using bulbs or flashlights
  • Describe what a protocol is

• Secondary
  • Draw a topology model of the school network
  • Field trip to examine security measures of school network
  • L2: Bandwidth analysis
  • L2: Describe examples of malware attacks and local countermeasures
NCO - Interdisciplinary opportunities

• Science: discuss how voltages are used on wired networks to carry signals, and how protocols are used to interpret signals.
• Engineering: create a circuit to turn on a bulb to simulate network traffic
• Math: compare MAC, IPv4, and IPv6 addresses in binary, hexadecimal, and decimal
• ELA: Research presentation on development of network topologies/technologies (e.g., Alohanet, Ethernet, Token Ring, etc.)
• Hour of Code activities in math, science, or engineering topics
• Other ideas in Chat
Cybersecurity – Primary Grades

• PK.NI.C.01 Recognize that passwords are private and should be kept secret.
• K.NI.C.01 Use a form of secure access to protect private information and discuss the effects of password misuse (e.g. logging into a device, educational websites, authentication, thumbprint recognition).
• 1.NI.C.01 Identify what authentication methods (passwords) are; explain why they are not shared; and discuss what makes a password strong. Independently, use passwords to access technological devices, apps, etc.
• 2.NI.C.01 Demonstrate use of strong authentication methods to access and protect devices and data. Understand the effects of retaining password privacy.
• 3.NI.C.01 Identify problems that relate to inappropriate use of computing devices and networks.
• 4.NI.C.01 Identify and explain issues related to responsible use of technology and information, and describe personal consequences of inappropriate use.
• 5.NI.C.01 Discuss real-world cybersecurity problems and identify strategies for how personal information can be protected.
• MG.NI.C.01 Evaluate physical and digital procedures that could be implemented to protect electronic data/information; explain the impacts of hacking, ransomware, scams, fake scans, and ethical/legal concerns.

• L1.NI.C.01 Recommend security measures to address various scenarios based on factors such as efficiency, feasibility, and ethical impacts.

• L2.NI.C.01 Compare ways software developers protect devices and information from unauthorized access.

• MG.NI.C.02 Compare the advantages and disadvantages of multiple methods of encryption to model the secure transmission of information.

• L1.NI.C.02 Explain tradeoffs when selecting and implementing cybersecurity recommendations.

• L2.NI.C.02 Use encryption and decryption algorithms to transmit/receive an encrypted message.
Cybersecurity – Practical Application

• Early Grades
  • Successfully authenticate
  • Come up with examples of strong vs weak passwords
  • Identify anti-malware practices and anti-virus software

• Middle Grades
  • Model school network firewall and related cybersecurity system
  • Practice using Caesar and other cypher techniques to pass coded messages

• High School L1
  • Matching exercise joining threats to protection measures
  • Research and compare cost of various protection measures
  • Practice justifying purchase

• High School L2
  • Research password strength concerns
  • Use a network sniffer to capture packets on a classroom wireless network
  • Describe or compare encryption algorithms (e.g., Diffie-Hellman vs RSA)
Cybersecurity - Interdisciplinary opportunities

- Practice writing and/or speaking to executive team to justify cybersecurity purchase
- Write draft security protocol for the school
- Math: investigate/describe differences between/among encryption algorithms (symmetric key, asymmetrical key, DHM, RSA, etc)
- Research presentation on codebreakers of WWII
- Math: YouTube Zach Star “This completely changed the way I see numbers” 16:15 (https://www.youtube.com/watch?v=lJ3CD9M3nEQ)
- Other ideas in Chat
Let's DO THIS!

Please take a moment and complete an Evaluation:

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