

Explore the Computer Science Standards Computing Systems

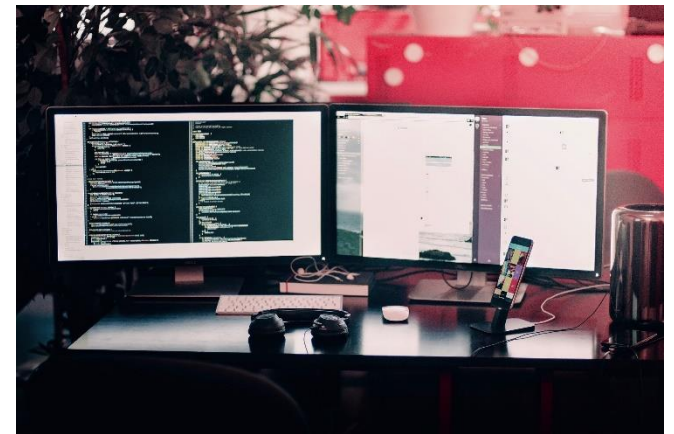
Introductions

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 Computing Systems category
- 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



Devices – Primary Grades



- PK.CS.D.01 With guidance, demonstrate how to operate a computing device.
- K.CS.D.01 Demonstrate how to operate a variety of computing devices.
- 1.CS.D.01 With guidance, select and use a computing device to perform a variety of tasks for an intended outcome.
- 2.CS.D.01 Select and use a computing device to perform a variety of tasks for an intended outcome.
- 3.CS.D.01 Identify how computing devices can be connected to other devices to extend their capabilities.
- 4.CS.D.01 Identify and explain how computing devices can be connected to other devices to extend their capabilities.
- 5.CS.D.01 Model and communicate how computing devices can be connected to other devices to extend their capabilities.

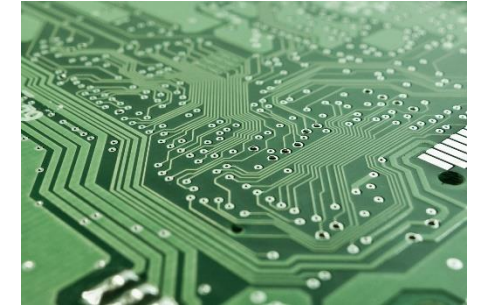


Devices – Middle and Secondary

- MG.CS.D.01 Develop and implement a process to evaluate existing computing devices and recommend improvements to design based on analysis of how other users interact with the device.
- L1.CS.D.01 Explain how abstractions hide the underlying implementation details of computing systems embedded in everyday objects.
- L2.CS.D.02 Describe how internal and external parts of computing devices function to form a system.



Devices - Practical application



- Early grades
 - Turn a device on/off
 - Use a handheld device to watch a video or play a game
 - Explain how handheld or laptops might be better for a set of tasks
 - Set up a robot to be controlled by a handheld
 - Use a device to program a drone
- Middle
 - Discuss “gaming” versus “workstation” computers
 - Analyze types of interfaces
- Secondary
 - Explore integrated devices (GPS on car, backup camera, blood pressure monitor)
 - L2: Disassemble and reassemble a computer, describing the parts
 - L2: Build a Raspberry Pi



Devices - Interdisciplinary opportunities

- Drones in gym – teaching fractions
- Sphero to teach periodic table
- Hour of Code activities in math, science, or engineering topics

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Hardware and Software – PK and K

- PK.CS.HS.01 With guidance, use appropriate terminology to locate and identify common computing devices and components in a variety of environments (e.g. turn on, navigate, open/close programs/apps).
- K.CS.HS.01 Use appropriate terminology to locate and identify common computing devices and components in a variety of environments (e.g. turn on, navigate, open/close programs/apps).
- PK.CS.HS.02 With guidance, correctly use software that controls computing devices (e.g. programs, browsers, websites, and applications).
- K.CS.HS.02 Identify and use software that controls computing devices (e.g. programs, browsers, websites, and applications).



Hardware and Software – 1 and 2

- 1.CS.HS.01 Use appropriate terminology in identifying and describing the function of common computing devices and components. (e.g. use an app to draw on the screen, use software to write a story or control robots).
- 2.CS.HS.01 Model the use of components of a computing system, its basic functions, peripherals, and storage features.(e.g. using the hard drive, memory/storage, printers, scanners, wireless and cabled connections, and cloud storage).
- 1.CS.HS.02 With guidance select and use appropriate software/apps for an intended outcome. (e.g. programs, browsers, websites, and applications)
- 2.CS.HS.02 Self select and use appropriate software/apps for an intended outcome. (e.g. programs, browsers, websites, and applications).



Hardware and Software – 3 - 5

- 3.CS.HS.01 Model how information flows through hardware and software to accomplish tasks.
- 4.CS.HS.01 Explain how information is translated, transmitted, and processed between hardware and software in order to accomplish tasks.
- 5.CS.HS.01 Illustrate how information is translated into binary numbers between software and hardware.
- No 3-5 CS.HS.02.



Hardware and Software – MG and HS

- MG.CS.HS.01 Model a computing system involving multiple considerations and potential tradeoffs of software and hardware, such as functionality, cost, size, speed, accessibility, and aesthetics (CSTA Practice - P5)
- L1.CS.HS.01 Compare levels of abstraction and interactions between application software, system software, and hardware layers.
- L2.CS.HS.01 Categorize the roles of operating system software.
- No MG.CS.HS.02.
- L1.CS.HS.02 Compare computer systems and determine advantages and drawbacks of each system.
- L2.CS.HS.02 Compare options for building a computer systems and determine advantages and drawbacks of each piece and how it will affect the overall performance.



Hardware and Software – Practical Application Elementary Grades

- HS.01

- Similar to D.01
- Ability to turn on and use a device
- LE grades: “model” means draw a rough representation of info flowing from sensors/inputs to outputs
- Basic binary representation in fifth grade, e.g., ability to read an ASCII chart

- HS.02

- Software side
- Ability to use software (PK – K)
- Ability to select software (1 – 2)
- Grades 3-5, merges in to HS.01



Hardware and Software – Practical Application MG and HS

- Middle Grades
 - Able to articulate considerations and tradeoffs in software/hardware selection
 - Collects cost requirements for various hardware/software solutions (e.g., iPad vs Chrome-based tablet vs laptop)
 - Discuss wireless vs. Bluetooth vs. wired connectivity
- High School L1
 - Describe how hardware and software works together for drones/GPS/smart TV/etc.
 - Compare computing systems based on cost and ability (e.g., gaming system vs workstation)
- High School L2
 - Describe what an operating system does
 - Compare Windows vs Linux O/S based on function
 - “Cost out” a computer system based on requirements
 - Compare/contrast Raspberry Pi with a more sophisticated device



Hardware and Software - Interdisciplinary opportunities

- Math – Binary conversion (standard #?)

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Input and Output - Elementary

- PK.CS.IO.01 With guidance, identify and apply basic input/output skills. Input (keyboarding, mouse, touchscreen, voice, camera, interactive board) Output (monitor, screen, printer, audio)
- K.CS.IO.01 Identify and apply basic input/output skills. Input (keyboarding, mouse, touchscreen, voice, camera, robotics, interactive board) Output (monitor, screen, printer, robotics, audio)
- 1.CS.IO.01 Understand and apply basic input/output skills. Input (keyboarding, mouse, touchscreen, voice, camera, robotics, interactive board) Output (monitor, screen, printer, 3D printer, robotics, audio)
- 2.CS.IO.01 Understand and use varying input/output skills. Input (keyboarding, mouse, touchscreen, voice, voice typing, camera, robotics, interactive board) Output (monitor, screen, printer, 3D printer, robotics, audio)
- 3.CS.IO.01 Demonstrate proper use of grade level appropriate input devices and produce digital artifacts with a controlled audience.
- 4.CS.IO.01 Demonstrate proper use of grade level appropriate input devices and produce digital artifacts with a controlled audience.
- 5.CS.IO.01 Demonstrate proper use of grade level appropriate input devices and produce digital artifacts selective publication based on audience/purpose.



Input and Output – MG and HS

- MG.CS.IO.01 Know and apply grade-level appropriate skills with input and output devices.
- L1.CS.IO.01 Demonstrate efficient use of input and output devices
- L2.CS.IO.01 Demonstrate use of course specific advanced input and output devices related to field



Input and Output – Practical Application - Elementary

- PK: can locate space bar, enter key, and some letters. Can identify monitor vs speaker vs printer as output
- K: demonstrates knowledge of layout of keys, left hand on left side and right on right
- 1: demonstrates knowledge of QWERTY and numbers and punctuation
- 2: uses hands on home row and shift key for capitals. Can demonstrate clicking to place insertion point.
- 3: demonstrates multiple input methods (typing, touchpad, mouse) and can type 5-10 wpm
- 4: 10-15 wpm and can demonstrate use of audio inputs and camera
- 5: 15-20 wpm w/ 85% accuracy looking away from the keyboard
- “Digital artifacts” include slideshow, video file, photos, programs, audio files



Input and Output – Practical Application – MG and HS

- MG: 20-30 wpm w/ 90% accuracy looking away from the keyboard and types at least seven pages of text into appropriate software program. Select output device (e.g., 3D printer, speaker, projector) based on need.
- L1: fluency on selected input and output devices (e.g., printer vs. plotter, using different screen outputs and resolutions, using various microphone audio inputs)
- L2: Robotics programming, joystick customization, employing motion and/or movement and/or light sensors, implementing GPS into a system, etc.



Input and Output – Interdisciplinary opportunities

- Any keyboarding class
- Any class involving printing
- Robotics activities
- CAD class

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Troubleshooting - Elementary

- PK.CS.T.01 Recognize that computing systems might not work as expected and with guidance can identify simple hardware or software problems (e.g. volume turned down on headphones, monitor turned off).
- K.CS.T.01 Recognize that computing systems might not work as expected and use accurate terminology to identify simple hardware or software problems (e.g. volume turned down on headphones, monitor turned off).
- 1.CS.T.01 Identify and describe basic hardware and software problems using accurate terminology (app or program is not working as expected, no sound is coming from the device, caps lock turned on, WiFi not working).
- 2.CS.T.01 Using accurate terminology, identify and resolve simple hardware and software problems and strategies for solving these problems.
- 3.CS.T.01 Identify, using accurate terminology, simple hardware and software problems and strategies for solving these problems.
- 4.CS.T.01 Identify, using accurate terminology, simple hardware and software problems that may occur during everyday use, discuss problems with peers and adults, and apply strategies for solving these problems.
- 5.CS.T.01 Using accurate terminology, identify simple hardware and software problems that may occur during everyday use.



Troubleshooting – MG and HS

- MG.CS.T.01 Systematically identify, fix, and document increasingly complex software and hardware problems with computing devices and their components.(CSTA Practice - P6)
- L1.CS.T.01 Develop guidelines that convey systematic troubleshooting strategies that others can use to identify and fix errors.
- L2.CS.T.01 Illustrate ways computing systems implement logic, input, and output through hardware components.



Troubleshooting - Application



- PK: able to communicate a problem (does not come on, etc.)
- K: communicate a problem with accurate terminology (page isn't loading)
- 1: communicate and seek solutions (check wifi, etc.)
- 2: employ simple troubleshooting strategies (unplug it, reset earphone jack, etc.)
- 3 - 5: communicate problem using accurate terminology and employ strategies such as rebooting, making sure caps lock is off, etc.
- MG: employ effective, structured process (flow chart, system design diagram, etc.) to identify and address cause of error
- L1: Create flow charts, troubleshooting diagrams, for use in troubleshooting problems.
- L2: Implement and troubleshoot logic gates or hardware modules



Troubleshooting- Interdisciplinary opportunities

- Any technical environment
- Web design class

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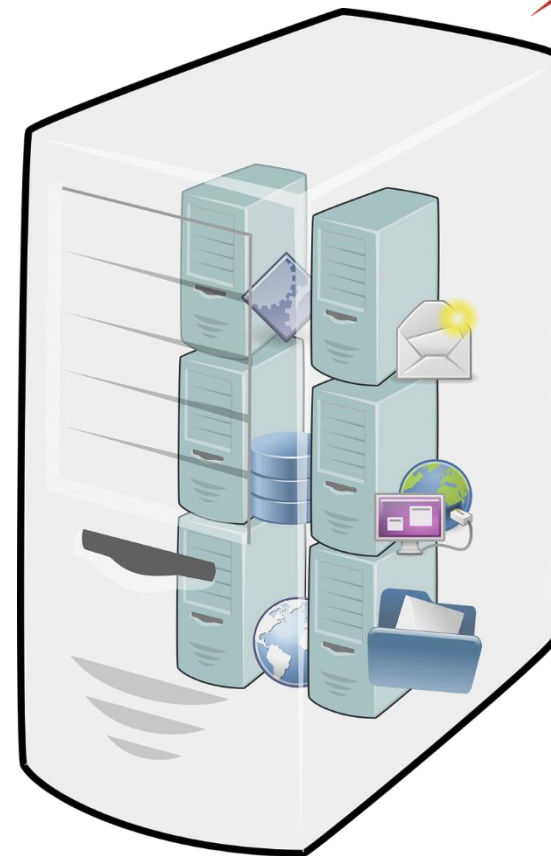


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Let's DO THIS!





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