Statewide IT Bridge Curriculum
Contextualized Science Module

Outcome #1 - Be introduced to computer hardware

Module Content -
Explore computer hardware; expand computer vocabulary; complete initial computer skills assessment

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Targeted ABE/ASE Content Standards -
5.S.CC.2 Demonstrate active listening skills.
5.R.RS.2 Determine the central idea or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept…
5.R.RS.4 Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context.

Targeted ESL Content Standards -
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.
ELP Standard 1 / AE.1.1 - determine a central idea or theme in oral presentations and spoken and written texts.
ELP Standard 5 / AE.5.2 - gather information from multiple print and digital sources
ELP Standard 8 / AE.8.1 - determine the meaning of general academic and content-specific words and phrases, figurative and connotative language, and a growing number of idiomatic expressions in spoken and written texts about a variety of topics, experiences, or events.

Activities & Resources -
NOTE: Instructor will need old desktop computer with side and/or top removed OR a computer photo from a site such as https://www.istockphoto.com/photos/pc-tower-inside

Activity 1: Envisage the inside of a computer
Invite students to draw a picture of what they think the inside of their computer looks like. Encourage them to show what they think makes the computer work.

Activity 2: Explore a computer
- Have students explore a computer using one of the following alternatives: https://edu.gcfglobal.org/en/computerbasics/inside-a-computer/1/
  OR
- Explore a physical computer that has the side and/or top removed to display the inside. As they read/explore, encourage students to name what they see, and make a list of any words or terms they do not understand. Add new words to the list as discussion continues. Words should include:
  - motherboard
  - chipset
  - BIOS
  - operating system
  - memory

Activity 3: Computer Vocabulary
- Have students go to www.Whatis.com to look up the words on their lists.

NOTE: Part of this lesson could be completed with students gathered around a single classroom computer, with a projected image of the website as the whole class views it together, with students working at individual computers in a lab setting, or with students working individually at a learning center computer.

- Next, write a list of words on a board or chart and have students give a verbal definition of each word or write a one-sentence definition for each word.
- Then ask students to create their own personal dictionary of computer terms. The five terms you provided for the activity can be the start of that dictionary. Encourage students to add to their lists of terms and definitions throughout the year as they learn more about computers and other technology. Consider having students use PowerPoint or Google Slides for their dictionaries.

Activity 4: Computer Skills Assessment

Have students answer the questions on the Computer check-in sheet and take the online basic skills assessment: https://assessment.digitalliteracyassessment.org/basic-computer-skills-1
- NOTE: Students need an account to access this assessment. Students need mouse and basic keyboard skills (arrow keys, enter key) for this assessment. Mouse activities (if needed):
  - Mouse Tutorial https://edu.gcfglobal.org/en/mousetutorial/
  - Mousercise at www.pbclibrary.org/mousing/mousercise.htm

Assessment -

Students will provide correct definitions for each of the five words in the activity. Answer Key: (Definitions from Whatis.com.)

1. A motherboard is the physical arrangement in a computer that contains the computer's basic circuitry and components.

2. A chipset is a group of microchips designed to work as a unit in performing one or more related functions.

3. BIOS (Basic Input / Output System) is the program a computer's microprocessor uses to get the computer system started after it is turned on.

4. An operating system (sometimes abbreviated as "OS") is the program that manages all the other programs in a computer.

5. Memory is the name for the electronic holding place for instructions and data that a computer's microprocessor can reach quickly.

Students complete the basic computer skills assessment.

ELL Supports / Instructor Notes -

Consider allowing students to create their dictionaries as language partners, if needed.

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Outcome #2 - Be introduced to computer software

Module Content -
Understand the concept of computer software; determine how hardware and software work together

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Targeted ABE/ASE Content Standards -
5.S.CC.2 Demonstrate active listening skills.
5.R.RS.2 Determine the central idea or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
4.R.RH.8 Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.
4.W.RB.3 Draw evidence from informational texts to support analysis, reflection, and research.

Targeted ESL Content Standards -
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.
ELP Standard 1 / AE.1.1 - determine a central idea or theme in oral presentations and spoken and written texts.
ELP Standard 5 / AE.5.6 - integrate information into an organized oral or written report
ELP Standard 9 / AE.9.2 - introduce and develop an informational topic with facts, details, and evidence.

Activities & Resources -
Get a basic understanding of computer software and conceptualize how software and hardware work together.
Activity 1: What is software?
- Distribute and review together "Introduction to Software" (located in the _IT Bridge Science Resources_ document)
- View "How Computers Work: Hardware and Software"
  https://www.youtube.com/watch?v=xnyFYiK2rSY
  - Consider using the GCF Global lesson on hardware and software as an introduction
    https://edu.gcfglobal.org/en/computer-science/hardware-and-software/1/
- Review the major types of software: operating system software, application software, programming software tools.
- Discuss other types of software: embedded software, server programs, email clients, multimedia players, image editors, voice chat. Ask students to contribute examples from their experience and make a categorized, collaborative list.

Activity 2: How software and hardware work together
- Read and discuss the following article: "Grace Hopper's Compiler: Computing's Hidden Hero" http://www.bbc.com/news/business-38677721 _(Grade level equivalency is 8)_
- Students make a list of ways hardware and software work together, based on what they learned from the video and article.

Activity 3: Summarize how hardware and software work together
- Students convert their notes to a well-constructed paragraph summarizing the ways hardware and software can work together.

Assessment -
Students write a paragraph summarizing the ways hardware and software work together. They will use evidence from the video and article to support their statements.

ELL Supports / Instructor Notes -
The article on Grace Hopper has a quantitative readability level of approximately 8th grade. ELL students may need additional support to increase comprehension.
If students have not had much writing instruction, the instructor may need to review the requirements of an effective paragraph, including topic sentence, methods for referencing sources, and concluding sentence.

Outcome #3 - Create a database by entering home inventory data into a form

Module Content -
Explain the benefits of a database compared to a workbook or spreadsheet; describe why businesses use databases; identify the main parts of a database; build a database to inventory home items for insurance purposes; evaluate techniques for selecting a pre-built template and entering data

Targeted ABE/ASE Content Standards -
5.R.FW.1 Understand and use technology systems.
5.R.RS.4 Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context.
5.W.WL.3 Produce clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience.
5.S.CC.2 Demonstrate active listening skills
5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.

Targeted ESL Content Standards -
ELP Standard 8 / AE.8.1 - determine the meaning of general academic and content-specific words and phrases, figurative and connotative language, and a growing number of idiomatic expressions in spoken and written texts about a variety of topics, experiences, or events.
ELP Standard 9 / AE.9.1 - recount a longer, more detailed sequence of events or steps in a process, with a clear sequential or chronological structure.
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about

a range of topics, texts, and issues.

Activities & Resources -
NOTE: In preparation for this lesson, consider using the following lesson to introduce databases to students:

- https://edu.gcfglobal.org/en/access2016/introduction-to-databases/1/ *(Access 2016 is covered in this lesson as an introduction, but instructors may choose to adapt the lesson to reflect the most recent Access release.)*

Activity 1: Complete the "Introduction to Databases Vocabulary Worksheet and Review" activities as a preview for the lesson (located in the *IT Bridge Science Resources* document).

Activity 2: Complete the "Intro to Databases Worksheet" (located in the *IT Bridge Science Resources* document). A key is provided for the instructor.
- Discuss the relevance of using databases.
  - Organization of vast amounts of data - discuss how overwhelming it would be to organize and keep track of employee information for a large retail corporation with thousands of employees.
- Explain the benefits of using a database as opposed to a workbook or spreadsheet.
  - On the surface, both types of software seem similar. After all, they store data, and you can enter data in a grid of cells.
  - The question is, "How do you want to organize your data?"
  - Database software has a relational structure that helps keep large amounts of information accurate and provides customized, manageable tables.
  - Spreadsheet software is used to analyze numbers using formulas, while database software is used for the storage of large amounts of data that can be accessed easily and quickly.
- Demonstrate selecting a template and entering data into the database.
  - Guided Practice: Instructor will use database software and demonstrate how to select and download a pre-built template from the database software package or the internet. Students will enter and save a new asset, choosing something from the classroom. Ask for one or two volunteers to demonstrate in front of their peers. Encourage students watching to peer-coach and evaluate the student demonstrator on his or her techniques.
    - Navigating to and opening the database software
    - Selecting and downloading a pre-built template from the database software package or the internet
    - Beginning a new database and entering data about an item in the classroom (a computer or projector is a good item)
    - Saving the new asset

Activity 3: Review the "Independent Database Creation" (located in the *IT Bridge Science Resources* document)

Activity 4: Review "Home Inventory Database Evaluation Rubric" (located in the *IT Bridge Science Resources* document)

Explain Independent Practice Activity

- Students will brainstorm the fields needed to enter home inventory information for insurance purposes (i.e., Item Name, Description, Model/Part Number, Estimated Purchase Price, etc.)
- Students will be responsible for "inventorying" at least 25 items from their home.
- They will create their own database using the skills taught in this lesson to create a home inventory database. Students will work on their personal home inventory databases independently.

Assessment -

Completed "Introduction to Databases Vocabulary Review"
Completed "Intro to Databases Worksheet"
Completed personal inventory (to be submitted as homework)

ELL Supports / Instructor Notes -

If the vocabulary is a challenge for students, the instructor may choose to add activities for vocabulary application, rather than just asking students to identify definitions.

Outcome #4 - Learn the importance and structure of firewalls

Module Content -

Learn what a firewall is and why it is important; discover what the OSI 7 Layer Model is and where a firewall should be operated within it; learn how to configure a firewall with firewall rules; learn to configure a Windows firewall

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Targeted ABE/ASE Content Standards -

6.R.RS.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem

5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.

5.W.WL.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures, experiments, or technical processes. **a.** Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting, headings, graphics (figures and tables) and multimedia when useful to aiding comprehension.

Targeted ESL Content Standards -

ELP Standard 5 / AE.5.6 - integrate information into an organized oral or written report

ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.

ELP Standard 5 / AE.5.5 - synthesize information from multiple print and digital sources.

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ELP Standard 3 / AE.3.4 - integrate graphics or multimedia when useful about a variety of texts, topics, or events

Activities & Resources -
Activity 1: Learn the fundamentals of firewalls
Use the lesson "Firewall Basics - Lesson 1" at
http://www.petraeus.org/fw/Firewall%20basics%20L1.pdf as an informational resource regarding firewalls. Pay particular attention to the section titled "Why Do You Need a Firewall." The instructor may choose to deliver the information from this lesson orally, provide portions of the text in writing for students to read, or a combination of both.

Activity 2: Virtual firewall
- Show video: https://www.youtube.com/watch?v=6UtiQwCX2wU
- Assign two students to be personal computers in a network. Give them signs to put on their chest that say "Personal Computer."
- Assign two students to be the "Firewall." Have students extend their arms out and connect them. Have them stand in front of the personal computer students.
- Have one student stand behind the firewall students and give them a sign that says "Internet."
- Facilitate discussion on why a firewall is important.
- Facilitate discussion on how a packet of information will travel internally and externally.

Activity 3: Summary activity
Students choose one of the following to demonstrate their understanding of how firewalls function and why they are important:
- With a partner, develop a slide presentation that explains how firewalls function and why they are important. Use images to depict visual representations of how firewalls work.
- Create a cartoon that demonstrates how firewalls work and why they are important. Include at least 6 panels.

Assessment -
Completed slide presentation or cartoon demonstrating function and importance of firewalls.

ELL Supports / Instructor Notes -
ELL students may benefit from having the "Firewall Basics - Lesson 1" material covered orally as a whole group. The printed text could be provided as a support, and the instructor could highlight/emphasize key terms and sections.

Outcome #5 - Discover basics of computer networking

Module Content -
Identify computer networking; describe network fundamentals; determine computer network terms

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Targeted ABE/ASE Content Standards -
5.R.RS.4 Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context.
6.R.RS.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
5.S.CC.2 Demonstrate active listening skills
5.S.CC.1 Initiate and participate effectively in a range of collaborative discussions with diverse partners on texts, topics and issues appropriate to skill level, building on others' ideas and expressing their own clearly and persuasively.

Targeted ESL Content Standards -
ELP Standard 8 / AE.8.1 - determine the meaning of general academic and content-specific words and phrases, figurative and connotative language, and a growing number of idiomatic expressions in spoken and written texts about a variety of topics, experiences, or events.
ELP Standard 1 / AE.1.1 - determine a central idea or theme in oral presentations and spoken and written texts.
ELP Standard 2 / AE.2.1 - participate in conversations, discussions, and written exchanges about a range of topics, texts, and issues.

Targeted IL IEL/CE Competencies -
EM11. Read safety signs and instructions commonly found at work.

Activities & Resources -
Identify what computer networking is and what it entails
NOTE: In preparation for this lesson, use the "Computer Network Fundamentals Teacher Pack" for information and activities regarding computer networking. If the instructor chooses, use the teacher pack to build out additional activities covering specific topics that go beyond the activities in this module.

Activity 1: Computer networking vocabulary
- Discuss vocabulary words that may appear frequently during computer networking discussions.
- Show students how to use the website http://www.webopedia.com
- Vocab word search exercise:
  - Distribute a worksheet that includes a word search for select vocabulary words. *(See below for options.)* Provide a key of definitions to keep in notebooks for future reference.
  - To create a word search, consider the following website: http://www.edhelper.com

Using the following vocabulary words:
1. Byte --equal to 8 bits
2. Bit --smallest unit of information
3. NIC --Network interface card

4. Worm --replicates self through disk & memory
5. Virus --software used to infect computer
6. Error control --testing for accurate transmission of data
7. Fiber optics – technology that transmits information as pulses of light
8. Infrared --invisible band of radiation
9. Physical layer --provide transmission of bits over network medium
10. Protocol --rules governing the transmission and receiving of data
11. Ethernet --most widely used LAN
12. Routing --forwards data to transmission
13. Topology --pattern of interconnection
14. Domain --all resources under the control of a single computer system
15. Address --the number of a particular memory
16. Microwave --vibrates at 1 GHz and above
17. Twisted pair --commonly used for telephone cabling
18. Technology --implies the use of computers
19. Internet --made up of over 65 million computers
20. FEC --forward error control

- Instructor will give an incentive for the first student to find information on various websites when asked to recall vocabulary words throughout the unit (e.g., give candy to first to find what "worm" means).

Activity 2: Discuss computer networking
NOTE: For Activities 2-5, use the "Computer Networking Fundamentals" presentation as the primary content resource - https://sway.office.com/H1ifD5KUZdLWkhFz *(Content may best be shared by projecting the presentation to the whole class and talking through specific sections orally, with the visuals as a support to comprehension.)*
- What is networking?
- How do networks help us?
  - Communication, sharing resources, sharing software, sharing data
- Describe network fundamentals including network types, topologies and design

Activity 3: What are the fundamentals of networking?
- Types, topologies, design and components
- Network types – LANs, MANs, WANs
- Watch the brief video "Types of Networks" as either a summary of this section or an introduction, depending on your student group and their background knowledge. https://www.youtube.com/watch?v=eVKjiHCUpZo&feature=youtu.be

Activity 4: LAN Network topology and other topologies
- What is a network topology?
- Watch the video "Understanding Network Topologies" https://www.youtube.com/watch?v=4ZaTa_JQM_E
- Discuss considerations when choosing a topology.
- Review these terms: domain name, IP address, worm, virus, byte, bit, protocols, token ring,

Ethernet, routing, network, topology, error (control), etc.

Activity 5: Components of a computer network
- Physical layer and what its components are (i.e., equipment, cables).
- Interfaces, hubs/switches, routers, cabling, software protocols
- Watch the video "What is TCP/IP?" https://www.youtube.com/watch?v=PpsEaqJV_A0&feature=youtu.be
- Instructor will point out on an actual computer or use www.blackbox.com to demonstrate where equipment is located.

Assessment -
Completed word search for key vocabulary terms
Optional: Students complete one of the activities in the Teacher Pack beginning on page 17, "Student Engagement With the Topic."

ELL Supports / Instructor Notes -
If the vocabulary is a challenge for students, the instructor may choose to add activities for vocabulary application, rather than just asking students to identify definitions.