“Intro to Computer Science Tour”
Grade 6-8: Pre-Lesson

Introduction:
This pre-visit lesson is designed to take place prior to the students’ viewing of the video segments. It provides appropriate background and prior knowledge upon which to build throughout the lesson. By completing the pre-visit material, your students will be better prepared to reap the most benefit from the video presentations they will see.

Vocabulary for Lesson:
To some, visiting a Naval vessel is almost as foreign and exotic as a spaceship. Many of the spaces, compartments, equipment, and parts of the vessel have a completely different name than a similar room or item in a building on land or simply no equivalent at all as that object is only found on a ship.

- **CIC** — acronym for *Combat Information Center*; on a Navy ship, a space where information from the ship’s radars and sensors, and data from other ships and planes are gathered and processed
- **computer hardware** — the physical components that a computer system requires to function; it includes but not limited to the housing, circuit boards, cooling fans, webcams, and power supply
- **computer software** — instructions that tell a computer what to do; includes programs, procedures, and routines associated with the operation of a computer system
- **console** — a unit accommodating a set of physical controls (screen, keyboard, trackball, touchpad, buttons, switches, or knobs) to interact with electronic equipment; a monitor and keyboard in a multiuser computer system
- **ciphertext (or cyphertext)** — the unreadable output of an encryption algorithm; looks like a series of random letters and/or numbers
- **decryption** — the process of converting an encrypted message back to its original (readable) format
- **encryption** — the process by which a readable message is converted to an unreadable form to prevent unauthorized parties from reading it
- **mast** — on a modern Navy ship, a metal, latticed structure where most of the vessel’s antennas and radars are placed and where the ship’s signal flags are flown from
- **plaintext** — readable text before it is encrypted into ciphertext, or readable text after it is decrypted
- **Message Processing Center** — the room on a Navy ship where all radio communication, teletype and encrypted messages were sent and received
- **NTDS** — acronym for *Naval Tactical Data System*; a highly secure data sharing system where information from multiple radars and data sensors (on different ships and planes) are shared to produce a real-time map of the battlespace
- **signal flag** — one of forty (40) flags each with different designs and colors representing letters, numbers, and operations; when flown from a ship’s mast, is a way of communicating with other ships
- **teletype machine** — a device that can send and receive text messages in different forms
- **TFCC** — acronym for *Tactical Flag Control Center*; a space where the admiral in charge of the battle group would receive information, give orders, and follow the status of operations being conducted
Engage:
- Start the conversation with students about the concept and/or their ideas about *computer science*. This is an opportunity to take note of your students’ prior knowledge about this subject.
- Generally, the definition of computer science is:
  - *Computer science is the study of computers, including computational theory, hardware and software design, algorithms and the way humans interact with technology.*
- Computer programming/coding may be the most common answer. If not given by students, suggest that other elements of *computer science* includes:
  - the variety of physical components such as input/output mechanisms, screens, printed circuit boards, cooling units, and computer housings
  - the range of how data is visually represented (patterns of color, light, dots, shapes) and viewed by an observer
  - the range of how data is represented in audio form (patterns of beeps, tones) during transmission or receipt of messages and information
  - the range of how data is represented in symbolic form (letter combinations, symbols, icons) on the screen
  - how letter and/or number patterns and sequences can be used to represent queries, instructions, status updates and encrypted data and/or messages

Explore:
- Provide students with a copy of the video Questions sheet.
- Have students view the videos.
  - How and when the students watch the videos will be at your discretion. Viewing the videos can be assigned as homework, or watched collectively together in class.
  - There is no specific viewing order for the videos.
  - Video titles include:
    - *Computer Hardware Design*
    - *Collecting & Exchanging Data*
    - *Forms of Data*
    - *Message Encryption & Decryption*

Explain:
- It is important that students understand how ordinary sailors, by carrying out their assigned duties on the Midway, used different types of computers and applications. Many of these computer systems were in use not only on the USS Midway, but throughout the US Navy’s fleet in the 1970s and early 1980s, years before personal computers and data sharing platforms became commonplace.
Evaluate:
• Students share their completed video Questions worksheet.

Elaborate:
• At the conclusion of each video, the presenter asks a question of the viewer if they have the skills or interest to pursue a career in a specific field of computer science. This could act as a prompt for students to investigate what are the current trends and developments in that particular part of computer science. In addition it could motivate students to delve deeper into what skills, education, and experience would be needed to work in that specific part of the computer field.
• The following are the prompts at the end of each video:
  o Computer Hardware Design
    ▪ “So maybe you’re interested in computers but aren’t interested in programming. Maybe you could develop the computer housing for use on a construction site, on a film, in a forest... or even on a Navy ship!”
  o Collecting & Exchanging Data
    ▪ “Do you have the imagination to create a system of data collection and exchanging that’s faster than the Internet and more secure than the NTDS system?
  o Forms of Data
    ▪ “What form will data look like in the future? Holographs of light patterns or maybe 3-D images? Will you be the one to develop it?”
  o Message Encryption & Decryption
    ▪ “Do you think you have the skills to create an unbreakable key and encryption code?”
VIDEO: *Computer Hardware Design*
- In what ways is the JETDS console made differently than a laptop or desktop computer?
- What are the purposes of these differences?

VIDEO: *Collecting & Exchanging Data*
- What did the NTDS software convert the radar “blip” into?
- How many years before the Internet was the Navy using this data sharing system?

VIDEO: *Forms of Data*
- The messages sent and received through the UGC-6 Teletype Machine took on what two different forms?
- What form does the Baudot Code take?

VIDEO: *Message Encryption & Decryption*
- What is the two-part process for sending and receiving secure communications?
- What do you call a message in a form that is readable?
- What is the name of the unreadable gibberish that is created by an encryption algorithm?
VIDEO: Computer Hardware Design
• In what ways is the JETDS console made differently than a laptop or desktop computer?
  o Keyboard set in an attached table.
  o Trackball instead of a mouse or touchpad.
  o Handles & access panels on front of console housing.
  o Housing made from up to ¼” thick ruggedized metal.
  o No internal cooling fan, used heat sinks and cool ambient air.
• What are the purposes of these differences?
  o To survive in a harsh environment that could include shock, vibrations and even explosions.

VIDEO: Collecting & Exchanging Data
• What did the NTDS software convert the radar “blip” into?
  o Into specific icons.
• How many years before the Internet was the Navy using this data sharing system?
  o 25 years.

VIDEO: Forms of Data
• The messages sent and received through the UGC-6 Teletype Machine took on what two different forms?
  o Typed messages or perforated dot patterns on a strip of paper.
• What form does the Baudot Code take?
  o Electronic pulses and beeps.

VIDEO: Message Encryption & Decryption
• What is the two-part process for sending and receiving secure communications?
  o Encryption (before sending) & decryption (after receiving).
• What do you call a message in a form that is readable?
  o Plaintext.
• What is the name of the unreadable gibberish that is created by an encryption algorithm?
  o Ciphertext (or cyphertext).