Human Computer Game

Preparation

<table>
<thead>
<tr>
<th>Grade Level: 4–9</th>
<th>Group Size: 20–30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time: 60–75 Minutes</td>
<td>Presenters: 1–3</td>
</tr>
</tbody>
</table>

Objectives
This lesson will enable students to:
- Name the four main function areas inside a computer
- Simulate the internal operations of a computer completing a function
- Compare and contrast the difference between human and computer parts that perform input, output, process, and storage functions

Standards
This lesson aligns with the following National Science Content Standards
- Science and Technology, grades 5–8
- Science in Personal and Social Perspectives, grades 5–8
- History and Nature of Science, grades 5–8

Materials
- “Parts of a Computer” PowerPoint
- Computer that can be opened to show the CPU and other components
- Storage device examples, including CD or DVD, hard drive, floppy disc, cassette tape, flash drive
- Markers (one for each group)
- Stopwatches (one for each group)
- Game cards
  - Red number cards – numbered 1 through 9
  - Blue operator cards – marked with +, −, x and / (or ÷)
  - Yellow – blank cards, two per group per game
- “Human Computer Game Script” handout (Appendix A)
- Computer function cards (Appendix B) – one set of six per group
  (Copied and separated)
- Memory chips (optional)
Preparation

Companion Book Suggestion:
The Magic School Bus Gets Programmed: A Book about Computers
(Cole, Sykora, Degan)
This book is a good reference to the subject material, and can be
read before or after the lesson is presented.

After the introduction, students will be divided into teams of six
for the game.

Introduction

Use the “Parts of a Computer” PowerPoint presentation to introduce the lesson, which can also
be found at www.micron.com/lessonplans.

Distribute memory chips.

Micron Technology manufactures memory chips. Although memory is crucial to the workings of
a computer, there are other parts to a computer besides memory chips. Look at your chips. The
mere size in relation to the actual machine you call a computer shows that there are many parts
of a computer that must work together to make your PC work.

Q: How has technology affected your life?
A: Answers will vary

Q: How have computers affected your life?
A: Answers will vary

Today we will be imitating the functions of a computer. The
functions work together courtesy of a motherboard, which
connects the parts. We will look at what is inside a computer as
we talk about the functions. (Trivia note: the boards that connect
into the motherboard are called… daughter boards!)

Use the open computer to identify the components as you talk about them.
Input

Information must somehow get into the computer and then the information must be translated into digital form.
Q: What are the various devices from which a computer can get Input?
A: Answers should include: keyboard, mouse, scanner, microphone, camera, graphic tablet, etc.

Q: How does your brain get input?
A: Hearing, sight, touch, smell, taste.

Process

The computer needs to do something, or process, what it has received. The CPU, or Central Processing Unit, is the main processing unit of a computer. It coordinates all of the actions of the machine like carrying out instructions, performing calculations, and interacting with all the components used to operate the computer.

More importantly, the microprocessor handles the fetch, decode, and execute steps of the computer system. To understand the efficiency of a computer’s processing system, you will become the parts of the computer and perform these three functions.

Computer Trivia:
Q: Have you ever seen a label on a computer that says “Intel Inside”? What does that mean?
A: It means that the CPU inside is made by the Intel Corporation. The two main manufacturers of CPU’s in the world are Intel and AMD.

Q: What does a human use for processing information?
A: The brain.

Storage

Computers have two types of storage: temporary and long-term storage.

RAM or Random Access Memory is a type of temporary storage that stores information as you use it. It is constantly being erased and rewritten as you open and close files. When you have a long document that you have written, but haven’t saved, it is stored in temporary storage, or RAM, for easy access. Complex video games require a lot of RAM in order to access information quickly.

When you want to save something permanently, you need to save it to long-term storage.
Q: What are some examples of long-term storage?
A: Answers can include: (show examples)
   - Hard drives
   - CD-ROMs (Compact Disc – Read Only Memory)
   - DVDs (Digital Video Discs)
   - Floppy disks (trivial)
   - Magnetic tape
   - Flash drives+
   - Solid State Drives++

These are examples of long term storage devices that keep information whether the computer is on or off.

Presenter can elaborate on each form of storage as he/she sees fit.
+ “Flash” drives get their name from the type of memory chips that are in them – called “Flash Memory”.
++ A Solid State Drives is a device made up of a multiple of Flash memory chips with a processor chip to manage the data.

Computers also have a special type of memory in them called ROM or Read Only Memory, which holds important information that the computer needs each time it runs.

Q: What do people use for storage?
A: Different parts of their brain.

Q: Are there different parts of the brain for short and long-term storage?
A: Yes

Output

When the computer is finally ready to display the information that it has been processing, it outputs information via different devices. The user needs to be able to retrieve the information or the result of the instructions given to the computer.

Q: What are some examples of output devices?
A: Answers should include: monitor, speaker, printer, plotter, etc.

Q: How does a person output information?
A: Answers can include: speaking, sign language, body language, etc.
**Conclusion**

A computer is an information–processing machine. A human being is also an information–processing entity.

Looking back on the information you’ve been presented with today, let’s examine how the elements of a computer relate to the thought process of a person.

**Summary Activity**

*Refer to the “Summary Activity” slide in the PowerPoint. If you are using an interactive white board, fill in the blanks.*

Think of both a computer and a person as information processing machines. Identify the four components of an information–processing device for both and complete the following table.

<table>
<thead>
<tr>
<th>Input done with</th>
<th><strong>COMPUTER</strong></th>
<th><strong>PERSON</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage done with</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information processing done by</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output done with</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Human Computer Game

Introduction

We are going to walk through the sequence that takes place in the computer when you give it a command. We will begin by identifying the various functions on the board. Each of you will be simulating the function of one part of the computer. Each group of six students will get Computer Function cards with the following titles:

- User
- Input
- Bus
- CPU
- Memory
- Output

We now have our Human Computer. We will be using it to perform a math function. *Explain each computer function as the card is handed out.*

Q: What do you think the Bus does in the computer?
A: Answers will vary
The computer talks in “bits”, the digital information signals that it uses. The Bus is how those signals get around.

Refer to the open computer or computer parts.
Q: Where do you think the Bus is?
A: Any of the flat cables present a good example of the Bus.
**Human Computer Game Activity**

Now we are ready to begin the game.

*The purpose of the game is to process through the steps required of a computer to perform a simple arithmetic (+, −, ×, ÷) operation.*

*The game can be done with one team at a time, timing their speed, or two teams competing against each other.*

*Divide the class into groups of six. Walk through the activity with the first group so that students can see how it works. Then you can time each group or have them compete against each other. Record each group's time on the board to compare with other groups as they complete the activity.*

*Have the group (or groups) come to the front of the class. Pass out a Function card to each member of the group. Place the red number cards and the blue operator cards where the Users can access them. Give the CPU two blank yellow cards and a marker. Explain to the students that you are going to read a script, and that they must follow the script exactly, no thinking ahead! The first team to write the correct answer (or the team with the fastest time to get an answer) is the winner!*

One of the most important aspects of a computer is its speed. Now we're going to time the groups to see how fast they can perform a given function. The time will be recorded to compare with the other groups.

*Use the Human Computer Game Script – Appendix A, to direct the game.*

**Discussion** (after the game)

Q: Were you surprised at how many steps it took to perform a simple math operation?
A: Answers will vary.

*Discuss how although calculators, computers, and even phones perform these simple operations very quickly, it is a much more complex operation than one could imagine!*
**Human Computer Game Script**

**Game notes:** The purpose of the game is to process through the steps required of a computer to perform a simple arithmetic (+, -, x, /) operation. Instruct the students to choose single digit numbers, no zeroes, and no duplicate numbers.

**Begin**
EVERYBODY in position, with role assignment cards.
USER CPU INPUT MEMORY BUS OUTPUT

**Turn on**
USER selects a simple math problem and writes it on board.
USER touches INPUT’s hand to turn computer ON.

**Number**
USER picks an appropriate RED card and gives it to INPUT.
INPUT gives the RED card to BUS.
BUS gives the RED card to CPU.
CPU gives the RED card back to BUS.
BUS gives MEMORY the RED card.
BUS returns.

**Function**
USER picks the appropriate BLUE card and gives it to INPUT.
INPUT gives the BLUE card to BUS.
BUS gives the BLUE card to CPU.
CPU keeps the BLUE card.

**Number**
USER picks the other appropriate RED card and gives it to INPUT.
INPUT gives the RED card to BUS.
BUS gives the RED card to CPU.
CPU keeps the RED card.
BUS gets the first RED card from MEMORY.
BUS gives CPU the RED card.

**Answer**
CPU looks at both RED cards and the BLUE card; writes the answer on a YELLOW card.
CPU gives the YELLOW card to BUS.
BUS gives the YELLOW card to MEMORY and returns.
CPU writes the answer on a 2nd YELLOW card and gives it to BUS.

**Output**
BUS gives the YELLOW card to OUTPUT and returns.
OUTPUT looks at the YELLOW card and writes the answer on the board.
USER raises hand, signifying the answer has been computed.
CPU

USER