

**Week 2: Connections and Troubleshooting**

For a class of 12 students, grades 6-9

**Materials Needed**

Check In Sheet

Student Nametags

Week 2 Slides displayed on projector

Tracking Sheets to hand out (24)

For classroom portion:

13 identical computers, pretested and “prepped” for troubleshooting. Also included are separate,

tested optical drives, hard drives, and RAM

13 sets of loose power cables, USB cables, VGA cables, Ethernet cables

For workshop portion:

12 identical computers, pre-tested if possible, with separate optical drives, hard drives, and RAM

~12 other computers, identical but different than previous, ready to be triaged

**Dell Optiplex 745s and 755s**

**Note: Students will be *paired up* to work on the in-class and in-workshop activities**

**for consistency and control, instructors should handle all pairing assignments**

**2:45 - Volunteer Assistants Arrive**

* Volunteers should sign in to timeclock and wear name badges

**3:15 - 3:30 - Student Check In**

* Students arrive by bus

**3:30 - Classroom Portion Begins**

-------------------------------------------Start Week 2 Slides presentation-------------------------------------------------

**Your Instructors**

and Volunteers. Review Classroom rules

Follow along with the instructors, don’t skip ahead

Questions are encouraged

**Last Week - Review**

Any questions about Week 1: Hardware?

**This Week - Learning Objectives**

* Input / Output devices = peripherals
* troubleshooting
* refurbishing

**Peripherals (2 slides)**

The things that are connected to a computer are called **peripherals**

**Group the Available peripherals as either Input or Output**

* Have peripherals laid out on one table, have students organize according to input/output.

Optional: divide into 2 groups, each with an instructor?

Additional Info

What’s a peripheral?

Things you attach or connect to a computer that let the user interact with it

They handle input and output

Input: mouse, keyboard, microphone

Output: monitor, printer, headphones, speakers

**Attaching Peripherals**

Ports and locations

Additional Info

Connectors, also called ports, plugs, and jacks, are on the outside of a computer

Some connectors go directly to the motherboard

These are the ones on the back of the computer, in the metal plate called the **I/O plate** (for input/output)

These are the most important connections. You’ll always have at least a few plugged in

**Motherboard I/O Panel**

Ask what they think I/O means….

**Expansion Cards**

Not typically used for Kramden computers and refurbishing, but can expand functionality for some computers. These are ways to ‘customize’ the hardware.

**Which peripherals will always be plugged into a computer?**

> **Answer:** Keyboard, mouse, monitor at least. Plus power, but power doesn’t count as a

peripheral.

Additional Info

* Other connectors go to components inside the computer that are attached to the motherboard
  + **front panel connectors** for USB, speaker, microphone
    - You might find these on the top or side of a computer too
  + **expansion cards** go into slots on the motherboard and their plugs are on the back of the computer
    - Expansion cards add new or improved functions to a computer

Examples: Graphics cards to add more monitors or better graphics, wireless cards, card with more USB ports

* + - These cards are sometimes called “daughterboards”

**Front Panel Connections**

for convenience

**Types of Connections (2 slides)**

* USB - used for most peripherals now (keyboard, mouse, webcam, flash drives, printers, and more)
* VGA or other monitor connection
* Headphones or speakers
* Ethernet for wired internet

**With your partner, take a set of cables back to your computer**

**>>** Have the students PAIR UP to work on the following activities

The computers you are putting back together today (Dell Optiplex 760) are several years newer than the computers they took apart last week (HP 6000s). They look very similar, but they use a different motherboard, CPU, and other improved internal parts

**>> Distribute a computer and sample cables to each student.** Gloves are optional. Glasses

and dust masks are not necessary.

> Have the students turn around their computers so they are looking at the **back**.

**Connections on a Dell Computer (5 slides)**

Slides as instructor prompts, but students will have the computer ‘stations’ in front of them, back of the computer facing forward. In order of slides, have students plug in all pertinent cable:

> Slide 1 power plug

> Slide 2 keyboard/mouse/ethernet

> Slide 3 vga port and similar but obsolete ports

> Slide 4 additional/unused ports and expansion slots

> Slide 5 front of computer

**> QUESTION:** Why would they put some of the same ports on the front as on the back? Why did they choose to put those specific types of ports there?

**Answer:** They’re used the most, and often plugged and unplugged frequently. Like plugging in

headphones at night, or using a USB flash drive for a few minutes to save some files.

Additional Info

>> Keyed Connectors

Students may have noticed that the cables only fit in one way around. “Hey, why won’t this fit in the port?” The plug and port are shaped so they only go together one way. This is called a **keyed** connector, the same way a door key only fits in a lock one way.

**Power ON your computer**

Computers will have a variety of initial ‘problems’ that were prepared in advance. Issues like:

* No RAM or unseated RAM
* RAM in wrong slot
* No Hard Drive or Optical Drive
* One or more cables disconnected from Hard Drive or Optical Drive
* Missing CMOS battery

**Troubleshooting (2 slides)**

Approaches for problem solving

**Power OFF computer but don’t open it**

Students find the power button and turn the compuer off

**Safety**

Ensure students understand risks and unplug any electronic device before attempting to repair it

**Refurbishing**

Define refurbishing and the importance of the tracking sheet

**Kramden’s hardware refurbishing is called Triage**

**Detailed Triage Steps (4 slides)**

Hand out tracking sheets to all students

***Instructor Note: The order of these items might need to be adjusted depending on***

***the computer the class is disassembling.***

>Slide 1 Tasks 1 - 4. Initial inspection at Recording K-number/attaching tracking sheet

>Slide 2 Tasks 5 - 6. Install components and boot to BIOS

>Slide 3 Introduce the concept of BIOS

>Slide 4 Tasks 7 - 9. Run Triage CD tests and remove CD when complete

**Finish the Triage Process -- Start another one**

Students complete Triage on prepped computers, then begin Triage from the beginning on 2nd identical computer (Dell Optiplex 755/760s)

**Troubleshooting**

Reinforce that troubleshooting is a fact of life

**Workshop**

Final slide, take a break and head to warehouse

**4:30 - Break time**

Snacks and Bathroom break

**4:45 - Workshop Portion begins**

Lead class to Warehouse Triage/OS Load area - Middle benches

**(5:00 - Wednesday Work Night volunteers will enter work area)**

Instructors will lead students through the triage process of 2 computers (3 if time permits)

**Triage first computer**

Students will take their computers with reassembled hardware into the warehouse and to the workbenches. They will finish the triage process for that computer.

Provide each student with a tracking sheet and K-Number sticker, pen, and Sharpie.

**Triage second computer**

The second computer should be the same or very similar to the first.

Students can pull the needed parts from the Parts Wall. Note: Parts from the wall won’t have been tested beforehand and may fail.

Reinforce the Troubleshooting steps if there are problem parts.

**Optional - Triage third computer**

If time permits, the students can try a third computer. It should be different from the first two. They will be much more likely to run into problems.

At the end of class, remind students that the computers they put together will be awarded to other kids who don’t have a computer at home.

**-----------------------------------------------EXTRAS / NOTES--------------------------------------------------------------**

**Step through the hardware installation part of the Triage process in the classroom**

Students will install the hard drive, RAM, and optical drive, but not plug in their computers.

**>> Distribute** RAM, optical drives, and hard drives to students

* Count their RAM - does it add up to 2048 MB or 2 GB?
* Find the size of the hard drive - is at least 40 GB?
* Is the hard drive in the special blue holder, or **caddy**?
* Does the optical drive have 3 screws in it (right both corners, left front corner)?
* Open the case
* Take out any existing RAM or Hard Drive in the case and give it to instructor
* Take out the floppy drive if there is one
* Put in the hard drive
* Connect the hard drive power and data cables
  + Mention that this type of data cable is called SATA
* Put the floppy back in
* Make sure its cables are connected
* Push back the white levers next to the RAM slots
  + Note there are 4 slots - we’re just using the two with white levers, not black ones
* Place the RAM in the correct orientation and
  + Note: You have to put the RAM in the right way. There is a notch on the bottom that means it will only go in one way.
* Push down with thumbs on the outer edges. Push the RAM in hard until the levers click.

**Watch instructor connect a computer to power to finish the process**

* Show the tracking sheet and K-Number sticker and fill them out
* Plug everything in
* Turn on computer - mention that the first thing a computer does is **POST, or Power On Self Test**
* Then it displays the manufacturer splash screen
* At this point you can press a special key to access very basic settings of the computer
  + This is the **BIOS** or **Basic Input Output System**
  + BIOS screens look different on different computers, but have a lot of the same settings you can adjust
  + Once you put in the settings you want, don’t change them! You can mess up your computer if you change the wrong things in BIOS.
* Change BIOS settings (time, date, boot order)
* Boot up using **Triage CD**
  + Note that the CD contains a very simple operating system and some special programs
  + It runs instead of the operating system on the hard drive
  + There may not even be an operating system on the hard drive!
* Run **Memtest** - This program tests every bit of RAM to make sure it’s working correctly
* Restart to Triage CD
* Run **GWScan** Quick/Short Test - This program tests the hard drive to make sure it’s not damaged and is saving files accurately

**>> While the GWScan short test is running (about 5 minutes), talk about Troubleshooting**

**Troubleshooting**

Find a problem? Figure out what’s causing it

The process of identifying a problem and finding the cause is called troubleshooting

* Identify the problem
* start ruling out possible causes
* fix the cause that remains
* re-test to see if the problem still happens

This process applies to both hardware and software.

Today you might need to troubleshoot hardware problems.

When we get back into the warehouse, ask one of the instructors if something isn’t working right and they’ll help you troubleshoot it.

You WILL run into problems when building or repairing a computer.

That’s OK, it’s normal. Computer hardware is complex and some of the parts are fragile.

Troubleshooting is the most basic thing that a computer technician or engineer does.

Even the most experienced PC technician gets stumped. You learn through experience and get better and faster at troubleshooting.

Each time you solve a problem, think about the cause and solution so you remember it when it happens again.

**>> Optional RAM Troubleshooting example:**

You put 2 sticks of RAM into a computer. It beeps and won’t turn on. How do you fix it?

Review the troubleshooting steps with the specific example of having 1 bad stick of RAM after installing 2 sticks in a computer.

Step 1: Describe the problem clearly:

“After inserting 2 sticks of ram in white-lever slots, Beeps when power button pressed. Nothing on the screen.”

Step 2. Identify possible causes:

One or both RAM sticks not inserted correctly?

One or both RAM sticks are broken or damaged?

Broken RAM slot on motherboard?

Broken motherboard?

Step 3. Process of Elimination:

Take out both of the RAM sticks.

Re-insert just one stick carefully. Does it work?

Put it in a different slot. Does it work?

Repeat for the other RAM stick. Does it work?

If one of the RAM sticks works, you know the cause!

Step 4. Test the solution:

Turn on the computer again. Verify that it now boots up.