

Unit 1, Lesson 6: How Does a Computer Remember?

Lesson Intro:

| Theme of the Day |
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| You (the teacher) realize that you forgot an important piece of information! You don't know how much memory the computer will need to work. To get the door open and the ship running again you will need to figure this out, and you will need your students help to do so. |

| Learning Objectives | Concepts (Social & Cross Curriculum) |
|--|--|
| <ul style="list-style-type: none"> ● Students will be able to use place value to relate ones, tens, hundreds and thousands to computer memory storage units of measurement. ● Students will be able to list the different components of the computer that contribute to its long and short term memory. ● Students will be able to explain what cloud memory means. | <ul style="list-style-type: none"> ● Connection/ Disconnection ● Storage ● Function |

| Vocabulary | Guiding Questions |
|---|--|
| <ul style="list-style-type: none"> ● Storage ● Megabyte ● Gigabyte ● Terabyte ● Hard Drive ● The Cloud ● RAM | <ul style="list-style-type: none"> ● What is memory? How does it work in humans? How does it work in computers? ● What is the difference between RAM, the Hard Drive, and the Cloud? ● Why might people store something in the Cloud instead of a Hard Drive? |

| Resources |
|---|
| <ul style="list-style-type: none"> ● Code in Class Videos Teacher/ Student facing 1.6 ● Space Bucks |

- Paper
- Pencils
- Pens
- Text for partner practice
- Memory Explanation Model
- Terabyte/Gigabyte Model
- Exit Slip 1.6
- Text Model Level 1-3

Lesson Procedure:

Camp Fire (15 min)

Don't Forget: *Students will need paper and pencils.*

Mini Lesson: Start the lesson by breaking the class into three groups. Give each group their instructions privately (so the other two groups don't hear).

Group 1:

The first group will write or draw a memory from a year or more ago. Each student can choose his or her own memory. Make sure to tell students that it should be something they are willing to share with the class.

Group 2:

The second group will select only one student to share a memory. You can pick the student if the group is having a hard time deciding. This student will be responsible for sharing his/her memory with the group, but everyone in the group will help to share the memory with the whole class.

Group 3:

The third group will memorize a sentence that you have created (feel free to make it silly). You should whisper the sentence to each student in the group. This group is not allowed to write or draw anything. They can only use their short-term memories. Encourage this group to practice what they are going to say by repeating it to themselves or sharing it with a partner.

Tell students they will have five minutes to finish this task. After five minutes, ask one person from Group 1 to share their assignment and what their group's process was for completing it. Then, ask all members of Group 2 to share their assignment and the memory that one group member shared with them. Finally, ask one member from Group 3 to explain their assignment. Then ask the whole group to share the sentence they memorized in unison.

Remind students that space bucks will be given to students who demonstrate teamwork and are on task.

Teacher Guided Learning (10 min)

Don't Forget: You will need the Memory Explanation Model, the Terabyte/Gigabyte Model and Exit Slip 1.6

Mini Lesson: Go over the theme for the day. Then, ask students: Where do you store your things? What types of things do you store? How do you store things so that they are neat and tidy? Does storing things in a tidy manner help you find them again? If so, how?

Then explain: Computers also help you store information. Just like you may use drawers, closets, desks, or bookshelves to store things, computers have different places to store things, too.

Connect what students did in the campfire to how storage works in a computer. Please note that during this discussion, you should not just lecture, but refer to the guiding questions (above) and get students engaged in a conversation. The script below covers the main points that should be covered in this discussion:

The first group retold memories from a year or more ago. This is similar to how a **hard drive** operates. It records things you want your computer to remember for a long time and it can be very large. This is similar to human's long-term memory, which allowed students in group 1 to recall a memory and share it.

The second group represented the **cloud**, which sends out information to other computers to remember for your computer through the internet. This group had one person share a memory with friends and then had them help in retelling their memory.

The third group only needed to remember a small amount of information (a sentence) for a short amount of time. This is similar to the **RAM** on a computer, which stores small amounts of information until the computer is shut off or unplugged.

Refer to the memory explanation model for the different types of computer memory storage. Ask students: why might people store something in the cloud instead of a hard drive? Possible answer: so that they can access their information from any computer.

Should each computer have RAM on it, why? Possible answer: Yes, because every computer will need to remember things in the short term like the websites I am on, and the answers I have on the computer's calculator, etc

Then explain that computer memories are stored in units called Megabytes, Gigabytes and Terabytes. Refer to the terabyte/gigabyte model.

1 Terabyte = 1,000 GB
1 Gigabyte = 1,000 MB

Exit Activity (5 min)

Give students 3 memories (memories and correct answers provided below) to sort as either RAM, Hard Drive, or the Cloud.

My dad's birthday is February 24th, 1953 (cloud or hard drive)

Both answers can be correct. It depends on how you want to store the memory and access it. For example, on a hard drive, I might want to have this memory on my computer for a long time. For the cloud, I might want to access this memory on other computers. This is a great talking point for students who have different answers.

Sneezing (RAM)

This memory should be stored on the RAM because it is a non-memorable event that you are unlikely to remember after a short period of time.

I broke my foot last year. (cloud or hard drive)

Both answers can be correct. It depends on how you want to store the memory and access it. For example, on a hard drive, I might want to have this memory on my computer for a long time. For the cloud, I might want to access this memory on other computers. This is a great talking point for students who have different answers.

(This will assess students' understanding of distinct functions of computer storage components.)

Partner/ Team Practice (20 min)

Don't Forget: Text Model Level 1-3 print for students (increasing in difficulty as the number increases)

Mini Lesson: Break students into partnerships based on their reading abilities. Give each partnership one of the texts from the model. Review with students what a sentence is and that each sentence, in this case, will take up 100 megabytes of memory. Explain to students that they will need to add up each sentence of the text (counting by 100's) to find the total amount of computer storage needed to store this text.

When students reach 1000 megabytes (10 sentences) they should write one gigabyte and then keep counting by 100 megabytes. (For example, 1 gigabyte, 100 megabytes, 1 gigabyte, 200 megabytes, 1 gigabyte 300 megabytes etc.) For the total amount of memory needed, it should be listed in gigabytes and megabytes. For example, if a text has 16 sentences it should be 1 gigabyte and 600 megabytes.

Another example would be if a text had 22 sentences it should be 2 gigabytes and 200 megabytes. Have a student recall and re-state the directions for the class before beginning independent work time.

Remind students that they can earn space bucks by helping their partners with the math.

Reflect/ Connect (5 min)

Mini Lesson: Hold a group discussion based on the following questions: What is the function/ purpose of each computer storage component (RAM, Cloud, and Hard Drive)? How can you relate each of these to human memory?

Remind students that all text, images, and other forms of information that you put on a computer takes up memory. Include any other big ideas/ learning objectives from the day. Clarify any misconceptions that arose during the discussion or earlier in the lesson. Give space bucks for good communication.

Standards Alignment:

Computer Science: **NGSS**

- Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1).
- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.(ETS1.B)

Standards Alignment:

Math: **Common Core**

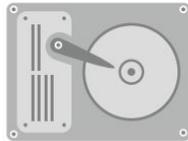
- 100 can be thought of as a bundle of ten tens — called a "hundred."
CCSS.MATH.CONTENT.2.NBT.A.1.A

Math:

Indiana State Standards

- 2.NS.7: Use place value understanding to compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using $>$, $=$, and $<$ symbols to record the results of comparisons
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THE MEMORY CHART



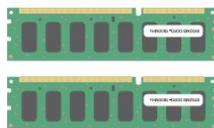
HARD DRIVE

Long Term Memory: where the information we want the computer to remember for a long time will go.



CLOUD

Shared Memory: a group of computers that create a memory bank for your computer to store shared information on.



RAM

Short Term Memory: where the computer sends information we want it to remember for the short period of time.

Terabyte/Gigabyte Model

1 TERABYTE
=
1,000 GB

1 GIGABYTE
=
1,000 MB



Exit Slip 1.6

WHAT TYPE OF MEMORY IS THE STORY?

1. My dad's birthday is February 24th 1953.

RAM HARD DRIVE THE CLOUD

2. Sneezing.

RAM HARD DRIVE THE CLOUD

3. I broke my foot last year.

RAM HARD DRIVE THE CLOUD



Text Model Level 1-3

NAME: _____

1

SENTENCE MEMORY MATH
1 SENTENCE = 100 MB
10 SENTENCES = 1,000 MB OR 1 GB



DIRECTIONS:

Read the following text and count how many sentences there are.

THE LIFE STORY OF WILLY THE WEASEL

(DOES NOT COUNT AS A SENTENCE)

Willy the weasel was born on April 1st, 2252. He was one of 44 brothers and sisters. His mom, Wilma, and his dad, Will, were the wisest weasels on the planet. They all lived in a tiny house on a planet called Weasel-tin. Willy's house looked like a very large shoe, as all houses on the planet did.

Willy went to cadet training at the Space School. He liked to play spaceships with his friends. Many times, they would look at the sky and dream of being up there one day. Willy also loved playing soccer and space marbles with his friends. Willy could be, and still is, very clumsy. This is very true when he is around computers.

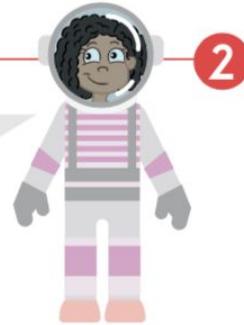
When Willy turned 22, he was able to go to space school and learn to be a cadet. He spent many years trying out different jobs on spaceships.

Willy loved flying space missions, and that is why he wanted to fly on the Arc. It was the fastest and newest spaceship ever. It also was a chance for him to take many of his friends into space, that is, until it broke.

_____ SENTENCES = _____ GIGABYTE AND _____ MEGABYTES



NAME: _____



SENTENCE MEMORY MATH
1 SENTENCE = 100 MB
10 SENTENCES = 1,000 MB OR 1 GB

DIRECTIONS:

Read the following text and count how many sentences there are.

JADE, THE REAL LIFE STORY

(DOES NOT COUNT AS A SENTENCE)

Jade was born on March 12th, 2264. She was born on the planet Earth in the city of New Chicago, Japan to two loving parents. She lived in a nice house in a pretty neighborhood. Her dad, Trey, was a famous captain and pilot. He won many awards due to his leadership and spaceship flying skills.

Jade had always wanted to be like her father. She studied and worked hard every day at school. She also loved leading her friends in different games and adventures. She always tried to help everyone and tried to be balanced in all that she did.

On Jade's 16th birthday, she received a letter from the Space Academy while she was sitting at breakfast next to her father. They both screamed like a firetruck and ran around the table chanting, "Going to space, going to space!"

Jade was one of the fastest cadets to finish the Space Academy, tying with her grandmother's and father's record. For many years, she flew missions with her father. She loved learning from him. She promised that someday she would be just like him.

Jade's first space assignment as a captain was for the Arc. It was the first time she would be away from her dad, but she was confident she could do it, even when the Arc's computer system broke down.

_____ SENTENCES = _____ GIGABYTE AND _____ MEGABYTES



NAME: _____



SENTENCE MEMORY MATH
1 SENTENCE = 100 MB
10 SENTENCES = 1,000 MB OR 1 GB

DIRECTIONS:

Read the following text and count how many sentences there are.

SPACE COWBOY STEVE: BIOGRAPHY OF THE YEAR

(DOES NOT COUNT AS A SENTENCE)

Now, before you start reading, just know that this is a space cowboy biography. Pay careful attention, as cowboys are mysterious and complex.

Space Cowboy Steve, or as I like to call him, "Cowboy S," was born in 2059 in the windy and desert-like planet, Dustbowl. He was born to loving, and sometimes dusty, parents named Bobby Sue and Rick. He had two brothers, one sister, and a chinchilla named Fluffy. His family owned a ranch next to the mountain, and you could often see raptor owls flying overhead.

Now, Cowboy S was known as a rascal in his early days, but he had a knack for fixing things and piloting small aircraft. He also had a way with animals and became life long friends with Space Donkey Bob when he was nine years old. This happened after he saved Bob from some very ferocious space mice. Now, I know what you're thinking, but these space mice were ten feet tall and had giant plates of yellow cheese.

Anyway, Cowboy S decided to go to the Space Academy and fly to the stars and beyond, while Space Donkey Bob went to Harvard. They had a dream of making it to a new planet where they could finally open up a restaurant that sold space donuts and collectible cups. After seven years, both friends were able to graduate from the Space Academy and Harvard. They both worked hard as space wranglers so that they could save money to buy their very own spaceship and supplies to open their restaurant.

They traveled for many years. One day, Cowboy S and Bob decided to make a pit stop on a planet for a bit and make sure they were heading the right way. Everything was going fine until they ran into Willy. As Cowboy S loved animals, he knew he needed to help this cute, earnest weasel and his cadets.

_____ SENTENCES = _____ GIGABYTE AND _____ MEGABYTES

