

A Read-Aloud/Think-Aloud Example

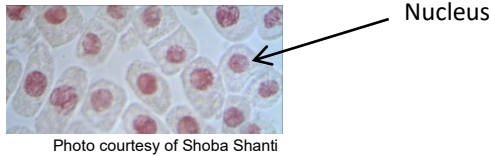
Understanding Inheritance: Results from Studies of Cells (Teacher Master)

Note: A read-aloud/think-aloud strategy gives you an opportunity to model what should be occurring in students’ minds as they read, especially informational text. As students read the handout along with you, mark up a projected copy of the text (see the following sample) to model and verbalize your thought processes. This helps students understand that reading is about making sense of the text, not simply saying the words.

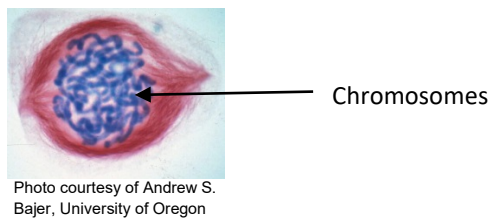
The following chart is intended as a detailed *example* for you to follow when implementing this strategy with your students. The essay appears in the left-hand column under the heading “Read Aloud,” and suggested teacher talk appears in the right-hand column under the heading “Think Aloud.” You know best which concepts your students find easy or more challenging to grasp, so delete or add teacher talk according to their needs. You do not need to use every teacher-talk suggestion; however, the teacher talk in red highlights important science content storyline ideas that students need to understand.

Read Aloud	Think Aloud
<p>Understanding Inheritance: Results from <u>Studies of Cells</u></p> <p>Around 1900, as more microscopes that are powerful were invented, scientists began to examine cells in greater detail to learn more about inheritance. They wanted to know which structures in cells carried <u>the information for traits</u>.</p> <p>They also wanted to know <u>where genes are found</u>.</p> <p>As scientists used microscopes and stains to see the structures inside cells, they made some important discoveries:</p>	<p>This essay must be about cells. We studied cells earlier this year!</p> <p>There must be something in cells that affects traits. Therefore, I will try to find out where this information could be located.</p> <p>This essay is about cells, and this sentence tells me that scientists wanted to know where genes are found. Therefore, I am going to predict that genes are found in cells!</p>

1. All plant and animal cells have a nucleus.



2. When a cell gets ready to divide, individual chromosomes inside the nucleus can be seen under a microscope when the right stain is used.



3. Each individual chromosome makes a copy of itself before the cell divides.

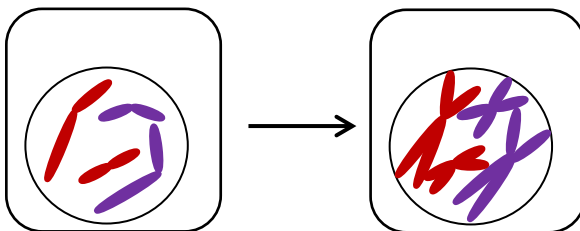


Figure 1. Artist's drawing of chromosomes making copies of themselves before the cell divides. The two red chromosomes came from the mother, and the two purple chromosomes came from the father. Humans have 23 pairs of chromosomes instead of the two pairs shown here.

I remember talking about that at the beginning of the lesson.

Cool! This picture shows what a nucleus looks like in a real cell!

I am not sure I get this. I'd better read it again. *[Read the sentence aloud again.]* The "when" makes it sound like you can see the chromosomes only when the cell is dividing.

Oh, I see. The drawing helps. The chromosomes inside the cell nucleus are getting thicker, and that makes them easier to observe with a microscope.

[Note to teacher: Sketch the cell and nuclear membranes as shown in this version.]

Oh! I think I have seen drawings of chromosomes that look like Xs before. Now I understand that the Xs actually represent copied chromosomes.

4. When the cell divides, each new cell gets exactly one of each copied chromosome.

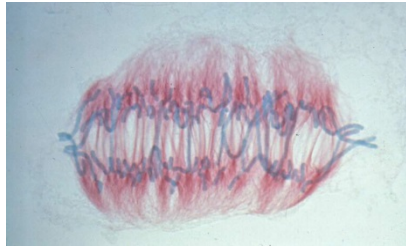


Photo courtesy of Andrew S. Bajer, University of Oregon

Figure 2. Photograph of the copies of each chromosome separating when a cell divides.

I do not really understand this picture. What does it show? Maybe I should ask someone.

[Note to teacher: Explain that the copied chromosomes now split (e.g., go from "X" to "I"), and a copy of each chromosome is drawn to opposite end of the cell. Then the cell splits into two. Sketch the dividing cell as shown here.]

Scientists also discovered that when a new individual is made, special kinds of cells combine. These special cells are called **egg cells** and **sperm cells**. Scientists thought that genes must be found in egg and sperm cells just as they are found in other body cells.

Eggs and sperm are special kinds of cells. Maybe what is special about them has to do with chromosomes and inheritance too. That makes sense because the egg and sperm come together to make individual offspring. So as I continue reading, I am going to look for special things about chromosomes related to eggs and sperm.

When scientists studied how egg and sperm cells are made, they discovered that this process is a bit different from the way other body cells are made. Here's how this process works:

I was right! This is about how eggs and sperm are different from other body cells.

- The cells that divide to make sperm and egg cells begin with a pair of each type of chromosome.*** All cells in most animals and plants start with a pair of each chromosome, but when egg and sperm cells are made, the pairs of chromosomes attach to each other. This attachment does not happen when other body cells are made.

This sentence is in bold type, which means it is something important to remember. The star at the end of the sentence means there is more information about this at the bottom of the page. *[Find the footnote and read the additional information.]*

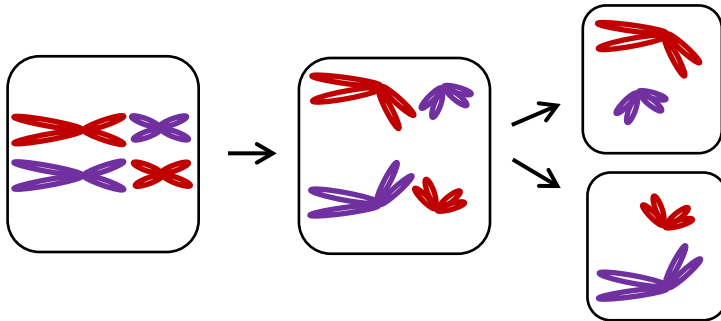
Paired Chromosomes



*This applies only to organisms that reproduce sexually.

This is a strange picture. According to the label, each thing that looks like a chromosome is actually the pair of chromosomes attached to each other.

2. **Each sperm or egg cell gets just one chromosome from each original pair of chromosomes.** When other body cells are made, the new cells get both chromosomes in a pair. The diagram shows that one chromosome is passed to the new cells, even though the chromosome still has an identical copy attached.



In sperm and eggs cells, one more division takes place to separate the copied chromosomes.

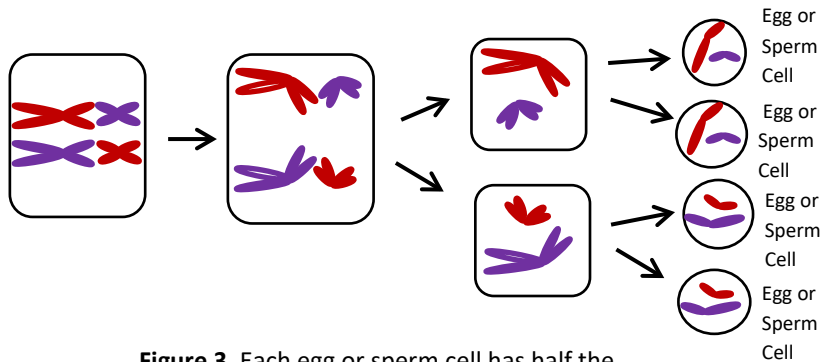


Figure 3. Each egg or sperm cell has half the chromosomes found in normal body cells.

3. **The sperm and egg combine to make an individual offspring.** The chromosomes from the sperm combine with the chromosomes from the egg. **The offspring get one chromosome from the father's original pair, and one from the mother's original pair. The resulting cell now has a pair of chromosomes, just like of all the body cells.**

This sentence is in bold too, so it is important. But I do not think I understand it. I'd better read it again more slowly. *[Read the sentence aloud again.]*

[Note to teacher: Explain that in egg and sperm cells, the pairs of copied chromosomes separate from each other into two new cells.]

OK, I guess it makes sense that the chromosome copies would separate and become single chromosomes again.

More bold type. I need to read this again more slowly. *[Read the paragraph aloud again.]*



Photo courtesy of Atlanta Center for Reproductive Medicine

Nucleus of Egg Cell

Nucleus of Sperm Cell

Oh, this picture helps. It shows the cell that is created after the sperm and egg unite. You can still see the sperm nucleus from the dad and the egg nucleus from the mom! Those bubble-like things inside the nuclei are the chromosomes from each parent!

In 1902, a young scientist named Walter Sutton formulated a hypothesis about cells. He saw that when the eggs and sperm are made, the way chromosomes move is similar to Mendel's description of the way genes move.

Sutton concluded that because genes behave in exactly the same way as chromosomes, they must be found on chromosomes.

The way chromosomes move when egg and sperm cells are made explains the patterns of inheritance that Mendel observed.

This paragraph sounds important. I'd better read it again. *[Read the paragraph again.]*

Earlier I predicted that genes are found in cells. This is even more specific: Genes are found on chromosomes in a cell. Remember the focus question for today? This is something that Mendel did not know!

I am not sure I understand this. I should ask for help.

[Note to teacher: Assure students that they will continue exploring this idea in the lessons.]