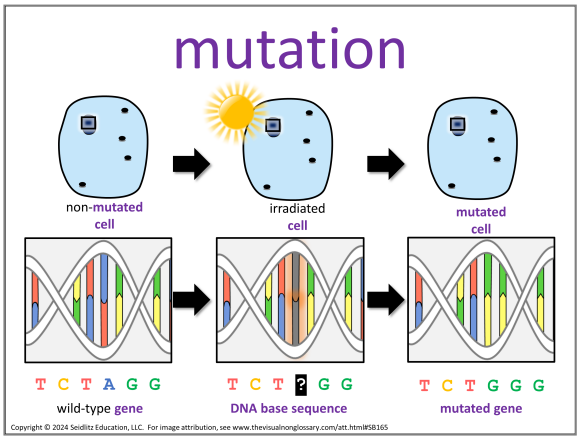
Teacher Guide for the Lesson on **mutation**



Standard:
B.7(C)

Content Objective:
We can identify how changes in **DNA**, such as **mutations**, affect organisms and evaluate the significance of those changes.

Language Objective: Answer the following question in complete sentences using the sentence stem and the key vocabulary of the lesson:

> What do you predict will happen when a mutated **cell** undergoes **mitosis**?
>
> *When a mutated **cell** undergoes **mitosis**, I predict...?*

Other key vocabularies: gene, cell, mitosis

By studying this visual, students might:

Notice	Wonder
• The sun is in front of the irradiated cell.	• What causes a base to change in a DNA sequence?
• The DNA strand in the “irradiated cell” has a changed base in its sequence.	• Can a small change in one base lead to a big effect on an organism?
• The DNA strand in the “normal cell” has a different sequence compared to the irradiated one.	• Are all mutations harmful?
• The colors of the bases match the colors of the letters.	• How does a mutation in one cell affect the whole organism?

• The change in the DNA is highlighted in a red box, emphasizing the base that was altered.	• Can mutations be fixed or reversed?

EXTENDING THE DISCUSSION

- After randomly calling on students, if there is anything from this list that was not mentioned, then ask the class, "Did anyone notice...?"
- After students have shared what they notice, ask the class, "Did anyone wonder...?" using the suggestions above or anything else you might think is interesting or relevant to the lesson.

Structured Conversation Prompts

OBSERVATIONAL	RELATIONAL	INFERENTIAL
What is a **mutation**? A **mutation** is...	How is a **mutation** related to a **gene**? A **mutation** is related to a **gene** because...	What do you predict will happen when a mutated **cell** undergoes **mitosis**? When a mutated **cell** undergoes **mitosis**, I predict...?

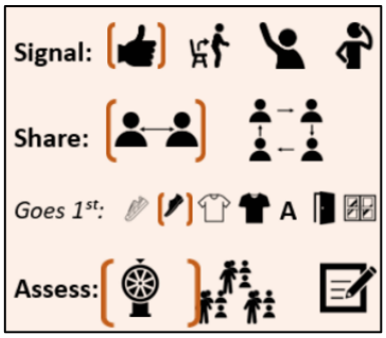
Example Student Responses to the Observational Question

Low-Level	High-Level
A **mutation** occurs by a change in a **DNA base**.	A mutation occurs by a change in the **DNA sequence**, as shown when a **base** in the irradiated **cell** is different from the one in the normal **cell**.

RESPONDING TO RESPONSES

Emphasize and celebrate each student's use of the key vocabulary to support a culture of "no wrong answers."

STRUCTURING STUDENT CONVERSATIONS



Have students list observations from the visual as a warm-up, then use the Q-SSS-A process to guide small-group conversations. In the slide decks, brackets can be moved to prepare the structured conversation. In the example to the right, students will be instructed: Q-SSS-A.

- To put a thumb up, then lower their hand when they are ready to answer the question
- To share with their elbow/shoulder partner, and that the student with the darkest shoe will share first
- That they will be randomly called on after the conversation

Here is an example of structuring a conversation with Q-SSS-A.

Note: the inferential question is the same as the language objective. It is recommended that students answer the inferential question in a small-group discussion before answering it individually as the closure or exit ticket of the lesson.

Structured Reading

READING PURPOSE	PAT LIST	POST-READING DISCUSSION
As we read, we'll explore how mutations occur and what effects they can have.	• what a mutation is • where mutations happen • what can cause a mutation • how mutations affect organisms • how mutations can spread	How can a small change in **DNA** make a big difference in an organism? *A small change in **DNA** can make a big difference because...*

STRUCTURING THE READING

Communicate the purpose of reading to the students and instruct them to make a note every time they see something on the PAT ("Pay Attention To") list. How you have students note items on the PAT list is up to you. This could include:

- Putting an asterisk in the margin
- Underlining text that supports the PAT list
- Putting a comment in the margin

Follow the reading with the post-reading discussion. Structure this discussion using the Q-SSS-A process just like the structured conversations in this lesson.

Note: you might find the relational question is better discussed before or after the reading. This depends on whether the relational question is directly related to the reading or might make connections across units.

DIFFERENTIATING THE READING

You will notice that three different reading passages are provided with this lesson. Look at the shapes in the top-left of each passage to determine the grade level.

BELOW GRADE LEVEL	ON GRADE LEVEL	ABOVE GRADE LEVEL
		
Triangle is bottom-left	*Square is bottom-left*	*Circle is bottom-left*

In a class with students at diverse reading level proficiencies, you can give the appropriate reading passage to different students, while having all students follow the same PAT list and post-reading discussion.