

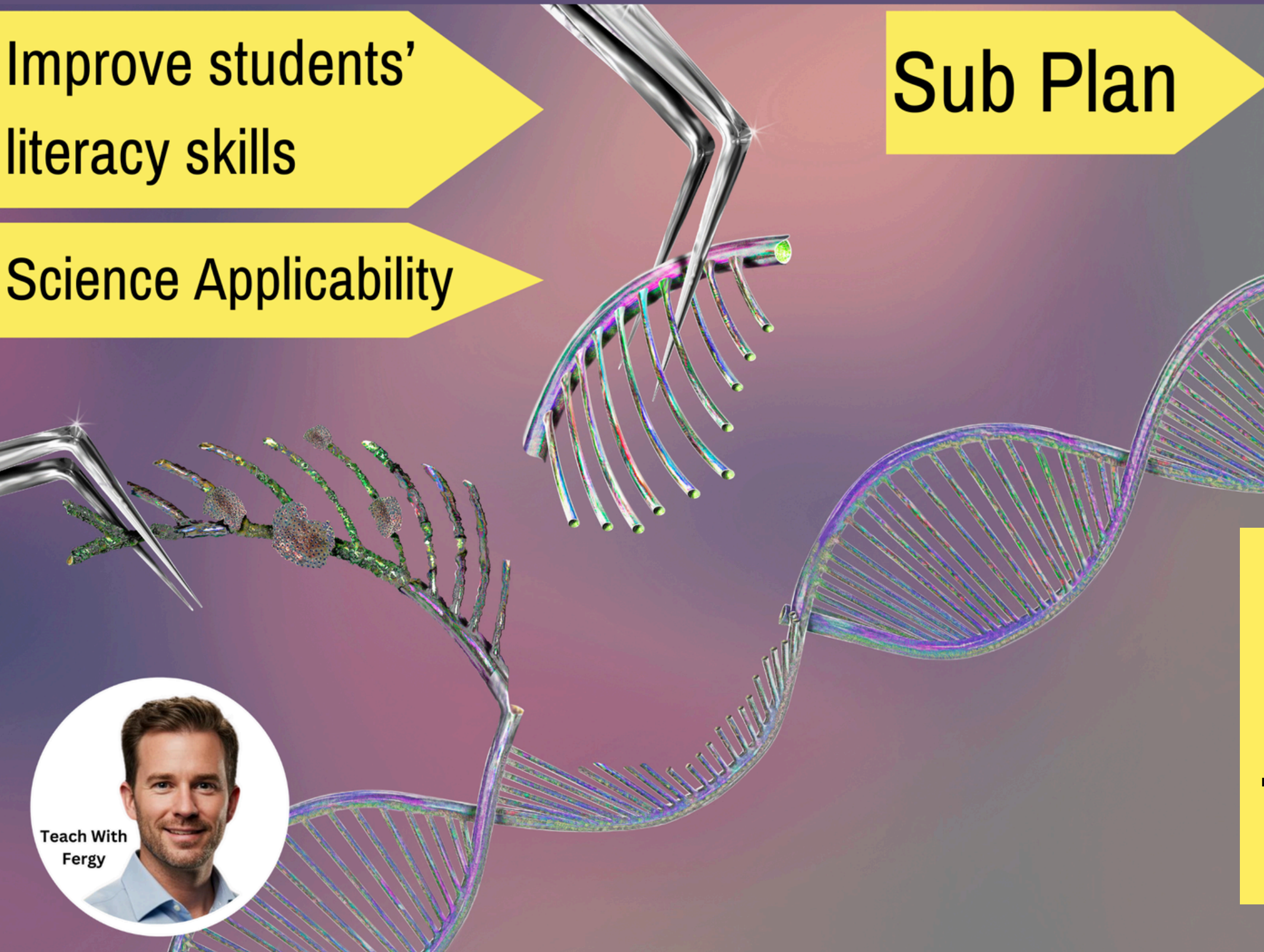
CRISPR GENE EDITING

GRADE 8 AND UP READING

Improve students'
literacy skills

Science Applicability

Sub Plan



SCROLL
to take a look inside!

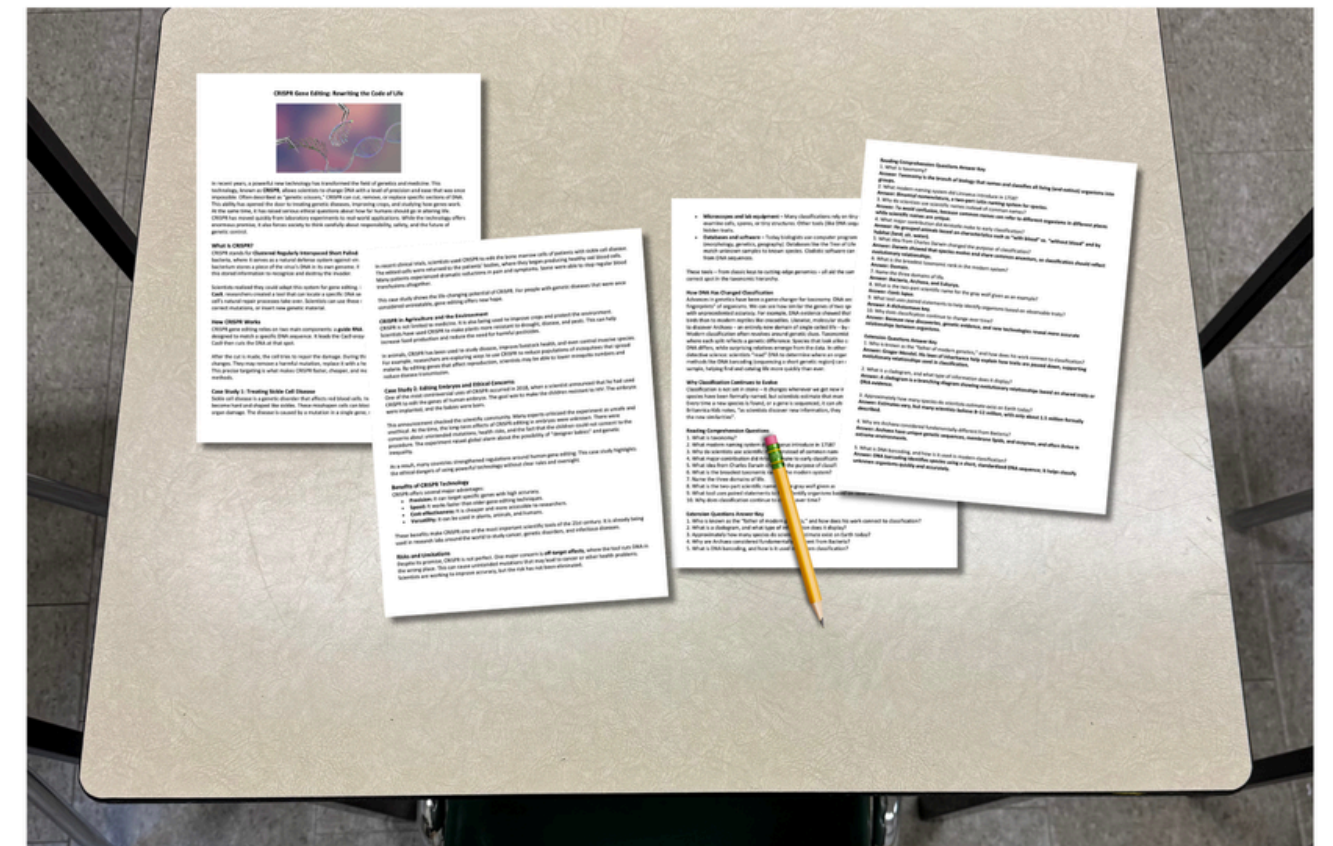


THE PROBLEMS YOU FACE

- Limited time to teach scientific literacy and strengthen students' reading and analysis skills.
- Need meaningful extension activities to engage fast-moving learners.
- Difficulty creating effective last-minute sub plans that still support student learning.

CLASSROOM READY

- Questions and Answer Key
- **No Prep, Ready-to-Use:** Print or assign digitally with Google Docs, Microsoft Word, and PDF formats for flexible classroom use
- **Includes Varied Question Types:** Knowledge, thinking, connecting, application, and open-ended questions.



What Will Your Students Learn?

READING COMPREHENSION ARTICLE & QUESTION BUNDLE

Article with
Comprehension
Questions

Grade 8 and Up

Print & Digital

- What Is CRISPR?
- How CRISPR Works
- Case Study 1: Treating Sickle Cell Disease
- CRISPR in Agriculture and the Environment
- Case Study 2: Editing Embryos and Ethical Concerns
- Benefits of CRISPR Technology
- Risks and Limitations
- Ethical Questions and Public Debate
- The Future of Gene Editing

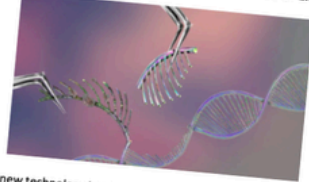
Comprehension Questions

1. What does CRISPR stand for, and where was it first discovered?
2. How does the Cas9 enzyme function in gene editing?
3. Why is CRISPR considered more precise than earlier gene-editing tools?
4. Describe how CRISPR was used in the sickle cell disease case study.
5. What benefits have been seen in the sickle cell trials?
6. How is CRISPR being used in agriculture?
7. What ethical concerns arise from editing embryos?
8. Name one potential benefit of CRISPR in agriculture.
9. Why is CRISPR considered a promising technology for treating genetic diseases?
10. Why do you think CRISPR is so important for the future of medicine?

Extension Questions

1. What are the ethical implications of CRISPR?
2. How do you think CRISPR will change the world?
3. What are the potential risks of CRISPR?
4. How do you think CRISPR will be used in the future?
5. Do you think CRISPR is a good idea?

CRISPR Gene Editing: Rewriting the Code of Life



In recent years, a powerful new technology has transformed the field of genetics and medicine. This technology, known as **CRISPR**, allows scientists to change DNA with a level of precision and ease that was once impossible. Often described as "genetic scissors," CRISPR can cut, remove, or replace specific sections of DNA. At the same time, it has raised serious ethical questions about how far humans should go in altering life. CRISPR has moved quickly from laboratory experiments to real-world applications. While the technology offers enormous promise, it also forces society to think carefully about responsibility, safety, and the future of genetic control.

What Is CRISPR?

CRISPR stands for **Clustered Regularly Interspaced Short Palindromic Repeats**. It was first discovered in bacteria, where it serves as a natural defense system against viruses. When a virus attacks a bacterium, the bacterium stores a piece of the virus's DNA in its own genome. If the virus attacks again, the bacterium uses this stored information to recognize and destroy the invader.

Scientists realized they could adapt this system for gene editing. By combining CRISPR with a protein called **Cas9**, researchers created a tool that can locate a specific DNA sequence and cut it. Once the DNA is cut, the cell's natural repair processes take over. Scientists can use these repair processes to delete faulty genes, correct mutations, or insert new genetic material.

How CRISPR Works

CRISPR gene editing relies on two main components: a **guide RNA** and the **Cas9 enzyme**. The guide RNA is designed to match a specific DNA sequence. It leads the Cas9 enzyme to the exact location in the genome. Cas9 then cuts the DNA at that spot.

After the cut is made, the cell tries to repair the damage. During this repair process, scientists can introduce changes. They may remove a harmful mutation, replace it with a healthy version, or disable a gene. This precise targeting is what makes CRISPR faster, cheaper, and more accurate than earlier methods.

Case Study

Sickle cell disease is a genetic condition that affects the blood. It causes red blood cells to become misshapen, leading to various complications. A recent case study showed how CRISPR was used to edit the DNA of sickle cell patients, resulting in a significant improvement in their health. This breakthrough offers hope for many other genetic diseases.

Google Access

Thank you for your purchase. Clicking the link below will automatically create a copy of your resources in your Google Drive. You'll find the file inside the "Shared with me" section on the left side of your Drive.

Important: Before you click, make sure you're signed in to the Google account you'd like the resources placed into. If the resources are added to the wrong account, simply sign out and then into the correct one and repeat the process.

Click here to place a copy directly into your Google Drive Account

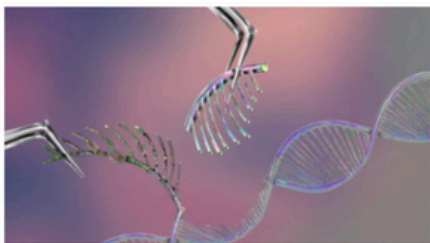
TWIF

PDF



Your Reading

CRISPR Gene Editing: Rewriting the Code of Life



In recent years, a powerful new technology has transformed the field of genetics and medicine. This technology, known as **CRISPR**, allows scientists to change DNA with a level of precision and ease that was once impossible. Often described as “genetic scissors,” CRISPR can cut, remove, or replace specific sections of DNA. This ability has opened the door to treating genetic diseases, improving crops, and studying how genes work. At the same time, it has raised serious ethical questions about how far humans should go in altering life. CRISPR has moved quickly from laboratory experiments to real-world applications. While the technology offers enormous promise, it also forces society to think carefully about responsibility, safety, and the future of genetic control.

What Is CRISPR?

CRISPR stands for **Clustered Regularly Interspaced Short Palindromic Repeats**. It was first discovered in bacteria, where it serves as a natural defense system against viruses. When a virus attacks a bacterium, the bacterium stores a piece of the virus’s DNA in its own genome. If the virus attacks again, the bacterium uses this stored information to recognize and destroy the invader.

Scientists realized they could adapt this system for gene editing. By combining CRISPR with a protein called **Cas9**, researchers created a tool that can locate a specific DNA sequence and cut it. Once the DNA is cut, the cell’s natural repair processes take over. Scientists can use these repair processes to delete faulty genes, correct mutations, or insert new genetic material.

How CRISPR Works

CRISPR gene editing relies on two main components: a **guide RNA** and the **Cas9 enzyme**. The guide RNA is designed to match a specific DNA sequence. It leads the Cas9 enzyme to the exact location in the genome. Cas9 then cuts the DNA at that spot.

After the cut is made, the cell tries to repair the damage. During this repair process, scientists can introduce changes. They may remove a harmful mutation, replace it with a healthy version, or disable a gene entirely. This precise targeting is what makes CRISPR faster, cheaper, and more accurate than earlier gene-editing methods.

Case Study 1: Treating Sickle Cell Disease

Sickle cell disease is a genetic disorder that affects red blood cells. Instead of being round and flexible, they become hard and shaped like sickles. These misshapen cells can block blood flow, causing pain, infections, and organ damage. The disease is caused by a mutation in a single gene, making it an ideal target for CRISPR gene editing.

In recent clinical trials, scientists used CRISPR to edit the bone marrow cells of patients with sickle cell disease. The edited cells were returned to the patients’ bodies, where they began producing healthy red blood cells. Many patients experienced dramatic reductions in pain and symptoms. Some were able to stop blood transfusions altogether.

This case study shows the life-changing potential of CRISPR. For people with genetic diseases that were once considered untreatable, gene editing offers new hope.

CRISPR in Agriculture and the Environment

CRISPR is not limited to medicine. It is also being used to improve crops and protect the environment. Scientists have used CRISPR to make plants more resistant to drought, disease, and pests. This can increase food production and reduce the need for harmful pesticides.

In animals, CRISPR has been used to study disease, improve livestock health, and even control invasive species. For example, researchers are exploring ways to use CRISPR to reduce populations of mosquitoes that spread malaria. By editing genes that affect reproduction, scientists may be able to lower mosquito numbers and reduce disease transmission.

Case Study 2: Editing Embryos and Ethical Concerns

One of the most controversial uses of CRISPR occurred in 2018, when a scientist announced that they had used CRISPR to edit the genes of human embryos. The goal was to make the children resistant to HIV. The embryos were implanted, and the babies were born.

This announcement shocked the scientific community. Many experts criticized the experiment as unethical. At the time, the long-term effects of CRISPR editing in embryos were unknown. There were concerns about unintended mutations, health risks, and the fact that the children could not consent to the procedure. The experiment raised global alarm about the possibility of “designer babies” and the potential for genetic inequality.

As a result, many countries strengthened regulations around human gene editing. This case study highlights the ethical dangers of using powerful technology without clear rules and oversight.

Benefits of CRISPR Technology

CRISPR offers several major advantages:

- **Precision:** It can target specific genes with high accuracy.
- **Speed:** It works faster than older gene-editing techniques.
- **Cost-effectiveness:** It is cheaper and more accessible to researchers.
- **Versatility:** It can be used in plants, animals, and humans.

These benefits make CRISPR one of the most important scientific tools of the 21st century. It is used in research labs around the world to study cancer, genetic disorders, and infectious diseases.

Risks and Limitations

Despite its promise, CRISPR is not perfect. One major concern is **off-target effects**, where the CRISPR system cuts DNA at the wrong place. This can cause unintended mutations that may lead to cancer or other health problems. Scientists are working to improve accuracy, but the risk has not been eliminated.

Another limitation is that not all diseases are caused by a single gene. Many conditions, such as heart disease and diabetes, involve multiple genes and environmental factors. CRISPR may not be effective for these complex disorders.

There is also the risk of unequal access. Advanced genetic treatments may only be available to wealthy individuals or countries, increasing global health inequalities.

Ethical Questions and Public Debate

CRISPR raises deep ethical questions. Should humans be allowed to edit embryos? Where is the line between treating disease and enhancing traits such as intelligence or appearance? Who decides what changes are acceptable?

Many scientists argue that CRISPR should be used only to treat serious diseases, not to enhance human abilities. Others worry that once the technology exists, it will be difficult to control how it is used. Governments, scientists, and ethicists continue to debate how to regulate gene editing responsibly. Public opinion also plays an important role. As CRISPR becomes more widely known, societies must decide what values they want to protect.

The Future of Gene Editing

CRISPR is still a young technology, and its full impact is not yet known. In the future, it may lead to cures for genetic diseases, safer food supplies, and new ways to fight environmental challenges. It may also change how humans think about health, identity, and biology.

What is clear is that CRISPR has given humans unprecedented power over DNA. With that power comes responsibility. The choices made today will shape how gene editing affects future generations.

Comprehension Questions

1. What does CRISPR stand for, and where was it first discovered?
2. How does the Cas9 enzyme function in gene editing?
3. Why is CRISPR considered more precise than earlier gene-editing tools?
4. Describe how CRISPR was used in the sickle cell disease case study.
5. What benefits did patients experience in the sickle cell trials?
6. How is CRISPR being used in agriculture or environmental science?
7. What happened in the embryo editing case study, and why was it controversial?
8. Name two risks or limitations of CRISPR technology.
9. Why do scientists worry about “designer babies”?
10. Why is public debate important in deciding how CRISPR is used?

Extension Questions

1. What other genetic diseases are currently being studied using CRISPR?
2. How do laws about gene editing differ between countries?
3. What are “off-target effects,” and how are scientists trying to reduce them?
4. How could CRISPR affect food production in developing countries?
5. Do you think human embryo editing should ever be allowed? Explain your reasoning.

Comprehension Questions – Answer Key

1. CRISPR stands for Clustered Regularly Interspaced Short Palindromic Repeats and was discovered in bacteria.
2. Cas9 is an enzyme that cuts DNA at a specific location guided by RNA.
3. It targets exact DNA sequences, reducing unwanted changes.
4. Scientists edited bone marrow cells to correct the gene causing sickle cell disease.
5. Reduced pain, fewer symptoms, and less need for blood transfusions.
6. Making crops resistant to disease, drought, and pests; controlling disease-carrying insects.
7. A scientist edited human embryos to resist HIV, raising safety and ethical concerns.
8. Off-target mutations, complex diseases, unequal access, and unknown long-term effects.
9. Because genetic enhancements could lead to inequality and ethical problems.
10. Society must decide how powerful technology should be used and regulated.

Extension Questions – Sample Answers (will vary)

1. Diseases such as cystic fibrosis, muscular dystrophy, and certain cancers.
2. Some countries ban human embryo editing, while others allow limited research.
3. Off-target effects are unintended DNA changes; scientists are improving accuracy and guide RNA design.
4. It could increase crop yields and reduce hunger.
5. Answers will vary.

Answer Key Included

Office, Google, and

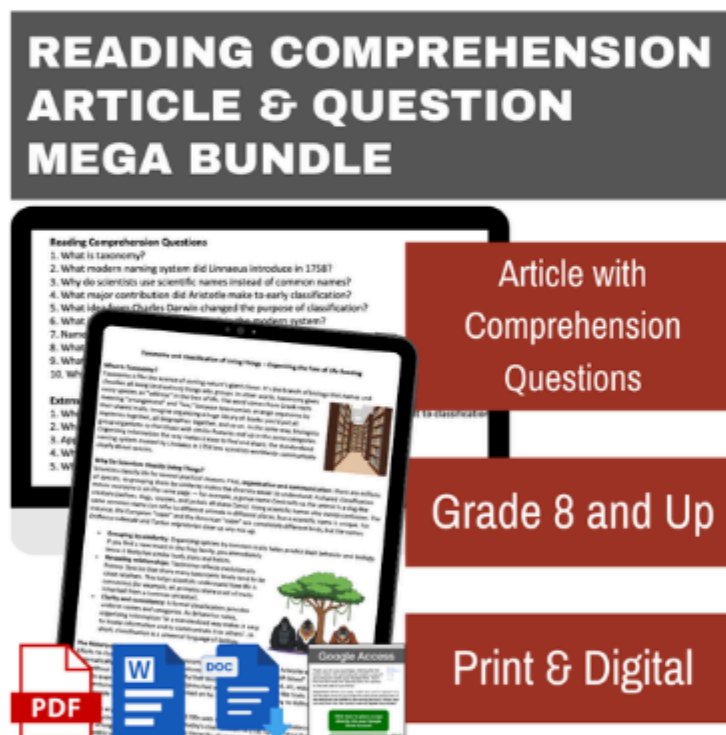
PDF Versions

Comprehension and Extension Questions



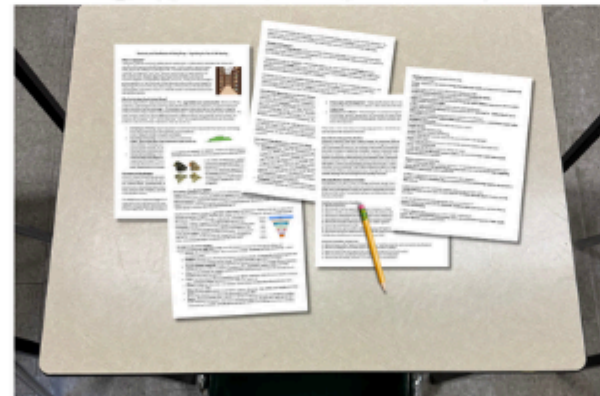
Upgrade to the Grade 8 and Up Reading Mega Bundle

Includes over 130 readings for students in grades 8 and up. The bundle covers all science topics and will save you over 75%.



CLASSROOM READY

- Questions and Answer Key
- **No Prep, Ready-to-Use:** Print or assign digitally with Google Docs, Microsoft Word, and PDF formats for flexible classroom use
- **Includes Varied Question Types:** Knowledge, thinking, connecting, application, and open-ended questions.



★★★★★ Extremely satisfied - It is a good supplemental activity either for review and at the same time introducing some concept. I also use this for sub plan. It is well presented, organized and interesting.

★★★★★ Extremely satisfied - This a great resource. I used this for a sub plan. It was fun and engaging for my students.

Grade 8 and Up Scientific Reading Comprehension Article Mega Bundle

ALL my current and future grade 8 and up readings, covering the following subject areas:

Biology
Chemistry
Earth and Space
Ecology and the Environment
Energy
Health
Natural Disasters
Physics



Improve your students' **Literacy and Analysis Skills**, use as an **Emergency Substitute Plan** or create **Applicability** in your classroom

**Click to
learn more!**

As a special bonus, I want to send you a few resources that you can use in your classroom tomorrow. Completely free and geared towards what you teach!



Just



and then choose what you teach!

thanks
**for your interest
in this resource!**



devon@teachwithfergy.com