BIOTECHNOLOGIST: GENETICALLY MODIFIED CROPS
8th Grade Biology/Natural Selection Unit Project

INTRODUCTION

INTRODUCE
Grouping: Whole class or small groups
Duration: 2-3 minutes
Activities:

- Read through the Task Overview

Agriculture is a very important part of the economy and society. As the population of the Earth continues to increase, the need for more food will continue to grow. It is expected that the Earth's population will increase by almost 2 billion people in 2050. Many people are concerned about how these 9 billion people will be fed.

BIG IDEA / ESSENTIAL QUESTIONS

EXPLORE TASK THEMES
Grouping: Whole class or Individual
Duration: 10 minutes
Activities:

- Review Big Ideas and Essential Questions with students
- Have students create written responses for one or more essential questions OR facilitate discussions around

Output

- Written student responses to one or more Essential Questions OR
- Group Discussion around answers to Essential Questions

BIG IDEA

- The survival of living things is dependent upon their adaptations and ability to respond to natural changes and human influences on their environment.
- Humans depend on the management and practices of agricultural systems.
- The cell is the basic unit and structure for all living things.

ESSENTIAL QUESTIONS

- How do adaptations enable an organism to survive?
- How do human innovations and actions impact the growth and development of organisms?
- How does the growth of food and fiber impact civilization?
- How does the genetic material of a cell affect the traits of cells and organisms?

G.R.A.S.P.

PROVIDE CONTEXT
Grouping: Whole class
Duration: 10 minutes
Activities:

- ∉ Read through Goal, Role, Audience and Situation

GOAL
Your goal is to persuade African governments that the use of genetically modified crops (GM) is an important choice for helping to feed the population in the coming decades. Many people have strong concerns related to using genetically modified crops. These concerns will need to be addressed to help people be less fearful of using GM seeds.

ROLE
You are a biotechnologist for a large agricultural corporation. You and a team of biotechnologists work together to develop new genetically modified seeds that can help increase the success of the seeds and therefore increase crop production. Your team has been asked by corporate leadership to communicate your work and the value of your work to national and global leaders concerned with the amount of food production happening within their countries.

AUDIENCE
Your audience will be leaders of African nations and the heads of the agricultural departments. The citizens and leaders of these countries have been debating the value of genetically modified crops. Many are concerned about the safety of these seeds for society and for the environment. They want to learn how this process works and why they should consider allowing genetically modified seeds to be used by farmers.

SITUATION
Agriculture is a very important part of the economy and society. As the population of the Earth continues to increase, the need for more food will continue to grow. It is expected that the Earth's population will increase by almost 2 billion people in 2050. Many people are concerned about how these 9 billion people will be fed.

PRODUCTS

REVIEW PRODUCTS
Grouping: Whole class, unless groups will work on different products - in that case have each small group do this step separately
Duration: 10-15 minutes
Activities:

- ∉ Read through the description of each product that is assigned

- ∉ Watch the product video(s)

DEVELOP/REFINE RESEARCH QUESTIONS
Grouping: Whole class, small group, or individual
Duration: 15-30 minutes
Activities:

- ∉ Read through product research questions

- ∉ Review notes/questions from the Career video

- ∉ Brainstorm any additional questions that will need to be answered for product creation

Output

- ∉ A list of questions/thoughts to which the students will research answers

1. RESEARCH PAPER

You and your team will need to conduct research related to the most common traits that are genetically manipulated for vegetable seeds. You will need to explain how these genes were manipulated and the value of these traits for crop success and yield. This paper should also address safety concerns related to genetically modified crops and whether or not these concerns are true. This paper will be shared with African leaders to help them feel secure in choosing to allow genetically modified seeds to be used by their farmers.

Are GMO's safe for people to eat?

Are they more successful than non-genetically modified crops?

How do they impact the environment?

BIOTECHNOLOGIST - RESEARCH PAPER

Achievement Levels	**1**	**2**	**3**	**4**
Research and Accuracy(x1)	Product demonstrates little support for claims with reasons and evidence.	Product demonstrates some support for claims with reasons and evidence based upon some research conducted.	Product demonstrates support for claims with clear reasons and relevant evidence based upon sufficient research.	Product demonstrates support for claims with clear reasons and relevant evidence based upon thorough research.
Genetic and Environmentals Factors Influencing Growth(x1)	The paper presents a minimal explanation for how environmental and genetic factors influence the growth of organisms.	The paper presents a somewhat detailed scientific explanation for how environmental and genetic factors influence the growth of organisms.	The paper presents an adequate scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	The paper presents a very detailed scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
Structural Changes to Genes(x1)	The paper does not provide an explanation as to why structural changes to genes effecting the structure and function of the organism.	The paper provides a minimal explanation as to why structural changes to genes effecting the structure and function of the organism.	The paper provides a somewhat detailed explanation as to why structural changes to genes effecting the structure and function of the organism.	The paper provides a detailed explanation as to why structural changes to genes effecting the structure and function of the organism.
Cell Structure and Function(x1)	The product presents little information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents some information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents adequate information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents detailed information to describe the function of a cell as a whole and ways parts of cells contribute to the function.
Conventions(x1)	Poor word choice used with little control of sentence sentence	Minimal variety of words used with limited and/or inconsistent control of sentence formation.	Variety of words used with adequate control of sentence formation. Some errors may be	Variety of words used with thorough control of sentence formation. Few

	formation. Errors are present in grammar, usage, spelling and punctuation. Writing style interferes with meaning.	Many errors may be present in grammar,usage, spelling and punctuation.Writing style interferes with meaning.	present in grammar,usage, spelling and punctuation. Overall writing style demonstrates adequate use of language and tone.	errors, if any, are present in grammar, usage, spelling and punctuation. Overall writing style demonstrates consistent use of language and tone.

2. MULTIMEDIA PRESENTATION

You and your team will need to construct a multimedia presentation. This presentation may be used to accompany the debate presentation and/or on the company or national government's website. You may wish to consider providing audio over the presentation if it is going to on a website.

It will be critical to share the safety and value of the genetically modified crops. This will be incredibly important for the farmers, citizens, and leaders. You should describe how the process of genetic modification works and the resulting traits of commonly used crops. How does this process help the crops be more successful, as well as increase the overall yield for the crop? You should consider any other concerns or points you believe important and include this information within this presentation.

What is the safety and value of genetically modified crops?

How does the process of genetic modification work?

What are the resulting traits of commonly used crops?

BIOTECHNOLOGIST - MULTIMEDIA PRESENTATION

Achievement Levels	**1**	**2**	**3**	**4**
Cell Structure and Function(x1)	The product does not present information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents minimal information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents adequate information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents detailed information to describe the function of a cell as a whole and ways parts of cells contribute to the function.
Beneficial Structural Changes to Genes(x1)	The product provides a minimal description as to why structural changes to genes effecting the structure and function of the organism can benefit the organism.	The product provides a partial description as to why structural changes to genes effecting the structure and function of the organism can benefit the organism.	The product provides an adequate description as to why structural changes to genes effecting the structure and function of the organism can benefit the organism.	The product provides a detailed description as to why structural changes to genes effecting the structure and function of the organism can benefit the organism.
Genetic and Environmentals Factors Influencing Growth(x1)	The product presents little scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	The product presents a partial scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	The product presents a sufficient scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.	The product presents a very detailed scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
Graphics and	The graphics and	The graphics and	The graphics and	The graphics and

Visuals(x1)	visuals provide minimal evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	visuals provide some evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	visuals provide sufficient evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.	visuals provide strong evidence to support the claims made through the presentation and make the information provided easy for the viewer to understand.
Aesthetics(x1)	The layout is inappropriate with awkward transitions. Font formats do not promote readability.	The layout is appropriate and aesthetically pleasing with awkward transitions. Font formats do not promote readability.	The technological choices and layout are appropriate and pleasing with transitions moving the audience from slide to slide. Font formats allow the reader to adequately read the presentation.	The technological choices and layout are appropriate and aesthetically pleasing with transitions that are smooth and strategic. Font formats have been carefully planned to enhance readability.

3. DIAGRAM

Your task is to visually explain the process of how genetically modified crops are made based upon the cell and the chromosomes present. In a diagram or on a poster, visually show or demonstrate structural changes to genes located on the chromosomes and how these changes impact proteins affecting the structure and function of the organism. This diagram should also include labels and brief explanations of the visuals.

How are genetically modified crops made?

What role do genes and chromosomes have in impacting traits?

BIOTECHNOLOGIST - DIAGRAM

Achievement Levels	**1**	**2**	**3**	**4**
Cell Structure and Function(x1)	The product presents little visual information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents some visual information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents adequate information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents detailed information to describe the function of a cell as a whole and ways parts of cells contribute to the function.
Genetic Factors Influencing Growth(x1)	The product does not present a scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents a minimally detailed scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents a somewhat detailed scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents a very detailed scientific explanation based on evidence for how genetic factors influence the growth of organisms.
Representation Quality(x1)	Representation demonstrates an little understanding of the scientific concepts and shows evidence of research.	Representation demonstrates some understanding of the scientific concepts and shows evidence of research.	Representation demonstrates a sufficient understanding of the scientific concepts and shows evidence of research.	Representation demonstrates an excellent understanding of the scientific concepts and shows evidence of research.

Drawing Details(x1)	Fewer than 85% of the assigned details are present OR most details are difficult to identify.	Almost all assigned details (at least 85%) have been added. A few details are difficult to identify.	Almost all assigned details (at least 85%) have been added. The details are clear and easy to identify.	All assigned details have been added. The details are clear and easy to identify.

4. DEBATE

You and your team will need to provide a 2-3 minute presentation for the leaders of the African nations attending this meeting to learn more about genetically modified crops. They are looking for long-term solutions for feeding the population and are concerned about the increasing global population. As part of this presentation, a number of agricultural leaders will be asking you questions about the value and safety of genetically modified crops. These individuals may have alternate points of view and it will be important to support your claims with evidence from your research.

What is the value and safety of genetically modified crops?

How do the genetically modified seed process work?

BIOTECHNOLOGIST - DEBATE

Achievement Levels	**1**	**2**	**3**	**4**
Persuasive Speaking(x1)	The product provides little argument to support claims with reasons and research.	The presentation provides some points to support claims with reasons and research and is presented emphasizing important points.	The presentation provides an adequate argument to support claims with clear reasons and research and is presented in a coherent manner emphasizing important points.	The presentation provides a thorough argument to support claims with clear reasons and research and is presented in a coherent manner emphasizing important points.
Presentation Delivery(x1)	The presentation is given with little command of language, eye contact, voice, pronunciation.	The presentation is given with partial command of language, eye contact, voice, pronunciation.	The presentation is given with sufficient command of language, eye contact, voice, pronunciation, and style appropriate to the audience.	The presentation is given with strong command of language, eye contact, voice, pronunciation, and style appropriate to the audience.
Genetic Factors Influencing Growth(x1)	The product does not present a scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents little scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents a somewhat detailed scientific explanation based on evidence for how genetic factors influence the growth of organisms.	The product presents a very detailed scientific explanation based on evidence for how genetic factors influence the growth of organisms.
Beneficial Structural Changes to Genes(x1)	The product does not provide a description as to why structural changes to genes effecting the structure and function of the organism benefit the organism.	The product provides a minimal description as to why structural changes to genes effecting the structure and function of the organism benefit the organism.	The product provides a somewhat detailed description as to why structural changes to genes effecting the structure and function of the organism benefit the organism.	The product provides a detailed description as to why structural changes to genes effecting the structure and function of the organism benefit the organism.

5. INFOGRAPHIC

Your team will need to create an infographic describing the 4-5 most popular genetically modified crops. You will want to share typical ways these are modified and how this can positively impact success of the crops. The infographic should also share how these crops are believed to be valuable in feeding the world in 2050. This should be easy to understand to help farmers and consumers feel more comfortable and confident using genetically modified crops.

What are the four or five most popular genetically modified crops?

Are GMO's safe for people to eat?

Are they more successful than non-genetically modified crops?

How do GMO's impact the environment?

BIOTECHNOLOGIST - INFOGRAPHIC

Achievement Levels	**1**	**2**	**3**	**4**
Cell Structure and Function(x1)	The product presents little information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents some information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents adequate information to describe the function of a cell as a whole and ways parts of cells contribute to the function.	The product presents detailed information to describe the function of a cell as a whole and ways parts of cells contribute to the function.
Beneficial Structural Changes to Genes(x1)	The product does not provide information to describe why structural changes to genes effect the structure and function of the organism in a beneficial way.	The product provides little information to describe why structural changes to genes effect the structure and function of the organism in a beneficial way.	The product provides a somewhat detailed description as to why structural changes to genes effect the structure and function of the organism in a beneficial way.	The product provides a detailed description as to why structural changes to genes effect the structure and function of the organism in a beneficial way.
Genetic Factors influencing Growth(x1)	The product provides minimal visual evidence explaining how genetic factors influence the growth of organisms.	The product provides some visual evidence explaining how genetic factors influence the growth of organisms.	The product provides adequate visual evidence explaining how genetic factors influence the growth of organisms.	The product provides very detailed visual evidence explaining how genetic factors influence the growth of organisms.
Graphics and Visuals(x1)	The graphics and visuals provide little evidence to support the claims made through the product and help persuade the viewer while making it easy for the viewer to understand.	The graphics and visuals provide some evidence to support the claims made through the product and help persuade the viewer while making it easy for the viewer to understand.	The graphics and visuals provide sufficient evidence to support the claims made through the product and help persuade the viewer while making it easy for the viewer to understand.	The graphics and visuals provide strong evidence to support the claims made through the product and help persuade the viewer while making it easy for the viewer to understand.