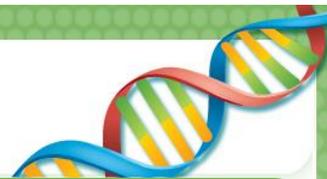


# Genetically Modified Product Innovations



## Introduction

Society today is in the midst of a genetically modified revolution. Newsworthy advancements in biotechnology make the headlines nearly every day as lifesaving pharmaceuticals are developed, animal welfare is improved, and improvements to agricultural production are made through weather and pest-resistant crops and higher quality, better tasting food.

As with many scientific breakthroughs, these advancements come with both societal judgment and debate; however, they are being made nonetheless, and oftentimes, with great success and profit.

This lesson will reveal if your students' genetically modified product innovations could make the headlines!



**Grade Level:** 9-12

**Time Needed:** 60 minutes

## Learning Objectives

After completing this lesson, students will be able to:

1. Formulate their own opinions of genetically modified products and their overall value
2. Expand their understanding of the realm of product innovations and areas of society which could be impacted by biotechnology or genetic engineering
3. Weigh the risks and benefits of genetically modified products

## Materials (per group)

- Copies of the GM Product Innovation Profile
- Poster Board
- Markers

## Next Generation Science Standards (NGSS)

As a result of activities for grades 9-12, all students will learn content in these areas:

### Topics

- **LS1:** Structure & Function
- **LS4:** Interdependent Relationships in Ecosystems

### Performance Expectation

- **HS-LS1-1:** Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells
- **HS-LS2-7:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity

### Dimensions

#### Practices:

- Constructing Explanations
- Obtaining, Evaluating & Communicating Information
- Engaging in Argument from Evidence

#### Disciplinary Core Ideas:

- **LS3.D:** Biodiversity in Humans

#### Cross-Cutting concepts:

- Structure & Function
- Stability & Change



## Instructional Process

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1. Make copies of the GM Product Innovation Profile (one per group).
2. Introduce the topic of genetically modified products (referring to the supplemental content/discussion prompts on the following page).
3. Introduce the activity. Explain how each student group will act as a product development company charged with creating a genetically modified product which is safe, commercially viable, beneficial, and low risk. Describe how groups must collaborate to complete the GM Product Innovation Profile, which summarizes their product innovations and prepares them to pitch their product concepts to an investor group (the class).
4. Introduce the GM Product Innovation Profile and explain its purpose: to document the group's genetically modified product "pitch."
5. Talk through each profile category with students to ensure they are comfortable with the information to be prepared.
6. Give students the following assignment:
  - Assemble in groups of three to four. Assign a scribe and a presenter.
  - Collect one GM Product Innovation Profile, one poster board, and one marker (or set of markers)
  - Take 15 minutes to brainstorm and identify a new, genetically modified product that has a valued use or benefit to society, and complete the GM Product Innovation Profile. Take an additional 10 minutes to prepare a "pitch" storyboard that your group's presenter will use to sell the product concept to an interested investor group (the class). Your mission is to obtain investor buy-in on the concept and a green light for product funding.
7. After groups have completed their storyboards, ask each group's presenter to pitch their product concept to the class in three minutes or less. (The pitch should address information documented on the GM Product Innovation Profile.) At the conclusion of the pitches, ask students to vote on the product which they'd be most interested in funding based on its anticipated value to society. Tally votes and announce the winning group.
8. After the product pitches conclude, ask follow-up questions, such as:
  - What can we learn from this activity?
  - Did this activity open your eyes to new ways in which biotechnology can be applied to product development? If so, how?



## Supplemental Content – Discussion of Genetically Modified Products

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1. Ask students to share their opinions of what they believe the term “genetically modified (GM) product” means.  
*(General definition: products that have been created, enhanced, or improved through the application of biotechnology.)*
2. What industries do you believe are significantly impacted by Gm products? (Discussion prompts: life sciences, agriculture, biology, healthcare, pharmaceuticals, etc.)
3. Society today is in the midst of a genetically modified revolution. Newsworthy advancements in biotechnology make the headlines nearly every day as lifesaving pharmaceuticals are developed, animal welfare and pest-resistant crops and higher quality, better tasting food. Based on these benefits, why do you believe there is much debate surrounding this topic?  
*(Discussion prompts: lack of understanding among the public, lack of consumer education by product promoters, and perceived risks outweigh the benefits.)*
4. Do you believe product development companies have an obligation to inform consumers that their products (or product parts or ingredients) are genetically modified? Discuss

## Follow-Up Questions

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1. What can we learn from this activity?
2. Did this activity open your eyes to new ways in which biotechnology can be applied to product development? If so, how?
3. Which products pitched in this activity do you believe were truly viable product considerations based on their value to society?
4. With regards to protein synthesis, how is a genetically modified organism similar to an organism that has not been modified? How are they different?



## GM Product Innovation Profile

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Define your target audience (Desired customer/customer group) and general demographics.

Describe your product (including proposed product name, if applicable) and its use.

Identify how this product will benefit the target audience.

Describe any potential risks associated with this product.

Define this product's competitive differentiation (how it is different/better than the competition).

Identify potential sales obstacles/challenges which must be overcome (for example, higher price point).

Create a sales pitch storyboard to present your product concept to an investor group (your class). Your pitch could be a visual advertisement with product tagline, a persuasive summary with testimonials from funding for your product's development. (USE THE POSTER BOARD PROVIDED).



## Plant Heredity – Student Sheet

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As with many scientific breakthroughs, these advancements come with both societal judgment and debate; however, they are being made nonetheless, and oftentimes, with great success and profit.

This lesson will reveal if your genetically modified product innovations could make the headlines!

### Materials (per group)

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- Copies of the GM Product Innovation Profile
- Poster Board
- Markers

### Procedure

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1. Assemble in groups of three to four. Assign a scribe and a presenter.
2. Collect one GM Product Innovation Profile, one poster board, and one marker/set of markers.
3. Take 15 minutes to brainstorm and identify a new, genetically modified product which is safe, commercially viable, beneficial to society, and low risk, then complete the GM Product Innovation Profile.
4. Take an additional 10 minutes to prepare a “pitch” storyboard that your group’s presenter will use to sell the product concept to an interested investor group (the class). Your mission is to obtain investor buy-in on the concept and a green light for product funding.
5. After all groups have completed their storyboards, each group’s presenter will be asked to pitch their product concept to the class in three minutes or less. (The pitch should address information documented on the GM Product Innovation Profile.) At the conclusion of the pitches, you will vote on the product which you would be most interested in funding (based on its viability and anticipated value to society). After all votes have been tallied, the winning group will be announced.



## Follow-Up Questions

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1. What can we learn from this activity?
2. Did this activity open your eyes to new ways in which biotechnology can be applied to product development? If so, how?
3. Which products pitched in this activity do you believe were truly viable product considerations based on their value to society?
4. With regards to protein synthesis, how is a genetically modified organism similar to an organism that has not been modified? How are they different?