

To foster student understanding of the concept “Genetic engineering techniques can manipulate the heritable information in DNA and, in special cases, RNA”, check out these additional resources on Plasmid-based transformation and Restriction Enzyme Analysis of DNA.

## Transformation

### **Bacterial Transformation:**

[http://highered.mheducation.com/sites/0072556781/student\\_view0/chapter13/animation\\_quiz\\_1.html](http://highered.mheducation.com/sites/0072556781/student_view0/chapter13/animation_quiz_1.html)

This animation by McGraw Hill describes the process of Bacterial Transformation. The description goes into more detail than is necessary to understand our lab but provides a useful visual on the concept of bacterial transformation.

### **Plasmid-based transformation**

<http://www.dnalc.org/resources/animations/transformation1.html>

This animation by Cold Spring Harbor’s Dolan DNA Learning Center gives a great visualization of plasmid-based transformation.

## Cloning DNA fragments using restriction enzyme & DNA ligase

<http://www.dnalc.org/view/15476-Mechanism-of-Recombination-3D-animation-with-with-basic-narration.html>

This 1 ½ minute animation shows a simplified version of how genes are cloned into plasmid vectors and grown in bacteria.

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To foster student understanding of “illustrative examples of products of genetic engineering”, check out these resources on Genetically Modified Foods.

## Genetically Modified Organisms

### **How are GMO’s created?**

<http://www.youtube.com/watch?v=2G-yUuiqIZ0>

This 5 ½ minute video explains the dilemma facing Hawaiian farmers back in the early 90s. A deadly virus was cutting the crop production of papaya in half. Farmers turned to genetic engineering to solve the problem.

### **GM- Food Safety**

[http://highered.mheducation.com/sites/007337797x/student\\_view0/chapter14/video\\_quiz\\_-\\_gm\\_food\\_safety.html](http://highered.mheducation.com/sites/007337797x/student_view0/chapter14/video_quiz_-_gm_food_safety.html)

You need quick time player to view this video! The video addresses how genetically modified foods have to be monitored for underlying food safety issues.

### **Do your students want more on GMO's?**

This 1-day lesson plan will connect what your students have learned about GMO's to the popular movie and novel, Hunger Games. The activities revolve around the genetically enhanced birds called jabberjays, which the Capitol created to spy on rebels. When these birds unexpectedly breed with mockingbirds they form a hybrid bird called the mockingjays. *Could a scenario like this, where a genetically engineered organism hybridizes with a wild animal or plant, happen in the real world? Why or why not?*

Students are divided into research groups to explore questions surrounding the concepts of genetically modified organisms.

<http://learning.blogs.nytimes.com/2012/05/16/hunger-games-science-investigating-genetically-engineered-organisms/?php=true&type=blogs&r=0>

### **Transgenic Animals:**

Read this article for a summary on transgenic animals, how they contribute to human welfare and ethical concerns.

<http://www.actionbioscience.org/biotechnology/margawati.html#primer>

### **Therapeutic Applications of Transgenic Technology:**

This 8 ½ minute audio describes the work being done by scientists in England who are using the process of DNA transfer in an attempt to enable mother's with mitochondrial diseases to have their own healthy biological children.

[http://www.npr.org/blogs/health/2014/11/10/360342623/combining-the-dna-of-three-people-raises-ethical-questions?utm\\_source=facebook.com&utm\\_medium=social&utm\\_campaign=morning-edition&utm\\_term=nprnews&utm\\_content=2035](http://www.npr.org/blogs/health/2014/11/10/360342623/combining-the-dna-of-three-people-raises-ethical-questions?utm_source=facebook.com&utm_medium=social&utm_campaign=morning-edition&utm_term=nprnews&utm_content=2035)

### **Cloned Animals**

This 6-minute video by the DNA Learning Center at Cold Springs explains the basics of cloning.

<http://www.dnalc.org/view/16992-Cloning-101.html>

### **Pharmaceuticals**

This 5 ½ minute video discusses how synthetic human insulin is made through the process of bacterial transformation.

<http://www.youtube.com/watch?v=iMosKBs-v0E>