

NOTE****

This lesson will be a follow up to an abridged version of the coding lesson. The previous lesson plan will be used as an introduction to how information can be represented as code, at the end of this lesson I will begin to talk about how DNA is the code of living organisms.

The next week will start with a review of DNA, then go into the biotech activity.

Biotech Lesson

Creator: Kevin Klicki

Title of Lesson: Introduction to biotechnology

Intended Grade Level(s):

7-8th grade

Main Objectives: Working off of the coding activity from last week, we will show how the DNA code can be cut and pasted to make genetically modified organisms.

Arizona State Science Standards Addressed:

PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes.

Common Core Standards Addressed:

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. [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

Suggested Supplemental Teacher Resources – References/ Websites:

<http://htwins.net/scale2/> : Scale of the universe interactive website gives students a sense of scale of biomolecules

Lesson Plan Description:

	<p>Purpose: to show how the DNA molecule parallels binary code which makes up games and apps, and how DNA can be manipulated to put traits from one organism into another.</p> <p>Materials: Slides with binary and DNA code compared side by side DNA model just for fun (optional)</p> <p>Demonstrate a cut and paste type scenario, where a piece of code is inserted into a larger sequence and show how it imparts new functions to the existing framework.</p> <p>Translate this to how an organism can be engineered to express new traits.</p> <p>Show some examples of how this has been done in real life: GFP mice, The vitamin A rice, cows that produce human growth hormone.</p> <p>Instructional Sequence: Now that we've been adjusted to the molecular scale of DNA, we can take a look at the role DNA plays in biotechnology.</p> <p>Demonstrate a cut and paste type scenario, where a piece of code is inserted into a larger sequence and show how it imparts new functions to the existing framework. (Powerpoint)</p> <p>Translate this to how an organism can be engineered to express new traits. (Power point)</p> <p>Show some examples of how this has been done in real life: GFP mice, The vitamin A rice, cows that produce human growth hormone.</p>
<p><u>Extend/ Elaboration</u></p>	<p>Talk about controversy of genetically modified organisms</p> <p>Purpose: To connect what students just learned in the biotech lesson to a popular topic in the media: GMO foods and other products</p> <p>Materials: Bring in some 'GMO free' food products, compare pictures of engineered foods to their naturally occurring counterparts</p> <p>Instructional Sequence:</p> <ol style="list-style-type: none"> 1. Ask students if they know or have heard the phrase GMO 2. Talk about how the cloning process which we just learned about plays into the creation of GMO's 3. Be sure to highlight the keyword 'Cloning' and describe what it means in this context

	<p>4. End with some pictures of cool genetically modified organisms and explain how the stigma against them is mostly based on misinformation.</p>
<p>Evaluation</p>	<p>Purpose: To have students reflect on what they learned in the lesson in a summative way.</p> <p>Materials: Notebooks</p> <p>Instructional Sequence:</p> <ol style="list-style-type: none"> 1. Ask students to reflect on what they learned in their notebook, what they thought was cool, what they want to know more about and so on. 2. Ask them to converse with their parent or guardian about what they learned today about genetically modified organisms and how they are made <p>Homework: Talk to your parent or guardian about what you did in class, get their thoughts on GMO's and biotechnology stuff.</p>

Possible Alternatives and Troubleshooting:

The GMO food products labels or packaging in the extend and elaborate step can be supplemented with power point slides, but if it's possible to have a tangible prop for students to interact with I think that would be better.

Appendix : Power point slides (coming soon)