**Lesson Study:**

**Benchmark**: SC.912.L.16.10 Evaluate the impact of biotechnology on the individual society and the environment including medical and ethical issues.

**Essential Questions:** How has biotechnology improved society? What are the drawbacks of these technologies? Should companies be able to own DNA contained in their products?

**Lesson Objectives (Purpose for Learning):**

Identify the positive and negative impact biotechnologies can have on society.

Develop the knowledge and skills they need to be able to participate in a meaningful dialogue about biotechnology and its impact on society.

Evaluate their own perceptions, ideas and solutions so that they are better able to make educated decisions about products they support and purchase.

**Explicit Instruction**:

Activate Background knowledge/Make connections prior to learning:

Before the lesson students are to receive and read a student handout which summarizes the importance of seeds and plant reproduction. Sentences outlining the importance of seeds should be underlined and sentences which describe a societal conflict should be circled. On the day of the lesson, students will bring to class the handout as well as question or sentence that summarizes the conflict described in the handout.

**I do**: Teacher: Will introduce the “What, Why, How, When” of the lesson by beginning class with a brief review of how genes are transferred into the genome of an organism and give a brief synopsis of the film, directing attention to the essential questions. Teacher will make connections to prior learning during the introduction as well. While watching the film (hook), students should think about whether or not they think companies should be able to own the DNA contained in plant seeds.

**We do**: Students will then watch a short segment of *Food, Inc*. which describes the genetic modification and patent of soybean seeds by Monsanto.

**We do**: After watching the segment of *Food, Inc*., students will briefly discuss some of the issues presented. What arguments could support each side? Teacher will demonstrate a “think aloud” higher order question/answer strategy with students.

**They do**: Students will then work in mixed ability groups of four and answer the following higher order questions:

1) From Monsanto’s perspective, they have invested considerable time and money to develop these new strains of seeds, the only way it makes sense to make this investment is to own the genetic information contained in the seed. The farmers benefit, better seeds which allows them to produce more soybeans using a less expensive herbicide. The environment benefits by being able to use an herbicide that quickly breaks down and doesn’t accumulate in soil and ground water. What consequences could result, both positive and negative, from allowing companies to own genetic information contained in their products?

2) Many individuals illegally download music from “free” sites. How does this situation compare to farmers using seeds / or seeds with genes, that they did not pay for?

3) In our country, things which are considered intellectual property are protected and can’t be used or sold without the permission of the creator/owner. Intellectual property can include art, writing, music, names, etc. Should people be able to own ideas? Why or why not?

4) What is positive and negative impact on the farmers by allowing a company to own the DNA in seeds?

5) One of the farmers in the Monsanto case settles because it was less expensive to settle than to fight the lawsuit. Is this fair? Why or why not? Does the side that has the most money win in lawsuits?

6) What laws/changes will have to be made in our legal system to address the new advances in biotechnology? Who will push for these changes?

**Differentiation:** Small group/mixed ability; simplifying questions and instructions

**Summary**: Students will then have the opportunity to share their thoughts with the class.

**They Do**: Students will write a short story which considers of the implications of being able to buy and sell DNA.

Notes:

1. *Food Inc., Discussion Guide*. Participant Media and the Center for Ecoliteracy, 2009 <http://www.takepart.com/foodinc/faq>
2. *Food Inc.* Dir. Robert Kenner. Perf. Eric Schlosser, Michael Pollan, Gary Hirshberg, Joel Salatin. DVD. Magnolia Home Entertainment, 2009.