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ABSTRACT

The goal of this interdisciplinary activity is to encourage students to think critically about the ethical, environmental, and human health consequences of producing and consuming processed foods.

Key Words: Botany; critical thinking; environmental studies; ethics; genetically modified crops; human health; nutrition; processed foods.

Food production was once a central component of each person's daily life. Now, however, large, specialized, and multinational industries produce, package, and distribute food. Consequently, the American diet has shifted from being composed predominantly of whole foods (for example, potatoes and broccoli) and minimally processed foods (canned tomatoes and frozen peas) to being dominated by highly processed foods (breakfast cereals and candy bars). Highly processed foods contain multiple ingredients, including whole-food derivatives (high fructose corn syrup and soybean oil), stabilizers (xanthan gum and gum arabic), preservatives (BHT and citric acid), coloring agents (red #40 and caramel color), and flavoring agents (natural and artificial flavors). The complexity of modern food production leaves most confused about what processed food is and where it comes from.

At the college level, we implement this activity in a course for non-biology majors (Plants and People) and a course for upper-level biology majors (Agriculture and Human Health) to encourage students to think critically about the ethical, environmental, and human health consequences of producing and consuming processed foods. As an introduction, we ask students to identify a common highly processed food item (i.e., Pop-Tarts) when given only its list of ingredients. We then present students with a processed food item (i.e., Total Blueberry Pomegranate cereal) and ask them to work in pairs to answer the questions below. Students use the Internet to supplement their preexisting knowledge base. To conclude, we facilitate a group discussion in which students share and compare their answers.

Middle and high school teachers can incorporate this activity into an existing unit on botany, environmental science, genetics, human

health, or nutrition. The following questions, which are divided into three subject areas, can be tailored to the age and educational level of any student. Students who understand genetic modification and human nutrition will be best equipped to answer the more difficult questions.

○ Identifying Ingredients

- (1) How many different ingredients make up this processed food item?
- (2) Which ingredients are derived from plants?
- (3) How many different species are included in this processed food item?
- (4) In what states, countries, and/or regions of the world are these species typically grown?

○ Understanding Food Processing

- (1) Why are foods processed? What are the benefits of processing foods?
- (2) Why are processed foods typically less expensive per calorie than whole foods?
 - (3) What are genetically modified crops? Why are they produced and grown?
 - (4) Are genetically modified crops more or less common in the United States than in other countries? Why?
 - (5) What are the differences between organic processed foods and non-organic processed foods?
- (6) How are plants processed to produce the ingredients in processed foods? For example, how is corn syrup derived from a corn plant?
- (7) What are natural flavors, artificial flavors, artificial colors, and preservatives? Where are they created? How do they differ? Why are they necessary?
- (8) What is the difference between vitamin/mineral enrichment and vitamin/mineral fortification?

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○ Considering Ethical, Environmental, & Human Health Consequences

- (1) Does the name of the processed food item accurately describe its ingredients? Is this marketing strategy fair to consumers? Why or why not?
- (2) What are the socioeconomic consequences (both positive and negative) of inexpensive processed foods?
- (3) What are the working conditions for people involved in food production?
- (4) Do any ingredients come from genetically modified crops? How do you know?
- (5) What are the environmental consequences (both positive and negative) of growing genetically modified crops?
- (6) What are the human health consequences (both positive and negative) of consuming genetically modified crops?
- (7) What are the environmental consequences (both positive and negative) of processing foods?
- (8) What are the human health consequences (both positive and negative) of consuming processed foods?

We find that this activity captivates students with a diversity of interests. While some students begin to question package labels and marketing strategies, others become cognizant of the environmental consequences of food production, and still others become concerned about the relationship between food and human health.

The diversity of backgrounds and interests among students leads to lively discussions that often overflow into conversations with their friends and families outside the classroom. By encouraging students to think critically about how food choices affect current social, environmental, and human health issues, this activity enables students and their families to make informed decisions in their everyday lives.

○ Additional Resource

Teaching the Food System: A Project of the Johns Hopkins Center for a Livable Future <http://www.jhsph.edu/research/centers-and-institutes/teaching-the-food-system>.

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