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# Food System Education Among High School Students

Senior Thesis in Sustainable Agriculture and Food Systems

Advisors: Professors Jessica Bolker and Carrie Hall

**Yussra Mohammed Taha Ebrahim**

Fall 2015 - Spring 2016

:o)

## Introduction

“What I learned about food in school is surprisingly little.”

Until I got to college and majored in it. These words are scrawled onto one of the thirty or so post-its marking a passage in my copy of Carlo Petrini’s movement-inspiring book “Slow Food Nation.” Throughout my degree program in sustainable agriculture and food systems, I have found myself walking from class to class in astonishment at my own ignorance. How did I not know? How did they let me graduate high school without knowing, how did they let me loose into society without teaching me first this most basic, most relevant, most crucial of information? How could they waste my time like this?

In her passionate book about reconnecting with food, Barbara Kingsolver writes, “Most people of my grandparents’ generation had an intuitive sense of agricultural basics... This knowledge has vanished from our culture.”<sup>1</sup> Michael Pollan’s evaluation of our culture’s current relationship with food is as follows: “... I contend that most of what we’re consuming today is no longer, strictly speaking, food at all, and how we’re consuming it... is not really eating, at least not in the sense that civilization has long understood the term.”<sup>2</sup> There is an obvious unnatural disconnect today, for the first time in human history, between producers and consumers. “It’s good enough for us that somebody, somewhere, knows food production well enough to serve the rest of us with all we need to eat, each day of our lives,” writes

Kingsolver.<sup>1</sup> She goes on to criticize our school systems for prioritizing our knowledge of colonial history over our knowledge of food, lamenting her city friends' lack of awareness that potatoes "have a plant part" and carrots come from the ground.<sup>1</sup> But she does not blame them for what they were never taught, what never used to have to be taught, and neither would Petrini; he too turns to the education system for answers: "The failure of schools to teach children about pleasure, gastronomy, food processing, the basics of agriculture, and the nutritional culture that is part of their identity is nothing short of scandalous."<sup>3</sup>

\*

I'm no farm girl, but I knew before my high school graduation that food grows out of soil. What I didn't know about were the numerous complex scientific, societal, and ethical controversies regarding modern food production. Although many people no longer produce their own food, our education system has not been revised to fit this new reality. Students spend thirteen years in public schooling, yet often graduate high school, like me, without an awareness of the processes involved in producing the food they eat every day. The urgency of this pedagogical shortcoming is evident in the fact that, as students become consumers, they make decisions that impact production with each purchase.

Considering their lack of knowledge on food production, what motivates these decisions? Unsurprisingly, one major factor is money; most Americans purchase the cheapest food options, regardless of how they were produced.<sup>4</sup> On the other hand, consumers who do avoid purchasing certain products, such as those containing GMOs, might do so for the wrong reasons; unfortunately, Americans' distrust of GMOs is often founded on ignorance.<sup>4</sup> There are those who do not appreciate that caution must be taken with genetic modification, and

there are those who overemphasize caution without correctly identifying the risks. To make educated decisions, consumers must be informed that the major concern with genetic modification is in the environmental imbalances it creates rather than the personal health risks it poses. But this distinction, being steeped in genetics, nutritional biochemistry, and agroecology, is so rarely made in public discourse--especially considering the fact that the GMO debate is riddled with the more easily accessible emotional arguments for and against, which are in turn used by corporations and politicians alike to manipulate the masses.

Of course, genetic modification is just one example of a modern food production controversy, but it might be the most notable. On top of the fact that consumers today have been separated from food production processes, these processes have also become increasingly complicated, thereby requiring a stronger science background to be properly understood. Without such a background, consumers will continue to make decisions based on uninformed opinions and be at the mercy of manipulative media put forth by stakeholders with an agenda. This exploitation of ignorance is carried out by supporters of every stance taken on every controversial food production debate. As food production is no longer a requirement for the livelihood of the average American, as food production today can be rather complex, and as manipulative forces are readily lurking, food system education is a crucial part of the development of a conscientious society.

This is what I fight for.

In designing this study, I sought to discover how much high school students know about where their food comes from. I hypothesized that since food system education is

typically not even offered as an elective course at the high school level, many students are unaware of the controversial ways in which the food they eat is produced.

“Nothing short of scandalous” indeed.

## Methods

The study consists of an online pre-survey, an interactive presentation, and an in-class post-survey. A comparison of the data of the pre-survey to those of the post-survey can determine the effectiveness of a single lesson on food systems. Ultimately, given that my hypothesis is supported, the results of the study can be used to argue for the incorporation of an entire course consisting of such lessons into the general high school curriculum. In order to determine high school students' educational background in food systems, I designed the survey to consist of the following types of questions...

- Questions meant to explore students' familiarity and experience with various topics relating to food systems.
- Questions that test students' knowledge on controversial food production methods.
- Questions asking students about their attitudes toward these controversies.

See Figure 1 for an example of a survey question, and refer to the end of this thesis to read the full survey, which consists of 14 questions.

- 6) What are GMOs? (Choose the most accurate answer to the best of your knowledge.)
- a) foods that are processed in laboratories/factories
  - b) lifeforms that contain a portion of genetic code from a different species
  - c) crops that have been crossbred with crops of other species
  - d) crops that are not organic
  - e) I don't know

Figure 1: An example of one of the survey questions asked.

The survey was given to two classes of sophomore biology students, a regular level class and a college preparatory class, at Portsmouth High School. It should be noted that the sample is not necessarily representative of the average American high school population. Portsmouth High School is a suburban public school. About 90% of the students are white, and about 80% are wealthy enough to be considered ineligible for free or reduced-price lunches.<sup>5</sup> Additionally, the graduation rate is over 90%, and almost a third of PHS seniors take at least one Advanced Placement exam at some point in their high school career.<sup>5</sup> Overall, the sample population is a rather privileged one. 28 students took the online pre-survey, which was hosted by Qualtrics; 39 students took the in-class post-survey that followed the presentation given and the class discussion facilitated as part of the study.

The interactive presentation, which took the form of a class discussion, consisted of visually intriguing slides designed to make students think (see Figure 2).



Figure 2: A few of the slides from the presentation.

Students were encouraged to ask questions and share their opinions with the class throughout the presentation, which covered both the societal and the scientific aspects of various food production controversies. Topics covered include...

- The Importance of Food System Awareness and Education
- Government Subsidies and Lobbying
- Monoculture, Polyculture, and Agroecology
- Natural Selection and the Different Levels of Artificial Selection
- The Pros, the Cons, and the Controversies of Genetically Modified Crops
- Food Labeling
- Alternatives to Conventionally Produced Food

Crucial food system topics not covered (due to time limitations) include...

- Obesity
- Food Insecurity
- The Treatment of Workers
- Factory Farming and Animal Welfare
- Environmental Concerns and Global Climate Change

## Results

### *Section 1 - Main Findings*

Most high school students did not know what GMOs are. Additionally, although most of the students were able to identify the correct answer to the survey question on GMOs after the presentation and class discussion, a large portion were not. Genetic modification is a complex topic that takes time to explain. More than one lesson is required to get the idea across well enough to equip students with an informed background on the timely controversial topic that they will continue to run into well beyond high school.



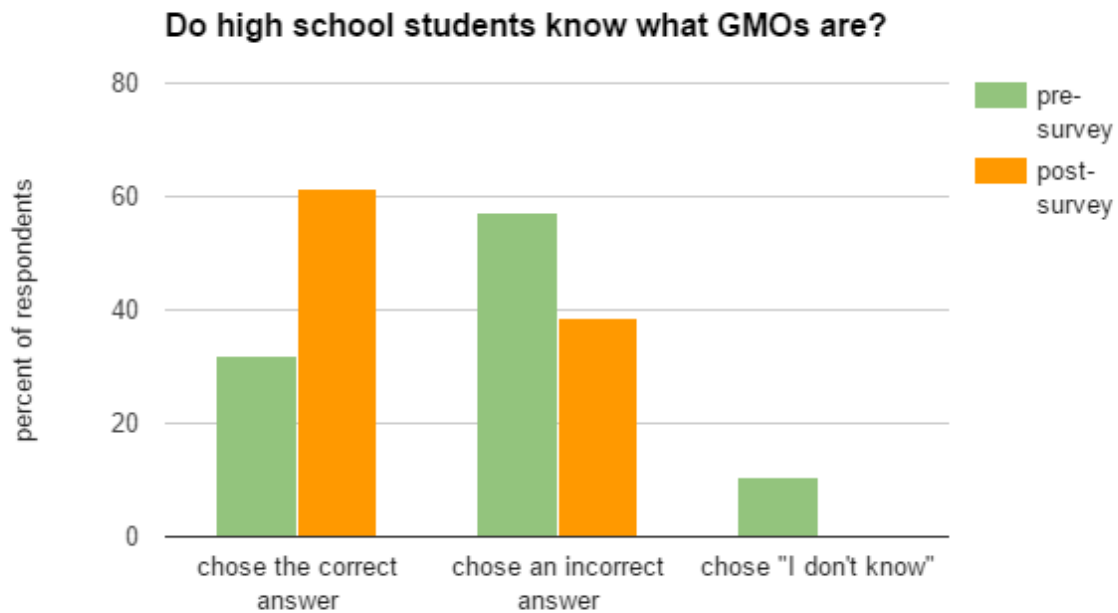


Figure 3: Do high school students know what GMOs are?

It is interesting to note that although many students did not seem to know what GMOs are, and some even had a hard time understanding the explanation provided during the extended discussion about genetic modification, most high school students did indicate on their survey (and demonstrate throughout the class discussion) that they do in fact care how their food is produced, and would be interested in taking a class on food systems. Additionally, this care and interest increased after the students participated in the lesson on food systems. Education successfully generated fascination. Fascination can grow into engagement, the increased involvement of future generations in food system issues.

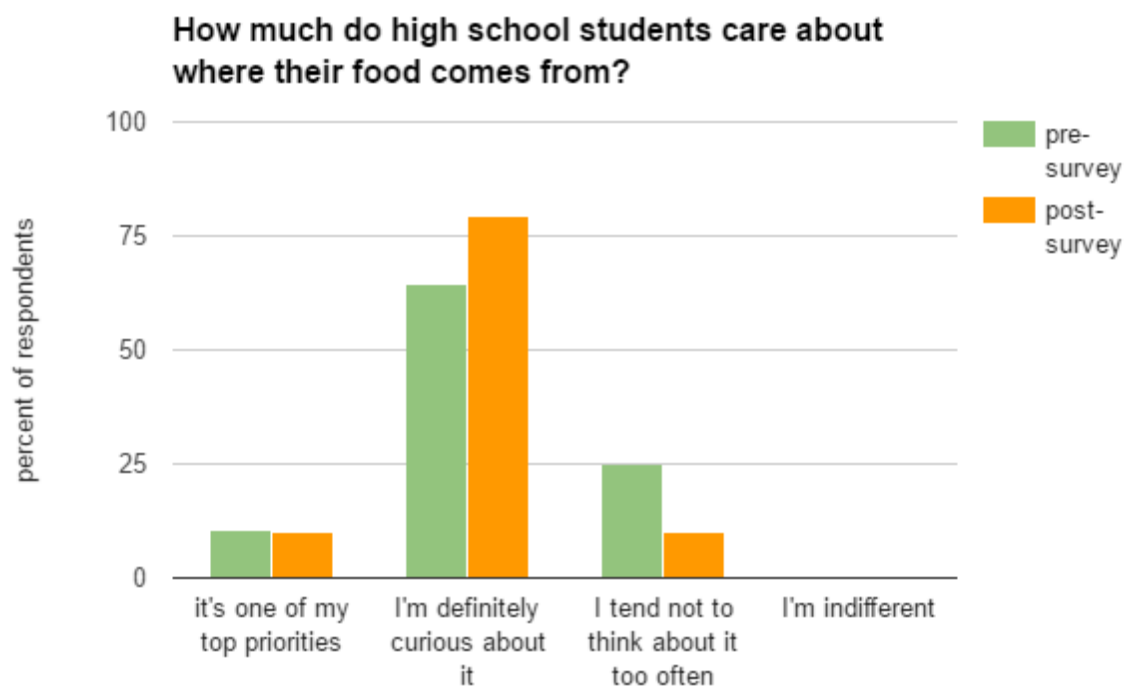


Figure 4: How much do high school students care about where their food comes from?

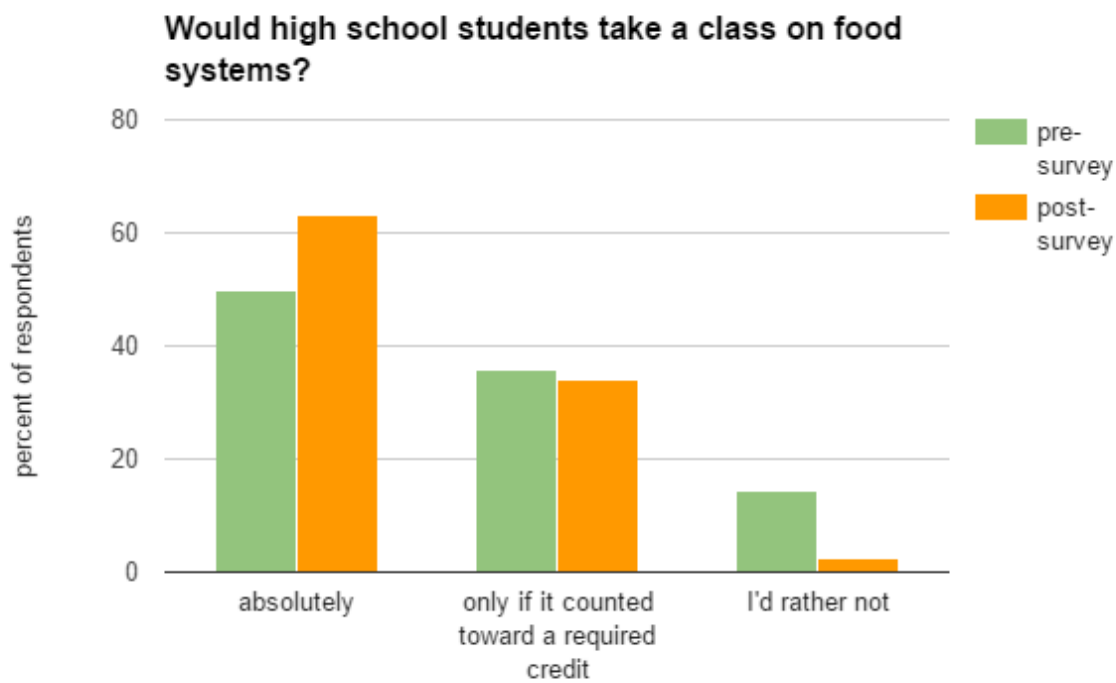


Figure 5: Would high school students take a class on food systems?

Finally, according to the survey results, very few high school students get their information about the food they eat from farms--the actual source of their food. The most common source of information was family/friends, followed by the internet, then school, then food packages, then advertisements, and finally, farms.

## *Section 2 - Additional Quantitative Data*

The tables and reportings that follow present some additional quantitative data of interest collected from the surveys.

Table 1: High School Students' Interest in Biology on a Scale from 1 to 5 (Averaged)

	Level 3 Students	Level 4 Students
Pre-Survey	4.8	3.1
Post-Survey	3.3	3.6

The pre-survey had a smaller number of respondents than the post-survey, but even in the results of the post-survey, no clear trend was evident in the data with regards to class level. Both classes expressed a moderate interest in biology.

Table 2: High School Students' Experience with Local Food (Pre-Survey)

<u>Topic</u>	<u>unfamiliar with it</u>	<u>heard of it</u>	<u>participate(d) in it</u>
Farmers' Markets	0	9	19
CSAs	21	7	0
Slow Food	23	4	1

Only data from the pre-survey are shown in Table 2, because the topics listed in this table were not given much coverage in the food system lesson.

High School Students' Perception of the Informativeness of the Terminology Used on Food Packages: The majority of students indicated in the pre-survey and the post-survey that some or all terms used on food packages are misleading. (The reality is that some terms are misleading, while others are meaningful, because their use is carefully regulated to inform consumers about how a food was produced.) Very few students felt that all food packages are reliable. Food labels were covered in the food system lesson, especially the meaningful organic label and the meaningless "all natural" label, yet there was a slightly greater indication in the post-survey that students found all labels misleading. Oddly enough, in the pre-survey, a larger portion selected the correct answer that some labels are misleading and others meaningful. These results could be explained by the fact that students were encouraged at the start of the food system lesson to question all claims so as to not be manipulated.

High School Students' Dietary Choices: The grand majority of students surveyed (about 90%) identified their diet as that of an omnivore, a few (about 10%) considered themselves vegetarian, and not one selected vegan. Those who considered themselves vegetarian generally indicated that they selected their dietary choice out of a greater concern for the environment or animal treatment rather than for personal health reasons.

High School Students' Opinion of Large-Scale Animal Farming: What follows is a discussion on a set of qualitative data that was able to be quantified. In both the pre-survey and the post-survey, the majority of students had an unfavorable opinion of large-scale animal farming, the answer of a smaller portion of students was categorized as "other," and very few students expressed that they find large-scale animal farming acceptable. "Other"

indicates that the response was either unclear or more complex than for or against, or that the student was indifferent or unsure about the matter.

### *Section 3 - Qualitative Data*

In two open-response questions on the survey, students were asked to define a term. Both questions clarified the context of the term's usage, starting out with the phrase "with regards to food production." The first term was "organic." Despite the clarification of context, a few respondents, biology students that they are, still answered the question with the biochemical definition of the term (i.e., containing carbon and hydrogen). But most students, even before participating in the lesson on food systems, demonstrated that they had a relatively accurate understanding of organic food as food defined by its production (food that is produced without synthetic fertilizers or pesticides, and that is free of GMOs). As for the second term, "sustainability," students' definitions varied, but many of them successfully arrived at the concept of the long-term preservation of both resources and life.

### Discussion

From the data emerged two key trends...

- 1) A lack of knowledge.
- 2) A desire to learn.

### *Section 1 - A Lack of Knowledge*

The lack of knowledge among high school students of food production processes that is evident in the data is unsurprising, but the results also offer hope: students' knowledge increased after the food system lesson. If a single lesson can be effective, imagine how much

progress a teacher could make with a classroom full of students over the course of a semester. Rather being kept ignorant of current events so as to dedicate time to memorizing the same dates from World War II that they did the year prior, high school students could be taught about issues relevant to their own context, issues that will always be relevant--food issues. But besides the fact that too much of their precious time is wasted in school with the current curriculum, the major concern with students' lack of knowledge is the fact that being informed is not a prerequisite for being involved--that is, students will grow up to contribute to society whether they are conscious of the significance of their contributions or not.

It would therefore be foolish not to educate students on the impact of their decision to purchase one animal product over another, to support one set of policies or the other, to oblige inertia or be an activist. If every product purchased were to be thought of as a process supported, people might rethink their decision to "buy" a decline in local biodiversity, or the destruction of traditional knowledge of nature and food, or the abuse of animals. If every decision were well-informed, every decision-maker well-educated, we could consider our species' opinionated nature a blessing. But uninformed opinions are something else.

According to a 2013 survey conducted by Rutgers University's William Hallman on Americans' understanding of and attitudes toward GMOs, many who do not know what GMOs are still have opinions on them.<sup>6</sup> In fact, one in four people who took the survey were not even aware of the existence of GMOs, yet, as Hallman stressed, "being uninformed doesn't stand in the way of having an opinion."<sup>6</sup> Hallman's findings are to some degree consistent with my personal experiences teaching the high school students, as one student repeatedly insisted on interrupting the lesson to call GM crops "Frankenstein crops" despite

my in-depth scientific coverage of the topic to the contrary. However, notes from a National Research Council workshop on the public's perception of GMOs state, in reference to Hallman's study, that "most of the uninformed opinions are not strongly held, so they are subject to change."<sup>6</sup> This revelation also provides hope, especially when paired with the fact that the data from this study indicates a clear desire among students to learn.

### *Section 2 - A Desire to Learn*

Not only did the data indicate that students are interested in learning more about food systems, this interest increased after the food system lesson. Contrary to the notion that people will only choose to learn more about a topic if they already care about it, it seems that knowledge is capable of motivating interest. Lessons can introduce, intrigue, and inspire. Even for the students who already cared about food system issues, the presentation brought the discussions surrounding these issues to the front of their mind. Such discussions must be ongoing, or caring will never grow enough to lead to action. Since these food system discussions are so important, and since students evidently want to continue participating in them, it is clearly time to reevaluate the long outdated high school curriculum.

The core subjects taught in American high schools are English, math, science, history, foreign language, literature, art, technology, health, and civics.<sup>7</sup> If food system education were to be included in the mix, it would probably most smoothly be incorporated into the biology curriculum. Biology, one of the three hard sciences, would be a good home for food system education because learning about food systems involves many of the branches of biology: botany, ecology, evolutionary biology, biochemistry, genetics, and more. Additionally, by placing biology into its urgent modern context, teachers are able to make the subject more

engaging, more applicable, and more important in the minds of students. The combination of biology education with food system education can benefit both subjects. Most high school students who are taught biology in the context of food production develop an appreciation for agriculture from a scientific standpoint as well as a societal one.<sup>8</sup>

But why should the already crowded and coveted curriculum space make room for food system education, of all of the suggestions that people have been fighting for? Students' time is valuable. Everyone and their local legislator would like a piece of it, because what students spend their time studying in many ways maps out the world's future. Multiple mathematicians would love to see students' greater engagement with math, while some English enthusiasts dream that students would learn to diagram sentences. STEM educators claim that their fields are the most helpful to humanity, liberal arts educators contend that their fields are the most meaningful, and a slew of other subjects that fall through the cracks have to nudge their way into the school system because students "need to learn them."

But people can't be expected to learn everything. Although there is great value to every field of study, public school only lasts for thirteen years. And not every person should be expected to become an expert, or even a novice, in every field. To maximize the unique potential of each person, the education system should encourage people to focus on what they are interested in and what allows them to offer the world what they have to contribute. To continue to draw up an increasingly specific curriculum meant to suit all students is to restrict their individuality, their freedom, and their ability to improve the world.

But food is the exception.



Yes, I dare suggest that food system education does indeed belong in the curriculum, at least as much as math or history do. Eating is not just an interest, a matter of personal taste. We all eat. We have to. And so long as we all eat, we should all have a basic awareness of the issues that surround this universal practice. What I am arguing for is general knowledge. If food system education is implemented at the high school level or earlier, then we can dilute the effects of the corrupt corporations that lobby to keep consumers in the dark about what they consume. Democracy crumbles in a society forced into ignorance. The voices of the people are silenced, without them ever realizing it, by the powerful few who repeatedly get away with telling the susceptible many how to think. To get students' attention, one of the first slides in my presentation read, "Everyone is manipulating you. Knowledge is your only defense." Thankfully, the data presented in this study have demonstrated that students are interested in learning about these matters that so greatly affect them and their world. And if some students find themselves rather unmoved by any new food system knowledge they gain, they have that right. They can go on and fight their own fight. But other students can have their world changed and in turn themselves change the world as a result of food system education, given the opportunity.

They should have that opportunity.

When asked if they would like to take a class on food systems, 50% of high school students said "absolutely." And after just one introductory lesson, that number jumped to over 60%. The interest is there, and so is the need--desperately so. I propose that schools make efforts to at the very least offer food system education to high school students as an elective, and offer more chances for students to learn about every part of the food

system--not just the consumption aspect--by way of outdoor classes, school gardens, and more. How else would humans who no longer personally farm the land for survival learn of its ways? Those who do not learn the ways of the land might find themselves imposing their own, and only fools believe that humans are the ones who control nature. Agroecologists and peace activists both can agree: it is better to learn about this world than to fight it.

### *Section 3 - Future Studies*

During the food system presentation, I asked the class to raise their hands if they kept a garden. When half of the hands went up, I found myself wishing I had thought to ask this question on the survey. For urban and suburban students, gardening might be the closest connection they have to the production side of the food system. Since the data revealed that students most commonly get their information about the food they eat from family/friends, it is possible that home gardens serve as learning tools, students' only consistent interaction with soil and what it bears. Future research on food system awareness should look into urban and suburban high school students' experience with gardening.

But rural populations should certainly not be overlooked; another interesting topic to be explored in future studies is the farming background of the sample population. The subjects surveyed for this study were suburban students living in a small city. It is rare for a Portsmouth High School student to have an agricultural background. But there are high schools that service rural farming communities, high schools with agriculture included in the curriculum, not to mention agricultural high schools. If the survey designed for this study were to be given to the students of an agricultural high school, farmers themselves, how

would the results differ? Do students who have grown up on a farm tend to know more about food system issues because they are producers, or would we still find a disconnect?

It would be very fascinating to find out.

Agricultural communities face unique challenges when it comes to food system education. For some schools that already teach agriculture, the next step is to teach sustainable agriculture. David L. Williams of Iowa State University argues for precisely this addition to high schools' agriculture curriculum, so as to produce a new generation of farmers that heal the environment rather than destroying it.<sup>9</sup> However, he writes that in order to make the most of changes to the curriculum, more "research is needed to show the way."<sup>9</sup> How should courses on food systems be taught? Should teachers emphasize the scientific aspects, or the varying perspectives in society? Is field experience the most effective way to learn, or is class discussion more engaging? How much food system education is needed for students to gain a solid understanding of the current food system discussions?

There are many answers to discover.

## Conclusion

There is an amusing irony present in our refusal to update our education system: many schools have yet to offer food system education because the need for such an education is a modern one, while students are still let out for the summer because the education system has not yet been revised from when, as Kingsolver writes, "... this arrangement was devised to free up children's labor when it was needed on the farm."<sup>1</sup> In

other words, schools are too behind to offer students an education in agriculture, but also so behind that they have yet to update the agricultural scheduling of the school year.

Students today don't know much about their food system. They don't know much about how we have been killing the soil and the bees and the small family farms and ourselves. But they want to. If we give them what they want, we legislators and educators and parents and friends, then we can rebuild the bridge between ourselves and the matter that we put into our bodies daily, the bridge that government subsidies and corporate lobbying have been destroying for the past century. If we give students what they want, we can finally restore balance to nature, and the dignity of food sovereignty to ourselves.

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# Survey on Food System Education Among High School Students

Yussra MT Ebrahim

2015-2016

:o)

- 1) What class are you in?
  - a) level 3 sophomore biology
  - b) level 4 sophomore biology (college prep)
  
- 2) On a scale from 1 to 5, how interested are you in biology?  
(1 = uninterested, 5 = very interested)
  
- 3) How much do you care about where your food comes from?
  - a) it's one of my top priorities
  - b) I'm definitely curious about it
  - c) I tend not to think about it too often
  - d) I'm indifferent
  
- 4) What does the acronym "GMO" stand for?
  
- 5) What are GMOs? (Choose the most accurate answer to the best of your knowledge.)
  - a) foods that are processed in laboratories/factories
  - b) lifeforms that contain a portion of genetic code from a different species
  - c) crops that have been crossbred with crops of other species
  - d) crops that are not organic
  - e) I don't know
  
- 6) With regards to food production, what does "organic" mean?

- 7) How informative is the terminology used on food packages?
- a) almost all food packages display some degree of false advertising
  - b) some terms are meaningless or even misleading, while others are carefully regulated and reveal useful information about how a food was produced
  - c) all food packages are reliable, because it's illegal for a company to mislead consumers about the products it sells in the United States
- 8) Which of the following best describes you?
- a) omnivore
  - b) vegetarian
  - c) vegan
- 9) If you chose b or c for #9, why?
- a) animal treatment concerns
  - b) environmental concerns
  - c) health concerns
  - d) other:
- 10) What is your opinion of large-scale animal farming?
- 11) With regards to food production, how would you define "sustainability"?

12) Fill out the following table by checking one box per row.

<u>Topic</u>	<u>unfamiliar with it</u>	<u>heard of it</u>	<u>participate(d) in it</u>
Farmers' Markets			
CSAs			
Slow Food			

13) Where did you learn the information you know about the food you eat? Rank the six sources of information below from 1 (the most informative) to 6 (the least informative).

farms

family/friends

school

online

food packages

advertisements

14) If Portsmouth High School offered a course on the food you eat and where it comes from, would you be interested in taking it?

- a) absolutely
- b) only if it counted toward a required credit of some kind
- c) I'd rather not