Seed to Sale: Microgreens as a Model for Teaching Crop Production and Marketing

Colby Gregg

200 Agricultural Administration Building
2021 Fyffe Road
Columbus, OH 43210

(580)678-9577

Gregg.186@osu.edu

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Introduction

One urban School Based Agricultural Education (SBAE) program. Twelve students. One nervous (but excited) teacher. A crop production class the likes of which this school had never seen before.

This was my experience in the Spring of 2019. I had a room of students excited to take a class that I had not so much as dreamed of teaching before. Yes, I had a classroom, but I mainly taught animal science. Yes, I had a greenhouse, but it was tiny and barely fit our Poinsettia crop in the fall. How could I best make use of my time with these city kids with only 18 weeks to teach them about the entire cycle of crop production? After spending my winter break gathering inspiration, I found my answer: Microgreens.

A relatively new classification of crop, microgreens are young vegetable plants that are sold at or before their first true leaf stage, including every part of the plant above the root (Treadwell et al., 2013). It is extremely important to note the difference between microgreens and sprouts, the latter of which is typically harvested *with* the root and has been linked to several foodborne illness outbreaks in the United States (Center for Food Safety and Applied Nutrition, 2019). While sprouts do offer a significantly quicker turnaround from sowing to harvest than microgreens, the warm, high moisture environment introduces additional pathogen hazards that should be avoided in non-commercial environments (Center for Food Safety and Applied Nutrition, 2019). This can make this process seem daunting, but microgreens are a window into crop production that not only keeps with current trends in the food industry, but also provides massive potential to serve as a tool to engage the general public in food production and add vital nutrients into consumers' diets (Kyriacou et al., 2016).

How it works

Growing microgreens is a process that can be as diverse as agriculture itself. The semester started by bringing the students together to brainstorm how they would operate a full seed-to-sale program. After two weeks of lessons on business planning and a general overview of crop production, the group chose a microgreen crop to start the process with and materials were ordered. Within the third week of the semester, students each had a very basic draft of a crop production plan, a flat of sown microgreen seeds, and a data collection process that would allow the students to record the variables they chose in cultivation process.

For two weeks, students were responsible in the first 5-10 minutes of class to maintain their crop and record their chosen variables. When the crops were 'fully' grown, students were taught the processes of harvesting, washing, packaging, and consumer testing for the crops. After a class discussion, the students were then instructed to revise their crop production plan and data collection sheets for the next cycle. This process was repeated, and students were instructed to revise their plans after each cycle.

Results to Date

By many metrics, this project could be considered a success. Students loved the real-world application of planning and observing their crops through the entire process from seed to sale. The class as a whole also showed continuous reflection and growth over the semester in

working both independently and collaboratively to create the best possible product. Within the 18-week time frame, all students completed at least five cycles of microgreens, with the highest achieving students completing up to eight. In the process, the teacher worked alongside the students and maintained eight additional "class" flats of microgreens. Through these flats, the instructor was able to provide students a glimpse of the diversity of species and products that could be the result of this production method. The SBAE program was also able to forge a relationship with the school's Culinary Arts classes to provide these microgreens as ingredients to be used in their "Salads and Vegetables" unit assessments.

Future Plans/Advice to Others

For this project, future plans would include developing a curriculum guide that directly ties crop production with microgreens as a model for use in high school classrooms. This curriculum could potentially be implemented not only in SBAE classrooms, but Biology, Botany, and Family and Consumer Science (previously known as Home Economics) classrooms as well. This would also be an exciting professional development workshop for SBAE teachers, especially for those in urban areas or with shorter class lengths than the traditional school year.

Through my experience with this activity, the advice I would give to others is:

1. *Provide student autonomy.* This project gives an opportunity for the SBAE teacher to provide students with ownership in their learning activities, particularly in the planning and evaluation processes.
2. *Implement this as a rotating activity.* The short timeframe of "seed to sale" microgreens allows teachers to implement a full project rotation every two weeks for the semester. With some creativity, this can be implemented as a learning tool for most, if not all, units in a traditional horticulture class.
3. *Remember Kolb!* With SBAE teachers' training in Kolb's experiential learning cycle (1984), this is the perfect opportunity for teachers to practice facilitating this cycle of Experience → Reflection → Abstraction → Experimentation. Particularly if this project is carried out multiple times!
4. *Have fun with it.* Teachers and students have the agency to fashion this project to their unique circumstances. This is also a good model to implement teaching the scientific method with measurable questions. What will happen if you grow microgreens indoor vs. outdoor? Do fertilizers have effects on microgreen crops? Will people be 'weirded out' by this? (Yes, they will be.)

Costs/Resources Needed

In total, for 12 students, the cost was approximately $144.42 for the semester. A breakdown of the associated costs can be found below in Table 1; note that this summary does not include the cost for an optimum growing space or basic utilities. Compared to traditional plant production, this project takes up a small surface area and can be facilitated in a variety of environments: from existing greenhouse table space (optimal) to indoor spaces without natural sunlight (less than ideal). Quantities and prices are based on the author's experience, assuming tax exempt status, free shipping, and planning for a class size of 12 students. There are potential opportunities for programs to sell microgreen product, but the program should be sure to follow local food production laws and school policies.

Table 1

Costs associated with the "Seed to Sale" Microgreen project.

Item	Unit	Price	Qty.	Total
1020 planter tray, Mega Heavy Duty[a]	10/pack	24.99	2	49.98
Pro Mix Premium All-Purpose Mix Potting Soil[b]	2 cu. ft.	13.97	2	27.94
'Mild Micro Mix' – Organic Microgreen *Brassica spp.* Seed[c]	1 lb.	66.5	1	66.50
Total (for 12 students)				144.42

[a]Sourced from Greenhousemegastore.com. [b]Sourced from Home Depot. [c]Sourced from Johnny's Selected Seeds

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