

Collaborating on an Accessible Cover Crop Curriculum

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Introduction

In the US alone, over 600,000 youth under age 18 are blind or have low vision (US Census Bureau, 2022). Unfortunately, these students are often left out of STEM/STEAM courses due to the extensive use of inaccessible content or materials (Bell & Silverman, 2019; Yalçin & Kamali Arslantas, 2020). Key access barriers include inaccessible technologies (e.g., sight-specific measurement tools or web-based tools that are not compliant with the Web Content Accessibility Guidelines), spatial information presented exclusively in visual formats (e.g., figures or maps), and exclusion from critical laboratory learning. Like sighted students, blind/low-vision students benefit from learning in a variety of modalities. Therefore, curricular materials should support learning modalities that are interactive and do not presuppose that students are sighted.

The 4-H Cover Crop Science Project Book was piloted and first adopted in Illinois but was always intended for a national audience. The 9-module curriculum was developed through collaborations between subject matter experts, formal and informal educators, a STEM accessibility expert, and preservice teachers of blind/low-vision students.



Procedure

Modules were:

- 1) written by faculty
- 2) revised by a STEM education specialist
- 3) reviewed by subject matter experts
- 4) piloted in informal education settings by pre-service teachers in ag. and biology
- 5) revised by a STEM education specialist, with a Facilitator's Guide added.
- 6) re-reviewed by subject matter experts
- 7) made accessible by pre-service teachers of blind/low-vision students
- 8) reviewed by members of the blind community
- 9) peer-reviewed by National 4-H

This collaborative procedure focused on developing a research-based curriculum, leveraging expertise in content, pedagogy, and accessibility throughout an iterative design process.

In order to validate the accessibility work for this curriculum, further reviews by the blind community are ongoing.

Costs associated with this work were primarily for time and effort. The methods described here could be accomplished by most organizations, even on a small budget. To offer learning materials of the best possible quality, we did choose to have a professional Braille transcription of the full curriculum (~\$250) and a professional tactile graphic for a calendar activity (~\$100).

Outcomes

In addition to a quality, research-based curriculum, this project provided opportunities for pre-service teachers to pilot lessons and for pre-service teachers of blind/low vision students to practice making STEM curricula accessible, including:

- reformatting digital documents for compatibility with access technology (e.g., screen readers or Braille displays)
- preparing files for Braille embossing
- creating tactile graphics (i.e., images intended for reading by touch).

The finished curriculum includes 9 modules in areas ranging from agronomy and earth science to economics and engineering.

How are Cover Crops Grown & Developed?

- Module 1A: A Plant Primer
What do flower parts tell us about plants?
- Module 1B: Cover Crops in the Rotation
How do cover crops fit between cash crops?
- Module 1C: Planting & Harvesting
Why do we build different farm machines?
- Module 1D: Natural & Artificial Selection
What do we do to improve crops over time?
- Module 1E: Gene Editing
How can we accelerate artificial selection?

What are the Benefits of Cover Crops?

- Module 2A: Reducing Soil Erosion
How do we keep land healthy?
- Module 2B: Pollinator Services
Which pollinators might we see in our field?
- Module 2C: Cover Crop Products
What can we make from cover crops?
- Module 2D: Crop Product Supply Chains
What happens to a crop after harvest?

Facilitator's Guide

Advice to Others

This was a great opportunity for all involved. Pre-service teacher participants expressed special appreciation for engagement in authentic work and enabling that work to serve a broader audience.

We would encourage all curriculum developers to consult with nonvisual accessibility experts and to reimburse these experts for their time when possible.

We would likewise encourage curriculum developers to include members of the blind/low-vision community in the development of accessible curricula.

Finally, we would encourage faculty who prepare teachers of blind/low-vision students to pursue collaborative projects such as the one described here.

We need to get more blind/low-vision students engaged in STEAM, and the only way to do that is to give them positive STEAM learning experiences throughout their educational journey!

References

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