Innovative Idea

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.

Methodology

The 10 modules in the original curriculum used leading-edge cover crop science to introduce national middle school learning standards in STEAM subjects. Modules were written by faculty before being rewritten at a fifth-grade reading level by the first author, a STEAM education specialist. Revised materials were reviewed by the curriculum authors and additional subject matter experts (i.e., researchers specializing in agronomy, economics, genetics, and other fields).

The modules were piloted in informal education settings (including 4-H, library, and summer school programs) in cooperation with three undergraduate students in agriculture or biology teacher education programs before being revised, reviewed again, and re-piloted. The final curriculum saw two modules dropped and one added to better tell a single narrative about the past, present, and future of cover crop science.

The authors then collaborated with the preservice teachers enrolled in an access technology course to make 4 of the 9 modules from the final curriculum fully accessible to blind/low-vision students. Due to the small class size, this team was unable to revise all 9 modules. Consequently, the group prioritized the modules that would present the most barriers, maximizing the impact of the work and facilitating critical learning opportunities for the preservice teachers: creating tactile graphics and transcribing STEAM worksheets into Braille.

The team used the five principles of blind STEM pedagogy (Shaheen, 2023) to evaluate the accessibility of each module and determine what remediation work was required. To make the modules accessible, the group reformatted the digital documents to ensure compatibility with access technology (e.g., screen readers or refreshable Braille displays), prepared files for embossing hard copy Braille, and created tactile graphics (i.e., images intended for reading by

touch). Finally, the class wrote a nonvisual accessibility appendix explaining how to teach the curriculum. This appendix will be integrated into the project book's Facilitator's Guide.

The first author and a small team then worked with the second author's assistance to make the remaining 5 modules accessible.

Results to Date

Curriculum changes were reviewed by members of the blind community, including the second author and a blind youth. Furthers reviews by the blind community are ongoing.

The curriculum is currently available free of charge at Shop4-h.org as an Illinois-approved and national peer-reviewed curriculum.

Advice to Others

This experience showed us the power of collaboration and the value of using real-world projects to engage preservice teachers of blind/low-vision students in the process of making curricula more accessible. This collaborative project enabled preservice teachers to practice the skills they will perform as professionals while also making a lasting impact on a national stage.

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.

Costs

Costs associated with this work were primarily for time and effort spent on the project. A few consumable materials were used in the design and revision process by the authors of the curriculum and the preservice teachers, but the methods described here could be accomplished by most organizations, even with a small budget.

The one task we could not have completed without professional services was the final Braille transcription (cost: apprimately $250 for setup and 2 hard copies). Although students were able to complete draft transcriptions using the free BrailleBlaster™ software, we hired a certified Braille transcriber to complete the final transcription. This enabled us to offer learning materials of the best possible quality.

References

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