Preparing SBAE Teachers to Support Scientific Literacy through Socio-Scientific Issues

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Introduction and Need for the Innovation

Public confidence in science is decreasing in the United States due to the spread of mis- and disinformation online (Herman et al., 2022). Misinformation (i.e., false or flawed information that is unintentionally spread) differs from disinformation, as the information is shared with the intent to manipulate or deceive (Herman et al., 2024). The ramification of decreased public trust in science has the potential to impact society in many negative ways but could especially harm the agriculture industry.

It could be argued that science teachers in American schools are responsible for developing scientifically literate adults. However, the opportunity to support scientific literacy in the school-based agricultural education (SBAE) classroom does exist. In today's era of fake news, the skillset required to evaluate scientific information is increasingly important, and educators' responsibility to teach these skills is more pressing than ever (Herman et al., 2024).

Socio-scientific issues are societal challenges that are both scientific and social (e.g., climate change, vaccination, genetically modified organisms) (Ewing & Sadler, 2020). Socio-scientific issues provide a clear and direct connection to the real world and challenge students because the issues are complex and often embedded in challenging systems (Ewing & Sadler, 2020). Because of their challenging and engaging nature, socio-scientific issues are effective tools for teaching scientific literacy skills to students (Zetterqvist & Bach, 2023).

Methodology

During the fall of 2023, a cohort of 17 teachers assembled for a three-credit professional development (PD) course on teaching socio-scientific issues using case studies. The cohort of teachers included seven SBAE teachers and ten science teachers. Two faculty members (one science education and one agricultural education) developed and led the professional development course. The fall semester's course comprised eight modules and four synchronous Zoom meetings. Each module included readings, recorded lectures, assignments, and quizzes. The modules covered the following topics: (1) Statistical Literacy; (2) Statistical Storytelling; (3) Evaluating Data Visualizations; (4) Nature of Science; (5) Claims, Comparisons, and Choices; (6) Autism and MMR Vaccination Case Study; (7) The Effects of Fungicides on Bumble Bee Colonies Case Study; and (8) Deep in the Weeds of Organic Farming Case Study.

Upon completing the course in the fall, teachers opted into a spring semester credit, during which they implemented their socio-scientific case study into their classrooms. To evaluate the course, a pre-and post-test was conducted in the fall of 2023, interviews were conducted with teachers at the end of the fall semester, and portfolios were collected and analyzed at the end of the spring semester.

Results and Implications

Of the seven SBAE teachers who started the course in the fall of 2023, five persisted until the end of the 2024 spring semester. Participant demographics are in Table 1. Upon reviewing interview transcripts, class assignments, and the final portfolio, the key themes that emerged

from the SBAE teachers were: (1) SBAE teachers are ***not*** science teachers, and (2) Expanding their Teaching Toolbox.

Table 1

Participant Demographics

Participant	Gender	Certification	Years of Agriculture Teaching Experience
1	Female	Traditional	11
2	Male	Traditional	8
3	Male	Traditional	25
4	Female	Traditional	13
5	Male	Traditional	1

Theme 1 – SBAE teachers are not science teachers

The SBAE teachers who participated in this course expressed a strong interest in integrating science concepts into the SBAE classroom. The instruction of scientific content knowledge fits in every SBAE pathway. Interestingly, the data supported that SBAE teachers have scientific content knowledge but lack science pedagogical content knowledge (PCK). SBAE teachers lack the science education pedagogical training that the science teachers received. Thus, the SBAE teachers did feel a bit in the dark during the PD course. If the PD intends for SBAE teachers to foster science literacy, additional instruction in science methods is justified, based on the feedback of these five SBAE teachers.

Theme 2 – Expanding Their Teacher Toolbox

Though the SBAE teachers lacked the confidence to teach the Nature of Science due to a lack of science PCK, they greatly valued learning specific teaching tools to help improve their instruction of science concepts. For example, teachers appreciated learning to read misleading graphs and were excited to use those instructional materials with their students. They also expressed interest in using the socio-scientific case studies in their future SBAE courses.

Future Plans and Advice to Others

Indeed, there is value in having SBAE teachers address socio-scientific issues in their classrooms, but they must have the skills needed to teach challenging scientific content appropriately. It was clear that SBAE teachers were at much different places than science teachers when it came to having the PCK of science education to fully understand the intricacies of the PD course in which they engaged. In the future, we recommend that SBAE teachers be introduced to concepts related to the Nature of Science or skills and that strategies for teaching socio-scientific issues be more heavily scaffolded. These strategies could be covered in short workshops or professional development courses differentiated for teachers with various levels of experience teaching the Nature of Science. Additionally, a clear focus on the teaching strategies and skills needed to teach scientific literacy was well-received by teachers and is recommended in the future.

References

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