

Teaching Science through Agriculture: Answering the “Where?”

Catlin M. Pauley
Michigan State University

Aaron J. McKim
Michigan State University

R. Bud Mckendree
Michigan State University

Catlin Pauley
480 Wilson Road, Room 131
East Lansing, MI 48824
(517) 432-0318
pauleyca@msu.edu

Teaching Science through Agriculture: Answering the “Where?”

Introduction

Since its conception, school-based agricultural education (SBAE) has evolved with the demands of society, alternating focus between periods of vocational preparation and agricultural science (McKim, Velez, Lambert, & Balschweid, 2017). Today, societal calls for increased science content throughout education (NAE & NRC, 2014), paired with the preparation of qualified graduates to fill an expected 15,500 annual openings in science, technology, engineering, and mathematics (STEM) careers in agricultural industries (NIFA, 2015), have centered the focus of SBAE on agricultural science. Furthermore, calls for diversity within classrooms and workplaces (National Research Council, 2009; Roberts, Harder, & Brashears, 2016) have spurred the growth of SBAE in suburban and urban communities, encouraging students with diverse experiences and ideas to consider agricultural science careers.

The evolution of SBAE has resulted in a landscape emphasizing science within SBAE curriculum (Wilson & Curry Jr., 2011) and the development of suburban and urban SBAE programs (Esters & Bowen, 2004). However, little is known of the relationship between the science taught within SBAE programs and the type of community (i.e., rural, suburban, urban) in which the program is located. The acquisition of such knowledge may illuminate opportunities to strengthen access to interdisciplinary science and agriculture learning across the landscape of SBAE programs. Thus, the purpose of this research is to examine the relationship between school community type and intentions to teach science within SBAE curriculum.

Methods

As part of a larger research project, data were collected from a random sample of SBAE teachers in the United States during the 2015-2016 school year. Initially, the sample frame was 950 teachers; however, due to frame error (e.g., incorrect email addresses), the useable frame was reduced to 830 SBAE teachers. A total of 212 completed surveys were returned (i.e., response rate = 25.60%) via a maximum of five email requests to complete the survey. To evaluate non-response bias (Lindner, Murphy, & Briers, 2001; Miller & Smith, 1983), on-time respondents ($n = 168$) were compared to late responders ($n = 44$) within the variables of community type and science teaching intentions. A lack of statistically significant differences suggested no evidence of non-response bias (Lindner et al., 2001; Miller & Smith, 1983).

Two components of the data collection instrument are salient to the current study. First, respondents were asked to self-identify teaching within a rural, suburban, or urban community. Second, within eleven curricular offerings (i.e., eight career pathways, General Agriculture courses, FFA, and SAE), respondents were asked to identify the percentage of curriculum that met the following definition, “purposeful inclusion of grade appropriate science (e.g. physical science, life sciences, and earth/space sciences) concepts and/or practices.” Analysis of the data resulted in an average intention to teach science within the 11 curricular offerings. These data are reported for rural, suburban, and urban teachers along with rankings, allowing comparisons of science content intended within SBAE programs located across community types.

Findings

Comparison of science teaching intentions by community type revealed teachers of all community types intended to teach science in nearly 50 percent of their top four pathways (see Table 1). Results show consistency amongst rankings of the top two pathways of suburban and urban teachers (i.e., animal systems and plant science systems); whereas, rural teachers intended to teach the most science within plant science systems and biotechnology systems. Comparisons also revealed teachers of urban communities intended to teach less science than their rural and suburban teaching peers in eight of the eleven curricular offerings, while suburban teachers intended to teach the most science in all pathways, with the exception of agribusiness systems.

Table 1

Comparing Intentions to Teach Science among Rural, Suburban, and Urban Teachers

Pathway	Rural		Suburban		Urban	
	Rank	Mean	Rank	Mean	Rank	Mean
Plant Science Systems	1	56.84	2	59.84	2	53.93
Biotechnology Systems	2	55.50	3	55.63	4	49.29
Animal Systems	3	54.31	1	61.13	1	55.00
Environmental Service Systems	4	53.00	5	53.89	5	46.25
Natural Resource Systems	5	50.99	4	55.21	3	49.50
Food Products and Processing Systems	6	48.21	6	50.33	6	43.13
General Agriculture	7	41.31	7	50.30	7	40.71
Power, Structure, and Technology	8	28.97	8	32.25	8	28.75
SAE	9	25.65	9	27.23	9	24.62
Agribusiness Systems	10	17.78	11	16.25	10	23.33
FFA	11	17.00	10	19.88	11	17.50

Note: Means represent average science teaching intentions within curriculum.

Discussion, Implications, and Conclusions

The purpose of this study was to examine the relationship between school community type and intentions to teach science within SBAE curriculum. Findings support the trend of emphasizing science within SBAE curriculum (McKim et al., 2017; Wilson & Curry Jr., 2011), especially in plant science, animal science, and biotechnology systems. However, the balance of science teaching intentions appears skewed across community types, illustrating urban SBAE students may not be afforded the same level of interdisciplinary science and agriculture learning as their rural or suburban peers. Thus, an opportunity is presented to the entire SBAE community to increase intentions to teach science in urban SBAE programs. The potential to encourage a broader range of students who are interested, and prepared to succeed, in science, SBAE, and agricultural careers compels our collective efforts.

References

- Esters, L. T., Bowen, B. E. (2004). Factors influencing enrollment in an urban agricultural education program. *Journal of Career and Technical Education*, 21(1), 25-37. <http://dx.doi.org/10.21061/jcte.v21i1.645>
- Lindner, J. R., Murphy, T. H., & Briers, G. E. (2001). Handling nonresponse in social science research. *Journal of Agricultural Education*, 42(4), 43-53. doi: 10.5032/jae.2001.04043
- McKim, A. J., Velez, J. J., Lambert, M. D., & Balschweid, M. A. (2017). A philosophical review of science and society within agricultural education. *Journal of Agricultural Education*, 58(2), 98-110. doi: 10.5032/jae.2017.02098
- Miller, L. E., & Smith, K. L. (1983). Handling non-response issues. *Journal of Extension*, 21(5), 45-50.
- National Academy of Engineering (NAE) and National Research Council (NRC). 2014. *STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/18612>.
- National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform*. Washington D.C.: United States Department of Education.
- National Research Council (2009). *Transforming agricultural education for a changing world*. Washington, DC: The National Academies Press.
- National Institute of Food and Agriculture (NIFA). (2015). *Employment Opportunities for College Graduates in Food, Agriculture, Renewable Natural Resources, and the Environment, United States, 2015-2020*. USDA, National Institute of Food and Agriculture (Award No. 14-38837-22371). Retrieved from <https://www.purdue.edu/usda/employment/>.
- Roberts, T. G., Harder, A., & Brashears, M. T. (Eds). (2016). *American Association for Agricultural Education national research agenda: 2016-2020*. Gainesville, FL: Department of Agricultural Education and Communication.
- Wilson, E. B., & Curry Jr., K. W. (2011). Outcomes of integrated agriscience processes: A synthesis of research. *Journal of Agricultural Education*, 52(3), 136-147. doi: 10.5032/jae.2011.03136