Preliminary Investigations into Agricultural Teachers’ Views of Sustainable Practices

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This presentation is based upon work supported by the National Science Foundation Graduate Research Fellowship Program. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
Problem and Purpose of Study

- **Problem**: as a whole, rural populations are more likely to be dismissive of efforts to adopt more sustainable practices than other populations.

- **Purpose of Study**: determining the extent to which the instructional model of agriscience education may be useful for increasing the adoption of sustainable knowledge and practice among rural students.

  This is a precursor to a larger design-based research project for developing a national sustainability agriscience curriculum.
Personal Background

- Agricultural Experience
- Teaching Experience
- National Agricultural Education Policy Experience
  - National AFNR Academic Standards
  - SAE Renewal National Taskforce
- NSF Graduate Research Fellow
Rural Americans comprise less than 20% of the total US population. However, they manage 97% of the land area in the United States (US Census Bureau, 2016)*. Rural Americans tend to be less supportive of efforts to improve sustainability compared to the national average. This is particularly true among farmers and other agriculturalists. The ag industry has vigorously supported environmental deregulation (Copeland, 2017). Only 10% of farmers believe that climate change is both occurring and due to human activity (Prokopy, 2014; Arbuckle, et al., 2015).

*The US Census Bureau defines a rural area as population or region outside of an urban area (a population center of 50,000+.
Many modern agricultural practices are currently unsustainable.

- Excess soil tillage degrades soil structural integrity and unnecessarily depletes soil nutrients (UNL, 2015).
- Current agricultural practices are the leading cause of impairment to rivers and streams (CDC, 2016).
- Rates of soil erosion are ten times greater on average than the rate of soil replenishment (Trautmann, Porter, & Wagenet, 2012).
- Full utilization of the EPA’s Best Management Practices among American farms has been sparse (Mulla, Birr, Kitchen, & David, 2008).
American agriculturalists tend to believe that they know what is best for the stewardship of their own land and that their actions are in accordance with these needs.

Farmers and ranchers are particularly regulation-adverse and believe that government regulations are largely a form of overreach (Waskom & Cooper, 2017).

Farmers are also prone to dismissing scientific conclusions in regards to ag-based concerns about sustainability.

Many agriculturalists feel that they have a privileged personal connection to their land and ecosystem services and are dismissive of outside opinions.

Many view scientific recommendations for more sustainable practices as “just opinions” (Doll, 2017).
Identity is likely a current key barrier for increased adoption of more sustainable agricultural knowledge and practice.

Agriculturalists tend to perceive that calls for more sustainable practices come from uninformed non-rural populations that lack sufficient expertise to make accurate judgments about ag practices.

As such, they tend to dismiss these suggestions as misinformed and misguided.

Curriculum that privileges rural identities may be crucial for changing this dichotomy.

Instructional methods that utilize a student’s sense of identity as a part of various communities can result in more informed action and decision making as a citizen (Birmingham and Calabrese Barton, 2014).
Overview of Agricultural Education in the US

- Agricultural education may be a valuable opportunity to reach rural populations who are resistant to adopting more sustainable practices.

- Agricultural education in the US currently enrolls nearly a million secondary students per year primarily from rural areas (Jackman & Schescke, 2014).

- As the framework of secondary agricultural education, the Three Circle Model may be potentially valuable for the purposes of rural sustainability instruction.

- This model stipulates that students need authentic career-based learning experiences as part of their ag education experiences.

- This closely resembles situated learning theories such as Communities of Practice (Lave & Wenger, 1991).
Communities of Practice

- Lave and Wenger (1991) suggested that learning happens mostly in authentic informal interactions.
  - These interactions serve as a means for the improvement of specific practices.

- Lave & Wenger define learning as a change in identity as a student moves from being a novice to increasingly acquiring expertise in a specific community of practice.
  - When student identity is privileged during instruction, students are likely have “constructive, persistent, focused interactions” (Nasir & Hand, 2008) resulting in more robust learning outcomes.

- The situated career learning opportunities inherent in agricultural education may prove to be a valuable means for increasing the adoption of sustainable knowledge and practice among rural students.
  - Little data exists in regards to the use of this model for this purpose (Barrick, 2015).
For agricultural education to be effective for increasing the adoption of sustainable knowledge and practice, ag instructors would need to be...

- Informed and supportive of the adoption of more sustainable agricultural practices.
- Able to effectively utilize their existing community-based instructional methods for sustainability instruction.

**Research Questions:***

1. Do agricultural educators have a positive, evidence-based understanding of sustainability? (esp. ecological sustainability)
2. Do agricultural educators have an increased capacity for effectively utilizing a community-based instructional model due to the unique conditions that occur in ag education?
Methods

- Semi-structured interviews of 16 instructors of agriscience content from four states.
- Interviews consisted of nine questions.
  - Four questions focused on agricultural sustainability.
  - Five questions focused on use of situated learning and community-based instruction.
- Of the participants:
  - Eleven were fully licensed teachers.
  - Five were undergraduate student-teachers in their final two years of teacher education.
  - Ages ranged from early 20s to late 50s.
  - Ideological affiliation was evenly distributed across the political spectrum.
Data Analysis & Triangulation

- The interviews were transcribed and coded using Dedoose computer coding software.
  - Initially the transcripts were analyzed using descriptive codes based on parameters and guidelines established by AERA (2006) and Miles, et al. (2014).
  - These codes were assessed for inter-rater reliability.
    - Codes were revised and discrepancies were discussed until complete consensus was achieved.
  - Interviews were triangulated with both a follow-up surveys of interview participants to confirm findings as well as a separate non-scientific survey of the attitudes of 59 agriscience teachers in Wisconsin.
    - Results were consistent across all measures.
Findings – Participant Archetypes

- **Two archetypes became prevalent among the responses during the coding process.**

  - **Farmer Promoters** are most identified by their **defense of farmers and current farming practices.**
    - Praised work ethic of farmers.
    - One-sided arguments ("Of course GMOs are safe!").
    - Exclusive world views ("if other people saw what we saw, they'd think differently)

  - **Sustainable Reformers** are most identifiable by their **willingness to critique current farming practices.**
    - More nuanced positions ("GMOs can be safe...")
    - Used quantitative numerical data in their arguments.
Findings - Sustainability

- The frequency at which participant responses were coded as ‘Sustainable Reformer’ suggests that ag instructors are both well-informed and supportive of ecological sustainability.
  - These instructors often adopt stances that put them at odds with the general worldviews of farmers and other rural residents (even though they all had direct connections to farming).
- In particular, agricultural educators were concerned about...
  - The long-term impacts of existing agricultural practices on soil health and water quality.
  - The impact of climate change on food production.
  - Levels of meat consumption in industrialized countries.
  - Rates of food waste.
The stances on sustainability of agricultural instructors align more with the consensuses of scientific research than with the worldviews most commonly seen among rural populations.
While 66% of instructors in this survey believed that climate change was caused by human activity and was a threat to agriculture, only about 10% of farmers accept that climate change is both real and caused by humans.

Wenger (2000) suggests that a community of practice can evolve to adopt new knowledge and practice due to the involvement of individuals who are skillful in creating connections between different communities. Wenger uses the term “brokers” to describe these individuals.

Agricultural educators may be potential brokers of sustainable knowledge and practice in rural communities of practice. They have direct connections with community members, agricultural professionals, and secondary school students.
Findings – Community-based Instruction

- Use of community-based instructional practices was widespread among all interviewed participants.
  - This suggests that a community-based approach to sustainability instruction would be well-received among this audience.

- Career-based community-based learning in off-site locations resulted in reports of...
  - More impactful learning for students with longer-lasting effects.
  - Stronger student engagement in classroom content.
  - Greater trust in the instructor and the content they taught.

- Participants frequently mentioned their struggles to create more opportunities for community-based learning.
  - They actively sought assistance to increase these options, suggesting that curriculum for this purpose would be valuable.
Conclusion

- **These are potentially promising results.**
  - Ag instructors are much more positive and informed about ecological sustainability than initially expected.
  - The use of community-based instruction appears to be common and enables improvements to classroom trust & engagement.

- **Additional data collection and analysis is still needed.**
  - Why isn’t existing ag instruction more impactful?
  - Can an emphasis on scientific literacy enable more transformative worldviews among students?

- **These findings will be used to guide the development of an open-access community-based sustainability curriculum that will be made available to agricultural instructors for use in their programs.**
Thank you to...

- Advisor: Charles “Andy” Anderson
- Collaborator: May Lee
- Wisc. Association of Ag Educators
- All Teacher Participants

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