



Preliminary Investigations into Agricultural Teachers' Views of Sustainable Practices

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Problem and Purpose of Study

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- **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.



Photo Credit: C. Kohn

Personal Background

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- **Agricultural Experience**
- **Teaching Experience**
- **National Agricultural Education Policy Experience**
 - National AFNR Academic Standards
 - SAE Renewal National Taskforce
- **NSF Graduate Research Fellow**



Sustainability & Rural Populations

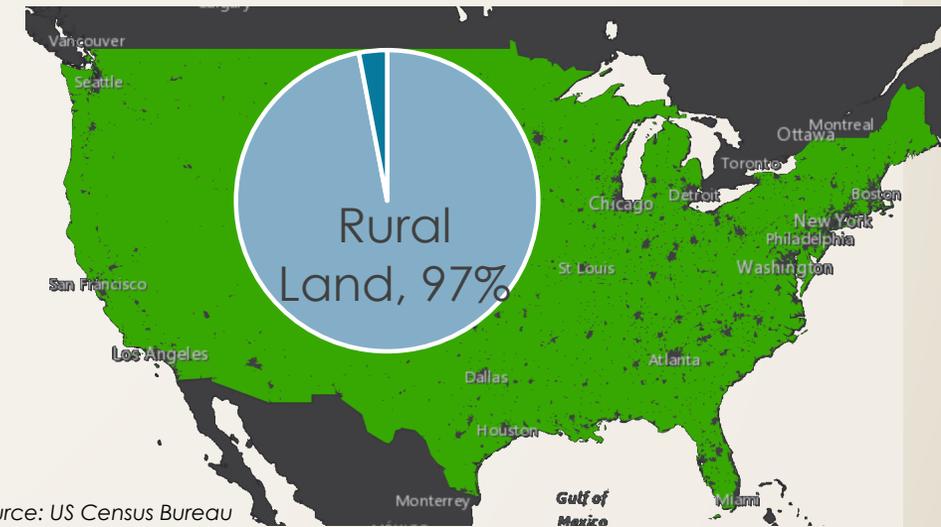
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➤ **Rural Americans comprise less than 20% of the total US population.**

- 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).



Source: US Census Bureau

*The US Census Bureau defines a rural area as population or region outside of an urban area (a population center of 50,000+).



Photo Credit: C. Kohn

Sustainability & Rural Populations

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➤ **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).



Sustainability & Rural Populations

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Photo Credit: C. Kohn

- **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).

Community-based Learning in Ag Ed

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Source: YouTube



Source: Four Paws and Whiskers

- 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).



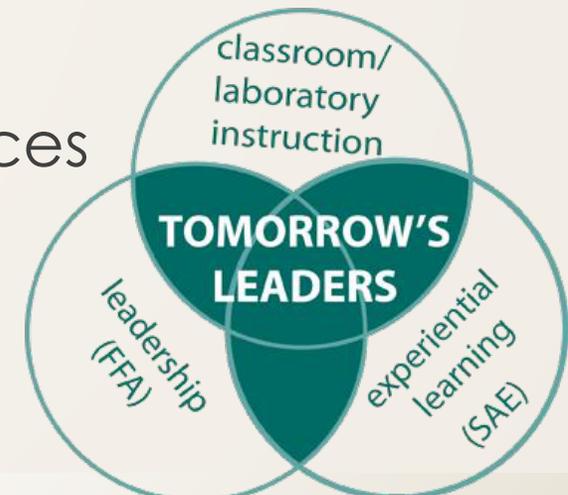
Source: Amazon



Overview of Agricultural Education in the US

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- **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).



Three Circle Model of Ag Education. (Source: NAAE)

Communities of Practice

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- **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).



Research Questions

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- **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

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- **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.



Source: WikiClipArt

Data Analysis & Triangulation

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- **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*

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➤ **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.

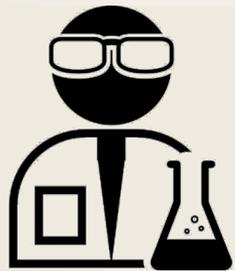
➤ One-sided arguments ("Of course GMOs are safe!").

➤ Exclusive worldviews ("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*

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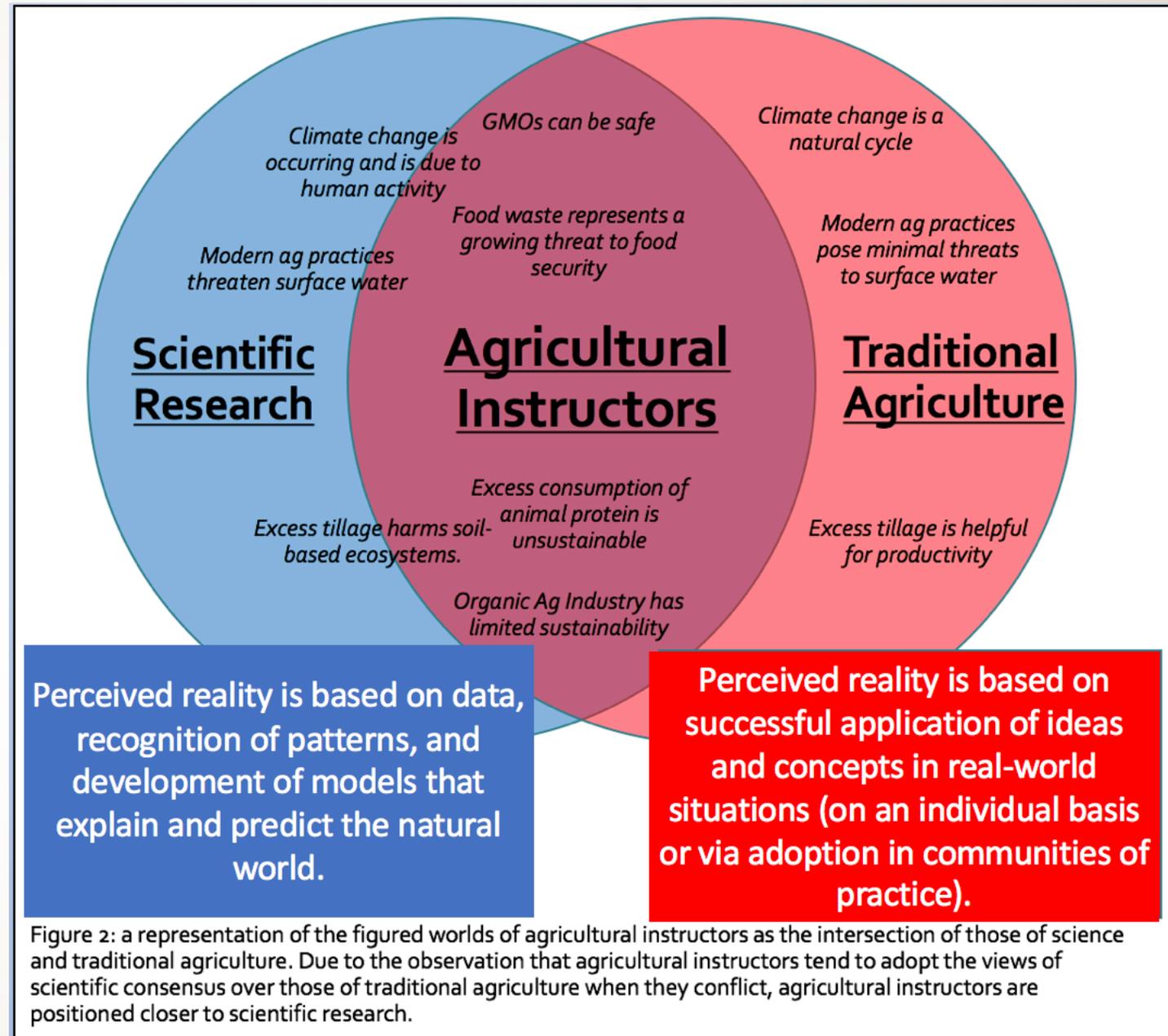
- **The frequency at which participant responses were coded as ‘Sustainable Reformer’ suggests that ag instructors are both well-informed and supportive of ecological sustainability.**
 - These instructors often adopt stances that put them at odds with the general worldviews of farmers and other rural 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.



Findings

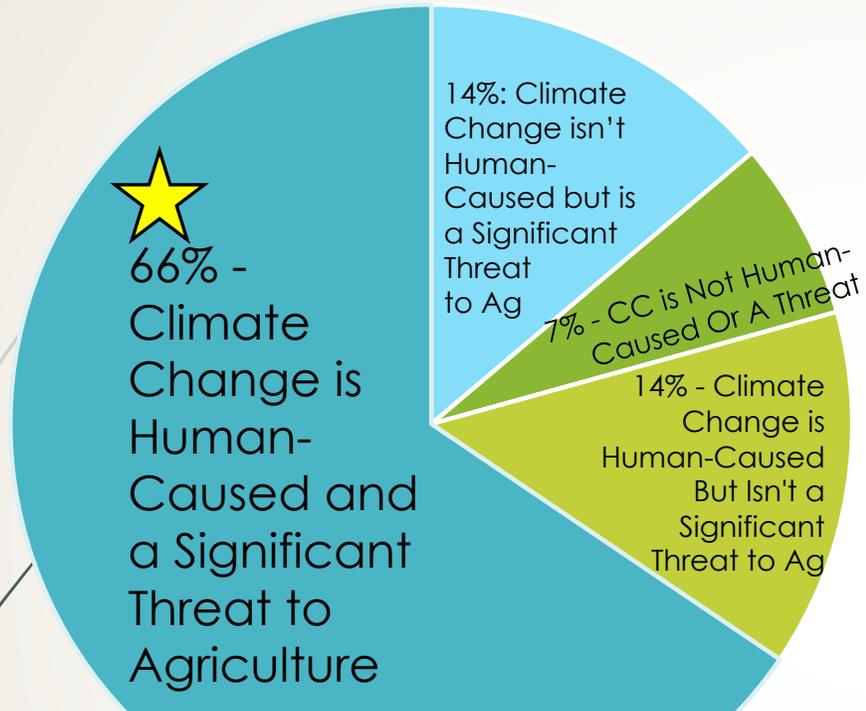
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- ➔ The stances on sustainability of agricultural instructors align more with the consensuses of scientific research than with the worldviews most commonly seen among rural populations.



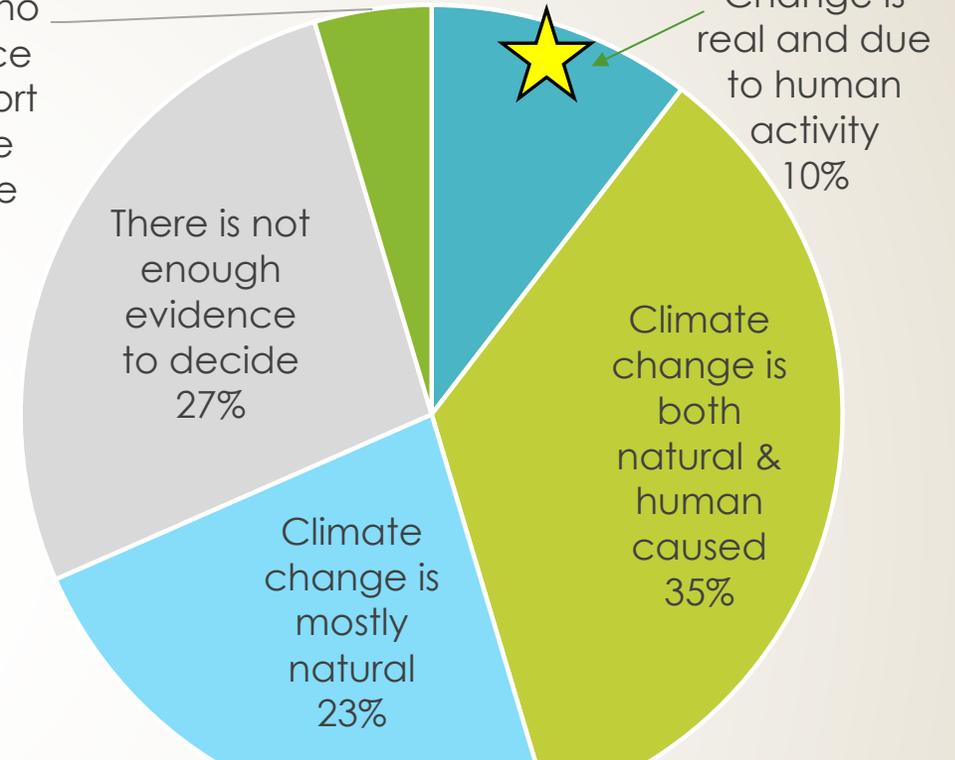
Central Tension of Rural Sustainability

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2017 Wisc. Agricultural Instructors
"Future of the Ag Industry" Survey

There is no evidence to support climate change 5%



2011 Iowa Farm & Rural Life Survey*

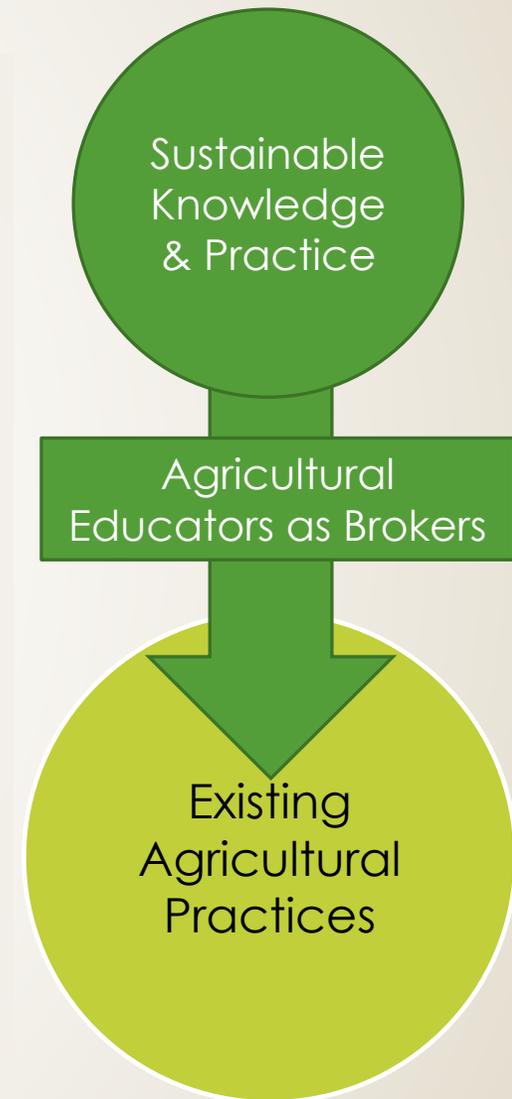
- ➔ While 66% of instructors in this survey believed that climate change was caused by human activity and was a threat to agriculture, only about 10% of farmers accept that climate change is both real and caused by humans.

*J. Gordon Arbuckle, J., Morton, L. W., & Hobbs, J. (2015). Understanding Farmer Perspectives on Climate Change Adaptation and Mitigation: The Roles of Trust in Sources of Climate Information, Climate Change Beliefs, and Perceived Risk. *Environment and Behavior*, 47(2), 205-234. <https://doi.org/10.1177/0013916513503832>

Ag Instructors as Brokers of Knowledge

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- **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*

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Photo Credit: C. Kohn



- **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 w/ 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

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- **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.**



Photo Credit: C. Kohn

➤ Thank you to...

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



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