Developing Agri-tudes: Evaluating a Pilot Agricultural Literacy Intervention

Introduction and Need for Research

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Introduction and Need for Research

Agricultural literacy describes the capacity of an individual to be able to demonstrate a clear conceptual understanding of agriculture, their ability to effectively communicate their agricultural understanding, and value the interconnected relationships within agricultural systems (Spielmaker et al., 2014), as well as demonstrate the ability to think critically (Meischen & Trexler, 2003), and make informed decisions (Kovar & Ball, 2013). Agricultural literacy is essential because it enables citizens to engage with agriculture, navigate its complexities, and make decisions that impact agriculture and broader society (NIMMS, 2024). However, many Americans lack agricultural literacy (Beierle & McKenna, 2024). The growing illiteracy has led to several significant adverse ripple effects. One area of agriculture that has faced particular scrutiny is livestock production. Research in this context highlights concerns related to production standards, the morality of animal products, and sustainability concerns (Dopelt et al., 2019). These topics often evoke strong emotions. This is unsurprising as agricultural literacy is shaped not only by an understanding of production and food systems but also by personal factors (Vallera & Bodzin, 2016). Despite the clear role of emotions in agricultural literacy (Spielmaker et al., 2014), this dimension remains poorly understood (NIMMS, 2024). The findings from this study will offer valuable insights into how an educational experience may be able to impact students' attitudes toward agriculture, contributing to the development of more agriculturally literate individuals.

Literature Review and Theoretical Framework

The NCAL Programmatic Logic Model identifies attitudes as a key outcome linked to agricultural literacy (Spielmaker et al., 2014). Attitudes are individuals' positive or negative emotional responses to actions or stimuli and key predictors of behavioral intent (Ajzen, 1991). Educational interventions, including agricultural literacy programs, can shape attitudes (Luan et al., 2022). Attitudes can be measured through multi-factor models comprising components such as affective (emotions or feelings), cognitive (beliefs or thoughts), and behavioral (past behaviors and future intentions) (Breckler, 1984). This study employs the multi-factor ABC (attitude, behavioral cognitive) Model of Attitudes (Breckler, 1984) as its theoretical framework, reflecting an individual's overall response to a particular object or concept (Phuong & Dung, 2022).

Methods

This quasi-experimental study evaluated pre- and post-surveys to assess the effectiveness of an 85-minute problem-based learning pilot conducted in spring 2024 with 78 first-year high school agricultural education students in northern Colorado. The group was selected through convenience sampling, utilizing the research team's connections with local agricultural education programs to facilitate implementation. The lesson was adapted from an eight-unit problem-based learning curriculum designed to enhance high school students' agricultural literacy regarding sustainability and animal agriculture.

Because no existing survey instrument adequately measured students' attitudes toward topics central to the curriculum, a new instrument was developed through a detailed, multi-step process during the spring of 2024. After each step, the instrument underwent rigorous revisions to refine its useability and reliability. Using the ABC model of Attitudes (Breckler, 1984) as the framework for the attitudinal survey question development, 10 survey items were carefully crafted to measure each

component of attitudes: affect (4), behavioral (3), and cognition (3). Each question was asked using a 7-point Likert scale ranging from strongly negative to strongly positive statements (Elangovan & Sundaravel, 2021).

Findings

Of the 78 student participants, 60 completed both surveys, resulting in a 76% completion rate for usable surveys. The research team transcribed responses into an Excel spreadsheet, assigning individual, anonymous participant codes. Subsequently, a codebook was generated. Next, the attitudinal data needed to be transformed for analysis; student responses were scored 1 through 7, and a mean score was created to represent the tendency of the participant's response to questions in that construct. These construct mean scores were then averaged to produce a summary mean score that represented their overall attitude score, with 1 representing a very negative attitude and 7 representing a very positive attitude. While Likert scale responses are technically ordinal and discrete, research commonly treats them as continuous (Leung, 2011).

Exploratory normality analyses in IBM SPSS, including histograms and Shapiro-Wilk tests, showed that transforming the data into mean scores resulted in a non-normal distribution (Sainani, 2012), a common challenge in Likert-scale instruments (Wu, 2007). Consequently, descriptive statistics for pre- and post-survey attitude scores were reported using median rather than mean. The pre-survey scores had a median of 4.8 (SD = 0.55), with an interquartile range (IQR) of 0.84, ranging from 4.4 to 5.2. The post-survey scores showed an increase, with a median of 5.1 (SD = 0.57) and an IQR of 0.75, ranging from 4.7 to 5.4. These results suggest a shift toward more positive attitudes following the intervention

Lastly, a Wilcoxon Signed-Ranks Test determined the effect of this intervention on the participants' attitudes toward sustainability and animal agriculture. The test revealed a statistically significant improvement in participants' scores post-intervention. Specifically, the positive ranks dominated (with a total rank sum of 228), indicating that most participants experienced an increase in their knowledge or attitudes. Only a small number of participants (4 out of 60) showed a decrease in their scores, and 37 participants had no change. With a p-value of 0.002, we could confidently conclude that the intervention led to a significant increase in knowledge and attitudes. The results, alongside the Z-value of -3.128, suggest that the intervention was effective in improving the outcomes for most participants, making the results both statistically significant and meaningful (Ferguson, 2009).

Conclusions and Recommendations

The findings of this study suggest that even brief educational experiences, such as the 85-minute session explored here, can influence students' attitudes toward agricultural issues. Although the short duration of the intervention may limit its long-term effects, this pilot study demonstrates the potential for even brief interventions to shape student perceptions, particularly regarding critical issues like sustainability in agriculture. Further research should investigate the sustained impact of such interventions over time to understand better how attitudes toward agricultural topics evolve, their interaction with knowledge acquisition, the influence of student characteristics on attitudinal formation, and whether short-term changes in attitude about agriculture can persist.

As a pilot experience, this study affirms that the curriculum used in this lesson is promising and suitable for broader implementation. Future research could explore how this curriculum can be adapted and expanded to address other socio-scientific topics in agriculture and assess other agricultural literacy-relevant outcomes such as decision-making, career interest, and critical thinking. This model could help educators foster not only knowledge but also meaningful shifts in attitudes toward complex agricultural issues, thus fostering agricultural literacy.

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