What's with the Attitude? Validation of an Agricultural Attitude Instrument

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Introduction and Need for Research

Agricultural literacy is a multidimensional framework that reflects how individuals engage with the agricultural system in their daily lives (Kovar & Ball, 2013; Spielmaker et al., 2014). The decisions we make every day impact this system (NIMMS, 2024). While most research on agricultural literacy has focused on knowledge acquisition and its assessment tools (Brune et al., 2020), agricultural literacy extends beyond knowledge. Long-term outcomes, such as behavior change and societal impact, may not be driven by knowledge alone (Ajzen, 2011). Thus, it is crucial to explore how agricultural literacy programs influence these broader outcomes and develop tools to assess them (NIMMS, 2024). This study aims to validate a survey measuring high school students' attitudes as part of a larger evaluation of an eight-unit agricultural literacy curriculum about sustainability and animal agriculture.

Literature Review and Theoretical Framework

The National Center for Agricultural Literacy (NCAL) Programmatic Logic Model highlights attitudes as a key outcome of agricultural literacy programming (Spielmaker et al., 2014). Attitudes describe a person's positive or negative emotions and are the most significant predictors of behavioral intent (Breckler, 1984). The ABC (Affect, Behavior, Cognition) model, proposed by theorists like Ostrom (1969), Bagozzi & Burnkrant (1979), and McGuire (1992) who conceptualize attitudes as interconnected components: cognition, affect, and behavior. This model, validated by Breckler (Breckler, 1984), provides the foundation for the development of the attitudinal survey instrument, illustrating how beliefs (cognitive), feelings (affective), and behaviors (intent or habit) together shape an individual's response to a specific object or concept (Breckler, 1984; Perry et al., 2022).

Methods

This study employed a multi-phase, mixed-methods design to develop and validate the survey. The instrument collected pre- and post-data on students' demographics, agricultural knowledge, and attitudes. However, this abstract focuses on developing and validating the attitudinal section, with items designed to capture the three components of attitudes (Breckler, 1984) using a seven-point Likert scale (Elangovan & Sundaravel, 2021). Research suggests that a Likert Scale instrument should, at a minimum, pass some internal consistency, such as Cronbach alpha or factor analysis, to be reliable (Allen & Seaman, 2007). The instrument development involved item generation from a literature review, expert consultation for content and face validity (Gunawan et al., 2021), and three pilot tests to refine reliability and validity. Revisions were made based on observations and statistical analyses. Cronbach's alpha was calculated to assess internal consistency, and a correlation matrix was constructed to confirm discriminant validity. An exploratory factor analysis (EFA) was conducted to assess construct validity. The results from the third pilot informed the final version of the attitudes section used in the more extensive study. The attitudinal portion of the instrument consisted of 15 questions: five assessing affect, five assessing behavior, and five assessing cognition.

Findings

Upon completing pilot #3, 75 students participated in the assessment, with 63 responses deemed usable for analysis. Reliability analyses were conducted for each construct and the overall instrument. Cronbach's alpha values indicated acceptable reliability across constructs:

affect (α = .754), behavior (α = .843), and cognition (α = .622). The overall instrument reliability was α = .689 when using construct mean scores. According to Shi et al. (2012), a Cronbach's alpha value between .60 and .80 is acceptable.

Inter-item correlations were reviewed to assess construct validity and prepare for exploratory factor analysis (EFA). Correlation matrices were created for each construct, and items with non-significant correlations at the .01 or .05 level were identified. These items were flagged for potential revision or removal pending the EFA results. Based on the reliability and correlation analyses, the following items were retained for EFA: four affective items, five behavioral items, and three cognitive items.

Suitability for factor analysis was confirmed with a Kaiser-Meyer-Olkin (KMO) value of .710 and a significant Bartlett's Test of Sphericity, $p < .05$ (Zhang et al., 2024). An EFA using principal axis factoring extracted four factors, accounting for 73.76% of the total variance (Yong & Pearce, 2013). All affective items are loaded appropriately onto a single factor (Factor 2, Affect). For the behavioral construct, three items were loaded onto Factor 1 (Behavior), while two behavioral items were loaded onto an unexpected fourth factor. Cognitive items primarily loaded onto Factor 3 (Cognition), though one item demonstrated cross-loading on both the behavioral (Factor 1; loading = .513) and cognitive (Factor 3; loading = .423) factors—the extraction of four factors, rather than the anticipated three, warrants further investigation. One possible explanation is that Factor 4 represents a subdimension of behavioral intentions, distinguishing between students' comfort discussing agricultural topics and their willingness to engage in future behaviors (e.g., pursuing careers or further education). The two behavioral items loaded onto this factor may require rewording to clarify this conceptual distinction. One societal consideration item from the cognition construct also cross-loaded on behavioral and affective factors. The ambiguity of the item's phrasing may explain its cross-loading and suggest a need for rewording to enhance conceptual clarity between cognition and behavior.

Conclusions and Recommendations

With minor revisions to the survey wording, the research team is confident that this instrument is reliable and valid for future agricultural literacy studies. It holds promise for evaluating student attitudes on agricultural topics and socioscientific issues like food access, agri-tech, and genetic modification in plant production.

However, the development of this instrument presented several challenges, and resources were limited, particularly within the field of inquiry. Given these constraints, the research team strongly believes that further research into the developmental process of survey instruments is necessary to enhance future instrument validation efforts in agricultural education and literacy. Insights gained from this process contribute to advancing agricultural literacy research in outcomes, in addition to knowledge, and can help refine and inform future methodological approaches. Future instrument development-related research should focus on strategies for survey development, especially in terms of item wording, construct clarity, and the application of psychometric techniques. These efforts will strengthen the validity of similar instruments and improve the accuracy of measurements in relevant research.

Lastly, additional exploration of the attitudinal construct is needed to advance our understanding of agricultural literacy formation and how to influence behavior-related outcomes. Examples of this research could include evaluating a long-term intervention on attitudes.

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