Survey Instrumentation Using Intercept Methods

Agricultural mechanics instruction in post-secondary agricultural education programs is a foundational teacher preparation and instruction component. To safely prepare agricultural students for agricultural careers, mechanical concepts and competencies are introduced, developed, reflected, and amended (Rasty et al., 2017; Schafbuch et al., 2016). Ensuring safe operation for the user and the equipment instruction relies on modeling procedures, including maintenance, development, and safety associated with potentially hazardous equipment (Mazur et al., 2015). This type of instruction has framed the pedagogy of skill development in mechanical coursework (Hancock et al., 2024; Lindner et al., 2016; McKibben et al., 2024). While safe use and operation are paramount for health, life, and safety, associated areas of concern and welfare, including hearing, eye, and respiratory protection, become just as vital. The community of agricultural extension and education has been successful in the implementation of aspects of the culture of safety (Hancock, 2024), hearing safety has been lacking (Hancock et al, 2023; Hancock & McKibben, 2024), though a serious problem in agricultural settings (Cecchini et al., 2024; Knoblock & Broste, 1998; McNamara et al., 2024; Mohammadrezaei et al, 2024), specifically with younger people (Beseler & Rautiainen, 2022).

Collecting participants' experience data through web-based or in-person collection methods is imperative to understand better the experiences, perceptions, and considerations targeted populations experience in response to an event. The fundamental value of intercept survey design is capturing in-moment feedback where the researcher can rapidly capture in-the-moment data (Flint et al., 2016). Often, intercept methods target purposively selected participants, dramatically increasing the distribution rate and decreasing the potential for participant apathy. Through this methodology, a researcher-designed instrument was developed to address participant perceptions and realities associated with agricultural mechanics safety during a statewide skill development event in Georgia.

The framing and development of the instrument were grounded in Ajzen's (2002) theory of planned behavior. This theory suggests that individual behaviors can help predict psychological determinants influenced by attitudes, norms, and controls. The development of this intercept instrument was explicitly intended to determine if participants attending the skills development event were aware of (Hancock et al., 2023) or practicing hearing protection directly related to their instruction of agricultural mechanics concepts.

Procedures

The development of the intercept-based questionnaire was framed within existing qualitative (Clemons et al., 2019; Hancock, 2023; Hancock, 20204; Lindner et al., 2004) hearing safety studies to specifically address participant's perceptions and realities associated with hearing safety awareness. Guided by established principals of survey-based research (Croom et al., 2023; Dillman, 2018), the initial questionnaire was field tested in March 2025 during the Georgia Safety Skill Development Event. Potential participants included all experienced agriculture teachers in Georgia, and participation depended on their attendance. During the event, 12 participants were in attendance, and 12 questionnaires were distributed, completed, and returned to the researcher.

The initial instrument was constructed using established paper-based methods (Dillman) consisting of 8.5" x 11.00" white paper stock, a cover sheet explaining the rationale for the study, pertinent contact information, and informed consent. The instrument's construction followed the traditional book format and used two staple positions on the left margin, offset by one-half inch. This type of formatting creates an environment of familiarity for the participant when considering the book-like nature of the instrument. Dillman (2000) advocated for the formulaic construction of paper-based copies to increase response rates and reduce user frustration. The instrument was constructed using four sections, including twelve Likert-type interval measurement questions with the following options: 1) very confident, 2) confident, 3) neither confident nor not confident, 4) somewhat not confident, and 5) not confident (Lindner & Lindner, 2024). Further sections included inquiry to gather information associated with hand-held power tools, pneumatic tools, stationary power tools, and hearing exposure. Each section used a truncated Likert-type interval measurement scale including 1) yes, 2) no, and 3) never use. The open-ended response questions also addressed participants' knowledge and awareness of decibel levels for nine standard hand-held tools, e.g., circular saw, power hand drill, jig saw, etc.

Results

The field test results for improving instrumentation identified specific areas of concern addressed after participant responses were collected. Specifically, addressing the clarity of the instrument title was revisited to ensure concise meaning. The addition of a personal question, "How would you rate your hearing?" (Dillman, 2000), was included on the cover page to aid in the contextual understanding of the field instrument while creating a personal connection with the participants. A reevaluation of the font and font size was considered from participant feedback and addressed to improve scale and readability. Our post-field test analysis indicated potential issues with the spacing of statements in questions, specifically when different statement/question formats were introduced on the same page. The results of our analysis aided in the redesign of question/statement organization to develop a two-column format to ensure even spacing, consistent inquiry construction, and equal question/statements on each page.

Sections two, three, and four were evaluated for user fatigue, pattern response tendencies, and readability. Subsequent changes were made to address the respondents' real difficulties better. A potential area of concern is the overwhelming number of possible responses in sections two, three, and four. When using Likert-type interval scales, the total number of questions must be multiplied by the number of available options. In this instrument, participants were subjected to 50 types of equipment and three choices, totaling 150 potential responses. Further evaluation addressing pattern response, user fatigue, and apathy will be investigated before initiating the more extensive, formal study. Section four, "average decibel," was evaluated and was improved by changing the participant response format from open response to scaled response.

Discussion

This field study aimed to develop and test instrumentation addressing agricultural mechanics teachers' awareness and perceptions of hearing protection practices during skill development events. Grounded in Ajzen's theory of planned behavior, the intercept survey

methodology allowed for collecting in-the-moment feedback from experienced agricultural teachers attending a statewide safety event. The foundational importance of agricultural mechanics instruction in preparing students for agricultural careers necessitates focusing on safety, particularly concerning potentially hazardous equipment and associated health concerns like hearing protection. This initial phase of instrument development is crucial for collecting valid and reliable data on this vital aspect of agricultural education.

The field test of the initial questionnaire, involving twelve participants, provided valuable insights for refinement: the need for a more precise title, including a personal hearing rating question, and improvements to font size, spacing, and question organization. Specifically, the analysis revealed potential issues with user fatigue and pattern response tendencies due to the extensive number of response options. Consequently, revisions were made, including adopting a two-column format for better spacing and consistent inquiry and changing the response format for decibel-level questions to a scaled response. These modifications underscore the iterative nature of instrument development and the importance of pilot testing to enhance research tools' clarity, readability, and overall effectiveness before broader implementation.

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