

Validation of Tasks Associated with Teaching School-Based Agricultural Education

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Introduction

Teachers in the United States are overwhelmed (Lin et al., 2024), burned out (Perna, 2023), and undervalued (Organisation for Economic Co-operation and Development, 2020; Teach Strong, 2016). Teachers have noted that factors such as working conditions, compensation, classroom autonomy, and involvement in school- or district-wide decision making influenced perceptions of their value (Akiba et al., 2023). Moreover, increased workload and insufficient school resources were identified as contributing to increased strain and stress on teachers (Harwin, 2024). The combination of these factors have decreased teachers' enthusiasm for their profession (Lin et al., 2024).

School-based Agricultural Education (SBAE) teachers are no exception to these stressors as they face diverse and extensive expectations from students, administrators, parents, and stakeholders (Traini et al., 2021), often requiring them to assume numerous roles and responsibilities (Phipps et al., 2008; Talbert et al., 2022; Terry & Briers, 2010). Insights into the needs of teachers (DiBenedetto et al., 2018; Roberts et al., 2020), the challenges they encounter (Boone & Boone, 2007; 2009), and the traits of effective teachers (Eck et al., 2019; Roberts & Dyer, 2004a) shed light on the roles expected of SBAE teachers (Traini et al., 2021). The interplay of professional needs, challenges, and desired characteristics forms a complex set of expectations for SBAE teachers (Best, 2023; [Best et al., 2025a; Haddad et al., 2023; Traini et al., 2021). Traini et al. (2021) suggested that developing a “flexible position description of the agriculture teaching job detailing tasks that are expected as well as those that are not expected” (p. 179) should be a priority in the profession. To address this need, (Best, 2023) sought to identify a comprehensive and specific list of tasks associated with teaching SBAE through their modified Delphi study using a panel of experts in the field of SBAE. This effort resulted in the identification of 238 tasks associated with teaching in a comprehensive SBAE program (Croom, 2008) in the areas of classroom and laboratory instruction (Best et al., 2025a), FFA advisement (Best et al., 2024a), supervising students' SAEs (Best et al., 2024b), and other professional responsibilities (Best et al., 2025b). Asking SBAE teachers to perform 238 separate tasks is unreasonable. Therefore, a need existed to validate the list of tasks SBAE teachers are expected to perform.

Theoretical Framework

Human Capital Theory (HCT) undergirded the study. HCT evaluates the acquisition of knowledge, skills, training, experiences, and education by individuals (Becker, 1964; Little, 2003; Schultz, 1971; Smith, 2010; Smylie, 1996). Smith (2010) found that individuals tend to acquire “sector-specific” (p. 42) skills that complement natural talent and occupational abilities.

Heckman (2000) asserted an individual's job performance is enhanced by their acquisition and development of such skills, which in turn benefits current and future employers (Lepak & Snell, 1999). As such, HCT can be applied to teachers and their value to schools, communities, and society (Myung et al., 2013; Smylie, 1996). The connection between HCT and job-specific tasks is fundamental, as HCT represents the attitudes, knowledge, skills, and experiences that enable teachers to perform specific job tasks (Robinson & Baker, 2013; Smith, 2010; Smylie, 1996).

Purpose and Objectives

Although the list of tasks associated with teaching SBAE (Best, 2023) helped fill gaps in the literature related to teacher tasks, the study was limited by the nature of the Delphi method (Hsu & Sandford, 2007), making it ungeneralizable to the greater population of SBAE teachers in the United States. Statistically validating the list of tasks associated with teaching SBAE could make it generalizable (Furr & Bacharach, 2014) to the profession. Therefore, the purpose of the study was to validate the list of tasks SBAE teachers are expected to complete as part of their professional roles and responsibilities. Two research objectives guided the study: (1) determine the primary tasks associated with teaching SBAE, and (2) determine the internal reliability of the tasks associated with teaching SBAE.

Methods

The study included all SBAE teachers in the United States ($N = 14,756$) in 2024 (Smith et al., 2024). The frame for the study was developed through acquisition of online state teacher directories that were publicly accessible as well as through contacting state staff or university faculty members in agricultural education, resulting in the successful delivery of emails to 13,047 SBAE teachers nationwide. Of those, 1,740 individuals (13.34%) in 46 states responded. To ensure accurate and valid results, if any single item was left unanswered by a respondent, the entire data set was excluded from analysis (Allison, 2002). After incomplete data sets were removed from the study, the number of usable responses was reduced to 819, resulting in a 6.28% valid response rate.

The data collection instrument included the original 238 tasks (Best, 2023) across four categories: classroom and laboratory instruction, FFA advisement, supervising students' SAEs, and other professional responsibilities. For each task, participants were asked to identify their level of agreement with the following statement: *This task is important for my role as a school-based agricultural education teacher*. Participants were asked to rate their agreement using a five-point agreement scale: 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Undecided/unsure*, 4 = *Agree*, and 5 = *Strongly agree*. The instrument was assessed for face and content validity (Gay et al., 2012) by a panel of experts consisting of five university faculty members at Oklahoma State University and was modified slightly to improve clarity.

Principal Component Analysis (PCA) was used to address Research Objective 1. The PCA was conducted using a Promax rotation because the components were determined to be correlated (Osborne, 2015). An acceptable Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (0.97) was produced through the analysis. Moreover, Bartlett's test of sphericity yielded a

statistical significant level ($p < .001$). These two combined measures indicated that the sample was adequate to perform PCA.

Components yielding an initial eigenvalue greater than 1.0 produced through parallel analysis were retained for further evaluation (O'Connor, 2000). The total explained variance of the model was evaluated, and communality extractions for items greater than 0.5 were noted. Based on these results, the initial PCA was conducted again while fitting the model to the number of components derived from the parallel analysis (O'Connor, 2000). Communalities and rotated factor loadings were evaluated to determine which components to retain based on the model. Factor loadings greater than 0.6 were retained for additional analysis (Beaver et al., 2013). This process was repeated until at least three items loaded at 0.6 or greater on each factor because the inclusion of at least three items in a component better ensures that the component was reliably measured (Furr & Bacharach, 2014). Once items were appropriately fitted to the correct number of components, those with factor loadings of 0.6 or greater were retained (Beaver et al., 2013).

Cronbach's alpha reliability estimates (Cronbach, 1951) were calculated to address Research Objective 2. First, a reliability estimate was determined for all the items related to tasks. Item-total statistics for the instrument were analyzed to determine if deletion of any given item would increase the alpha coefficients. A Cronbach's alpha score equal to or greater than 0.7 on a scale of 0.0 to 1.0 was considered reliable (Field, 2018; Nunnally, 1978). Next, the reliability of each validated component (or construct) was evaluated using a Cronbach's alpha coefficient for their corresponding items. The alpha level also was assessed to determine if the deletion of any items impacted the overall reliability for a component (Field, 2018).

Findings

The initial PCA produced 40 components with eigenvalues exceeding 1.0, resulting in 40 potential components for the dataset. Thirteen components loaded above the eigenvalues produced from parallel analysis. As a result, the PCA was conducted once more, fitting all 238 items to the 13 components. The KMO value was deemed acceptable (0.97), and Bartlett's test again produced a statistical significance level ($p < .001$). Further, the component loadings and associated communalities produced by the PCA were analyzed to determine what items to retain by examining a Promax rotation. Ninety-two of the instrument's 238 items loaded at 0.6 or greater on at least one component and were retained for additional analysis.

Next, the 92 items were reanalyzed through an additional, unfixed PCA with extraction based on produced eigenvalues. The sampling adequacy of the dataset was acceptable (KMO = 0.97; Bartlett's test = $p < .001$), and 13 components produced eigenvalues greater than 1.0, accounting for 67.53% of the model's variance. Eight of these components loaded above those produced by parallel analysis and were selected for additional evaluation. The 92 items were then reanalyzed using an additional PCA with extraction fixed to eight components. The component loadings and associated communalities for the 92 items were analyzed using a Promax rotation. The rotated component matrix for the PCA fixed to eight components was evaluated to determine the component structure of the items retained. As a result, 69 items were retained with factor loadings of 0.6 or greater on at least one of the eight components. However, the eighth component contained only one item.

Because components cannot be retained when they contain fewer than three items loading at 0.6 or greater (Furr & Bacharach, 2014), the PCA was conducted three additional times, fixed to seven, six, and five components, respectively, until the model adequately fit the dataset (Furr & Bacharach, 2014). As such, 69 items were retained with factor loadings of 0.6 or greater on at least one of the five components that accounted for 54.90% of variance explained by the model, which was deemed acceptable (Guadagonli & Velicer, 1988; Streiner, 1994). Table 1 displays the components, number of retained items in each component, examples of tasks included in the components, and the components' respective Cronbach's alpha estimates.

Table 1

Components, Number of Retained Items, Examples of Retained Tasks, and Cronbach's Alpha Estimates (n = 69 items)

Component Titles	<i>n</i>	Examples of Select Item Descriptions	α
Supervised Agricultural Experiences (SAEs)	21	Track SAE data Assist all students in developing a SAE Assist all students in planning a SAE	0.97
Advising a FFA Chapter	25	Assist FFA officer team with meetings Attend chapter meetings Budget for chapter Program of Activities	0.96
Other Professional Responsibilities	9	Complete attendance verification reports Collaborate with fellow school staff Attend faculty/staff meetings	0.90
Classroom and Laboratory Instruction	7	Provide content area expertise Provide hands-on learning experiences Stay current with industry trends	0.84
FFA Awards and Degrees	7	Assist students in developing American degree applications Assist students in developing chapter degree applications Assist students in developing proficiency award applications	0.95
Overall	69		0.97

Note. Due to page limitations, item descriptions represent examples of tasks in each component and do not reflect all items retained in the construct.

Conclusions, Implications, and Recommendations

The findings of the study indicated SBAE teachers are expected to complete a range of tasks associated with teaching SBAE. Sixty-nine items were retained across five components reflecting the primary job tasks expected of SBAE teachers. These tasks were related to Supervised Agricultural Experiences, Advising a FFA Chapter, Other Professional Responsibilities, Classroom and Laboratory Instruction, and FFA Awards and Degrees. These conclusions reinforce the findings of (Best, 2023) that the tasks associated with teaching SBAE reflect the comprehensive, three-component SBAE model (Croom, 2008). Further, the numerous job-specific tasks expected of SBAE teachers reflect the development of specialized skills, thus building their human capital (Smith, 2010). Not only do these sector-specific skills provide the opportunity to improve the human capital of SBAE teachers (Robinson & Baker, 2013), they also have the potential to boost their employability, perceived value, and success in the teaching profession or in others (Becker, 1964; Little, 2003; Schultz, 1971; Smith, 2010).

This study validated the list of tasks associated with teaching SBAE as developed by (Best, 2023). The five components identified through the PCA encompassed the three components of the comprehensive SBAE model (Croom, 2008) and reflected all four of the primary areas found in the Delphi study conducted by (Best, 2023). Moving forward, the instrument should be referred to as the Primary Tasks for Teaching SBAE (PT-SBAE). The PT-SBAE, as well as each of the five components, were deemed reliable due to strong Cronbach alpha coefficients (Nunnally, 1978). Further, inter-item correlations for each component indicated that embedded items were adequately interrelated (Field, 2018). Finally, removal of any item would not have improved the Cronbach's alpha coefficient for any component or the PT-SBAE overall. Therefore, all 69 items were retained as part of the complete, validated list of tasks associated with teaching SBAE. As such, the PT-SBAE instrument was deemed valid and reliable. Because the PT-SBAE was validated as a complete, reliable list of tasks associated with teaching SBAE, we recommend it be used in its entirety. However, acceptable internal reliability estimation coefficients (i.e., Cronbach's alpha coefficients; Nunnally, 1978) and adequate inter-item correlations (Davis, 1971) were found for each of the five components. As such, the components also could be used independently. Moreover, we recommend the instrument and its components be used in conjunction with teachers' personal and professional characteristics, such as career stages, certification types, and program sizes to better target the specific deficiencies of teachers and potential professional development programming they may need. Providing professional development opportunities that meet teachers' specific needs better engages them in content they find most relevant and meaningful (Lee, 2005), contributing to their acquisition of additional human capital (Becker, 1964; Little, 2003; Schultz, 1971; Smith, 2010; Smylie, 1996).

As SBAE continues to change and expand (National FFA Organization, 2024), the personal and professional characteristics of teachers (Smith et al., 2024) who deliver the program should adapt, as well. As such, the need exists to continually evaluate perceptions of individuals regarding the importance of tasks and areas in which to improve SBAE. Thus, we recommend similar studies be conducted specifically targeting various groups based on their individual and situational characteristics. Such studies should investigate the nuanced differences that may exist but were not included in the scope and design of this study. Further, validating the PT-SBAE greatly increases the utility of the instrument to the profession. Opportunities, therefore, exist to

contextualize various research studies using the PT-SBAE to further describe attributes of the profession and its teachers. As such, we also recommend additional research be conducted to further develop measurable scales that could be used in conjunction with the PT-SBAE such as P-E fit, self-efficacy, competency, job-satisfaction, stress, and burnout, among other areas of interest in the profession. Such research has the potential to provide valuable insight into the reasons teachers choose to enter, remain in, or leave the profession prematurely as well as how the field can improve teacher recruitment and retention efforts. Moreover, the instrument could be used to identify additional areas of support and development for teachers, thus enhancing their human capital (Smylie, 1996).

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