

# Validation of the School-Based Agricultural Education Model of Support Instrument

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## Abstract

Research on the needs of school-based agricultural education (SBAE) teachers has been conducted since 1983, driven by historic attrition within the profession, yet we do not have the depth of understanding necessary to provide actionable change to SBAE teachers to empower and support them in their practice. The Conceptual Model of Support for School-Based Agricultural Education Teachers was used to frame this study's purpose of establishing an instrument that takes a more human lens to support SBAE teachers. The instrument resulted in five components including personal needs, intracurricular program needs, relationship needs within the school and community, classroom/instructional needs, and school-based support needs with a total of 46 items validated through the principal component analysis with .60 reliability for all 46 items was indicated with a Cronbach's alpha of .951. Recommendations include evaluating the humanistic needs of in-service SBAE teachers. Additionally, preservice teacher preparation programs should use the instrument to evaluate SBAE teacher aspirants during their student teaching internship. Future research should consider the current needs of SBAE teachers using the validated instrument to determine opportunities to increase the level of effectiveness and individual wellness of SBAE teachers.

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## Introduction and Problem Statement

Driven by historic attrition, school-based agricultural education (SBAE) teacher needs research has been conducted since 1983 (DiBenedetto et al., 2018; Eck & Edwards, 2019). Needs continue to evolve with stress, personal wellness, and work-life balance representing areas of focus in SBAE research that are related to the overwhelming amount of work, dedication, tasks, and the mental, physical, and emotional stress that comes with managing an SBAE program (Best et al., 2023; Marsh et al., 2023; Phipps et al., 2008; Shoulders et al., 2021). To maintain SBAE teacher job satisfaction and develop career specific human capital (i.e., education, skills, training, and experiences directly related to a chosen career; Fisher & Royster, 2016), leading a balanced life (i.e., personal wellness, boundaries, and work-life balance) has been recommended (Eck et al., 2020; Marsh et al., 2023). However, Marsh et al. (2023) reported 21st century programs were still faced with support gaps and inadequate professional development in previously identified need areas, potentially resulting in frustration and burnout (Klassen & Chiu, 2010; Marsh et al., 2023).

Researchers have identified specific challenges impacting SBAE teachers' job satisfaction (Boone & Boone, 2009; DiBenedetto et al., 2018; Doss et al., 2023). Doss et al. (2023) reported 114 items across seven categories associated with challenges impacting job satisfaction: classroom activities, SBAE program management, relationships, professional development, personal factors, and miscellaneous job responsibilities. While DiBenedetto et al. (2018) and Doss et al. (2023) recommended further exploration and professional development to address these recurring issues, neither provided the depth needed for proactive solutions to improve SBAE teacher needs or job satisfaction. This task is elusive because a “one size fits all” approach to career-specific human capital development through professional development is often ineffective in meeting the needs of all SBAE teachers (Klassen & Chiu, 2010), perhaps requiring a more human lens, giving rise to the need for this study.

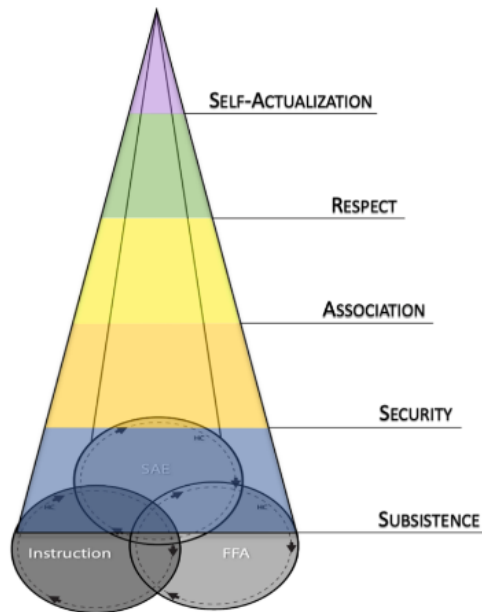
## Theoretical and Conceptual Framework

The conceptual model of support for SBAE teachers was developed to describe professional development needs within a hierarchy of support (Marsh et al., 2023), giving the needs and job satisfaction of SBAE teachers a human lens. As such, this model served as the conceptual framework for this study. When describing the Conceptual Model of Support for SBAE Teachers, it uses the three-component model for agricultural education (FFA, n.d.) as the base of the pyramid due to the interdependency of the classroom, student leadership and career development (FFA), and Supervised Agricultural Experience (SAE) components in SBAE programs and the overlapping roles among each experienced by SBAE teachers. Human capital development takes place in each of the three components (depicted as dashed line with arrows in Figure 1) based on the needs of the individual SBAE teacher taking into consideration their teaching effectiveness, personal characteristics, and professional characteristics (Eck et al., 2019). As SBAE teachers develop human capital in each component, they ascend to higher levels (subsistence, security, association, respect, self-actualization) of Maslow's Hierarchy for

Teachers (Fisher & Royster, 2016), further developing career-specific human capital and reducing challenges contributing to SBAE teacher attrition (Doss et al., 2023; Eck et al., 2019; Fisher & Royster, 2016; FFA, n.d.).

### Figure 1

*The Conceptual Model of Support for School-Based Agricultural Education Teachers* (Marsh et al., 2023).



Items categorized as subsistence (i.e., *accessibility training, classroom management skills, and support for teacher mental health*) represent “need(s) for sustaining and supporting SBAE teachers in their daily practice, helping to provide to the ability to survive within the profession” (Marsh et al., 2023, p. 126). The subsistence level items within the hierarchy will need to be supported differently to meet SBAE teachers' human needs than items at the level of association (i.e., *community support, parent support, and support from school and local administration*). Association-needs represent the importance of belonging and the relationships that support and surround SBAE teachers (Doss et al., 2023; Marsh et al., 2023). While the conceptual model of SBAE teacher support is focused on individual SBAE teacher needs, Maslow’s hierarchy of needs does not describe or account for how school site, community, and external factors can influence a teacher’s effectiveness and practice. Impacts of these external factors, either positive or negative, can be understood with self-determination theory (SDT). SDT suggests individuals have three basic needs: autonomy, competence, and relatedness, providing a rationale supporting how external factors can impact an SBAE teacher’s level of effectiveness and individual wellness (Ryan & Deci, 2000).

Currently, there is not a way to objectively measure and quantify teacher needs based on their location within the model, providing for the need of this study. Evaluating SBAE teachers'

human needs and where they align within the model of support can improve how we address human capital development within the profession, promoting their effective SBAE teaching practices (Eck et al., 2020; Marsh et al., 2023).

## Purpose and Objectives

A current limitation within the conceptual model of support for SBAE teachers is that needs are conceptually aligned at the lowest potential level within the hierarchy (i.e., subsistence; see Figure 1). A validated instrument could assess an individual's human needs, representing needs within different levels of the hierarchy, and provide clear insight to meet specific human capital needs of individuals. Additionally, the development of a valid instrument for evaluating SBAE teacher's needs to discover national trends within the profession has been recommended (Duncan et al., 2006). Given this clear need, the purpose of this study was to establish a more human lens to support SBAE teachers. The following research objectives guided the study:

1. Determine the primary components of support for SBAE teachers.
2. Validate the conceptual model of support for SBAE teachers as a potential instrument for evaluating teacher needs.
3. Determine the internal consistency reliability of the components of the instrument.

## Methods and Procedures

A non-experimental survey research design (Privitera, 2020) was employed to evaluate in-service SBAE teachers ( $N = 3,729$ ) within Region II of NAAE (i.e., Arkansas, Louisiana, Kansas, Colorado, New Mexico, Oklahoma, and Texas) using a census approach. The email contact frame was developed using existing listservs and email frames, allowing for personalized communication. Five-hundred-fifty-three emails were returned undeliverable, resulting in an accessible population of 3,176. Email correspondence followed the tailored design method (Dillman et al., 2014), including the purpose of the study, authenticity (university logo), and the lead researcher's contact information, along with the anticipated timeline for data collection. The initial email was followed by three points of contact to invite SBAE teachers to participate in the study (Dillman et al., 2014), resulting in 581 responses (18.3% response rate), of which 303 responses were complete and eligible for data analysis. While nonresponse bias was of concern given the response rate, respondents were representative of the population of interest. Data collected in this study was compared to the corresponding population values of SBAE teachers, per recommendations from the National Center for Education Statistics (Bose, 2001). Specifically, NAAE Region II was reported to be 46.0% female as of the 2023 National Supply and Demand Study (Foster et al., 2024), which is the same as the respondents (46.0% female and 54.0% male). In addition, respondents aligned with the Supply and Demand Study related to certification type (i.e., majority traditionally certified) and state representation (i.e., Texas was the largest, followed by Oklahoma). Given the anonymous nature of data collection (i.e., mass email and listserv recruitment) and the approved IRB protocol, collecting non-respondents was not possible, which is a limiting factor of the study, and the data presented should be considered accordingly.

The instrument was developed using items from the findings of Doss et al. (2023) and Marsh et al. (2023) focusing on job satisfaction, human capital, and individual human needs of SBAE teachers. Based on previous literature (Boone & Boone, 2009; Clark et al., 2014; DiBenedetto et al., 2016; Doss et al., 2023; Marsh et al., 2023; Maslow, 1943; Rosser, 2020; Touchstone, 2015), the 153 items were organized into categories by the research team, including classroom factors (40 items), SBAE program management (31 items), relationships (26 items), professional development (9 items), personal factors (10 items), and miscellaneous job responsibilities (19 items) to encompass the comprehensive model for SBAE. The classroom factors categories represent characteristics like *classroom management, land lab instruction, keeping student records, and lesson planning* (Boone & Boone, 2009; DiBenedetto et al., 2018 Doss et al., 2023). SBAE program management factors consist of items such as *the role of the FFA advisor, training CDE teams, SAE programs, and program planning and prioritization* (Boone & Boone, 2009; DiBenedetto et al., 2018 Doss et al., 2023; Rosser, 2020; Touchstone, 2015). Relationship factors represent interactions between SBAE teachers and others, such as students in the agriculture program, the *school secretary, the superintendent, local community members, and assistant principals* (Boone & Boone, 2009; Doss et al., 2023; Fisher & Royster, 2016; Marsh et al., 2023; Rosser, 2020; Touchstone, 2015). The professional development construct factors include *state professional organizations, clear policies and procedures, life-long learner, and purposeful professional development* (Boone & Boone, 2009; Doss et al., 2023; Eck et al., 2020; Marsh et al., 2023). Personal factors construct included *health (mental, physical, and emotional), work and home life balance, and teacher motivation* (Boone & Boone, 2009; Clark et al., 2014; Doss et al., 2023; Marsh et al., 2023; Maslow, 1943). The individual needs construct includes *rest, balanced nutrition, the ability to ask for help, and the ability to navigate life crises* (Fisher & Royster, 2016; Marsh et al., 2023; Maslow, 1943). Participants were asked to identify their current level of effective integration on a five-point Likert-type scale (i.e., 1 = never/high need and 5 = always/low need), for each of the 153 items.

To address research objectives one and two, a principal component analysis (PCA) was used to reduce the number of items in the instrument to a smaller dataset of related items (Costello & Osborne, 2005). PCA with a Varimax rotation, developed by Kaiser (1958), was chosen with the assumption that the seven constructs are correlated due to the relation with SBAE teacher needs (Doss et al., 2023). The research team evaluated the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, eigenvalues, parallel analysis, component loadings, and commonalities for item reduction. While the initial instrument was evaluated for face and content validity, additional validity was established through the PCA (Field, 2018 Privitera, 2020). To address reliability, Cronbach's alpha coefficients were established to provide internal consistency reliability for Model of Support for SBAE Teachers instrument per the third research objective.

## Findings

### Research Objective 1: Determine the Primary Components of Support for SBAE Teachers

To address research objective one, the 153-item instrument (see Table 1) was analyzed to determine the primary components to reduce items in the model of support for SBAE instrument using PCA. The KMO measure of sampling adequacy equaled 0.77 which is within

the accepted range according to Cerny and Kaiser (1977). The initial PCA resulted in 34 components loading above a 1.0 eigenvalue. The 34 components were compared to parallel analysis resulting in eight factors loading above the output. Data were re-analyzed (PCA with Varimax rotation) fitting the 153 items with the eight factors accounting for 51.8 percent of the variance found. The component and communality loadings of the rotated matrix of all 153-items were analyzed and it was determined 54-items should be retained from the Varimax-rotated PCA. Items were fixed to eight components based on loadings of 0.6 or higher in at least one component area. A sample of the 99 items not retained included statements related to *managing paperwork, managing instructional time, maintaining student records, developing a program budget, lesson planning, relationships with CTE directors, relationships with university faculty in Agricultural Education, relationships with the State FFA Association, managing lab/facilities, develop curriculum, used new technology, and engage in professional organizations.*

**Table 1**

*Retained PCA Component Loadings and Communalities (54 items, n =303)*

Items	1	2	3	4	5	6	Communality
R_5					.54		.384
R_8			.53				.480
R_9					.90		.856
R_10			.63				.545
R_12			.67				.489
R_16			.82				.733
R_19					.89		.834
R_21			.76				.710
R_22			.85				.778
R_23			.84				.78
R_24			.65				.54
C_1				.67			.63
C_3				.75			.65
C_12				.68			.65
C_23				.59			.50
C_25				.66			.56
C_28				.656			.59
P_1		.73					.61
P_2		.68					.51
P_3		.72					.62
P_4		.72					.59
P_6		.81					.72
P_7		.77					.65
P_8		.73					.73
P_9		.77					.65
P_11		.76					.66
P_12		.70					.69
P_14		.80					.73
P_15		.77					.66
P_18		.68					.55
P_20		.67					.59
P_28		.62					.57

Items	1	2	3	4	5	6	Communality
M_5	.65						.54
M_15	.75						.68
PR_4						.58	.43
PR_9						.55	.53
PE_1	.84						.75
PE_2	.69						.56
PE_3	.81						.73
PE_4	.68						.52
PE_5	.68						.57
PE_7	.85						.78
PE_8	.83						.75
PE_10	.65						.53
MH_1	.74						.58
MH_2	.81						.68
MH_3	.75						.61
MH_4	.76						.61
MH_5	.78						.65
MH_7	.67						.57
MH_8	.59						.44
MH_10	.80						.67
MH_15	.31		.36				.45
MH_16	.35		.32			.52	.53

*Note.* Factor loadings below .30 are not displayed; extraction values are based on communalities; R = Relationships, C = Classroom/Instruction, P = Program factors, M = Miscellaneous factors, PR = Professional factors, P = Personal factors, MH = Maslow's Hierarchy – Individual needs. Items with a strikethrough were not retained. Please see the attached instrument for the original items and corresponding item codes.

The 54 retained items were then re-analyzed using an additional PCA to verify the number of components using the reduced dataset. The analysis resulted in a KMO measure of 0.91. Six components resulted in eigenvalues above parallel analysis (i.e., a simulated data set with the same number of items and respondents to optimize component extraction), demonstrating the need to re-analyze the PCA with a Varimax rotation while limiting items to fit within six components. The component loadings and communalities of the rotated matrix were analyzed using a Varimax rotation of the retained 54 items to develop the final component structure of items resulting from the six components (see Table 1).

The PCA fit to six components resulted in 46 (of 54) items loading at or above a 6.0, explaining 58.7% of the variance in the dataset. The five components are outlined in Table 2 with the corresponding and updated item numbers to represent the SBAE model of support instrument. One construct (professional needs) and eight items did not fit the six-construct model. Removed items included *managing relationships with other teachers*, *appreciation of individual differences*, *purposeful professional development*, and *the ability to ask others for help*.

**Table 2***Emerging Components and Retained Items (46 items)*

Component Title	Item	Corresponding Item Description
1. Personal Needs (Safety and Security)	P_1	Ability to take care of yourself
	P_2	Manage stress
	P_3	Health (mental, physical, and emotional)
	P_4	Change in family dynamics
	P_5	Work and home life balance
	P_6	Death of a relative or close friend
	P_7	Financial loss
	P_8	Emotional health support
	P_9	Support for teacher mental health
	P_10	Teacher motivation
	P_11	Rest
	P_12	Balanced nutrition
	P_13	Exercise and physical activity
	P_14	Body function is regulated
	P_15	Good general health
	P_16	Established a routine
	P_17	I can cope with stress/anxiety in healthy ways
2. Intracurricular Program Needs	I_1	Role as the FFA advisor
	I_2	Managing the FFA chapter
	I_3	Managing the total Agricultural Education program
	I_4	Attending fairs/showing/exhibitions
	I_5	Training CDE teams
	I_6	Being competitive in CDEs
	I_7	Livestock and project center management
	I_8	Training LDE teams
	I_9	Being competitive in LDEs
	I_10	Being competitive with livestock projects
	I_11	SAE programs
	I_12	SAE visits
	I_13	Fundraising for FFA activities
	I_14	FFA award applications
	I_15	Resources for awarding and recognizing SAEs
3. Relationship Needs within School and Community	R_1	Relationship with principal
	R_2	Relationship with transportation director
	R_3	Relationship with superintendent
	R_4	Relationship with school board
	R_5	Competence of superintendent
	R_6	Competence of school board
	R_7	Competence of counselors
4. Classroom/Instructional Needs	C_1	Teach effectively
	C_2	Ability to use different teaching methods and strategies
	C_3	Engaging students in critical thinking activities
	C_4	Standards alignment
	C_5	Amount of time allotted for preparation
5. School-Based Support Needs	S_1	Relationship with assistant principals
	S_2	Competence of assistant principals

*Note.* P = Personal Needs, I = Intracurricular Needs, R = Relationship Needs, C = Classroom/Instructional Needs, and S = School-Based Support Needs. The numbers presented in this table will be used from this point forward.

### Research Objective 2: Validation of the SBAE Model of Support Instrument

The final instrument resulted in five components represented with 46 items. All 46 items loaded at a value greater than .60 (Guadagnoli & Velicer, 1988), and their communalities meet an acceptable level, according to Hair et al. (2010). The original instrument represented 153 items compiled from different validated studies of Doss et al. (2023) (132 items) and Marsh et al. (2023) (42 items). Using the constant comparative method, 21 duplicative items from the studies were removed to create the comprehensive original 153 items prior to data collection (Creswell & Poth, 2018). The resulting 46 items are considered valid based on the PCA results measuring the component (Privitera, 2020) of the model of support for SBAE. In addition to the validity of the previously developed items, a reliability estimate based on 46 items resulted in an acceptable Cronbach's alpha of .95 (Nunnally, 1978). We evaluated the deletion of any item that may have increased the total Cronbach's alpha score. After analysis of the item-total statistics, it was determined that the removal of any item would decrease the total Cronbach's alpha level instead of increasing it, resulting in the retention of all 46 items as part of the valid model of support instrument for SBAE teachers.

### Research Objective 3: Determine the Internal Consistency Reliability of the Components of the Instrument

The 46-item instrument was deemed valid through a PCA loading on five components, with a Cronbach's alpha of .95. Reliability estimations were calculated using the corresponding items within each of the five components. The first component, identifying personal needs depicting individuals' *subsistent* and *safety* needs, is a combination of 17 items, resulting in a Cronbach's alpha of .96. It was determined that the removal of any of the 17 items would result in a decreased Cronbach's alpha of the first component, leading to all items being retained. The 17 items have substantial positive correlations (Davis, 1971), demonstrating interrelated items measuring the personal needs component (Field, 2018). The second component, intracurricular program needs, depicted program-specific needs related to FFA and SAE, represented by 15 validated items, resulting in a Cronbach's alpha of .95. It was determined that the removal of any of the 15 items would result in a decreased Cronbach's alpha of the second component, leading to all items being retained. The 15 items have substantial positive correlations (Davis, 1971), demonstrating interrelated items measuring the intracurricular program needs component (Field, 2018).

The third component included relationship needs from the surrounding school and community, with seven items representing relationships with and the competence of individuals who serve in support roles within proximity of the SBAE program with resulting Cronbach's alpha of .90. The removal of any item would reduce the Cronbach alpha of the instrument, resulting in all items being retained. Additionally, the seven items have substantial positive correlations (Davis, 1971), demonstrating a measure of interrelated items. The fourth component included classroom/instruction needs and resulted in Cronbach's alpha of .83 for the five validated items. The deletion of any item would result in a reduction of Cronbach's alpha, so all items were retained. The five items have a moderate to very strong positive correlation (Davis, 1971). The fifth component, school-based support needs, included two items with a Cronbach's alpha of .51, thus falling below the *acceptable* threshold of .70 or greater (Nunnally, 1978). Eisinga et

al. (2013) suggested that coefficient alpha for a two-item scale is not a meaningful measure and recommended reporting the Spearman-Brown reliability indicator. The Spearman-Brown estimate resulted in .51 for the two items, but the deletion of the two items would reduce the overall 46-item instrument reliability with a Cronbach's alpha of .95, leading researchers to retain the two items even though two-item scales are problematic (Yan & Green, 2011).

## Conclusions and Recommendations

This study resulted in a valid and reliable SBAE model of support instrument. The five emerging components included personal needs, intracurricular program needs, relationship needs, classroom/instructional needs, and school-based support needs. These represent six of the seven original categories. While professionalism was the category lost through the PCA, could it be that being professional is assumed? In addition, school-based support emerged as its own component, demonstrating a difference in item performance with items that referred to relationships and competence of administrators versus relationships and competencies of others who serve in support roles within proximity of the SBAE program. Perhaps this is due to the administrative tasks of assistant principals who manage and engage with SBAE teachers more directly. The retention of two items within this component may suggest that further research is needed to consider the implications and additional items that may expand the school-based support needs of SBAE teachers.

The personal needs component represented the greatest quantity of retained items and were merged from personal factors and Maslow's hierarchy of needs representing human psychological needs for subsistence and safety as an individual and within the profession, aligning with the conceptual model of support for SBAE. Could it be that SBAE teachers' basic human needs are not being met and teachers are becoming more frustrated within the profession (Marsh et al., 2023; Ryan & Deci, 2000; Fisher & Royster, 2016). In addition to personal needs, intracurricular needs was the second largest retained component, representing a plethora of tasks related to program planning, FFA advisement, competitive events, and SAE management.

While the classroom/instruction component was reduced to five items, the items are closely related to historical SBAE needs, potentially indicating a change is needed in tactics used to support teachers in meeting their classroom/instruction needs. The classroom/instruction needs identified in this study aligned with those in the SBAE effective teaching instrument (Eck et al., 2019) representing the human capital skills needed to be effective. Regardless of the historical context of these needs, new teachers are being prepared through SBAE teacher preparation programs or entering the profession from alternative routes, therefore the need to consider and evaluate this component remains essential.

We recommend the SBAE model of support instrument be used by stakeholders (i.e., administration, state staff, and teacher mentors) to continually evaluate the humanistic needs of in-service SBAE teachers to provide the context for how SBAE teachers need the content,

curricula, professional development, mentoring and/or resources to be presented to make them more impactful for supporting their needs, reducing potential job-related stress and increasing retention within the profession. Additionally, preservice teacher preparation programs should use the instrument as a student self-assessment to evaluate the SBAE teacher aspirants during their professional education core courses and student teaching internship, measuring the impact of early field experiences, supports, professional networking, and student teaching placement opportunities that meet their humanistic needs and develop their human capital prior to entering the SBAE classroom. Employing a longitudinal design would allow teacher preparation programs to observe the growth of students from their pre-service program into their career, where it would be expected that participants continue to grow and develop, moving them from the subsistence level up through respect and self-actualization (Marsh et al., 2023). Given the variety of uses for the instrument (i.e., complete program/instrument or specific component), it is recommended that assessment data evaluate individual components or item responses to determine the needs of participating SBAE teachers.

Future research should consider the current needs of SBAE teachers using the validated instrument to determine opportunities to increase the level of effectiveness and individual wellness of SBAE teachers (Ryan & Deci, 2000). Perhaps such implementation could improve work-life balance and job satisfaction by helping SBAE teachers manage a successful program (Marsh et al., 2023; Phipps et al., 2008; Shoulders et al., 2021). It is also recommended that the Model of support instrument be evaluated to consider if the components reflect the needs of those involved in non-formal agricultural education and higher education professions within agriculture and adapted, as needed, to provide a humanistic lens to inform retention and job satisfaction efforts.

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