

Content Knowledge Preparation: Describing Department Heads' Perceptions of Preservice Teachers' Training within AFNR Pathways

Abstract

Historically, agricultural teacher preparation programs have supplied the majority of early-career educators. Unfortunately, many preservice teachers report feeling unconfident about teaching in certain agriculture, food, and natural resources (AFNR) pathways. This study evaluated how department heads perceive the alignment of teacher preparation programs with the national AFNR standards. We used a descriptive correlational research design to collect data from agricultural education department heads on the number of courses required by teacher preparation programs within each AFNR pathway and the extent to which their programs teach each AFNR standard. Overall, we distributed the survey electronically to $N = 85$ department heads and received $n = 25$ usable responses. The results indicated that teacher preparation programs focus the most on the animal systems, plant systems, and power, structural, and technical systems pathways. Participants reported requiring 1-3 courses within each AFNR pathway, but also indicated that those courses only somewhat prepare students to teach the corresponding AFNR standards. Additionally, department heads at non-RI institutions rated their alignment with the AFNR standards significantly higher in some areas than department heads at RI institutions. We recommend evaluating teacher preparation programs to ensure that their coursework meets the needs of preservice educators.

Keywords: Agricultural Education; Teacher Preparation; Content Knowledge

Review of Literature

Since the passage of the Smith-Hughes Act of 1917, qualified agricultural educators have been in short supply (Eck & Edwards, 2019). Recently, recruiting and retaining qualified educators has been one of the most significant challenges in school-based agricultural education (SBAE; Lemons et al., 2015). While there are many factors affecting an educator's decision to remain in the profession, Norris et al. (2024) identified that "working with motivated students," "attitude towards students," and "confidence in educating students" are some of the most impactful factors affecting an educator's decision to remain in the classroom (p. 42). Solomonson et al. (2021) identified similar reasons Illinois educators remain in the profession. While a passion for educating students is a significant part of the career (Norris et al., 2024; Solomonson et al., 2021), many educators lack confidence in their ability to provide quality instruction in various areas of agricultural education (Wood et al., 2024). Wood et al. (2024) found that educators believed content-specific professional development would positively impact their instruction. Additionally, Wood et al. (2024) identified that educators' prior professional experiences were more impactful to their instruction than the teacher preparation program.

The agricultural teacher preparation program aims to prepare preservice educators for classroom success. The three-component model of agricultural education suggests that educators should be prepared to provide comprehensive instruction in the eight agriculture, food, and natural resources pathways, engage students in work-based learning opportunities through supervised agricultural experiences (SAEs), and provide leadership development through the FFA organization (Croom, 2008). Sorensen et al. (2014) identified that early-career agricultural educators struggle to manage some aspects of FFA/SAE and feel unconfident teaching in some areas of agricultural education. While content knowledge describes preservice educators'

understanding of agricultural topics, pedagogical content knowledge refers to their ability to teach agricultural content (Garcia & Norris, 2025). Garcia and Norris (2025) found that many preservice educators are dissatisfied with the pedagogical content knowledge and content knowledge they received in their teacher preparation program. In many cases, preservice educators value teaching in all eight national agriculture, food, and natural resources (AFNR) pathways, but their perceived competence to provide quality instruction in these areas varies widely (Snider et al., 2021).

Smith et al. (2023) reported that 869 students graduated from license-eligible teacher preparation programs nationally, but many preservice educators never enter the teaching profession (Igo & Perry, 2019). In the 2022-2023 academic year, approximately 78.7% of license-eligible graduates chose to teach SBAE, while others chose to attend graduate school, teach another subject, or find alternative employment (Smith et al., 2023). This decision not to teach could stem from a wide range of factors, but many early-career educators struggle to implement FFA/SAE, manage the learning environment, and develop curriculum in some AFNR areas (Norris et al., 2023), which could influence preservice educators' career decisions. Additionally, preservice teachers' intent to teach is often tied to their "expectations of the teaching profession, love of the FFA, need for relevant instruction, community, variety of learning environments, and career intent" (Eck et al., 2021, p. 218). Smalley and Rank (2019) found that preservice teachers identified that agricultural educators have many duties outside the agriculture program, that FFA and SAE are pivotal to the role, and that many educators have a work-life imbalance. Preservice teachers' realization of the realities of an agricultural educator's duties could be from their internship experience, with many only spending 21.6% of their time on classroom instruction, with the remaining time spent on FFA activities, SAE observations,

lesson planning, administrative/professional duties, etc. (Frost et al., 2018). McKim and Velez (2015) determined that confidence in program management and science integration positively influenced early-career educators' career commitment. If teacher preparation programs target areas of need, they could increase preservice teachers' confidence and, ultimately, reduce teacher attrition.

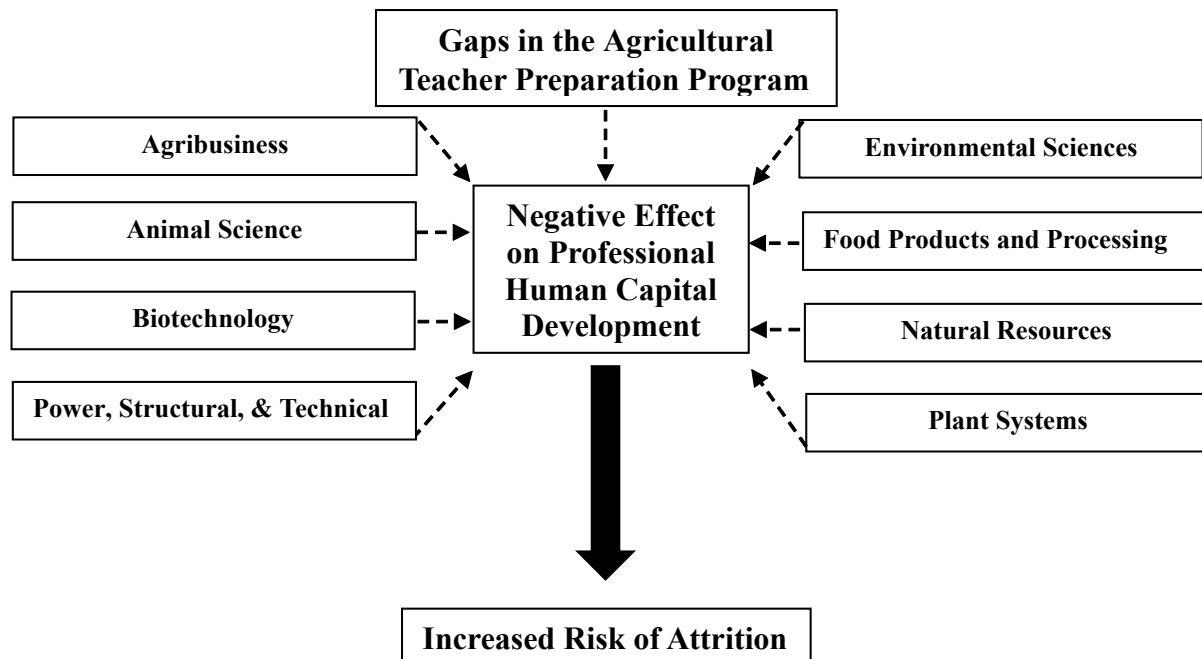
Many preservice teachers report feeling unconfident in teaching some areas of agricultural education (Snider et al., 2021). McLean and Camp (2000) evaluated teacher preparation programs in the U.S. and determined that their required coursework varied widely. Rankin and Edwards (2024) found that required agricultural mechanics courses have declined in teacher preparation programs over the last few decades. In recent years, the number of hours required for an undergraduate degree has decreased, with many major courses eliminated to make room for core courses required at the post-secondary level (Maas et al., 2023). Swortzel (1999) found that the average agricultural teacher preparation program required 131 credit hours. With external pressure to reduce undergraduate degree requirements to 120 hours, reducing contact hours in an undergraduate degree creates difficulty for teacher preparation programs (Maas et al., 2023). Houck and Kitchel (2010) indicated that educators must deeply understand the content they teach to respond to student questions and to diversify teaching methods, but preservice educators often do not feel prepared to teach in each AFNR pathway (Snider et al., 2021). Furthermore, institutions that focus heavily on research may create a conflict between teaching and research, reducing time spent on instruction (Karagiannis, 2009). To mitigate these issues, understanding the coursework required in teacher preparation programs could help identify gaps in preservice teachers' training.

Theoretical Framework

The human capital theory (HCT) served as the theoretical underpinning for this study (Becker, 1993). The HCT posits that an individual's professional competence expands with increasing inputs such as experience, education, and specialized training (Becker, 1993). In the context of this study, as preservice educators' pedagogical content knowledge increases, their competence will also grow, as postsecondary teacher preparation programs provide relevant coursework within each AFNR pathway (Education and Specialized Training). Snider et al. (2021) determined that many preservice teachers have reservations about teaching within the AFNR pathways. Additionally, Garcia and Norris (2025) found that many preservice teachers are dissatisfied with the pedagogical content knowledge, referring to their ability to teach their content knowledge, that they received in their teacher preparation program. This lack of confidence in teaching within the AFNR pathways can put early-career educators at risk of attrition, as 41% of educators leave the profession within their first five years of employment (Ingersoll et al., 2014). This risk is compounded by additional issues within the profession, such as career burnout (Smith & Smalley, 2018), job satisfaction (Blackburn et al., 2017), and work-life imbalance (McKim & Sorensen, 2020; Sorensen et al., 2016). Furthermore, institutions with high research expectations for post-secondary faculty can create a conflict between research and teaching, as these two activities compete for faculty time and resources (Karagiannis, 2009). Institutions measure research output through Carnegie designations, including Very High Research Activity (R1), High Research Activity (R2), and so on. If teacher preparation faculty dedicate more time and resources to research in response to professional expectations, it could reduce their focus on instruction, creating gaps in preservice teachers' human capital development (Figure 1; Karagiannis, 2009).

Figure 1

Factors Affecting Agricultural Educators' Professional Human Capital Development



Purpose and Objective

This study sought to describe how agricultural education department heads perceive their teacher preparation programs' curricula align with the national agriculture, food, and natural resources (AFNR) standards and to identify gaps in required coursework. The following research objectives guided this study:

1. Describe to what degree department heads perceive teacher preparation programs' required coursework alignment with the national AFNR standards.
2. Assess the differences in teacher preparation programs' AFNR preparation levels between R1 institutions and non-R1 institutions.

Methods

Participants

We utilized a descriptive correlational research design to describe how teacher preparation programs' required coursework aligned with the national AFNR standards. The study population was academic department heads who served as administrators for agricultural teacher preparation programs. We selected this population because of their administrative influence over the teacher preparation program and their familiarity with the agricultural teacher preparation degree plan. We identified $N = 85$ academic department heads nationwide. We used a census to reduce sampling bias, resulting in $n = 25$ usable responses and a 29.4% response rate. The average teacher preparation program was housed in the College of Agriculture, served 48 preservice teachers, and had 52 teacher preparation graduates in the last five years (see Table 1).

Table 1

Demographics of Surveyed Agriculture Teacher Preparation Programs

State	College Program	Number of Current Undergraduates	Number of Graduates in the Last 5 Years
State 1	College of Agriculture	17	25
State 2	College of Education	75	25
State 3	College of Agriculture	23	23
State 4	College of Agriculture	20	90
State 5	College of Agriculture	230	190
State 6	College of Agriculture	30	37
State 6	College of Business and Technology	22	20
State 7	College of Edu. & College of Agri.	3	3
State 7	College of Agriculture	92	126
State 8	College of Education	12	15
State 9	College of Agriculture	16	30
State 10	College of Agriculture	63	76
State 11	College of Education	8	1
State 11	College of Agriculture	45	47
State 12	College of Education	2	8
State 13	College of Agriculture	32	37
State 13	College of Agriculture	70	86
State 14	College of Agriculture	70	86
State 15	College of Agriculture	145	150

State	College Program	Number of Current Undergraduates	Number of Graduates in the Last 5 Years
State 16	College of Agriculture	29	24
State 16	College of Agriculture	27	23
State 16	College of Agriculture	52	30
State 17	College of Agriculture	40	42
State 17	College of Applied Arts	28	26
State 18	College of Agriculture	48	85

Note. States were blinded to ensure participant anonymity. n = 25

Instrumentation

We developed the instrument in Qualtrics and distributed it via email to each department head using their employee email. We developed the instrument using the agriculture, food, and natural resources (AFNR) standards and pathways (National Council for Agricultural Education [NCAE], 2015). The NCAE developed these AFNR standards to represent the content taught nationally within SBAE (NCAE, 2015). The eight AFNR pathways include Agribusiness Systems, Animal Systems, Biotechnology Systems, Environmental Service Systems, Food Products and Processing Systems, Natural Resource Systems, Plant Systems, and Power, Structural, and Technical Systems. The instrument asked participants to report how many courses in their teacher preparation program are required in each AFNR pathway. Moreover, within the eight AFNR pathways, there are 37 Common Career Technical Core (CCTC) standards. The instrument also asked participants to rate the degree to which the required coursework in their teacher preparation program taught those standards. Participants rated alignment to each standard on a Likert scale ranging from 1 = *None*, 2 = *Some*, 3 = *Moderate*, 4 = *Strong*, and 5 = *Very Strong*. The instrument also collected demographic data on the teacher preparation program, including state, undergraduate teacher preparation enrollment, and the number of recent teacher preparation graduates in the past five years.

Reliability and Validity

We assessed the instrument's content, construct, and face validity with a committee of three New Mexico State University faculty and one graduate student, and deemed it acceptable for this audience. We assessed the instrument's reliability *post hoc* using Cronbach's alpha coefficients, which ranged from .86 to .98. These coefficients met the minimum threshold for a reliable instrument (Ary et al., 2010).

Data Collection

We initially distributed the survey in February 2024 and followed up with three weekly reminder emails to encourage responses (Dillman et al., 2014). Overall, we received $n = 54$ responses. Of the $n = 54$ responses, $n = 25$ were complete, and $n = 29$ were incomplete, resulting in a 29.4% response rate. We excluded incomplete responses from the analysis because they lacked critical data. To assess non-response bias, we evaluated the results from early and late respondents (Lindner et al., 2001). We defined early respondents as those who responded to the initial email ($f = 10$) and late respondents as those who responded to the three reminder emails ($f = 15$) (Dillman et al., 2014). We used an independent-samples t -test to evaluate non-response bias, and the results indicated no non-response bias in seven of the eight pathways. There were statistically significant differences between early ($M = 2.80$, $SD = 1.06$) and late ($M = 1.68$, $SD = .62$) responders in the Food Products and Processing Systems Pathway $t(23) = 3.34$, $p = .003$, Cohen's $d = 1.36$.

Data Analysis

We analyzed the data using SPSS v. 28.0. We used central tendencies to address research objective one and an independent-samples t -test to address the second research objective. To effectively analyze Likert data using parametric statistics, groups of items should be combined to

form constructs (Norman, 2010; Sullivan & Artino, 2013). This study combined data from each CCTC standard in each AFNR pathway to form a construct for each area.

Limitations

We believe this study provides a robust national analysis of required coursework in teacher preparation programs. While this study offers insight into teacher preparation programs' strategies for training teachers, it has limitations. This study used the national AFNR standards to represent the content taught within each pathway. Typically, each state has standards that dictate the content taught in an agricultural education course. These state-level standards can differ from the national standards and may better reflect an educator's content-knowledge expectations in that state than the national AFNR standards. We chose to utilize the national AFNR standards because of this study's national scope, and many teachers prepared in a specific state will teach in other states. Another limitation is the statistically significant response bias in the food products and processing area. Additionally, department heads are not always the primary administrator for the agricultural education degree plan, even if it is in their department, which could limit the results. We assumed that the academic department heads were familiar with the agricultural education degree plan they oversee, even if they are not the primary administrator. Because of these limiting factors and the low response rate (29.4%), the results of this study should not be generalized beyond the participating institutions.

Results

Research Objective One

The first research objective was to describe the degree to which the required coursework in teacher preparation programs aligns with the national AFNR CCTC standards. The results suggest that most agricultural teacher preparation programs require coursework in all AFNR

pathways, with an average of 1-3 courses in each pathway. The most taught AFNR pathways included Animal Systems, Plant Systems, and Power, Structural, and Technical Systems (see Table 2).

Table 2

Number of Agricultural Content Courses Required in Each AFNR Pathway

AFNR Pathway	<i>n</i>	<i>M</i>	<i>SD</i>
Agribusiness Systems	25	2.88	1.01
Animal Systems	25	3.24	1.05
Biotechnology Systems	25	1.64	1.15
Environmental Service Systems	25	2.04	1.14
Food Products and Processing Systems	25	1.64	1.15
Natural Resource Systems	25	2.04	1.17
Plant Systems	25	3.28	1.10
Power, Structural, and Technical	25	3.08	1.08

Overall, department heads reported that the coursework somewhat to moderately aligned with the AFNR CCTC standards in that pathway. The most aligned pathways included the Plant Systems ($M = 3.05$, $SD = 1.04$), Animal Systems ($M = 3.00$, $SD = .96$), Power, Structural, and Technical Systems ($M = 2.63$, $SD = .96$), Agribusiness Systems ($M = 2.58$, $SD = .82$), and Natural Resource Systems ($M = 2.50$, $SD = 1.02$) pathways. The least aligned pathways included Food Products and Processing Systems ($M = 2.13$, $SD = 1.06$), Environmental Service Systems ($M = 2.28$, $SD = .92$), and Biotechnology Systems ($M = 2.35$, $SD = 1.07$) pathways (see Table 3).

Table 3*Rating of Teacher Preparation Programs' Focus on AFNR Pathway Standards*

AFNR CCTC Standard	<i>n</i>	<i>M</i>	<i>SD</i>
Agribusiness Construct Score	25	2.58	.82
ABS.01. Apply management planning principles in AFNR businesses.	25	2.92	.86
ABS.02. Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.	25	2.60	.76
ABS.03. Manage cash budgets, credit budgets, and credit for an AFNR business using generally accepted accounting principles.	25	2.60	.82
ABS.04. Develop a business plan for an AFNR business.	25	2.44	.87
ABS.05. Use sales and marketing principles to accomplish AFNR business.	25	2.32	.80
Animal Systems Construct Score	25	3.00	.96
AS.01. Analyze historic and current trends impacting the animal systems industry.	25	2.80	1.04
AS.02. Utilize best-practice protocols based upon animal behaviors for animal husbandry and welfare.	25	3.16	1.07
AS.03. Design and provide proper animal nutrition to achieve desired outcomes for performance, development, reproduction, and/or economic production.	25	3.04	.98
AS.04. Apply principles of animal reproduction to achieve desired outcomes for performance, development, and/or economic production.	25	3.00	.96
AS.05. Classify, evaluate, and select animals based on anatomical and physiological characteristics.	25	3.16	.99
AS.06. Apply principles of effective animal health care.	25	3.08	.91
AS.07. Analyze environmental factors associated with animal production.	25	2.76	.78
Biotechnology Systems Construct Score	25	2.35	1.07
BS.01. Assess factors that have influenced the evolution of biotechnology in agriculture (e.g., historical events, societal trends, ethical and legal implications, etc.).	25	2.36	.99
BS.02. Demonstrate proficiency by safely applying appropriate laboratory skills to complete tasks in biotechnology.	25	2.56	1.26
BS.03. Demonstrate the application of biotechnology to solve problems in Agriculture, Food, and Natural Resources (AFNR) systems (e.g., bioengineering, food processing, water management, horticulture, forestry, livestock, crops, etc.).	25	2.12	.97
Environmental Service Systems Construct Score	25	2.28	.92
ESS.01. Use analytical procedures and instruments to manage environmental service systems.	25	2.00	.87
ESS.02. Evaluate the impact of public policies and regulations on environmental service system operations.	25	2.16	.90

AFNR CCTC Standard	<i>n</i>	<i>M</i>	<i>SD</i>
ESS.03. Develop proposed solutions to environmental issues, problems, and applications using scientific principles of meteorology, soil science, hydrology, microbiology, chemistry, and ecology.	25	2.40	.96
ESS.04. Demonstrate the operation of environmental service systems (e.g., pollution control, water treatment, wastewater treatment, solid waste management, and energy conservation).	25	2.24	.93
ESS.05. Use tools, equipment, machinery, and technology common to tasks in environmental service systems.	25	2.60	.96
Food Products and Processing Systems Construct Score	25	2.13	1.06
FPP.01. Develop and implement procedures to ensure safety, sanitation, and quality in food products and processing facilities.	25	2.12	1.05
FPP.02. Apply principles of nutrition, biology, microbiology, chemistry, and human behavior to the development of food products.	25	2.24	1.01
FPP.03. Select and process food products for storage, distribution, and consumption.	25	2.00	1.16
FPP.04. Explain the scope of the food industry and the historical and current developments of food products and processing.	25	2.16	1.03
Natural Resource Systems Construct Score	25	2.50	1.02
NRS.01. Plan and conduct natural resource management activities that apply logical, reasoned, and scientifically based solutions to natural resource issues and goals.	25	2.40	1.00
NRS.02. Analyze the interrelationships between natural resources and humans.	25	2.56	1.04
NRS.03. Develop plans to ensure sustainable production and processing of natural resources.	25	2.52	1.01
NRS.04. Demonstrate responsible management procedures and techniques to protect, maintain, enhance, and improve natural resources.	25	2.52	1.01
Plant Systems Construct Score	25	3.05	1.04
PS.01. Develop and implement a crop management plan for a given production goal that accounts for environmental factors.	25	2.44	1.08
PS.02. Apply principles of classification, anatomy, and plant physiology to plant production and management.	25	3.32	1.11
PS.03. Propagate, culture, and harvest plants and plant products based on current industry standards.	25	3.40	1.04
PS.04. Apply principles of design in plant systems to enhance an environment (e.g., floral, forest landscape, and farm).	25	3.04	.94
Power, Structural, and Technical Systems Construct Score	25	2.63	.96
PST.01. Apply physical science principles and engineering applications to solve problems and improve performance in AFNR power, structural, and technical systems.	25	2.80	.96

AFNR CCTC Standard	<i>n</i>	<i>M</i>	<i>SD</i>
PST.02. Operate and maintain AFNR mechanical equipment and power systems.	25	3.16	.99
PST.03. Service and repair mechanical equipment and power systems.	25	2.80	.96
PST.04. Plan, build, and maintain AFNR structures.	25	2.36	.91
PST.05. Use control, monitoring, geospatial, and other technologies in AFNR power, structural, and technical systems.	25	2.04	.98

Note. Likert Scale Ranges from 1 = *None*, 2 = *Some*, 3 = *Moderate*, 4 = *Strong*, 5 = *Very Strong*.

Research Objective Two

For the second research objective, we used an independent-samples *t*-test to assess statistical differences in teacher preparation scores between R1 institutions and non-R1 institutions within each pathway. The analysis found no statistically significant differences between R1 institutions and non-R1 institutions (see Table 4).

Table 4

Independent Samples t-test Assessing Institution Type and AFNR Pathway Preparation

Constructs	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
R1 Institution	13	2.39	.49				
Agribusiness Systems				-1.49	23	.15	-.60
Non-R1 Institution	12	2.79	.82				
R1 Institution	13	2.89	.75				
Animal Systems				-.73	23	.47	-.29
Non-R1 Institution	12	3.12	.82				
R1 Institution	13	2.05	1.03				
Biotechnology Systems				-1.60	23	.12	-.64
Non-R1 Institution	12	2.67	.86				
R1 Institution	13	2.00	.55				
Environmental Service Systems				-1.99	23	.06	-.80
Non-R1 Institution	12	2.58	.88				
R1 Institution	13	1.98	.83				
Food Products & Processing Systems				-.79	23	.44	-.32
Non-R1 Institution	12	2.29	1.13				
R1 Institution	13	2.50	.90				
Natural Resource Systems				.00	23	1.00	.00
Non-R1 Institution	12	2.50	1.12				

Constructs	<i>n</i>	<i>M</i>	<i>SD</i>	<i>t</i>	<i>df</i>	<i>p</i>	Cohen's <i>d</i>
R1 Institution	13	2.73	.90				
Plant Systems				-2.00	23	.06	-.80
Non-R1 Institution	13	2.40	.75				
R1 Institution	13	2.52	.77				
Power, Structural, & Technical Systems				-.74	23	.47	-.30
Non-R1 Institution	12	2.75	.77				

Note. $\alpha = .05$.

Conclusions, Discussions, and Implications

Academic department heads of post-secondary agricultural teacher preparation programs across the United States were asked to share the number of courses their program requires in each AFNR pathway and rate their degree plan's focus on each AFNR CCTC standard. The study's results suggest that teacher preparation programs differ in the number of courses they require in agribusiness systems, animal systems, environmental service systems, and power, structural, and technical systems. Programs also differed substantially in the number of courses required in biotechnology systems, food products and processing systems, natural resource systems, and plant systems. This indicates that across the United States, agricultural teacher preparation programs differ in the content-knowledge-building courses required of preservice agricultural educators. Overall, programs emphasized animal and plant systems the most, with the least emphasis on food products and processing systems. Internal and external pressures to reduce undergraduate degrees to 120 credit hours have prompted many teacher preparation programs to reduce the number of major courses to make room for required core courses (Maas et al., 2023). Rankin and Edwards (2024) found that the number of required courses in agricultural mechanics has decreased over the past few decades. This shift in teacher preparation degree plans may help explain knowledge gaps among preservice and early-career educators.

The analysis in the first research objective suggested differences in the emphasis on each AFNR CCTC standard in the content courses required for preservice agricultural educators

across teacher preparation programs. The results indicated some misalignment between the content agricultural educators are expected to teach under the national AFNR standards and the content they receive in their teacher preparation programs. This misalignment could explain preservice educators' dissatisfaction with the quality, quantity, and transferability of the content knowledge they received (Garcia & Norris, 2025; Rice & Kitchel, 2015). It could also help explain preservice educators' lack of confidence entering the classroom (McKim et al., 2017; Snider et al., 2021) and their subsequent attrition from the profession (Lemons et al., 2015). If teacher preparation programs align their required coursework with AFNR standards, they could provide the education and specialized training needed to increase human capital (Becker, 1993), improve competence, and reduce teacher attrition.

Moreover, results from the second research objective indicated that department heads at R1 and non-R1 institutions rated the alignment of their teacher preparation programs with AFNR standards similarly. This finding indicates that R1 and non-R1 institutions have similar alignment with AFNR standards in their agricultural teacher preparation programs. Karagiannis (2009) suggested that increasing research and administrative responsibilities negatively affect instruction. If this is true, the results of this study suggest that the increased research expectations of R1 institutions may not negatively affect agricultural teacher preparation programs' alignment with the AFNR standards.

Recommendations for Future Practice and Research

This research revealed a misalignment in the quality and quantity of courses required by teacher preparation programs in each AFNR pathway. Additionally, academic department heads rated the required coursework as somewhat to moderately preparing preservice educators to teach the AFNR CCTC standards. This is especially important in the agricultural education

profession, where educators are tasked with teaching these standards but are often not fully prepared to do so in each area (Snider et al., 2021). We recommend evaluating the teacher preparation program to ensure coursework is required in each AFNR area and that each required course aligns with the AFNR standards, equipping preservice teachers with the content knowledge needed to succeed in the classroom. Universities should also consider reducing the required core coursework and adding courses designed to enhance preservice teachers' content knowledge and pedagogical skills, as well as help them develop strategies for teaching agricultural content. We also recommend additional quantitative studies to evaluate how well each teacher preparation program's required coursework aligns with its state-level standards. This could provide more localized insight into coursework gaps that this research did not evaluate.

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