Pedagogical Content Knowledge: Describing Teacher Preparation Programs' Required Curriculum within AFNR Pathways and Standards

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Introduction, Purpose, and Objectives

Over the last several decades, one of agricultural education's largest problems has been recruiting and retaining highly qualified agricultural educators (Lemons et al., 2015). Unfortunately, approximately 50% of new educators will leave the profession within their first five years (Moser & McKim, 2020). While agricultural educator attrition has been associated with numerous factors, one of the main factors is the educator's lack of pedagogical content knowledge (McKim et al., 2017). Pedagogical content knowledge is defined as how teachers relate what they know to what they know how to teach (Cochran, 1997). Educators can feel unconfident in their abilities without pedagogical content knowledge, leading to attrition (McKim et al., 2017). One of the main sources of pedagogical content knowledge is the traditional teacher preparation program, but many agricultural teacher preparation program graduates feel unprepared for the classroom (Rice & Kitchel, 2015). This study sought to describe how well teacher preparation programs' curriculum aligns with the national Agriculture, Food, and Natural Resources (AFNR) standards to identify gaps in required coursework. The following research objective guided this study:

1. Describe to what degree teacher preparation programs' required coursework is aligned with the national AFNR standards.

Theoretical Framework

The theoretical framework that guided this study is the Human Capital Theory (HCT; Becker, 1993). The HCT posits that an individual's professional competence expands as inputs such as experience, education, and specialized training increase (Becker, 1993). In the context of this study, as post-secondary teacher preparation programs provide relevant coursework within each AFNR pathway (Education and Specialized Training), the pedagogical content knowledge of preservice educators will be increased, and their competence will be amplified.

Methods

This study utilized a descriptive correlational research design to describe how teacher preparation programs' required coursework aligns with the national AFNR standards. The population for this study was department heads who served as administrators for the teacher preparation program. This population was selected due to their administrative influence over the teacher preparation program. There were $N = 89$ department heads over teacher preparation programs nationwide. A census method was employed to reduce sampling bias. The instrument was developed in Qualtrics and was distributed via email to each department head using their employee email. The survey was distributed four times in weekly intervals to stimulate responses and increase the response rate (Dillman et al., 2014). Overall, we received $n = 54$ responses, equating to a 60.7% response rate. Of the 54 responses, 25 were complete and 29 incomplete. The incomplete responses were excluded from the analysis due to a lack of data.

The instrument utilized in this study was developed using the Agriculture, Food, and Natural Resources (AFNR) standards and pathways (NCAE, 2023). The National Council for Agricultural Education (NCAE) developed these AFNR standards, representing the content taught nationally within school-based agricultural education (SBAE; NCAE, 2024). There are eight AFNR pathways, including 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. Within the eight AFNR pathways, there are 37 Common Career Technical Core (CCTC) standards. The instrument asked participants to rate the degree to which the required coursework in their teacher preparation program taught those standards. The participants rated the alignment to each standard using a Likert scale ranging from 1 = *None*, 2 = *Some*, 3 = *Moderate*, 4 = *Strong*, and 5 = *Very Strong*. The instrument's reliability was assessed *post hoc* utilizing Cronbach's alpha reliability coefficients, which ranged from .86 to .98. These reliability coefficients met the minimum threshold for a reliable instrument (Ary et al., 2010). The validity of the instrument was assessed by a committee of three New Mexico State University faculty and one graduate student and was deemed acceptable. The data for this study was analyzed using SPSS v. 28.0, which utilized central tendencies to execute the research objective. To effectively analyze Likert data using parametric statistics, groups of five more 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 constructs.

Results

The results of this analysis suggested that most agricultural teacher preparation programs require coursework in all the AFNR pathways, with an average of 2-3 courses required in all pathways. The most taught AFNR pathways included Animal Systems, Plant Systems, and Power, Structural, and Technical Systems. The most concerning finding was that department heads rated the coursework as 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), and Power, Structural, and Technical Systems (M = 2.63, SD = .96). The least aligned pathways included Food Products and Processing Systems (M = 2.13, SD = 1.06), Environmental Service Systems (M = 2.28, SD = 1.07), and Biotechnology Systems (M = 2.35, SD = 1.07).

Conclusions, Implications, and Recommendations

The results suggest that there is a misalignment in what agricultural educators are asked to teach in the national AFNR standards and the content they receive in their teacher preparation program. This misalignment could explain preservice educators' dissatisfaction with the quality, quantity, and transferability of the content knowledge they received (Rice & Kitchel, 2015). Additionally, it could help explain preservice educators' lack of confidence going into the classroom (McKim et al., 2017) and their subsequent attrition from the profession (Lemons et al., 2015). If teacher preparation programs can align their required coursework with the AFNR standards, it could provide the education and specialized training to improve competence (Becker, 1993). The results of this study guided the researchers in recommending the evaluation of required coursework for preparation programs.

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