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A Historical Review of Course Requirements in Agricultural Mechanics for Agricultural Education, Teacher Education Undergraduates at Nine 1862 Land-Grant Universities

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Preparing pre-service students to teach agricultural mechanics is a difficult task due to the career pathway including a great variety of topics (Byrd et al., 2015). This study examined the trend in requirements in 1862 land-grant universities for number of courses, course credit hours, and course topics related to agricultural mechanics, as well as the total credit hours needed for degree completion in agricultural education, teacher education. Overall, the universities examined had lessened the total course credit hours related to agricultural mechanics courses from 8.33 to 11.83 credit hour requirements in 1980, to a range of 6.67 to 8.33 credit hours in 2021. As such, the total credit hours required for teacher education degree completion in agricultural education had decreased from an average of 128.4 total credit hours to 125.0 credit hours over the same time period. Course topics found to be the most common from 1980 to 2021 were Intro to Ag Mechanics, Welding, and Construction/Structures. It is recommended that qualitative interviews be conducted with cognizant university faculty to ascertain the importance of the various course topics and analyze how topics were identified as priorities in their respective programs, including whether the views of industry stakeholders were considered and addressed.

Keywords: agricultural education, agricultural mechanics, courses

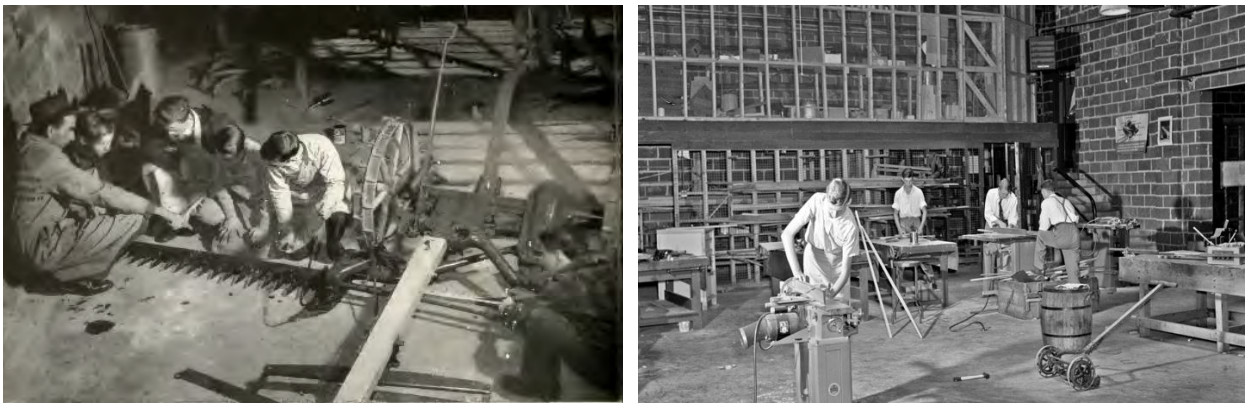
Introduction

The teaching of vocational agriculture mechanics at the collegiate level can be traced to before the enactment of the Smith-Hughes Act of 1917 at some institutions (Herren & Hillison, 1996). The longstanding historical prominence of agricultural mechanics instruction in school-based agricultural education (SBAE) is depicted in Figure 1. Courses have ranged from metal fabrication to electricity to structures to machinery over time (Burris et al., 2005; Byrd et al., 2015; Granberry et al., 2023; Hubert, 1996; Twenter & Edwards, 2017). Burris et al. (2005) and Granberry et al. (2023) identified that agricultural mechanics is one of, if not, the highest rated student interest area in SBAE programs, making it a fundamental content area of agricultural education. Granberry et al. (2023) identified 10 agricultural mechanics competencies as either *important* or *somewhat important* to undergraduate education by 94 university faculty who taught pre-service teachers of SBAE. However, in the early 1990s, Harrison et al. (1993) found

that a decrease in students enrolling in traditional vocational agriculture education at the secondary and post-secondary levels, as well as in career and technical education degree programs, coupled with the reduced funding of programs had led to a decline in course offerings and requirements by some undergraduate programs. Moreover, Hubert and Leising (2000) noted that "student teachers reported high levels of anxiety associated with teaching agricultural mechanics prior to and during their student teaching" (p. 24), which may have been due to less experience with the subject while completing teacher preparation courses. This aligns with Granberry et al. (2023) findings that of the agricultural mechanics competencies identified as having importance, university faculty members perceived that pre-service teachers were either only *somewhat prepared* or *poorly prepared* in eight of the competencies.

Figure 1

Historical Examples of Agricultural Mechanics Course Content Taught in SBAE



Note. Left image taken from Bonn (1943). Copyright 2016 The Library of Congress. Right image, "School Facilities," National FFA Organization, 1947, *FFA in Action*, Issue 2, p. 18. Copyright 1947 National FFA Organization.

A decline in teacher preparation requirements for agricultural mechanics led to more of an emphasis on teaching basic content knowledge and less on laboratory management and methods to teach such content, according to Hubert (1996). This is concerning as "laboratory instruction has emerged as a principal fixture of formal instruction and often provides students with experiential learning opportunities that help them acquire agricultural-based knowledge and skills" (Granberry et al., 2023, p. 1). Nonetheless, McKim and Saucier (2013) identified a decrease from an average of 17.39 course credit hours of agricultural mechanics instruction taken at the post-secondary level to 11.30 course credit hours of instruction for pre-service students over a 41-year period (see Table 1, p. 157). On the other hand, Hubert (1996) found that three-fourths of the 59 university programs identified in their study required only 2.9 course credit hours or less of instruction related to agricultural mechanics for degree completion. Although nearly 20 years expired between these studies, the difference and related rationale warrants closer examination. This decrease in courses and course credit hours required for degree completion in agricultural education, teacher education has led to concerns regarding the effectiveness of instruction in agricultural mechanics by SBAE teachers (Granberry et al., 2023; McKim & Saucier, 2013).

Ralph Tyler, whom many consider a leader in curriculum development and instructional design, contended that "[b]y the cumulation of many educational experiences profound changes develop in the learner" (Tyler, 1958, p. 106). This would include teachers' acquisition of knowledge and skills to teach agricultural education. A review of agricultural mechanics course requirements and course topics to identify trends in content preparation of SBAE instructors over time could inform university teacher educators, members of state staffs, school administrators, and other stakeholders about current requirements in agricultural mechanics. The preparedness of beginning instructors to teach agricultural mechanics, including potential deficits and needs for in-service education, would be important implications.

Upheavals and Challenges to SBAE beginning in the 1980s. As the program specialist for Agriculture, Agribusiness, and Natural Resources in the Bureau of Occupational and Adult Education in the United States Department of Education, Dr. Byron F. Rawls, in his article "Facing a Decade of Change," identified seven challenges agricultural education would face in the coming decade. At least three of Rawls' challenges that supported the framing of this study included the following:

1. Changes in the way teachers see their responsibilities and opportunities. Much more information is needed in order to adjust the attitudes of the entire profession concerning preparation and retention of teachers who will provide quality instruction at all levels.
2. Accurate matching of required competencies, including personal development, with the duties to be performed will have implications for initial preparation for an occupation and for keeping current in employment through programs designed for this purpose.
3. Technology will continue to change. The base for technological development is much broader than a decade ago. We are surely going to see astounding developments within the agricultural complex in the next decade. One can only guess what the parade of agricultural technology will be, but we must be responsive in our program planning and implementation to keep up and, if possible, stay ahead of developments. (Rawls, 1980, p. 5)

In the 1970s and leading into the 1980s, enrollment in post-secondary agricultural education programs increased 102%, and also increased 27% for secondary school students taking courses in SBAE (Warmbrod, 1980). However, a key concern for the future of agricultural education, as identified by Warmbrod (1980), was the competency of teachers graduating universities in agricultural education, teacher education. Warmbrod (1980) asked: "Are university graduates certified to teach as highly competent technically and professionally as they should be?" (p. 8). His admonition included teachers' abilities to teach agricultural mechanics.

A second factor that supported this study's framing was the passage and enactment of the 1984 Carl D. Perkins Vocational Education Act. The Carl D. Perkins Vocational Education Act of 1984 (H.R. 4164) was federal legislation devoted to

> [s]trengthen[ing] and expand[ing] the economic base of the nation, developing human resources, reducing structural unemployment, increasing productivity, and strengthening

> the nation's defense capabilities by assisting the States to expand, improve, and update high-quality programs of vocational-technical education, and for other purposes. (para. 1)

Due to these factors identified as major issues facing agricultural education in the past, and the variety of instructional topics taught in university agricultural mechanics courses over time, the number of required instructional hours and content areas taught continues to be a topic of debate in the discipline (Byrd et al., 2015; Clark et al., 2021; McKim & Saucier, 2013; Rasty et al., 2017; Saucier et al., 2012). With differences in the findings for the number of course credit hours offered and required at various universities preparing SBAE teachers, the phenomenon warranted a historical review to better understand trends that may presage the future outlook and related teacher preparation needs.

Purpose and Research Questions. This historical research study's purpose was to explore the course credit requirements at select 1862 land-grant universities from 1980 to 2021 regarding agricultural mechanics and related courses. The year 1980 was chosen for the beginning of data collection due to the 1980s having unfolded as a decade of great upheaval and change in vocational education overall, including agricultural education. As such, the 1983 report *A Nation at Risk* (Bell, 1983) as well as enactment of the first Carl D. Perkins Act (H.R. 4164), respectively, called for a renewed emphasis on academic course-taking by secondary school students and for what would become known as career and technical education assisting to achieve that aim.

The research questions that guided this study were the following: (a) What was the trend in course requirements related to agricultural mechanics for completion of vocational agriculture education, career and technical education, and agricultural education undergraduate degrees across nine 1862 land-grant universities over time? and (b) What topics were taught in agricultural mechanics courses for degree completion in agricultural education, teacher education at nine 1862 land-grant universities over time?

Methodology

Historical research methods were used in the study's data collection process (McDowell, 2002) by accessing online databases and search engines, exchanging personal communications, and reviewing institutional library resources. The institutional participants for this study were identified by deriving a systematic sample (Bellhouse, 2005) from the population of 1862 land-grant universities ($N = 50$). Systematic sampling is a technique that is used for its convenience and simplicity, while also allowing for participants within a population to have an equal chance to be selected for study (Bellhouse, 2005). It is recommended that a minimum of 10% of the population be sampled for inferential data; however, for statistical data analysis, a representative sample greater than 20% is recommended (Bellhouse, 2005). Although 1862 land-grant institutions have not been the sole source of agricultural education and teacher preparation, they were a primary source in many cases, as well as the oldest and most predominant providers of SBAE teachers in most states. The three AAAE regions framed the sub-groups of the study: (a) North-Central, (b) Southern, and (c) Western. Each sub-group had all of the 1862 land-grant universities alphabetized; such were numbered based on that alphabetical order and a random number generator was used to select three institutions from each region. As such, three

institutions, for a total of nine, were randomly chosen ensuring that each region was equally represented (Bellhouse, 2005).

The institutions identified for this study were North Dakota State University (ND State Univ.), Purdue University, and West Virginia University (WV Univ.) of the North-Central region; University of Arizona (Univ. of AZ), University of Idaho (Univ. of ID), and Washington State University (WA State Univ.) of the Western region; and Auburn University, Louisiana State University (LA State Univ.), and University of Kentucky (Univ. of KY) of the Southern region. The universities were contacted to provide documents pertaining to the course-taking requirements for their respective undergraduate degrees in agricultural education, teacher education, or otherwise named from 1980 to 2021. Cronon (2009) explained that historical researchers seek to uncover documents that aid them in answering their research questions. A *document*, according to Cronon (2009), "can be a book or a newspaper, but it can also be almost anything else that contains traces of the past: a photograph, a map, an artifact, a memory, a landscape—almost anything" (para. 11).

Our primary sources included university records of degree completion requirements, or course-taking requirements, as set forth by the respective academic departments and their institutions. Secondary sources were documents that cited primary sources. The key terms and phrases used to aid in retrieving the study's sources via online searches were agricultural education degree requirements, agricultural mechanics course requirements in agricultural education, career and technical education degree requirements, historical agricultural mechanics requirements for vocational and career and technical education degrees, and vocational agriculture education degree requirements. Searching for "agricultural education," "career and technical education," and "vocational agriculture" reduced the possibility of *presentism* occurring if considering historical versus more current-day naming conventions (Johnson & Christensen, 2012). The universities' digital archives were also searched to gather data. In addition, electronic mail messages were sent to faculty identified as teaching in the nine institutions' agricultural education, teacher education units to further source data.

A database collection detailing all documents received, identified, and examined for accuracy and authenticity was created to organize findings to answer the study's research questions (McDowell, 2002), i.e., internal criticism and external criticism of the findings were conducted (Johnson & Christensen, 2012). Data were organized by date to establish a chronological order. Next, an analysis of the course requirements by university was completed. Data analysis consisted of determining the average number of course credit hours related to agricultural mechanics courses required by the institutions, number of courses required, total course credit hours required for undergraduate degree completion, and course content, i.e., identifiable topics. Limitations of this study include no response from some of the institutional representatives contacted, as well as unobtainable or incomplete faculty records in a few cases.

Findings

Research Question 1: What was the trend in course requirements related to agricultural mechanics for completion of vocational agriculture education, career and technical education, and agricultural education undergraduate degrees across nine 1862 land-grant universities over time? Online searches using nine universities' internal search engines and their respective websites and personal communications with faculty members who taught and supervised three of the institutions' agricultural education teacher preparation

programs (A. Marx, personal communication, November 2, 2021; R. Roberts, personal communication, October 4, 2021; B. Talbert, personal communication, October 4, 2021) yielded archived course catalogs and related information about undergraduate degree completion requirements. The catalogs, for examples see Figure 2 and Figure 3, offered descriptions of course titles, course topics, and requirements for undergraduate degrees in agricultural education, teacher education, including agricultural mechanics.

Figure 2

University Course Catalog Example, Louisiana State University 1987 – 1988

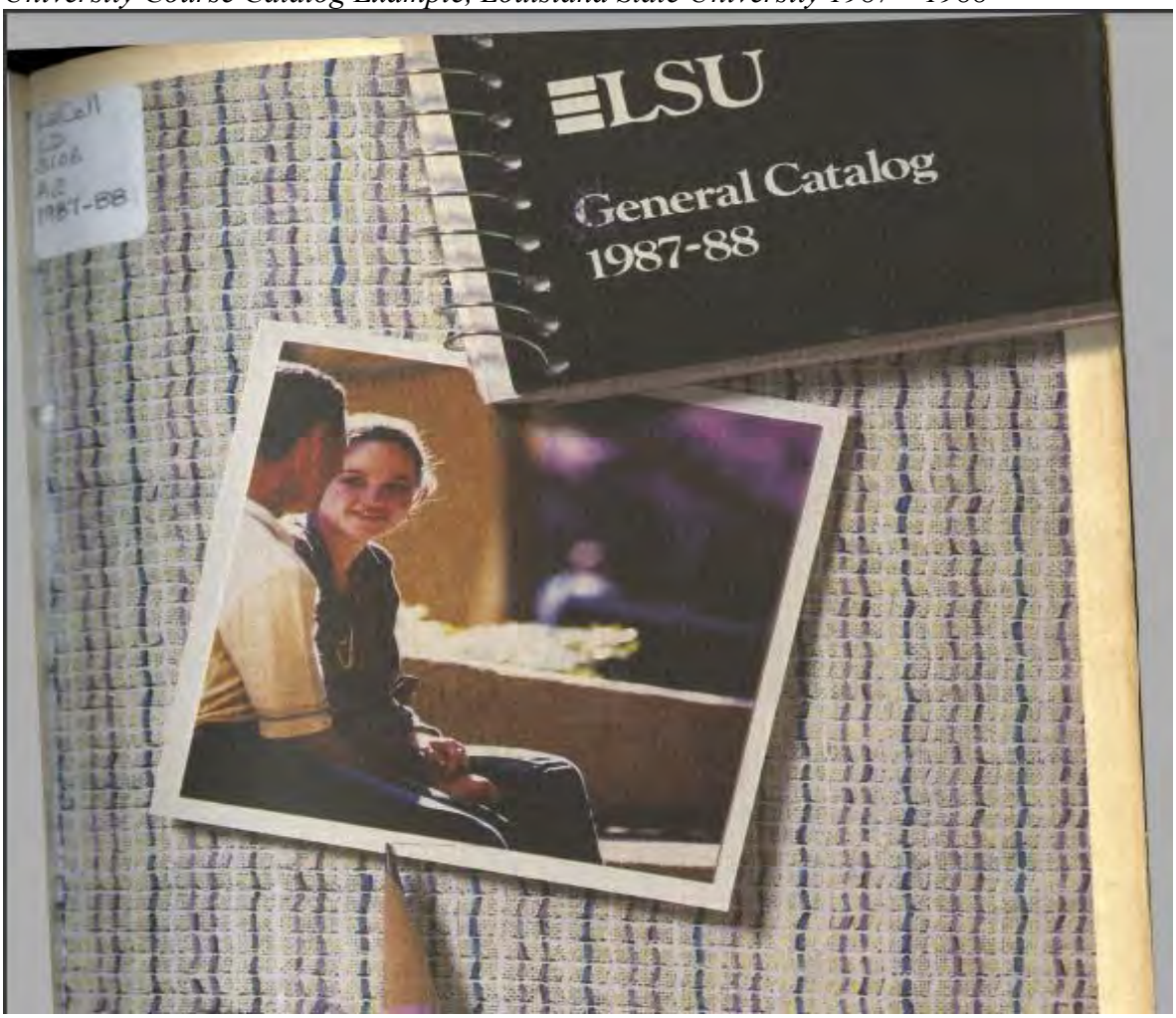


Figure 3

University Course Catalog, Examples of Course Titles, University of Idaho 2016 – 2017

AGED 454	Facilities Organization and Management	2 cr
AGED 460	Practicum: Secondary School Teaching in Agriculture	10 cr
AGED 461	Student Teaching Portfolio	2 cr
AGED 470	Proseminar in Agricultural Education	1 cr - Max 2 cr
AGED 471	Senior Capstone in Agricultural Education	1 cr
ASM 107	Beginning Welding	2 cr
ASM 202	Agricultural Shop Practices	2 cr
ASM 210	Small Engines	2 cr
ASM 407	Advanced Welding	1 cr
BIOL 115	Cells & the Evolution of Life	3 cr
BIOL 115L	Cells and the Evolution of Life Laboratory	1 cr
COMM 101	Fundamntls Public Speaking	2 cr

Results displayed in Table 1 show an analysis by five-academic-years increments, excluding the most recent of six-years, with the first year indicating the fall semester of that academic year, i.e., 1980 is inclusive of the 1980 – 1981 academic year. The course credit hour requirements in agricultural mechanics and related courses are provided by said increments for each institution. Credit hours with a year in parenthesis immediately below it indicates a credit hours requirement change at the beginning of that academic year, e.g., 14^{a} ('81) indicates a new requirement of 14 course credit hours at the beginning of the 1981 – 1982 academic year. In the case of Washington State University, regarding its four agricultural education, teacher education degree options (see Tables 1 & 2), as offered from the fall term of 1980 to the spring term of 1983, an average was calculated.

Table 1

Course Credit Hour Requirements for Agricultural Mechanics and related Courses for Undergraduate Degree Completion in Agricultural Education, Teacher Education from 1980 to 2021 at Nine 1862 Land-Grant Institutions

Years	ND State Univ.	Purdue Univ.	WV Univ.	Univ. of AZ	Univ. of ID	WA State Univ.	LA State Univ.	Auburn Univ.	Univ. of KY
1980 – 1984	[d]	5–8[b]	17	11 14[a] ('81)	[d]	7[c], 12[c], 22[c] 19[a] ('83)	6	[d]	6
1985 – 1989	[d]	5–8[b]	17	14 15[a] ('89)	[d]	16	6 0– 6[a,b] ('88)	[d]	6
1990 – 1994	12 ('94)	4	17	15 11[a] ('93)	[d]	16 7[a] ('91)	0–6[b] [a,d] ('91)	[d]	6
1995 – 1999	10	4	17 8–11[a,b] ('97)	11	6 ('96)	7	[d]	6 ('98)	6
2000 – 2004	10	4	8–11[b]	14	6	7	[d]	6	6
2005 – 2009	10 11[a] ('09)	4	8–11[b] 7[a] ('09)	14	6	7 6[a] ('06)	[d]	6	6
2010 – 2014	11 12[a] ('12)	6	7 6[a] ('11) 8[a] ('12)	9	6 7[a] ('12)	6	[d] 0– 15[a,b] ('11)	6	6
2015 – 2021	12	6	8	9	7 10[a] ('20)	6	0– 15[b]	6	6
Average	11.00	5.13	11.04	12.45	6.85	10.06	5.50	6.00	6.00

Note. [a] Indicates that the requirements went into effect at beginning of the academic year. [b] Indicates range of course credit hours inclusive of these universities' required elective course credit hours. [c] Indicates multiple degree options and the course credit hour requirements for each. [d] Indicates that course credit hour requirements were either not provided or not found.

The credit hours required for degree completion from the sample, if averaged for the 41-year time frame, ranged from 5.13 to 12.45 (see Table 1). Four universities showed a decrease in credit hour requirements for agricultural mechanics and related course content over time (see Table 1). Washington State University was found to have offered four-degree options that required different numbers of credit hours in agricultural mechanics for degree completion and teaching certification. The institution offered degree options in (a) production agriculture – mechanics, (b) production agriculture – business, (c) agricultural resources – forestry, and (d) horticulture. The latter three-degree options had a requirement of 7 to 12 course credit hours in agricultural mechanics or related subject areas (see Table 1). However, the production agriculture – mechanics degree option had courses totaling 22 credit hours for degree completion.

Six universities had established a finite number of credits required for degree completion from 1980 to 2021. Three institutions, however, had either ranges or recommendations of credit hours for degree completion at some point from 1980 to 2021. By offering a recommendation of credit hours, and not a finite requirement, students had flexibility to choose on which course concentration areas they focused prior to becoming certified to teach SBAE. Louisiana State University was an anomaly from the years of 1991 through 2009, i.e., specific course requirements were not outlined in its course catalogs. Rather a requirement of 50 course credit hours in agricultural studies and approval from the student's academic advisor was specified.

As the number of course credit hours required in agricultural mechanics were reduced, the average number of courses required for degree completion also declined. Most courses identified in this study ranged from two to three credit hours. With recommended or required courses averaging such, it might be assumed that each university held students to this standard for degree completion. However, this was not always the case as indicated in Table 2.

Table 2

Total Courses in Agricultural Mechanics and related Courses required for Undergraduate Degree Completion in Agricultural Education, Teacher Education from 1980 to 2021 at Nine 1862 Land-Grant Institutions

Years	ND State Univ.	Purdue Univ.	WV Univ.	Univ. of AZ	Univ. of ID	WA State Univ.	LA State Univ.	Auburn Univ.	Univ. of KY
1980 – 1984	[d]	3	6[b]	4 5[a] ('82)	[d]	3[c], 4[c], 9[c] 7[a] ('83)	2	[d]	2
1985 – 1989	[d]	3	6[b]	5	[d]	6	2 2[a,b] ('88)	[d]	2
1990 – 1994	4[b] ('94)	2	6 1–8[a,b] ('93)	5 4[a] ('93)	[d]	6 3[a] ('91)	2[b]	[d]	2
1995 – 1999	4[b]	2	1–8[b] 3[a] ('97)	4	3 ('96)	3	2[b]	2 ('98)	2
2000 – 2004	4[b]	2	3	5	3	3	[d]	2	2
2005 – 2009	4[b]	2	3 2[a] ('09)	5	3	3 2[a] ('06)	[d]	2	2
2010 – 2014	4[b]	2	2 3[a] ('12)	3	3 4[a] ('12)	2	[d]	2	2
2015 – 2021	4[b]	2	3	3	4	2	[d]	2	2
Average	4.00	2.25	3.75	4.30	3.33	3.85	2.00	2.00	2.00

Note. [a] Indicates the number of courses required went into effect at the beginning of that academic year. [b] Indicates total courses, with electives, based on that university's requirements. [c] Indicates multiple degree options and various course requirements for each. [d] Indicates that the course requirements were either not provided or not found.

The average number of courses required from 1980 to 2021 was 3.05 for degree completion at the nine universities studied. Before 1995, four institutions either recommended or required four to nine courses in agricultural mechanics. However, from the 1995 – 1996 academic year to the 2009 – 2010 academic year, all but West Virginia University and the University of Arizona required only two to four courses in agricultural mechanics or related courses. Beginning with the 2010 – 2011 academic year, all nine institutions would recommend or require four or fewer courses related to agricultural mechanics. Identifying total credit hours required for undergraduate degree completion in agricultural education, teacher education was also important to understanding the importance of agricultural mechanics course-taking and space for such in the institutions' undergraduate degree programs' requirements. Findings regarding total course credit hours required for degree completion are shown in Table 3.

Table 3

Total Course Credit Hours required for Undergraduate Degree Completion in Agricultural Education, Teacher Education from 1980 to 2021 at Nine 1862 Land-Grant Institutions

Years	ND State Univ.	Purdue Univ.	WV Univ.	Univ. of AZ	Univ. of ID	WA State Univ.	LA State Univ.	Auburn Univ.	Univ. of KY
1980 – 1984	[c]	[c]	136	130	[c]	120	135 136[a] ('82)	[c]	120
1985 – 1989	[c]	[c]	136	130	[c]	130	136 144[a] ('88)	[c]	120 128[a] ('86)
1990 – 1994	136 ('94)	[c]	136	130	[c]	130	144 135[a] ('91)	[c]	128
1995 – 1999	136 128[a] ('96) 135[a] ('97) 125[a] ('98) 129[a] ('99)	[c]	136	130 120[a] ('97)	132 ('96)	134	135	210[b] ('98)	128

2000 – 2004	129 128[a] ('03)	[c]	136	120	132	134 137[a] ('01)	135	120 125[a] ('04)	128
2005 – 2009	128 126[a] ('06) 128[a] ('07) 129[a] ('09)	130 ('07)	136	120	132	137 141[a] ('08) 126[a] ('09)	135	125	120
2010 – 2014	129 131[a] ('13) 130[a] ('14)	130 133[a] ('12) 128[a] ('14)	136 137[a] ('12) 136[a] ('13)	120	132 128[a] ('14)	127 126[a] ('11) 129[a] ('14)	132 120[a] ('12)	125 127[a] ('14)	120
2015 – 2021	130	128	136 120[a] ('16) 128[a] ('20)	120	128	129 125[a] ('20)	120	129 123[a] ('16)	120

Note. [a] Indicates the requirements went into effect at the beginning of the identified academic year. [b] Indicates total course credit hours required by the four-year, three-quarter academic year in place at that institution. [c] Indicates total course credit hours were either not provided or not found.

Research Question 2: What topics were taught in agricultural mechanics courses for degree completion in agricultural education, teacher education at nine 1862 land-grant universities over time? Reviewing course credit requirements for degree completion revealed different courses were offered by the universities over time. A common trend in courses included hot and cold metal working (welding), introduction to agricultural mechanics topics, agricultural structures, and small gas engines. These courses were found to have been required by a majority of the universities from 1980 to 2021. Of the four most common course topics identified, three courses were related to the acquisition of knowledge in specific content areas. Courses associated with the teaching of agricultural mechanics, however, were mainly focused on preparing pre-service teachers in laboratory management and the instruction of agricultural mechanics or related courses, i.e., appropriate pedagogical practices.

Five of the nine universities experienced changes in courses from 1980 to 2021, with four course topics the most modifications. Six universities had zero to one course change in their agricultural mechanics curriculum during the period studied. Washington State University and West Virginia University experienced the most change in their agricultural mechanics courses from 1980 to 2021 (see Table 4). Prior to 1995, West Virginia University required courses that included six of the nine identified course topics, the most of any institution. Louisiana State

University had the fewest specified courses after 1990, with the expectation that students would complete one or more related elective courses pending their advisor's approval (see Table 4).

Table 4

Topics Taught in Agricultural Mechanics Courses for Degree Completion in Agricultural Education, Teacher Education, 1980 to 2021, at Nine 1862 Land-Grant Universities

Years	ND State Univ.	Purdue Univ.	WV Univ.	Univ. of AZ	Univ. of ID	WA State Univ.	LA State Univ.	Auburn Univ.	Univ. of KY
1980 – 1984	[b]	1, 4, 9	[b]	2, 4, 9	[b]	1, 2, 3, 8, 9	1, 4	[b]	[a]
1985 – 1989	[b]	1, 4, 9	[b]	1, 2, 3, 4, 9	[b]	1, 2, 3, 4, 8, 9	1, 4 [a]	[b]	[a]
1990 – 1994	2, 4, 8	1, 4	[b]	1, 2, 3, 4, 9	[b]	1, 2, 3, 4, 8, 9	[a] [b]	[b]	[a]
1995 – 1999	2, 4, 8	1, 4	6, 8, 9	1, 2, 3, 4, 9	1, 2, 3	1, 2, 9	[b]	1, 4	[a]
2000 – 2004	2, 4, 8	1, 4	6, 8, 9	1, 2, 3, 4, 9	1, 2, 3	1, 2, 9	[b]	1, 2, 4	1, [a]
2005 – 2009	2, 4, 8	1, 4	2, 4, 8	1, 2, 3, 4, 9	1, 2, 3	1, 2, 9	[b]	1, 2, 4	1, [a]
2010 – 2014	2, 4, 8	2, 4	1, 4, 5, 9	1, 2, 3, 4	1, 2, 3	2, 9	[b]	1, 2, 4	1, [a]
2015 – 2021	2, 4, 8	2, 4	1, 4, 5, 9	1, 2, 3, 4	1, 2, 3	2, 9	[b]	1, 2, 4	1, [a]

Note. 1 = Introduction to Agricultural Mechanics; 2 = Welding; 3 = Small Gasoline Engines & Agricultural Power; 4 = Construction/Structures; 5 = Electricity; 6 = Plumbing & Irrigation; 7 = Agricultural Computer Systems; 8 = Electives, 9 = Teaching Agricultural Mechanics. [a] Indicates course(s) was/were not specified and subject to advisor approval. [b] Indicates information was not found for the required courses' topics.

Discussion

This study highlighted the importance of reviewing university teacher education curricula and aligns with Tyler's (1958) assertions on educational change and curriculum theory. Through the analysis of nine 1862 land-grant institutions, it was found that these universities, on average, were requiring fewer courses related to agricultural mechanics, fewer course credit hours associated with agricultural mechanics, and fewer total course credit hours for degree completion in agricultural education, teacher education. This trend in course credit hour reduction is supported by Johnson et al. (2012) findings regarding total course credit hour requirements for bachelor's degrees in the United States from 1972 through 2011. Rawls (1980) foresaw student population change in SBAE programs and agricultural technology continually evolving over time. Moreover, Rasty et al. (2017) found that the level of exposure to certain course topics at the post-secondary level had an impact on instructors' perceived importance to teach agricultural mechanics content. However, decline in teacher preparation course requirements regarding content knowledge and teaching methods in agricultural mechanics could lead to less effectual instructors teaching SBAE (Granberry et al., 2023; McKim & Saucier, 2013). As such, more needs to be known about the content of courses that teacher preparation students take and its relevance to the skills needed by industry, not only for today but also in the future.

"Even as teacher educators take on additional responsibility[ies] divergent from the . . . focal point of teacher preparation, the needs of middle school and high school agricultural teachers are changing" (Myers & Dyer, 2004, p. 44), pedagogical and content knowledge are likely to remain high among the teacher's needs for professional development. In particular, the self-efficacy of first-year SBAE teachers for teaching agricultural mechanics has been reported to be lower than for all other agricultural education content areas (Granberry et al., 2023). Nevertheless, Burris et al. (2005) concluded that agricultural mechanics and related curricula was one of the highest rated instructional areas in SBAE, according to the program's students and Missouri's Department of Elementary and Secondary Education. Because technical skills in agricultural mechanics are rated consistently as one of the highest skill sets needed by beginning teachers to perform well (Albritton & Roberts, 2020; Clemons et al., 2018; Smalley et al., 2019), it is imperative that the content of and changes to related preparatory courses for pre-service teachers of SBAE be decided carefully. As such, institutions' teacher preparation courses in agricultural education should align with the curricula expected to be taught in SBAE so that the needs of a 21st century workforce are anticipated and met.

Conclusions, Implications, and Recommendations

The purpose of this historical inquiry was to explore the course requirements at nine 1862 land-grant Universities from 1980 to 2021 regarding agricultural mechanics and related courses. Two research questions guided the study: (a) What was the trend in course requirements related to agricultural mechanics for completion of vocational agriculture education, career and technical education, and agricultural education undergraduate degrees across nine 1862 land-grant universities over time? and (b) What topics were taught in agricultural mechanics courses for degree completion in agricultural education, teacher education at nine 1862 land-grant.
universities over time?

Regarding research question one, the average number of course credit hours in agricultural mechanics required for completion of degrees in agricultural education, teacher education declined from 1980 to 2021, from a range of 8.33 to 11.83 credit hour requirements in

1980, to a range of 6.67 to 8.33 credit hours required for degree completion in 2021. This finding aligns with prior studies that reported a reduction in the technical agricultural mechanics courses needed for degree completion by agricultural education undergraduate students (Hubert & Leising, 2000; Trickett et al., 2023). The total number of courses required for degree completion in agricultural education, teacher education also decreased from 1980 to 2021. The average number of courses required declined from an average of 4.13 courses in 1980, to an average of 2.75 courses in 2021, as related to agricultural mechanics. Total credit hours required for degree completion in agricultural education, teacher education had also decreased from an average of 128.4 to 125.0 total credit hours from 1980 to 2021. It is recommended that additional research be conducted on other agricultural content courses, e.g., animal science, plant science, and so forth, required for degree completion in agricultural education, teacher education to assess the change or stability in required agricultural content overall and to compare requirements by content areas. In addition, we recommend that comparisons between 1862 land-grant institutions, 1890 land-grant institutions, and other colleges and universities preparing teachers of SBAE be examined for similarities and differences regarding their course-taking requirements over time.

With regard to question two, although total course credit hours related to agricultural mechanics for degree completion in agricultural education had declined, the topics of the courses required had not changed in significant ways at most universities. How much the content of these courses may have changed remains an open question that warrants additional study. More than one-half of the institutions had kept the same or similar course topics for degree completion in agricultural education, teacher education. This may imply that the universities identified those courses as important components of teacher preparation in their programs and in their states' SBAE programs during the study's timeframe. However, we recommend that qualitative interviews be conducted with teacher educators to ascertain their rationale regarding the importance of the courses and determine how they concluded each course was a high need for degree completion in their respective states. Additional research could also seek to determine whether select agriculture courses might fulfill some of the general education requirements of agricultural education, teacher education undergraduates. If current agriculture course-taking requirements continue to be reduced (Clark et al., 2021; Rasty et al., 2017), it is important to identify courses of agriculture that may be substituted for general education courses in some instances.

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