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Agricultural extension curriculum relevance for preparing youth for modern technology-driven farming

¹Rachel Marie Foster and ²Brandon Tyler Matthews

^{1,2}Department of Agricultural Education, Department of Agricultural Leadership, Texas A&M University, College Station, Texas, USA

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Corresponding Author: Rachel Marie Foster

Abstract

While agricultural technology advances rapidly, many extension curricula remain anchored to decades-old content frameworks. This research assessed curriculum relevance for preparing youth for technology-driven farming careers, drawing on 194 students, 38 educators, and 27 industry representatives across Texas between September 2022 and June 2023. Precision agriculture was rated the most important content area (26.8% of weighted relevance), followed by data analytics (21.3%). A curriculum-industry alignment gap averaging 1.84 on a 5-point scale indicated substantial misalignment. Students with experiential learning scored 34.7% higher on technology readiness than classroom-only peers.

Keywords: Agricultural education, curriculum relevance, youth preparation, precision agriculture, technology-driven farming, extension education, digital skills, experiential learning, career readiness

Introduction

Modern farming bears little resemblance to the agriculture most extension curricula were designed to serve. Satellite-guided tractors, drone-based scouting, sensor-driven irrigation, and data analytics have transformed food production ^[1]. Yet extension education has not kept pace, leaving young people ill-prepared for careers contemporary agriculture offers ^[2, 3].

In the United States, the average farm operator age has risen to 57.5 years ^[4]. Young people interested in agriculture expect technology-intensive pathways but encounter programs focused on conventional knowledge ^[5]. Texas, generating over \$25 billion in agricultural output annually, offers a useful context with both high-tech operations and traditional systems ^[6].

This research examined: (a) how students, educators, and industry representatives rated the relevance of current extension curriculum content areas for technology-driven farming careers; (b) the magnitude of alignment gaps between curriculum content and industry skill demands; and (c) whether experiential learning exposure was associated with higher technology readiness among youth ^[7, 8].

Theoretical Framework

The curriculum relevance framework posits that educational effectiveness depends on alignment between content delivered, learner needs, and labor market requirements ^[9]. Complementing this, experiential learning theory argues that knowledge is constructed through concrete experience, reflection, conceptualization, and experimentation ^[10]. Together they predict that curricula incorporating hands-on

technology interaction will outperform lecture-based approaches.

Materials and Methods

Materials

A convergent mixed-methods design collected data between September 2022 and June 2023 from three groups: students in final undergraduate years ($n = 194$), extension educators ($n = 38$), and industry representatives ($n = 27$) from four Texas universities. The 42-item questionnaire measured curriculum relevance, technology readiness, experiential learning exposure, and career intention. Ethics approval: Texas A&M IRB (Protocol TAMU-IRB-2022-0847, August 2022).

Instrument Development

Content areas were identified from curriculum standards and industry job posting analysis. Expert panel review reduced 48 items to 42 (CVI = 0.88). Pilot testing with 34 students yielded satisfactory reliability (Cronbach alpha = 0.85; subscale range 0.78-0.89). The technology readiness subscale was adapted from Parasuraman and Colby.

Methods

Curriculum relevance ratings were analyzed through weighted scoring across six content areas. The curriculum-industry alignment gap was computed as the absolute difference between educator ratings of current content coverage and industry ratings of content importance. Between-group comparisons (students with vs. without experiential learning) used independent t-tests. One-way

ANOVA compared relevance perceptions across respondent groups. Focus group data (four groups of 8-10 participants)

were analyzed thematically. All analyses used SPSS 28.0 at $p < 0.05$.

Results

Table 1: Curriculum content area relevance ratings by respondent group (weighted scores)

Content Area	Students	Educators	Industry	Overall (%)
Precision Ag Technology	24.1	22.7	33.6	26.8
Data Analytics/Farm Mgmt	19.8	18.4	25.7	21.3
Drone/Remote Sensing	21.3	14.2	16.8	17.4
Agribusiness/Marketing	16.4	17.8	11.3	15.2
Soil & Crop Science	10.7	16.3	8.2	11.7
Extension Communication	7.7	10.6	4.4	7.6

Industry representatives placed substantially more weight on precision agriculture and data analytics than educators, while educators rated traditional content areas like soil

science and communication higher. ANOVA confirmed significant between-group differences for precision agriculture ($F = 8.41$, $p < 0.001$) and data analytics ($F = 6.73$, $p = 0.002$).

Table 2: Technology readiness scores by experiential learning exposure

Readiness Dimension	Experiential (n=87)	Classroom-only (n=107)
Technology optimism	4.12	3.34
Innovation willingness	3.89	2.78
Practical tech competence	3.74	2.61
Digital confidence	3.96	3.07
Overall readiness	3.93	2.95

Students with experiential learning exposure scored significantly higher on all technology readiness dimensions ($p < 0.001$ for each). The largest gap appeared in practical

technology competence (3.74 vs. 2.61), which is the dimension most directly linked to hands-on equipment interaction.

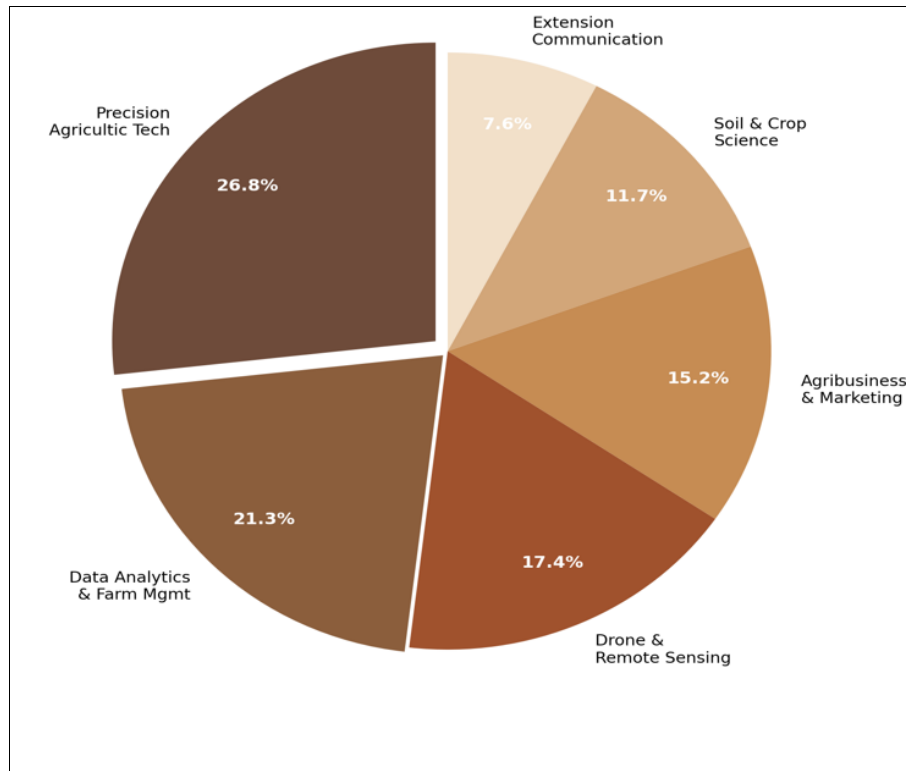


Fig 1: Distribution of overall curriculum content area relevance ratings for technology-driven farming careers

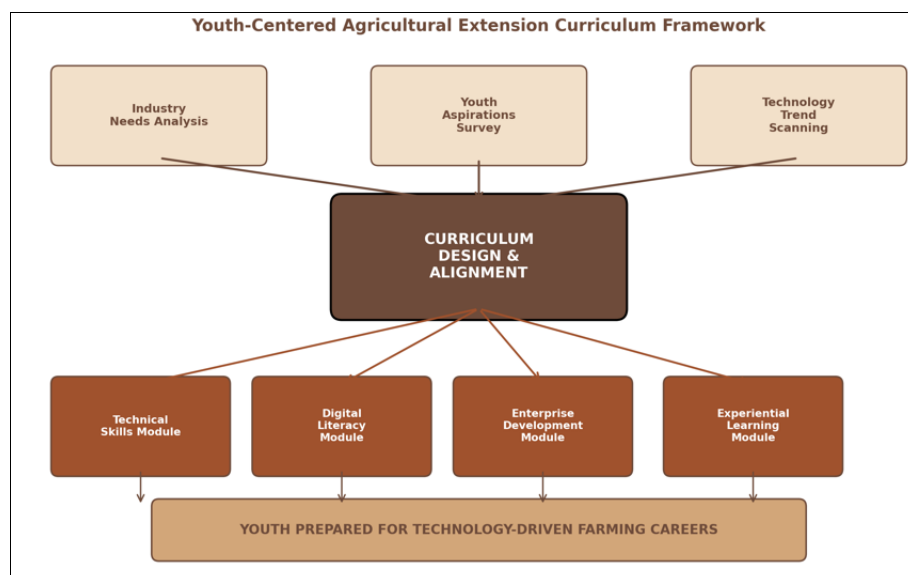


Fig 2: Youth-centered agricultural extension curriculum framework integrating industry needs, youth aspirations, and technology trends

Comprehensive Interpretation

The curriculum-industry alignment gap averaged 1.84 on a 5-point scale, with the widest gaps in precision agriculture technology (2.31) and data analytics (2.17). Focus group discussions revealed that educators acknowledged these gaps but cited resource constraints, institutional inertia, and their own limited training in newer technologies as barriers to curriculum updating. Industry participants expressed frustration that graduates often lacked basic data handling skills that they considered entry-level requirements.

Discussion

The curriculum-industry alignment gap confirms that extension curricula have not kept pace with agricultural technology transformation [2, 3]. Industry representatives weighted precision agriculture and data analytics more heavily than educators, a disconnect attributed to generational technology differences and slow institutional revision [11, 12].

The strong experiential learning-readiness association supports the prediction that hands-on technology engagement outperforms classroom instruction [10]. The 34.7% readiness advantage translates to reduced employer training costs and faster productive contribution [13].

The low relevance rating for traditional extension communication content was surprising and potentially concerning. While digital tools are clearly central to modern farming, the interpersonal and community engagement skills that extension communication develops remain important for careers that involve working with diverse farming communities [14, 15]. A balanced curriculum would integrate technology skills without abandoning the relational competencies that distinguish extension professionals from pure technicians.

Practical Applications

These findings carry direct implications for curriculum designers. Extension education programs should audit current content against industry skill demands at least biennially, with formal input from technology-intensive agricultural employers. Experiential learning components,

including farm technology internships, precision agriculture labs, and drone operation practicums, should be expanded from elective to required status. Educator professional development in emerging agricultural technologies is equally important, since instructors cannot teach what they themselves haven't mastered. Industry partnerships offering shared equipment access and guest instruction can help bridge resource gaps without requiring full institutional procurement of expensive technology.

Conclusion

Agricultural extension curricula show a substantial alignment gap with the skill demands of technology-driven farming careers, most pronounced in precision agriculture and data analytics content. Industry representatives consistently rated these technology areas as more important than educators did, pointing to a perception gap that compounds the content gap. Experiential learning exposure was strongly associated with higher technology readiness among students, with the largest advantage appearing in practical competence.

Modernizing extension curricula to reflect current agricultural technology landscapes is not optional if these programs aim to attract and prepare young people for viable farming careers. Integrating more hands-on technology exposure, strengthening data literacy components, and maintaining regular curriculum-industry alignment checks are practical steps that programs can implement without wholesale restructuring.

References

1. Wolfert S, Ge L, Verdouw C, Bogaardt MJ. Big data in smart farming: a review. *Agricultural Systems*. 2017;153:69-80.
2. Spielman DJ, Birner R. How innovative is your agriculture? Using innovation indicators and benchmarks to strengthen national agricultural innovation systems. Washington: World Bank; 2008. 47 p.
3. Rivera WM. Agricultural extension in transition worldwide: structural, financial and managerial reform

- strategies. Public Administration and Development. 2001;21(2):151-161.
4. USDA. 2017 Census of Agriculture: summary and state data. Washington: National Agricultural Statistics Service; 2019. 820 p.
 5. Doerfert DL. National research agenda: American Association for Agricultural Education research priority areas for 2011-2015. Journal of Agricultural Education. 2011;52(1):13-21.
 6. Texas Department of Agriculture. Texas agricultural statistics 2022. Austin: TDA; 2023. 156 p.
 7. Roberts TG, Harder A, Brashears MT. American Association for Agricultural Education national research agenda 2016-2020. Gainesville: Department of Agricultural Education and Communication; 2016. 72 p.
 8. Stripling CT, Ricketts JC. Research priority 3: sufficient scientific and professional workforce that addresses the challenges of the 21st century. Journal of Agricultural Education. 2016;57(4):95-105.
 9. Tyler RW. Basic principles of curriculum and instruction. Chicago: University of Chicago Press; 1949. 128 p.
 10. Kolb DA. Experiential learning: experience as the source of learning and development. Englewood Cliffs: Prentice Hall; 1984. 256 p.
 11. Easterly RG, Warner AJ, Myers BE, Lamm AJ, Telg RW. Skills students need in the real world: competencies desired by agricultural and natural resources industry leaders. Journal of Agricultural Education. 2017;58(4):225-239.
 12. Shoulders CW, Myers BE. Teachers use of agricultural laboratories in secondary agricultural education. Journal of Agricultural Education. 2012;53(2):124-138.
 13. Knobloch NA. Is experiential learning authentic? Journal of Agricultural Education. 2003;44(4):22-34.
 14. King DL, Rucker KJ. Preparing agricultural communication graduates for the profession: a profile of needed competencies. Journal of Applied Communications. 2013;97(3):69-83.
 15. Edgar DW, Roberts TG, Murphy TH. Structured communication: effects on teaching and learning in a college of agriculture course. Journal of Agricultural Education. 2009;50(1):33-44.
 16. Scherer HH, Holder B. Agricultural technology and implications for extension education. Journal of Extension. 2019;57(3):1-8.
 17. McKim AJ, Velez JJ, Lambert MD, Barkley AP. A philosophical review of science and society within agricultural education. Journal of Agricultural Education. 2017;58(2):98-110.
 18. Lamm AJ, Lamm KW, Rodriguez MT, Owens CT. Examining leadership style influence on engagement in a national change process: implications for leadership education. Journal of Leadership Education. 2016;15(4):1-14.
 19. Martin MJ, Enns KJ, Garton BL. A qualitative examination of the personal characteristics needed for the ideal professor of agricultural education. Journal of Agricultural Education. 2019;60(3):178-196.
 20. Phipps LJ, Osborne EW, Dyer JE, Ball A. Handbook on agricultural education in public schools. Clifton Park:

Thomson Delmar Learning; 2008. 576 p.