



Research Article

Career-stage differences in professional learning needs among secondary school agriculture teachers: A provincial study in Thailand

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Abstract

This study examined and prioritized the competency-development needs of secondary school agriculture teachers in Phra Nakhon Si Ayutthaya Province, Thailand. A quantitative cross-sectional survey design was employed. The population comprised 73 teachers in the Occupational Learning Area, from whom 45 teachers responsible for agriculture or agriculture-related subjects were selected through cluster sampling by school size followed by simple random sampling. Data were collected using a researcher-developed questionnaire covering five core competency domains and six functional competency domains. The questionnaire was evaluated by three experts for content validity using the item-objective congruence index. Data were analyzed using frequencies, percentages, means, standard deviations, and descriptive rankings. The overall need for core competency development was high ($M = 4.32$, $S.D. = 0.21$). Teacher ethics and integrity was the highest-rated core competency and the only domain rated very high ($M = 4.54$, $S.D. = 0.36$), followed by self-development and teamwork. The overall need for functional competency development was also high ($M = 4.26$, $S.D. = 0.21$), with teacher leadership receiving the highest rating ($M = 4.39$, $S.D. = 0.35$), followed by community relationships and collaboration for learning management. Across all 11 domains, teacher ethics and integrity, teacher leadership, self-development, and community collaboration emerged as the leading priorities. The findings demonstrate broad competency-development needs and suggest that professional development programs for secondary school agriculture teachers should integrate professional ethics, leadership, continuous self-development, and school-community collaboration.

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Introduction

Agricultural education plays an important role in preparing young people to understand food production, natural resource management, agricultural technology, entrepreneurship, and the sustainability of agrifood systems. Education is increasingly recognized not only as a fundamental right but also as a mechanism for developing the knowledge, skills, and values required for sustainable agrifood-system transformation (Food and Agriculture Organization of the United Nations [FAO], 2025). In Thailand, agricultural education also connects scientific knowledge, practical experience,

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local wisdom, occupational preparation, and the Philosophy of Sufficiency Economy to support the balanced and sustainable development of learners and communities (Pongsuk, 2020). At the secondary school level, it can connect classroom knowledge with practical activities, local livelihoods, community resources, and emerging challenges such as climate change, food security, digital agriculture, and responsible resource use. The quality and relevance of these learning experiences therefore depend substantially on agriculture teachers' professional knowledge, pedagogical competence, leadership, and capacity to collaborate with communities.

The work of secondary school agriculture teachers is particularly complex because it integrates academic instruction, experiential learning, technical agricultural content, classroom and laboratory management, student development, and relationships with farmers and community organizations (Smalley et al., 2019). Thailand's Basic Education Core Curriculum positions occupational learning as a means of developing learners' knowledge, practical work skills, problem-solving abilities, responsible use of resources, and preparation for further education and employment (Office of the Basic Education Commission [OBEC], 2008, 2017). Agriculture teachers must therefore maintain competence in both teaching and rapidly changing agricultural practices while ensuring that practical learning activities are meaningful, safe, and responsive to local contexts.

Consequently, agriculture teachers require a combination of core competencies—such as achievement orientation, professional ethics, teamwork, service orientation, and self-development—and functional competencies directly related to curriculum and learning management, learner development, classroom management, educational research, teacher leadership, and community collaboration. These competency areas are consistent with Thailand's professional standards, which require teachers to demonstrate professional knowledge, effective instructional practice, commitment to learner development, collaboration with relevant stakeholders, and continuing professional self-development (Teachers Council of Thailand, 2019). Such competencies should not be regarded as static attributes acquired during initial teacher preparation; rather, they must be continuously developed throughout teachers' professional lives.

Continuous professional learning has become a central component of teacher professionalism because teacher development is an ongoing process through which teachers revise their knowledge, practices, and professional identities (Avalos, 2011). UNESCO and the International Task Force on Teachers for Education 2030 (2024) emphasize lifelong professional development, collaboration, professional autonomy, and meaningful teacher participation as essential conditions for strengthening the teaching profession. Similarly, international evidence indicates that professional development is most valuable when it addresses teachers' actual needs, is connected to their working contexts, and enables active and collaborative learning (OECD, 2019, 2020). Teacher professional learning is also shaped by interactions among individual characteristics, professional-learning activities, and the organizational conditions of schools (Opfer & Pedder, 2011). Effective professional learning should therefore extend beyond standardized, one-size-fits-all training and respond to the responsibilities, experiences, and challenges encountered by particular groups of teachers. Desimone (2009) further argued that effective professional development is characterized by content focus, active learning, coherence, sufficient duration, and collective participation. Identifying teachers' professional learning needs is thus an important preliminary step in designing relevant and effective development programs.

However, teachers' professional learning needs may change as their careers progress. Early-career teachers commonly focus on adapting to school environments, strengthening subject-matter and pedagogical knowledge, managing classrooms, and building professional confidence. Mid-career teachers may seek opportunities to enhance instructional practices, assume leadership responsibilities, collaborate with colleagues and communities, or respond to new curricular and technological demands. More experienced teachers may possess substantial practical knowledge but may require support in adapting to policy changes, emerging technologies, changing student characteristics, and expanded professional roles. Research has shown that teachers' participation in formal and informal learning opportunities varies across the career cycle (Richter et al., 2011). More recent evidence also suggests considerable diversity within career phases, indicating that professional learning cannot be effectively designed on the basis of career stage alone without considering teachers' contexts and responsibilities (Coppe et al., 2024).

Career-stage differences are especially relevant in agricultural education, where teachers must continually update both pedagogical and technical competencies. Roberts et al. (2020) found that secondary agriculture teachers at different career stages expressed both shared and distinctive professional development needs. Early-career teachers particularly needed stronger technical agricultural knowledge and support in performing unfamiliar responsibilities, whereas mid- and later-career teachers encountered different contextual challenges and professional expectations. Similar evidence from agricultural education indicates that teachers encounter different challenges across their career phases and therefore require professional development that responds to their experience and responsibilities (Sorensen et al., 2014). A review of needs-assessment studies in school-based agricultural education similarly demonstrated that agriculture teachers' development needs vary according to teaching experience, program responsibilities, and local circumstances (DiBenedetto et al., 2018). These findings support differentiated professional learning that recognizes teachers' changing expertise and responsibilities rather than providing identical activities to all participants. Nevertheless, the literature on professional development in school-based agricultural education remains concentrated in a limited number of national settings, and further context-sensitive evidence is required (Claflin & Wasilewski, 2026).

In Thailand, national education policy emphasizes learner competency, active learning, digital technology, educational innovation, career preparation, and the continuing development of teachers and educational personnel (Ministry of Education, 2023). Within this policy environment, secondary school agriculture teachers are expected to integrate agricultural knowledge with practical learning, occupational preparation, technological application, learner development, and engagement with local communities. Their responsibilities are influenced by differences among schools, agricultural conditions, available facilities, community resources, and student interests. However, empirical evidence concerning the professional learning needs of Thai secondary school agriculture teachers remains limited. In particular, little is known about whether teachers at different career stages perceive their core and functional competency-development needs differently. Without such evidence, professional development programs may emphasize general policy priorities while insufficiently addressing needs arising from teachers' experience levels and actual working environments.

Provincial-level investigation is valuable in this respect because the work of agriculture teachers is closely connected to local agricultural, social, and educational conditions. Phra Nakhon Si Ayutthaya Province presents a relevant context because its schools operate within communities where agricultural livelihoods coexist with industrialization, urban development, and changing patterns of land and resource use. Examining teachers within a defined provincial education system makes it possible to generate contextually grounded evidence for local educational planning. Although findings from one province should not be generalized to all agriculture teachers in Thailand, they can provide an empirical basis for developing differentiated professional learning and informing comparable studies in other provinces.

Accordingly, this study examined career-stage differences in the professional learning needs of secondary school agriculture teachers in Phra Nakhon Si Ayutthaya Province, Thailand. It focused on perceived needs related to core and functional competencies and investigated whether these needs differed according to teachers' career characteristics, particularly years of service, current professional position, and experience in teaching agriculture. By adopting a career-stage perspective, the study seeks to move beyond an overall description of teachers' needs and contribute evidence for designing more targeted, context-responsive, and professionally meaningful development opportunities for secondary school agriculture teachers.

Objectives

This study aimed to examine professional learning needs among secondary school agriculture teachers at different career stages. The specific objectives were:

- To assess secondary school agriculture teachers' professional learning needs in relation to core and functional competencies.
- To compare core and functional competency development needs across teacher career stages.
- To compare and prioritize teachers' perceived development needs across the core and functional competency domains.

Method

Research Design

This study employed a quantitative cross-sectional survey design to examine the competency-development needs of secondary school agriculture teachers. It assessed teachers’ perceived needs for developing core and functional competencies and compared these needs across career stages defined by years of agricultural teaching experience. The study was conducted in Phra Nakhon Si Ayutthaya Province, Thailand, during the 2023 academic year.

Participants

The population comprised 73 teachers in the Occupational Learning Area under the Phra Nakhon Si Ayutthaya Secondary Educational Service Area Office during the 2023 academic year. The participants were 45 teachers responsible for teaching agriculture or agriculture-related subjects. They were selected using cluster sampling by school size, followed by simple random sampling. All 45 questionnaires were returned and found to be sufficiently complete for analysis.

Because the participants were drawn from schools within one provincial education service area, the findings should be interpreted within this context and should not be generalized to all secondary school agriculture teachers in Thailand.

Research Instrument

Data were collected using a researcher-developed questionnaire comprising two sections. The first section collected participants’ demographic and professional information, including sex, age, educational level, professional position, years of service, grade levels taught, and agricultural teaching experience.

The second section assessed teachers’ perceived competency-development needs in two domains. Core competencies comprised achievement orientation, service mind, self-development, teamwork, and teacher ethics and integrity. Functional competencies comprised curriculum and learning management, student development, classroom management, analysis, synthesis, and classroom research, teacher leadership, and relationship and collaboration with communities for learning management.

Items were rated on a five-point Likert-type scale ranging from 1 (very low need) to 5 (very high need), with higher scores indicating greater perceived competency-development needs. Mean scores were interpreted according to the criteria presented in Table 1. The questionnaire was reviewed by three experts for content validity, and item–objective congruence was examined before data collection.

Table 1. Rating Scale and Interpretation of Mean Scores

Response score	Response category	Mean-score range	Interpretation
5	Very high need	4.50–5.00	Very high
4	High need	3.50–4.49	High
3	Moderate need	2.50–3.49	Moderate
2	Low need	1.50–2.49	Low
1	Very low need	1.00–1.49	Very low

Note. The interpretation criteria were adopted from Silpcharu (2007).

Instrument Validity and Reliability

The questionnaire was developed through a review of relevant literature, Thailand’s teacher competency framework, and previous studies on teachers’ competency-development needs. Its content validity was evaluated by three experts, who assessed the consistency of each item with its intended objective and competency domain using the item–objective congruence (IOC) index. The questionnaire was revised in accordance with the experts’ recommendations before data collection.

Internal consistency was assessed using Cronbach’s alpha for the core and functional competency scales and their respective subscales. A coefficient of .70 or higher was considered acceptable for group-level research. Corrected item–total correlations were also examined to assess the consistency of the items within each competency domain.

Career-Stage Classification

Career stage was operationalized according to participants’ years of experience in teaching agriculture rather than chronological age or total years of service. For analytical purposes, participants were classified into three groups: early-career teachers with less than 3 years of experience ($n = 9$), mid-career teachers with 3–10 years of experience ($n = 13$),

and experienced teachers with 11 years or more of experience ($n = 23$). This classification retained the boundaries recorded in the original dataset while ensuring sufficient group sizes for meaningful statistical comparisons.

Data Collection

Permission to collect data was obtained from the relevant educational authority and participating schools. An official letter from King Mongkut's Institute of Technology Ladkrabang was submitted to the directors of the participating schools to request permission and assistance with data collection. The questionnaires were distributed through the schools to 45 selected agriculture teachers during the 2023 academic year. All 45 questionnaires were returned, resulting in a response rate of 100%. The completed questionnaires were checked for completeness, coded, and entered into SPSS for statistical analysis.

Data Screening and Analysis

The original SPSS dataset was screened for coding accuracy, response ranges, missing values, distributional characteristics, and potential data-entry errors (Field, 2018). Negatively worded items, if any, were reverse-coded before composite scores were calculated. Mean scores were computed for five core competency domains and six functional competency domains, with higher scores indicating greater professional learning needs. Cronbach's alpha was used to assess the internal consistency of the competency scales (Cronbach, 1951).

Frequencies and percentages were used to summarize participants' characteristics, while means and standard deviations described their professional learning needs. Participants were classified into five career stages based on agricultural teaching experience: less than 3 years, 3–10 years, 11–15 years, 16–20 years, and 21 years or more.

Differences in competency-development needs across career stages were examined using one-way ANOVA when the assumptions of normality and homogeneity of variance were adequately met. Welch's ANOVA was used when variances were unequal, whereas the Kruskal–Wallis test was applied when parametric assumptions were substantially violated (Field, 2018). Significant omnibus tests were followed by Tukey, Games–Howell, or adjusted pairwise comparisons, as appropriate. Effect sizes were reported using eta squared or omega squared for parametric tests and epsilon squared for nonparametric tests (Lakens, 2013). All tests were two-tailed, with statistical significance set at $p < .05$.

Results

Participant Characteristics

The demographic and professional characteristics of the 45 participants are presented in Table 2. The characteristics included sex, age, educational level, grade levels taught, and career stage based on agricultural teaching experience.

Table 2. Demographic and professional characteristics of the participants

Characteristic	<i>n</i>	%
Gender		
Male	19	42.22
Female	26	57.78
Age (years)		
Under 30	12	26.67
30–40	18	40.00
41–50	9	20.00
51–60	6	13.33
Highest educational level		
Bachelor's degree	30	66.67
Master's degree	15	33.33
Grade levels taught		
Lower secondary	13	28.89
Upper secondary	11	24.44
Both lower and upper secondary	21	46.67
Career stage based on agricultural teaching experience		
Early career: less than 3 years	9	20.00
Mid-career: 3–10 years	13	28.89
Experienced: 11 years or more	23	51.11

Table 2 shows that most participants were female (57.78%), aged 30–40 years (40.00%), and held a bachelor's degree (66.67%). Nearly half taught at both lower- and upper-secondary levels (46.67%). Regarding career stage, most were experienced teachers with 11 years or more of agricultural teaching experience (51.11%), followed by mid-career (28.89%) and early-career teachers (20.00%).

Core Competency-Development Needs

The demographic and professional characteristics of the participants were examined to provide an overview of the study sample. These characteristics included sex, age, highest educational level, grade levels taught, and career stage based on agricultural teaching experience, as presented in Table 2.

Table 2. Teachers' core competency-development needs

Core competency	M	S.D.	Level	Rank
Teacher ethics and integrity	4.54	0.36	Very high	1
Self-development	4.37	0.45	High	2
Teamwork	4.31	0.28	High	3
Achievement orientation	4.25	0.41	High	4
Service mind	4.20	0.44	High	5
Overall	4.32	0.21	High	—

Table 2 shows that most participants were female (57.78%), aged 30–40 years (40.00%), and held a bachelor's degree (66.67%). Nearly half taught at both lower- and upper-secondary levels (46.67%). Regarding career stage, most participants were experienced teachers with 11 years or more of agricultural teaching experience (51.11%), followed by mid-career (28.89%) and early-career teachers (20.00%).

Functional Competency-Development Needs

The second objective was to examine teachers' perceived needs for developing functional competencies. Six domains were assessed: curriculum and learning management, student development, classroom management, analysis, synthesis, and classroom research, teacher leadership, and community relationships and collaboration for learning management. The means, standard deviations, levels, and rankings of these competency-development needs are presented in Table 4.

Table 3. Teachers' functional competency-development needs

Functional competency	M	S.D.	Level	Rank
Teacher leadership	4.39	0.35	High	1
Community relationships and collaboration for learning management	4.36	0.43	High	2
Classroom management	4.28	0.45	High	3
Curriculum and learning management	4.27	0.38	High	4
Analysis, synthesis, and classroom research	4.14	0.50	High	5
Student development	4.13	0.50	High	6
Overall	4.26	0.21	High	—

Table 4 shows that teacher leadership received the highest mean score ($M = 4.39$, $S.D. = 0.35$), followed by community relationships and collaboration for learning management ($M = 4.36$, $S.D. = 0.43$). Student development received the lowest mean score ($M = 4.13$, $S.D. = 0.50$), although it remained at a high level.

At the item level, the greatest need was reported for using and developing innovative media and technology for learning management ($M = 4.51$, $S.D. = 0.62$), followed by building collaborative networks with communities for learning management ($M = 4.45$, $S.D. = 0.71$) and demonstrating professional maturity appropriate to the teaching role ($M = 4.43$, $S.D. = 0.73$). These findings demonstrate consistently high perceived development needs across all functional competency domains.

Priority Areas for Competency Development

To provide an integrated view of teachers' professional development priorities, the five core competency domains and six functional competency domains were ranked together according to their mean scores. Higher mean scores represented greater perceived needs for competency development. The overall priority ranking is presented in Table 5.

Table 5. Overall Priority Ranking of Core and Functional Competency-Development Needs

Rank	Competency domain	Competency type	M	S.D.	Level
1	Teacher ethics and integrity	Core	4.54	0.36	Very high
2	Teacher leadership	Functional	4.39	0.35	High
3	Self-development	Core	4.37	0.45	High
4	Community relationships and collaboration for learning management	Functional	4.36	0.43	High
5	Teamwork	Core	4.31	0.28	High
6	Classroom management	Functional	4.28	0.45	High
7	Curriculum and learning management	Functional	4.27	0.38	High
8	Achievement orientation	Core	4.25	0.41	High
9	Service mind	Core	4.20	0.44	High
10	Analysis, synthesis, and classroom research	Functional	4.14	0.50	High
11	Student development	Functional	4.13	0.50	High

Note. $n = 45$. Scores ranged from 1 (*very low need*) to 5 (*very high need*). Rankings were based descriptively on the mean scores and do not indicate statistically significant differences among the competency domains.

Table 5 indicates that teacher ethics and integrity was the highest-priority area for competency development ($M = 4.54$, $S.D. = 0.36$), followed by teacher leadership ($M = 4.39$, $S.D. = 0.35$), self-development ($M = 4.37$, $S.D. = 0.45$), and community relationships and collaboration for learning management ($M = 4.36$, $S.D. = 0.43$). These four domains represented the most prominent development priorities across the two competency categories.

Analysis, synthesis, and classroom research ($M = 4.14$, $S.D. = 0.50$) and student development ($M = 4.13$, $S.D. = 0.50$) occupied the lowest positions in the ranking. Nevertheless, both were rated at a high level, indicating that the teachers perceived substantial development needs across all 11 competency domains. The results therefore suggest a broad pattern of competency-development needs, with particular priority given to professional ethics, leadership, self-development, and community collaboration.

Discussion

The findings revealed that secondary school agriculture teachers perceived high development needs across all five core competencies and six functional competencies. The overall mean scores for core competency development ($M = 4.32$, $S.D. = 0.21$) and functional competency development ($M = 4.26$, $S.D. = 0.21$) indicate that teachers recognized the importance of continuing professional learning across multiple dimensions of their work. This broad pattern may reflect the increasingly complex responsibilities of agriculture teachers, who must integrate subject-matter knowledge, practical agricultural skills, instructional management, student development, technological application, and collaboration with communities. The finding supports the view that teachers' professional learning should be continuous, contextualized, and closely connected to their actual responsibilities rather than delivered as isolated or standardized training activities (Desimone, 2009; OECD, 2019). In the Thai context, Chaijit (2022) similarly found that secondary school teachers demonstrated high levels of competency across domains including teamwork, self-development, achievement orientation, professional ethics, teacher leadership, classroom research, curriculum management, and community collaboration.

Teacher ethics and integrity emerged as the highest-priority competency and was the only domain rated at a very high level ($M = 4.54$, $S.D. = 0.36$). This result suggests that the participating teachers regarded ethical conduct not simply as compliance with professional regulations but as a fundamental condition for maintaining trust, fairness, responsibility, and credibility in their relationships with students, colleagues, parents, and communities. Teachers regularly encounter ethical dilemmas involving fairness, professional responsibility, institutional expectations, and relationships with students, demonstrating that ethical competence must be developed through reflection on authentic professional situations (Shapira-Lishchinsky, 2011). Ethical responsibility is particularly important in agricultural education because instruction frequently involves practical activities, the use of animals, plants, equipment, natural resources, and community-based knowledge. Teachers must therefore make responsible decisions concerning learner safety, environmental stewardship, resource use, assessment, and respect for local knowledge. This finding is consistent

with Thailand's professional standards, which position ethics, professional responsibility, and commitment to learners as central attributes of the teaching profession (Teachers Council of Thailand, 2019). It is also broadly consistent with Chaijit's (2022) finding that professional ethics and the teachers' attitudes toward their profession constituted important components and predictors of teacher competency. Professional development in this area should consequently extend beyond presenting codes of conduct and should engage teachers in analyzing authentic ethical dilemmas arising from classroom, school, agricultural, and community contexts.

Teacher leadership was the highest-rated functional competency ($M = 4.39$, $S.D. = 0.35$) and the second-highest priority across all 11 competency domains. This finding reflects the expanding role of teachers as instructional leaders, innovators, mentors, coordinators, and agents of change rather than solely as classroom instructors. Teacher leadership commonly extends beyond the classroom through mentoring, professional collaboration, instructional improvement, and participation in school-level change (Wenner & Campbell, 2017). Agriculture teachers often organize practical projects, supervise agricultural activities, coordinate resources, establish external partnerships, and connect school learning with occupational and community contexts. Consequently, they require leadership competencies that enable them to initiate improvements, guide collaborative work, respond to technological and environmental changes, and support colleagues and learners. Pintong et al. (2022) identified teamwork, technology use, instructional integration, innovation development, and the cultivation of 21st-century skills as essential elements of teacher leadership in Thailand's Education 4.0 context. International research in agricultural education also indicates that leadership and program-management needs remain important components of agriculture teachers' professional development (Rada & Smalley, 2025). Previous research in school-based agricultural education has also identified program design, leadership, and the management of supervised agricultural experiences as important areas of professional development (Hainline & Smalley, 2023). The present finding therefore supports professional-learning programs that provide teachers with opportunities to lead school-based agricultural projects, mentor peers, manage innovation, and participate meaningfully in school decision-making.

Self-development ranked second among the core competencies and third across all competency domains ($M = 4.37$, $SD = 0.45$). This finding suggests that the participating teachers recognized the need to continually update their knowledge and practices in response to changes in agricultural science, educational technology, curricula, learner characteristics, and societal expectations. Agricultural knowledge is particularly dynamic because it is shaped by innovations in production, climate change, digital agriculture, food safety, environmental management, and changing market conditions. Initial teacher preparation alone may therefore be insufficient to sustain professional competence throughout an agriculture teacher's career. Chaijit (2022) similarly found that self-development was among the most highly rated teacher competencies and emphasized the importance of acquiring new knowledge and continuously improving instructional practices. The present finding is also consistent with international evidence indicating that effective professional development should involve active learning, coherence with teachers' work, collaboration, and sustained engagement over time (Darling-Hammond et al., 2017; Desimone, 2009). In particular, digital competence should be understood not merely as the ability to operate technological tools but as an integrated capacity involving pedagogical judgment, ethical responsibility, professional collaboration, and the purposeful use of technology to support learning (Falloon, 2020). Professional development for agriculture teachers should therefore combine the updating of technical agricultural knowledge with pedagogical development, digital competence, reflective practice, peer learning, and opportunities to apply new knowledge in authentic teaching situations.

Community relationships and collaboration for learning management was the second-highest-rated functional competency ($M = 4.36$, $SD = 0.43$) and ranked fourth across all competency domains. At the item level, building collaborative networks with communities was the second-highest-rated development need ($M = 4.45$, $SD = 0.71$). This finding is particularly meaningful for agricultural education because communities provide authentic learning resources, including farmers, agricultural enterprises, local administrative organizations, government agencies, community experts, production sites, and local wisdom. Effective collaboration enables teachers to connect classroom content with local agricultural practices, occupational opportunities, and real-world problems. However, productive school–community

partnerships require competencies in communication, coordination, network building, shared planning, and managing the expectations of diverse stakeholders. Rada and Smalley (2025) similarly found that relationships with school personnel and agricultural organizations were important components of agriculture teachers' work, while professional development priorities included the effective use of advisory groups and agricultural support networks. More broadly, research on teacher collaboration has shown that meaningful collaborative practices can support professional learning, shared problem-solving, instructional improvement, and collective responsibility, although their effectiveness depends on organizational support and the quality of the collaborative activities (Vangrieken et al., 2015). The present findings therefore suggest that community collaboration should be treated as a professional competency to be intentionally developed rather than as an informal responsibility that teachers are expected to acquire independently.

Although analysis, synthesis, and classroom research ($M = 4.14$, $S.D. = 0.50$) and student development ($M = 4.13$, $S.D. = 0.50$) occupied the two lowest positions, both remained at a high level. Their lower rankings should therefore be interpreted as relative priorities rather than evidence that these competencies are unimportant. Classroom research allows teachers to examine learning problems, evaluate instructional innovations, and make evidence-informed improvements, while student development is central to supporting learners' academic, occupational, social, and personal growth. Thongphukdee and Prongprommarat (2021) found continuing needs for developing teachers' 21st-century learning-management competencies and proposed a development model combining training, clinical supervision, and professional learning communities. Matchara (2022) also reported that a professional-learning-community model significantly improved teachers' competencies after participation. These findings suggest that classroom research and student development could be strengthened through job-embedded approaches in which teachers collaboratively identify problems, implement interventions, examine learner evidence, and reflect on their practices.

The overall pattern supports an integrated rather than fragmented approach to professional development. Ethics provides the professional foundation, leadership enables teachers to initiate and sustain improvement, self-development supports continual updating, and community collaboration connects learning with authentic agricultural contexts. These competencies can be developed simultaneously through professional learning communities, mentoring, collaborative action research, community-based agricultural projects, and teacher-led innovation. Such an approach is consistent with evidence that effective professional development is content-focused, collaborative, sustained, and embedded in teachers' work (Darling-Hammond et al., 2017; Desimone, 2009). A recent systematic review further indicated that sustained, collaborative professional learning accompanied by continuing support has greater potential to improve teachers' practices and student learning outcomes than isolated training activities (Ventista & Brown, 2023). It may also be more appropriate than short-term, one-size-fits-all training for responding to the diverse responsibilities of agriculture teachers.

The findings should nevertheless be interpreted with caution. The study involved only 45 teachers from one provincial education service area and relied on self-reported perceptions. High scores represent perceived development needs and should not be interpreted as direct evidence of low actual competence. Moreover, the rankings were based on descriptive differences in mean scores; they do not demonstrate statistically significant differences among competency domains. Although the study was framed around career stages, conclusions regarding differences between early-career, mid-career, and experienced teachers should be made only after the corresponding inferential analyses are reported. Previous agricultural-education studies have shown that professional-development needs may vary by career stage—for example, early-career teachers may require support with program logistics, pedagogy, and classroom management, whereas more experienced teachers may prioritize leadership, technology, and context-specific responsibilities (Rada & Smalley, 2025; Roberts et al., 2020). Further analysis and research with larger, multi-provincial samples, competency observations, interviews, and school-level evidence would therefore strengthen understanding of how professional learning should be differentiated across teachers' career trajectories.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

- Prioritize teacher ethics and integrity. Professional development should emphasize ethical decision-making, professional responsibility, learner safety, fairness in assessment, responsible use of agricultural resources, animal welfare, environmental responsibility, and respect for community knowledge, as teacher ethics and integrity received the highest rating.
- Strengthen teacher leadership. Schools and educational service area offices should provide agriculture teachers with opportunities to lead instructional improvement, coordinate agricultural learning projects, mentor colleagues, manage educational innovations, and participate in professional learning communities.
- Promote continuous self-development and technological competence. Agriculture teachers should receive ongoing development in emerging agricultural knowledge, sustainable and digital agriculture, contemporary teaching approaches, and the design and application of innovative media and technology for learning management.
- Expand school–community collaboration. Schools should support agriculture teachers in establishing learning networks with farmers, community experts, agricultural enterprises, government agencies, local administrative organizations, and higher education institutions to facilitate community-based and authentic agricultural learning.
- Implement integrated, practice-based professional development. Professional-development programs should combine workshops with mentoring, professional learning communities, peer observation, collaborative classroom research, community-based projects, and follow-up coaching. Their effectiveness should be assessed through changes in teaching practices, the quality of agricultural learning activities, community participation, and student outcomes.

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