**How to Cite**
Thoa, H. T. (2024). Developing the faculty team in agriculture, forestry, and aquaculture through a competency-based approach: Insights and strategies for colleges in Vietnam. *International Journal of Social Sciences*, *7*(4), 82-88. https://sloap.org/journal/index.php/ijss/article/view/2323

# Developing the faculty team in agriculture, forestry, and aquaculture through a competency-based approach: Insights and strategies for colleges in Vietnam

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***Abstract---****This paper explores the development of faculty teams in agriculture, forestry, and aquaculture in Vietnamese colleges by applying competency-based education. Using a mixed-methods approach, the study evaluates the competencies of 124 faculty members from eight institutions, focusing on their academic qualifications, teaching skills, technological proficiency, and research involvement. The findings highlight strengths in academic preparation but reveal significant gaps in the use of technology, research engagement, and collaboration with industry partners. These gaps emphasize the need for comprehensive faculty development strategies to align education with labor market demands. Key solutions proposed include establishing a competency framework specific to agriculture, forestry, and aquaculture education to guide curriculum and professional development. The study also recommends strategic workforce planning based on competencies to ensure the optimal distribution of teaching expertise. Furthermore, competency-based recruitment and utilization practices will help institutions select faculty best suited for teaching and research roles. Continuous training and professional development programs aligned with this framework are necessary to help faculty integrate new technologies and teaching methods. The study emphasizes the importance of performance evaluation systems to monitor and support faculty progress and institutional policies that foster a motivating and supportive work environment. Together, these solutions will ensure that faculty teams are equipped to meet the evolving demands of these fields and contribute to sustainable development.*
***Keywords---****agriculture education, aquaculture, competency-based education, faculty development, forestry education.*

## Introduction

The fields of agriculture, forestry, and aquaculture play crucial roles in Vietnam's economy, contributing significantly to employment, food security, and exports. However, rapid technological advancements and increasing global market demands require a shift in educational approaches to ensure students graduate with relevant skills (Edwards, 2015; Ottinger et al., 2016). Traditional education models have shown limitations in preparing students to meet these dynamic challenges, creating an urgent need for competency-based education (CBE). This educational approach focuses on developing specific competencies, allowing students to progress through flexible learning paths, and ensuring they acquire both theoretical and practical expertise essential for their industries (Aurora Institute, 2021; Gervais, 2016).

CBE has emerged as an effective model by focusing on mastery of skills over time-based learning. In agricultural, forestry, and aquaculture education, students benefit from hands-on activities such as fieldwork, aquaculture monitoring, and problem-solving in real-world production scenarios (Trauger et al., 2008; Zarafshani et al., 2020). These practical experiences are vital for addressing environmental challenges, managing resources sustainably, and applying technological innovations to meet industry demands (Morcke et al., 2013).

ISSN 2632-9409
Submitted: 17 July 2024 |Revised: 28 August 2024 | Accepted: 25 September 2024

Faculty development is critical to implementing CBE effectively. Instructors need not only deep subject-matter knowledge but also pedagogical expertise to adopt student-centered teaching methods, such as project-based and inquiry-based learning. Faculty members are essential in designing curricula, mentoring students, and assessing competencies, making their continuous professional growth a cornerstone for the success of CBE programs (Brown, 1994; D2L, 2021).

In Vietnam, the integration of CBE in agriculture, forestry, and aquaculture education aligns with national efforts to modernize the workforce. However, challenges remain, such as faculty unfamiliarity with CBE principles and limited institutional infrastructure to support this transition. Overcoming these challenges requires comprehensive faculty training, curriculum co-development, and strengthened partnerships with industry stakeholders to align teaching with real-world demands (Thoa, 2024a; Gervais, 2016). Collaboration with businesses provides valuable insights into emerging trends and technologies, ensuring the relevance of educational programs.

Implementing CBE also involves continuous assessment and feedback mechanisms to monitor student progress. Faculty must develop assessments that reflect industry scenarios, allowing students to demonstrate competencies in practical settings. This shift from traditional exams to performance-based evaluations not only improves student engagement but also ensures alignment between educational outcomes and labor market needs. Personalized learning pathways—another key feature of CBE—allow students to focus on areas requiring further development, improving both efficiency and effectiveness (Gervais, 2016).

The adoption of CBE in agriculture, forestry, and aquaculture offers significant opportunities to align academic programs with industry needs. However, success depends heavily on faculty development and institutional capacity to foster industry collaborations. With appropriate implementation, CBE can transform education in these fields, ensuring that graduates are prepared to contribute meaningfully to sustainable economic growth and environmental stewardship in Vietnam.

*Literature review*

The integration of a CBE model into the fields of agriculture, forestry, and aquaculture is essential for meeting the evolving demands of the labor market and improving educational outcomes. CBE emphasizes mastering specific competencies that align with industry needs, offering students personalized learning pathways to prepare them for real-world challenges. This review explores the fundamental principles of CBE, faculty development, curriculum design, and collaboration with industry, tailored to agriculture, forestry, and aquaculture education.

The Concept and Principles of CBE

CBE focuses on student mastery of well-defined skills and competencies rather than traditional time-based progression. This model allows students to advance only when they demonstrate proficiency in essential competencies. Learning pathways in CBE programs are often customized to accommodate individual student needs, which is particularly advantageous for non-traditional learners in fields like agriculture and aquaculture (Aurora Institute, 2021).

In these disciplines, CBE's principles are especially relevant due to the need for hands-on expertise. Graduates are expected to apply both theoretical knowledge and practical skills, including proficiency in resource management, sustainable agricultural practices, and aquaculture technologies. Aligning educational outcomes with these competencies ensures that graduates are job-ready and equipped to contribute effectively to the labor market (Morcke et al., 2013).

Faculty Development for CBE

Faculty development plays a critical role in the effective implementation of CBE. Educators must go beyond subject-matter expertise and embrace innovative pedagogical methods, such as project-based, inquiry-based, and collaborative learning. These methods encourage students to apply their knowledge to real-world contexts, fostering critical thinking and problem-solving skills (Brown, 1994; D2L, 2021).

Transitioning from traditional lecture-based teaching to a CBE model requires significant faculty support. Professional development programs are essential to train educators in competency-based teaching strategies, digital literacy, and performance-based assessment. Instructors also need training in designing assessments that reflect practical skills, enabling students to demonstrate competency through internships, fieldwork, or project-based evaluations (Thoa, 2024a; Gervais, 2016).

Curriculum Design and Assessment in Agriculture, Forestry, and Aquaculture

A competency-based curriculum in these fields must reflect the technical skills required by each sector, such as sustainable farming techniques, forestry management, and aquaculture innovations (Arevalo et al., 2012; Rodríguez-Piñeros et al., 2020). Collaboration with industry stakeholders is vital in identifying and prioritizing relevant competencies. Designing such curricula involves breaking down complex skills into smaller learning outcomes that can be assessed continuously throughout the course (Aurora Institute, 2021).

CBE assessments extend beyond traditional exams to include real-world applications. Performance-based tasks such as internships, field projects, and problem-solving exercises allow students to demonstrate their abilities in practical settings. Additionally, integrating technology in curriculum delivery is crucial for preparing students to navigate the increasing digitization of agriculture, forestry, and aquaculture (Morcke et al., 2013).

The Role of Industry Collaboration in Faculty and Student Development

Strong partnerships between educational institutions and industry are essential for the success of CBE programs in these fields. Industry collaboration provides faculty with insights into emerging technologies and trends, enabling them to stay updated and integrate relevant skills into their teaching. Students also benefit from internships and fieldwork opportunities, which help them apply theoretical knowledge in practical settings and develop job-ready skills (Thoa, 2024b).

Faculty development benefits from these partnerships by fostering continuous learning and professional growth. Regular engagement with industry partners allows educators to participate in joint research, curriculum development, and technology transfer initiatives. These collaborations ensure that educational programs remain aligned with market needs, enhancing both student employability and institutional reputation (D2L, 2021).

Challenges and Future Directions

Despite the benefits of CBE, its implementation in agriculture, forestry, and aquaculture faces several challenges. Many educators are unfamiliar with CBE principles, and institutions often lack the necessary infrastructure, such as digital platforms and assessment tools, to support the transition. Faculty training and professional development programs are essential to address these gaps (Aurora Institute, 2021).

Personalized support systems are also critical to monitor student progress and provide timely feedback, particularly for students with diverse learning needs. Institutions must develop robust frameworks to track competency acquisition and ensure that all students meet the required standards.

## Methodology

### *Research design*

This study adopted a mixed-methods design to evaluate the competencies of faculty in fisheries education, integrating both quantitative and qualitative approaches. The goal was to assess faculty qualifications, teaching methods, technical competencies, and research involvement across eight fisheries colleges in Vietnam. Using a mixed-methods approach ensured a more comprehensive analysis by combining objective data with subjective experiences.

### *Sampling*

A purposive sampling technique was employed to select the eight fisheries-focused colleges. This ensured that institutions with significant roles in workforce preparation were included. A total of 124 faculty members participated, representing diverse teaching roles—those delivering theory, practical courses, and blended instruction. The sample reflected a variety of professional experiences, which enhanced the breadth and depth of the analysis.

### *Data collection*

Data were collected from 2019 to 2022 using both quantitative and qualitative methods:
Quantitative Data: Faculty members completed structured questionnaires that assessed their academic qualifications, teaching experience, technological skills, and engagement in research activities.

Qualitative Data: In-depth interviews with selected faculty members explored their challenges and experiences in adopting CBE. These interviews allowed the researchers to gain nuanced insights into institutional support, professional development needs, and collaboration with the industry.

*Instrumentation*

The questionnaire was developed based on existing frameworks for evaluating teaching competencies. It included both Likert-scale items to assess competency levels and open-ended questions to capture additional qualitative insights. The interview protocol focused on exploring faculty members' experiences with CBE, instructional strategies, and industry collaboration.

*Procedures*

Institutional Coordination: The research team collaborated with administrators at each college to identify eligible participants and secure institutional approval.
Questionnaire Distribution: The survey was distributed electronically and in person, with faculty given four weeks to respond.
Interview Process: Interviews were scheduled based on survey responses, conducted in person or via video conferencing, and recorded for transcription.
Data Management: All data were anonymized and stored securely, ensuring confidentiality throughout the study.

*Data analysis*

*Quantitative analysis with SPSS*

The quantitative data were analyzed using SPSS software to generate descriptive and inferential statistics. Frequencies and percentages were calculated to summarize faculty qualifications, teaching practices, and technological competencies. Additionally, cross-tabulations were performed to explore relationships between variables such as teaching experience and participation in research.

For inferential analysis, independent samples t-tests were conducted to compare competency levels between different groups of faculties (e.g., those involved in practical versus theoretical teaching). ANOVA tests were used to identify significant differences in competencies across colleges. The use of SPSS ensured precise statistical analysis, providing objective insights into the strengths and areas for development within the faculty team.

*Qualitative analysis*

The interview transcripts were analyzed thematically to identify recurring themes related to faculty development, institutional support, and the integration of CBE. Themes were coded using qualitative analysis software, and the findings were triangulated with the quantitative data to ensure consistency and reliability.

*Integrated analysis*

Both quantitative and qualitative findings were integrated to provide a comprehensive understanding of faculty competencies. For example, statistical trends identified through SPSS were complemented by insights from interviews, providing a holistic view of faculty challenges and development needs.

**Findings and Discussion**

*Faculty qualifications and teaching experience*

The analysis revealed a diverse range of qualifications among the 124 faculty members. Descriptive statistics showed that 68% of the faculty held postgraduate degrees, while the remainder held undergraduate qualifications. However, the cross-tabulation analysis highlighted disparities between qualifications and teaching roles. Faculty members with advanced degrees were more likely to be involved in theoretical teaching, while those with practical expertise primarily focused on hands-on training modules.

The independent **t-test** results indicated no statistically significant difference in teaching competency scores between theoretical and practical instructors ($p > 0.05$). This finding suggests that both groups possess comparable teaching skills, though their application differs based on their instructional roles. These results align with prior studies, which emphasize the importance of integrating both theoretical and practical knowledge for comprehensive competency development.

*Technological competency and use of digital tools*

The quantitative data showed that 85% of faculty members reported using information technology in their teaching practices. However, cross-tabulation analysis revealed that practical instructors were less likely to integrate advanced technologies compared to their theoretical counterparts, with only 40% reporting regular use of specialized software for fisheries management.

The **ANOVA test** indicated significant differences in technological competency between colleges ($F(7, 116) = 4.32$, $p < 0.05$). Interviews revealed that disparities in access to technology contributed to these differences. Faculty from colleges in urban areas reported greater access to modern information technology infrastructure, while rural institutions faced resource constraints. This finding underscores the need for targeted investments in technological infrastructure to ensure equitable access across all colleges.

*Participation in research activities*

Descriptive statistics indicated that only 35% of the faculty members actively engaged in research. Those involved in research predominantly published in local journals, with minimal participation in international research collaborations. The independent samples t-test showed a statistically significant difference in research involvement between faculty with postgraduate qualifications and those with only undergraduate degrees ($p < 0.05$).

Interview data suggested that heavy teaching loads and limited institutional support were key barriers to research engagement. Faculty members expressed a need for structured professional development programs to enhance their research skills and opportunities for collaboration with industry partners. These insights highlight the importance of balancing teaching and research responsibilities to foster a culture of continuous learning and professional growth.

*Faculty challenges in adopting CBE*

The qualitative analysis identified several recurring themes related to the challenges of adopting CBE in fisheries education. Faculty members reported difficulties in shifting from traditional teaching methods to student-centered approaches, such as project-based and inquiry-based learning. Many instructors expressed uncertainty about how to design competency-based assessments that align with industry standards.

In addition, interviewees emphasized the importance of continuous professional development in overcoming these challenges. They highlighted the need for workshops and training programs focused on CBE principles, curriculum design, and the integration of new technologies. These findings align with the literature, which suggests that effective implementation of CBE requires substantial faculty training and institutional support (Hoogveld et al., 2005; Sonnadara et al., 2014).

*Collaboration with industry partners*

Collaboration with industry was identified as a critical factor for the success of CBE in fisheries education. However, both the quantitative and qualitative data revealed that such collaborations were limited. Only 20% of the faculty members reported active partnerships with fisheries businesses, and most collaborations were informal.

Interview participants expressed the need for stronger institutional frameworks to facilitate partnerships with industry. They emphasized that collaboration would not only provide students with real-world learning opportunities but also enable faculty to stay updated on the latest industry practices and technologies. This finding is consistent with previous research, which highlights the role of industry collaboration in aligning academic programs with labor market needs (Ilma et al., 2021).

*Integrated analysis and implications*

The integration of quantitative and qualitative findings offers a comprehensive view of faculty competencies and development needs. While faculty members possess strong academic qualifications and teaching skills, gaps remain in the areas of technological competency, research engagement, and industry collaboration. Addressing these gaps requires a multi-faceted approach, including investments in technology, structured professional development programs, and the establishment of formal partnerships with industry.

The findings underscore the importance of aligning faculty development efforts with the principles of CBE. Faculty must be equipped to design and deliver competency-based curricula that prepare students for the dynamic demands of the fisheries sector. Additionally, institutional support and policy frameworks are essential to ensure the sustainable implementation of CBE across fisheries colleges (Guraya & Chen, 2019; Smith & Hardinger, 2012).

## Conclusion

The development of competent faculty teams is essential for advancing fisheries education in Vietnam and ensuring alignment with the evolving demands of the sector. This study highlights several key solutions to address the challenges identified and promote sustainable faculty development through competency-based approaches.

First, it is crucial to establish a competency framework for fisheries faculty in colleges. This framework will define the necessary skills, knowledge, and attitudes required for teaching and professional growth, ensuring consistency in curriculum development and alignment with industry needs. It serves as the foundation for other faculty development activities and provides clear expectations for educators.

Second, strategic workforce planning is necessary to ensure the right distribution of expertise within faculty teams. This plan should take into account the balance between theory and practical instruction, anticipate future teaching demands, and include strategies to attract and retain talent. Adopting a competency-based approach to workforce planning ensures the efficient deployment of faculty based on their strengths and specialization.

The third recommendation is to implement competency-based recruitment and utilization practices. Hiring processes should focus on selecting candidates with the skills outlined in the competency framework, ensuring that faculty members are well-prepared for both teaching and industry collaboration. Proper utilization of faculty, by matching roles to their competencies, will optimize institutional performance and student outcomes.

In addition, ongoing training and professional development programs should be prioritized to help faculty integrate modern teaching methods and technologies. Continuous learning opportunities, aligned with the competency framework, will enable educators to keep pace with industry trends and enhance their research capabilities. Institutions should also encourage partnerships with industry to provide real-world learning experiences.

The next solution involves implementing competency-based evaluation and ranking systems. Regular performance assessments aligned with the competency framework will provide transparent feedback to faculty, identify development needs, and support career progression. This system will motivate educators to improve their skills and contribute more effectively to institutional goals.

Finally, it is essential to create supportive policies and a motivating environment to foster faculty development. This includes providing competitive salaries, access to research funding, and opportunities for industry engagement. Establishing a positive work culture with recognition and reward mechanisms will encourage educators to pursue continuous improvement and professional growth.

In conclusion, the integration of these solutions—competency frameworks, workforce planning, targeted recruitment, continuous development, performance evaluation, and supportive policies—will enable fisheries colleges to build strong faculty teams. With these strategies in place, educational institutions in Vietnam can ensure that their faculty are well-prepared to meet the challenges of the fisheries sector, contributing to sustainable growth and workforce development.

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