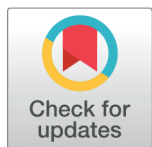


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Development of Contextualized Competency-Based Intervention Program for Pre-Service Teachers in Technology and Livelihood Education

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Abstract

Objectives: This study determined the competency development needs of pre-service teachers enrolled in the Bachelor of Technology and Livelihood Education (BTLEd) program based on program standards and anchored on Competence Motivation Theory. **Method:** Quantitative descriptive research design was employed among 143 third- and fourth-year BTLEd pre-service teachers through total enumeration. Data were collected using a validated questionnaire (Cronbach's $\alpha = 0.73$) and triangulated through observations and interviews. Descriptive statistics was used to described the development needs while Kruskal-Wallis test was used to analyze the data since the set of data is not normally distributed. **Findings:** Respondents demonstrated a high level of interest in the BTLEd program (Mean = 3.23) despite experiencing a high level of difficulty (Mean = 2.77). Only 39.86% possessed National Certifications, with Bread and Pastry NC II (16.8%) as the most common qualification. Overall, competency development needs were rated very much needed (Composite Mean = 3.19 ± 0.89), with the highest needs in Assessment and Reporting and Personal Growth and Professional Development (Mean = 3.27 each). Students reporting greater program difficulty exhibited significantly higher competency development needs in Content Knowledge and Pedagogy ($H = 8.058, p = 0.018$), Learning Environment ($H = 8.483, p = 0.014$), and Diversity of Learners ($H = 8.416, p = 0.015$), whereas interest level showed no significant differences. **Novelty:** This study applies Competence Motivation Theory by integrating psychographic factors and competency assessment to inform the design of the Strengthening Knowledge and Improving Lifelong Learning (SKILL) Program, a contextualized competency-based intervention that translates empirical findings into targeted strategies for strengthening teacher preparation and curriculum implementation. This contextualized competency-based intervention was designed to translate empirical evidence into targeted strategies that support curriculum implementation and enhance the preparation of future Technology and Livelihood Education teachers.

Keywords: Competency development; Livelihood education; Program Standard; Teacher education

1 Introduction

Educational quality is widely recognized as being strongly influenced by teacher competence, as effective learning is facilitated and the changing needs of students are addressed through competent teaching practices. As educational systems continue to evolve, teacher education institutions are expected to prepare graduates who possess not only strong pedagogical knowledge but also technical expertise, professional values, digital competence, and the ability to adapt to diverse learning environments. In the Philippines, the Philippine Professional Standards for Teachers (PPST) and the Commission on Higher Education (CHED) program standards for the Bachelor of Technology and Livelihood Education (BTLEd) reflect these expectations by promoting competency-based teacher preparation that responds to the demands of twenty-first-century education, and they provide a framework that equips future teachers with the knowledge, skills, and professional competencies needed to succeed in diverse learning environments⁽¹⁾.

Recent literature shows that preparing competent teachers has become increasingly complex. Beyond developing content knowledge and teaching strategies, pre-service teachers are now expected to demonstrate digital competence, instructional innovation, professional adaptability, and lifelong learning skills. Digital competence has been recognized as an essential component of teacher preparation because meaningful technology integration into teaching and learning is increasingly expected of future teachers⁽²⁾. Many pre-service teachers recognize the importance of digital competence; however, they continue to face challenges in building the technological readiness, confidence, and practical experience necessary for effective technology integration in teaching⁽³⁾. These findings highlight the need for teacher education programs to create authentic learning opportunities that allow pre-service teachers to develop competencies beyond what can be achieved through traditional classroom instruction.

Current evidence also indicates that competency development is strengthened when teacher education programs provide meaningful professional learning experiences. Innovative professional development initiatives and sustainable learning environments significantly enhance teachers' competencies by encouraging reflective practice, collaboration, and continuous improvement⁽⁴⁾. More emphasis has been placed on flexibility, technological proficiency, and interdisciplinary competencies as significant qualities of future education, highlighting the need for teacher education programs to continuously respond to changing educational contexts⁽⁵⁾.

In the Philippine context, teacher education institutions continue to face challenge in preparing competent pre-service teachers. Although pedagogical knowledge is acquired during their teacher training, many of them are still facing challenges in translating knowledge to classroom practice. Teaching efficiency has been associated to stronger pedagogical competence⁽⁶⁾, while awareness of the Philippine Professional Standards for Teachers does not necessarily guarantee readiness for professional practice without continuous competency development⁽⁷⁾,⁽⁸⁾. This concern is reflected in more recent studies showing that many pre-service teachers still feel insufficiently prepared to meet professional teaching standards despite completing their academic requirements⁽⁹⁾. Career readiness has likewise been viewed as a gradual process that develops through meaningful teaching experiences, confidence, and sustained professional growth rather than academic performance alone⁽¹⁰⁾. Taken together, these findings indicate that competency development should not be confined to meeting curricular requirements; instead, it should be strengthened through continuous practice, reflective learning, and meaningful professional experiences, while the effectiveness of teacher education programs in preparing future teachers for authentic classroom practice should be regularly assessed. This is more evident in Technology and Livelihood Education (TLE) where pre-service teachers are expected to integrate pedagogical competence with technical and vocational skills. In addition to learning instructional strategies, they are expected to develop practical skills that meet industry standards and earn National Certifications that validate their technical skills. The effective use of media and instructional technologies has been linked to improved performance of teaching in TLE, noting the growing importance of technological competence in technical-vocational education⁽¹¹⁾. At the same time, there is evidence that teacher education programmes meet the expectations of classroom competences but there are still gaps between university preparation and competences needed in actual teaching practice⁽¹²⁾.

Despite these advances, several gaps remain in the existing literature. Most previous studies have examined teacher competence, preparedness, digital competence, and career readiness as separate aspects of teacher education, with limited attention given to how students' psychographic characteristics particularly their interest in the degree program and the challenges they encounter during teacher preparation which shape their competency development. Although academic, instructional, and field-related challenges experienced by pre-service teachers have already been documented⁽¹³⁾, their influence on competency development needs has received relatively little empirical attention. Likewise, while Competence Motivation Theory provides a valuable explanation of how motivation and successful learning experiences contribute to competence development⁽¹⁴⁾, its application in assessing the competency development needs of BTLEd pre-service teachers remains limited. Existing studies also tend to end with general recommendations for training or curriculum enhancement, with

few translating their findings into structured, evidence-based intervention programs that directly address identified competency gaps.

Addressing these gaps is important because competency development involves more than complying with curriculum requirements. It is shaped by students' motivation, learning experiences, perceived challenges, opportunities for authentic practice, and institutional support. Understanding how these factors interact can help teacher education institutions design interventions that respond to students' actual developmental needs while strengthening curriculum implementation and professional preparation.

Therefore, this study aims to determine the competency development needs of pre-service teachers enrolled in the Bachelor of Technology and Livelihood Education program based on the program standards and Competence Motivation Theory. Specifically, it seeks to describe the respondents' psychographic profile in terms of interest in the degree program and perceived level of difficulty, identify the National Certifications they have obtained, determine whether competency development needs differ according to these psychographic characteristics, and develop a contextualized competency-based intervention program to address the identified competency gaps.

2 Methodology

Quantitative descriptive type of research method was utilized in the study. This method is deemed appropriate for this study in order to assess the competency development needs of the BTLEd pre-service teachers along program's standards. There were 143 or 100% BTLEd students combined from third year to fourth year this first semester school year 2022-2023 served as respondents. Total enumeration was applied to this study inviting all the students from third year to fourth year this school year to answer the survey questionnaire.

The instrument utilized for the study on identifying the Competency Development Needs of BTLEd Students is adapted and modified from the actual checklist of the CMO 78, series 2017 which is the Policies, Standards and Guidelines for BTLEd⁽⁸⁾. The questionnaire was validated by the three (3) experts in TLE, educational management, and measurement and evaluation. The content validity results indicate that most questionnaire items demonstrated excellent expert agreement, as evidenced by an Item-Level Content Validity Index (I-CVI) of 1.00, reflecting unanimous consensus regarding their relevance and clarity. Although a few items obtained an I-CVI of 0.67 which suggests the need for minor revisions, these values remain acceptable for further refinement based on expert feedback rather than outright elimination. Furthermore, the Scale-Level Content Validity Index using the Average method (S-CVI/Ave) of 0.94 exceeds the recommended threshold of 0.90, confirming that the instrument possesses excellent overall content validity and is appropriate for measuring the intended constructs.

It was pilot-tested to at least 30 respondents who were not part of the actual participants. The reliability test was conducted using Cronbach's alpha with the computed value of 0.73 which considers the questionnaire with good internal consistency. This served as a self-assessment tool in identifying the areas that need to be improved by the college. The result of the survey was verified through asking from point of clarification from the respondents for confirmation that helped the researcher in the discussion.

All respondents were provided by the online survey questionnaire form but only those students who are interested and willing to participate in the self-assessment survey where asked to participate for ethical consideration. In strict compliance with the Data Privacy Act of 2012, the researcher ensures the protection and confidentiality of all personal information collected in the conduct of this study. Any personal or other data provided by participants are processed solely for the purposes of research activities. Collected information is securely stored and accessible only to the researcher and will not be shared or disclosed to any third parties without the prior explicit written consent of the individuals concerned. These measures are implemented to uphold the highest standards of ethical research practice and data privacy.

Meanwhile, frequency count, percentage, ranking and weighted mean are the descriptive statistics utilized in describing and presenting the gathered data from the survey. The gathered data is tested its normality using Shapiro-Francia or Shapiro-Wilk test in determining the nature of data whether normally distributed or not. The non-parametric test was used in the study because of the normality test result with computed p-value of 0.046 which is less than 0.05 that signifies that the data set is not normally distributed. Kruskal Wallis test was used for the test of difference.

Table 1 presents the 4-point modified Likert Scale to interpret the result of the data gathered on the level of competencies needed by the students

The four-point Likert scale presented in Table 1 served as the primary basis for quantifying and interpreting the competency development needs of pre-service teachers by assigning numerical values to their self-assessed levels of preparedness across identified competencies. Specifically, it enabled the researcher to compute weighted means and systematically categorize responses into levels such as "Very Much Needed" to "Not Needed," thereby translating subjective perceptions into measurable data. This scaling framework ensured consistency in data analysis and facilitated clear interpretation of whether competencies

Table 1. Four-point scale used to interpret the result of the data gathered

Scale	Range	Assessment	Interpretation
4	3.51-4.00	Very Much Needed (VMN)	Competency not fully developed- not yet prepared to begin teaching
3	2.51-3.50	Much Needed (MN)	Competency moderately developed- moderately prepared to begin teaching
2	1.51-2.50	Less Needed (LN)	Competency slightly developed- slightly prepared to begin teaching
1	1.00-1.50	Not Needed (NN)	Competency fully developed- -prepared to begin teaching

were underdeveloped or already attained, which ultimately informed the design of the contextualized competency-based intervention program aligned with the actual needs of the respondents

3 Results and Discussion

This study describes the psychographic characteristics of the students in terms of their interest towards BTLED program, and also the level of difficulty they experience as shown in Table 2.

3.1 Psychographic Profile

Table 2. Psychographic profile of the respondents in Terms of Level of Interest and Difficulty Encountered in the Program (N=143)

Profile	Category	Frequency	Percent
Interest	Very Low	1	0.70
	Low	10	6.99
	High	87	60.84
	Very High	45	31.47
Difficulty	Very Low	3	2.1
	Low	44	30.8
	High	76	53.1
	Very High	20	14.0

Note: Level of Interest (Mean=3.23, High); Level of Difficulty (Mean = 2.77, High)

More than 92% of the respondents reported high or very high interest in the BTLED program, indicating that most students entered teacher education with a strong commitment to their area of study. This implies that students are generally aware of the significance of Technology and Livelihood Education as a profession and are still motivated despite the rigorous nature of the curriculum. The laboratory activities, the competency-based learning experiences and the opportunities to develop practical skills seem to be reinforcing the engagement of students with the program. However, the small number of respondents reporting low interest is worthy of note, because low motivation can have an impact on persistence, engagement in learning, and professional identity formation in the long term. According to Mamayabay and Quilestino⁽¹⁵⁾, many BTLED students prefer to pursue teacher education because they are eager to teach and they want to help the learners to acquire life skills for real life situations. Rubio and Saenz⁽¹⁶⁾ found that pre-service teachers who had a stronger commitment to teacher education reported higher levels of professional competence and confidence. Similarly, Alviola⁽¹⁷⁾ stated that career readiness is not only affected by the academic preparation but also by the commitment of the students to the teaching profession and their confidence in carrying out professional responsibilities.

However, the present findings also reveal an important distinction. While previous studies primarily associated students' interest with motivation⁽¹⁵⁾, teaching commitment⁽¹⁷⁾, and career readiness⁽¹⁶⁾, the present study found that a high level of interest did not necessarily correspond to lower competency development needs. Although respondents remained highly interested in becoming teachers, they still perceived considerable gaps in their professional competencies. This suggests that motivation alone is insufficient to guarantee competency acquisition. Competency development requires sustained exposure to authentic learning experiences, mentoring, and structured opportunities to translate theoretical knowledge into classroom practice. This finding reinforces the assumptions of Competence Motivation Theory, which argues that motivation is strengthened when learners successfully master increasingly challenging tasks rather than through interest alone⁽¹⁴⁾.

Another possible explanation is the changing landscape of teacher education. Recent systematic reviews have emphasized that future teachers are expected to develop competencies beyond traditional pedagogical knowledge. Digital competence^{(2), (3)}, technology integration^{(18), (19)}, and adaptive teaching⁽²⁰⁾ have become equally important components of teacher preparation. Consequently, even highly motivated students may perceive themselves as insufficiently prepared because the competencies expected of twenty-first-century teachers continue to expand.

Regarding the level of difficulty encountered, the majority of respondents reported experiencing high or very high levels of difficulty throughout the BTLED program. Although face-to-face instruction has resumed after the COVID-19 pandemic, students continue to experience challenges associated with skill acquisition, laboratory work, technological resources, and opportunities for authentic practice. Since BTLED is a competency-based and skills-oriented program, many of the required competencies cannot be fully developed through theoretical instruction alone.

These findings are consistent with Mamayabay and Quilestino⁽¹⁵⁾, who reported that pandemic-related disruptions limited students' opportunities to practice technical skills, thereby affecting competency development. Francisco et al.⁽²¹⁾ likewise observed that unstable internet connectivity and limited access to technological resources continued to influence students' learning experiences beyond the height of the pandemic. Similarly, Napanoy et al.⁽¹³⁾ found that pre-service teachers commonly experience academic, technological, and practicum-related challenges that reduce their confidence before entering the teaching profession.

Recent international studies show that these challenges are no longer about access to technology but increasingly about the ability to use technology effectively for teaching. As Marais⁽²⁾ states, digital competence is no longer an optional skill but has become a necessary professional competency for future teachers. Similarly, Darmenova et al.⁽³⁾ found that many pre-service teachers still have a problem with digital readiness due to insufficient opportunities of teacher education programs for meaningful technology integration. Mwananyama and Ngao⁽¹⁸⁾, Curtis et al.⁽²²⁾, Sheikh and Nath⁽²³⁾ and Young et al.⁽²⁰⁾ reached similar conclusions as they proved that structured digital competency training, technology-rich teaching practice and competency-based placements significantly improve pre-service teachers' confidence and instructional competence.

The findings also align with Tejano et al.⁽¹²⁾, who observed that although teacher education curricula generally correspond with classroom competency expectations, important gaps remain between university preparation and actual teaching practice. Likewise, Bihasa⁽⁹⁾ and Brown et al.⁽²⁴⁾ emphasized that pre-service teachers continue to require additional classroom exposure and experiential learning before they can confidently demonstrate professional competence. Suwono and Prasetyo⁽⁴⁾ further argued that competency development is strengthened when institutions provide continuous mentoring, collaborative learning, and innovative professional development opportunities rather than relying solely on formal coursework.

Unlike previous studies which examined teacher readiness, digital competence or career readiness separately, this study explored students' psychographic characteristics, their competency development needs and their professional preparation simultaneously, framed by Competence Motivation Theory. This broader view suggests that students' perceived learning difficulties are more related to their needs for competency development than to their interest. More importantly, the findings did not only identify competency gaps but also served as the empirical basis for the development of the SKILL (Strengthening Knowledge and Improving Lifelong Learning) Program, a contextualized competency-based intervention specifically designed for BTLED pre-service teachers. This is the unique contribution of the study in that it translates the assessment findings into an evidence based intervention framework that directly addresses the competency gaps while responding to the contextual realities of teacher education institutions.

3.2 National Certifications

Table 3 shows the National certifications obtained by the pre-service teachers. National Certification (NC) is the recognition of skills and knowledge through assessment of competence by TESDA assessors. This is done to determine if the student is competent or not yet competent against industry standards. Graduates of this program are expected to develop the competencies necessary to teach TLE effectively and to become TVET trainer and assessor. This national certification is required to be acquired by students to ensure the acquisition of the competencies.

Among the 143 respondents, 57 (39.86%) reported that they have earned at least one National Certification (NC) in a specific competency qualification. The most common certification was Bread and Pastry Production NC II, followed by Computer Systems Servicing, Food Processing, Cookery, Dressmaking, Tailoring and Organic Agriculture Production. The distribution reveals that many students appreciate the value of industry certification but opportunities to acquire skills in various TLE specializations are not equally distributed. The clustering of certifications in Bread and Pastry Production could be attributed to the availability of training facilities, qualified trainers and existing partnerships between senior high schools and TESDA-accredited assessment centers. On the other side, availability of institutional resources and evaluation of competency appear to be limiting certifications in other specializations

Table 3. National Certifications Attained by BTLEd Pre-service Teachers

National Certification	F	%
Bread and Pastry NCII	24	16.8
Computer System Servicing	9	6.3
Food Processing NC II	7	4.9
Cookery NC II	6	4.2
Dressmaking NCII	5	3.5
Tailoring NCII	4	2.8
Organic Agriculture Production NC II	2	1.4
Others	0	0.0
TOTAL	57	39.86

Students also cited financial constraints, limited access to assessment centers and the effects of the COVID-19 pandemic as reasons for the low number of National Certification holders. Many respondents explained that the first two years of the program were conducted mainly through online learning limiting opportunities to participate in laboratory activities, practical training and competency assessments. Given BTLEd's strong focus on hands-on skills development, it is probable that these limitations impacted students' readiness to pursue industry certification. Mamayabay and Quilestino⁽¹⁵⁾ identified similar challenges that "limitations during the pandemic" hindered students' opportunities to develop and demonstrate practical skills in Technology and Livelihood Education. Similarly, Napanoy et al.⁽¹³⁾ found that diminished exposure to authentic learning experiences led to lower pre-service teachers' confidence and preparedness for professional practice. The present findings support recent findings that stress the importance of competency-based and work-integrated learning in teacher education. Mazlan et al.⁽²⁵⁾ state that work-based learning helps TVET students to develop technical competencies that are aligned with Industry 4.0 expectations, while Rohanai et al.⁽²⁶⁾ indicate that authentic experience at the workplace can enhance technical skills and professional confidence. Similarly, Estubio and Sarsale⁽²⁷⁾ found that pre-service TVET teachers are more ready for classroom teaching when knowledge, skills and attitudes are developed simultaneously through competency-based training. The study highlights the need to give students enough opportunities to attain industry-recognized qualifications before they graduate. The low number of students who have obtained certification is somewhat contrary to the expectations of the Philippine K–12 curriculum. The former identifies National Certification as one of the outcomes expected of Technical-Vocational-Livelihood education. Villanueva⁽²⁸⁾ argued that TESDA and the Department of Education viewed competency assessment as an important tool to ensure that graduates have skills aligned with industry standards. However, the present results suggest this is difficult to achieve in practice. Competency assessment can be done. However, availability of training, assessment fees, facilities and qualified assessors remain factors that affect students' ability to achieve National Certifications. This suggests that institutional and contextual factors may influence certification acquisition in addition to students' willingness.

This interpretation is consistent with recent international evidence. Tejano et al.⁽¹²⁾ reported that although teacher preparation programs generally align with classroom competency expectations, there continue to be gaps between institutional preparation and the competencies expected in professional practice. Likewise, Bihasa⁽⁹⁾ discovered that many pre-service teachers still feel they are not adequately prepared to meet standards of professionalism before entering the teaching profession. Suwono and Prasetyo⁽⁴⁾ also argued that the development of competencies is strengthened when teacher education institutions offer continuous professional support, mentoring and innovative learning environments outside of conventional classroom learning. Taken together, these studies indicate that developing competency is an institutional commitment that cannot be left entirely to the individual student.

Previous studies have mainly examined the employment benefits of National Certifications^{(29), (30)}, and this study adds another significant aspect. National Certification should be known as a proof of pre-service teachers' competency-based instruction in Technology and Livelihood Education and not only as a credential for employment. Students who have undergone competency assessment get a real feel of industry standards, performance evaluation and workplace expectations, which helps them to better link technical expertise with classroom teaching. This perspective is built upon prior research that conceptualizes National Certification as a vital part of teacher preparation, not just a requirement for employment.

The findings also have implications for teacher education institutions. The number of collaborations with TESDA-accredited assessment centers, the level of financial support for competency assessment and the inclusion of certification opportunities in the BTLEd curriculum could be increased to encourage more students to avail of industry recognized qualifications before graduation. The initiatives would not only enhance the students' employability but also their professional competence and confidence as future TLE teachers. This study adds to the understanding of how industry qualifications can inform teacher

preparation, and provides evidence to support the development of the proposed competency-based intervention program by contextualizing National Certification within the broader arena of competency development.

3.3 Competency Development Needs in Terms of Content Knowledge and Pedagogy

The findings indicate that Content Knowledge and Pedagogy remains one of the areas where BTLEd pre-service teachers require the greatest support. Respondents rated the ability to demonstrate the competencies required under the Philippine TVET Trainers Assessors Qualifications Framework as one of their highest development needs ($WM = 3.29$, $SD = 0.81$), followed closely by mastery of subject matter and discipline ($WM = 3.24$, $SD = 0.91$). These results suggest that although students have completed professional education and major courses, many still perceive themselves as needing additional preparation before they can confidently perform the roles expected of future TLE and TVL teachers.

One possible explanation is that the development of content expertise in Technology and Livelihood Education is not simply knowing theories and concepts. It requires repeated practice of applying technical knowledge in actual teaching and industry environments. The students themselves pointed to the need for more practical learning experiences, suggesting that classroom instruction may not be enough to develop the competencies expected of TVET educators. Their responses underscore the value of experiential learning, where technical skills, pedagogical knowledge and professional judgment are developed concurrently through meaningful practice. This finding is consistent with Basal⁽³¹⁾ who stated that mastery of subject matter by teachers, combined with good pedagogical skills, enables them to provide meaningful learning experiences and maintain students' interest in the classroom. Likewise, Estubio and Sarsale⁽²⁷⁾ found that pre-service TVET teachers are more prepared when knowledge, skills and professional attitudes are developed in an integrated way, rather than as isolated competencies. These results are in line with the idea that competence development should not be only theoretical, but also reinforce the application of teaching and technical skills in practice.

Recent studies also suggest that teacher competence has become multi-dimensional. Mazlan et al.⁽²³⁾ claimed that work-based learning is a crucial component in preparing TVET students for Industry 4.0 as it enables them to acquire technical competencies, workplace values, and problem-solving skills in authentic settings. Similarly, Tejano et al.⁽¹²⁾ reported that the teacher education curriculum was generally aligned with classroom competency expectations, but there was still a disconnect between university preparation and the realities of professional teaching. These observations align with the present findings suggesting that curriculum alignment may not automatically translate into competency development if students are not given adequate opportunities to turn learning into practice. And the growing power of digital technologies has transformed expectations of what constitutes teacher competence. Marais⁽²⁾ pointed out that digital competence has become a key component of teacher professionalism. Darменова et al.⁽³⁾ observed that many pre-service teachers still face challenges in developing the technological competencies needed for modern classrooms. In a similar vein, Zeng et al.⁽³²⁾ found that digital competence, technology integration and continuous professional learning were crucial aspects of effective teacher preparation in their systematic review. These studies extend the interpretation of the present findings by suggesting that mastery of content and pedagogy now requires the ability to integrate digital technologies into teaching and learning.

The advent of artificial intelligence adds to this necessity. Literacy of pre-service teachers in generative artificial intelligence has been found to significantly influence their willingness to integrate emerging technologies into teaching⁽³³⁾ and preparedness for AI integration has become an important competency among future Filipino teachers⁽³⁴⁾. More recent studies have reached similar conclusions. Mwananyama and Ngao [18] argued that purposeful integration of AI-supported learning environments into teacher education improves pedagogical competence and Curtis et al.⁽²²⁾ and Sheikh and Nath⁽²³⁾ showed that structured digital training enhances the confidence and instructional ability of pre-service teachers. In sum, these results suggest that it is not possible to separate content knowledge and pedagogy from digital competence, as future teachers are increasingly required to integrate disciplinary expertise with technology-enhanced instructional practices.

A key contribution of the present study is that it extends the previous research beyond identifying competency gaps. Previous research has focused on subject mastery, digital competence or work-based learning as separate parts of teacher preparation. However, this study shows how these competencies together affect the developmental needs of BTLEd pre-service teachers. The students' suggestions for more classroom exposure, industry immersion and authentic teaching experiences provide practical evidence that the development of competencies is best served when technical expertise, pedagogy and professional practice are integrated throughout the curriculum. These findings were directly translated into the design of the suggested competency-based intervention program, thus ensuring that the proposed strategies meet the real learning needs of the students and not only the prescribed curriculum standards.

3.4 Competency Development Needs in terms of Learning Environment, Diversity of Learners, Curriculum and Planning and Assessment and Reporting

The uniformity in the high level of competency development needs across all domains indicates that BTLEd pre-service teachers are aware of areas of importance for which they still require additional preparation before entering the teaching profession. The most rated needs were about facilitating learning using diverse instructional strategies (WM = 3.17), developing instructional plans and learning resources for diverse learners (WM = 3.19), and strengthening competencies in assessment, reporting, and ICT integration (WM = 3.27). These responses suggest not a lack of confidence, but an awareness by students of the increasing complexity of the competencies expected of beginning teachers. As they are getting ready for their teaching practice, it looks like they realize that good teaching is not just about knowing the subject matter, but also knowing how to plan for inclusive teaching, include technology and make good instructional decisions. One possible explanation for these findings is the lack of opportunities for sustained, authentic teaching experiences during their professional preparation. While the curriculum is the basis of knowledge, students expressed the need to have more opportunities to practice microteaching, digital lesson design, classroom simulations, and assessment tasks that are closer to actual teaching situations. Bernardo et al.⁽³⁵⁾ also found similar results, where pre-service teachers often need extra support in transforming theoretical knowledge into effective classroom practice, particularly in diverse and technology-mediated learning environments. Similarly, Thaanyane and Jita⁽³⁶⁾ found that meaningful teaching practice greatly enhances professional competence by providing students with opportunities to use pedagogical knowledge in authentic classroom contexts.

The findings reported here are also indicative of broader trends in teacher education. Recent studies have shown that the competence of teachers now includes not only classroom management and delivery of instruction, but also other skills. The digital competence was identified as a core component of teacher professionalism by Marais⁽²⁾ and Zeng et al.⁽³²⁾. Guo et al.⁽³⁶⁾ showed that the technology integration and pedagogical content knowledge could be enhanced through collaborative lesson planning. Likewise, Young et al.⁽²⁰⁾ indicated that competency-based teaching placements could lead to a significant increase in digital competence and classroom readiness. These studies support the current findings that curriculum planning, assessment literacy, and ICT integration should be developed in tandem, as opposed to separate competencies. While CMO No. 78, s. 2017⁽¹⁾ lists the competencies that BTLEd graduates are expected to possess, this study offers empirical data on the areas where students still need help. In contrast to earlier studies that looked at teacher preparedness or digital competence in isolation, the present study emphasizes the competency domains that students themselves believe need the most development. The results provided a more solid basis for designing targeted competency-based interventions that will address the gap between curriculum expectations and actual classroom readiness and thus strengthen the preparation of future TLE teachers.

3.5 Competency Development Needs in terms of Community Linkages and Professional Engagement

The findings suggest that pre-service teachers highly value professional ethics, as well as community engagement and collaboration, but also see them as areas to be developed further. The highest rated competency was maintaining professional and ethical teaching standards across local, national and global contexts (WM = 3.31) and the second highest was participation in community oriented activities (WM = 3.27). Students value these competencies; however, the composite mean (WM = 3.21) indicates that many students do not yet feel adequately prepared to translate these expectations into professional practice.

One possible explanation could be that opportunities to engage with schools, communities and multidisciplinary teams are limited during pre-service preparation. The best way to develop professional values and ethical decision-making is not merely classroom instruction but authentic experiences that allow students to interact with diverse learners, parents, and community stakeholders. This finding is consistent with Rohanai et al.⁽²⁶⁾ who pointed out that work-based learning enhances professional competence through exposing pre-service teachers to authentic educational settings. Similarly, Cahulugan et al.⁽³⁷⁾ found that meaningful leadership experiences improve students' confidence, collaboration and decision-making skills and Vergara et al.⁽³⁸⁾ found that exposure to inclusive learning environments increases teachers' preparedness to respond to diverse classroom needs. Recent studies suggest that professional engagement⁽³⁹⁾ does not stop at the school-based practice. The significance of collaborative professional learning to strengthen the teachers' competencies has been found by Suwono and Prasetyo⁽⁴⁾. Yalley et al.⁽⁴⁰⁾ have also stressed that meaningful community engagement helps future teachers develop social responsibility and transferable life skills which are essential for professional practice.

In contrast to previous studies that focus on teaching competence⁽²⁶⁾, preparedness⁽³⁸⁾ or work-based learning⁽⁴⁾,⁽⁴⁰⁾, this study shows that community engagement and professional responsibility are still major developmental needs of BTLEd pre-service teachers. These findings highlight the importance of enhancing school-community partnerships and integrating

authentic community-based experiences into teacher education programs to better prepare future teachers for their professional and civic responsibilities.

3.6 Competency Development Needs in Terms of Personal Growth and Professional Development

The findings show that BTLEd pre-service teachers view personal and professional development as an essential component to becoming effective educators. The highest-rated development needs were to demonstrate a strong service orientation (WM = 3.31), participate in research and knowledge creation (WM = 3.27), engage in lifelong learning through experiential opportunities (WM = 3.27), and reflect on teaching practices and student learning (WM = 3.24). The results indicate that while students value continued professional development, they still feel there is a gap between understanding these expectations and confidently applying them in practice.

One potential explanation is that opportunities for career development are likely to be significant only when students are engaged in authentic teaching, research, and community engagement. Classroom instruction can introduce these concepts but reflective practice, research participation, and field experiences allow prospective teachers to develop the confidence and professional identity needed for lifelong learning. This is in agreement with the findings of Thaanyane and Jita⁽³⁶⁾ who established that pedagogical competence is significantly improved through teaching practice, mentoring and reflective activities which allow pre-service teachers to connect theory with classroom realities. In addition, Cahulugan et al.⁽³³⁾ stated that leadership experiences increase students' confidence, self-efficacy, and decision making, thus supporting their professional development.

Recent evidence also indicates the growing importance of continuous professional learning in teacher education. Suwono and Prasetyo⁽⁴⁾ mentioned that ongoing professional development and collaborative learning contribute to creating reflective practitioners who continuously improve their teaching. Similarly, Vergara et al.⁽³⁸⁾ found that professional learning is continuous and improves teachers' confidence and readiness to tackle diverse educational contexts.

Unlike previous studies that primarily examined professional growth through teaching practice or leadership experiences, the present study identifies the specific areas where BTLEd pre-service teachers continue to require support. These findings provide an evidence-based foundation for designing interventions that strengthen research engagement, reflective practice, service orientation, and lifelong learning, thereby preparing future TLE teachers for continuous professional development throughout their careers.

3.7 Summary of Competency Development Needs

Overall, as shown in Table 4, most of the students have very high level of development needs in competencies required in the teaching profession. Among these competencies, the need to develop assessment and reporting, curriculum planning, personal growth and professional development, and community linkages and professional engagement are the top most needed competencies to be developed among the students.

Table 4. Summary of Competency Development Needs

Competency Standard	CM	SD	R	NN	LN	MN	VMN
A. Content Knowledge and Pedagogy	3.15	0.77	7.0	5.28	17.67	33.88	43.17
B. Learning Environment	3.17	0.87	6.0	4.20	18.18	34.27	43.36
C. Diversity of Learners	3.19	0.90	5.0	5.59	15.38	33.57	45.45
D. Curriculum and Planning	3.23	0.81	3.0	4.55	15.38	30.77	49.30
E. Assessment and Reporting	3.27	0.90	1.5	4.90	15.38	27.97	51.75
F. Community Linkages and Professional Engagement	3.21	0.84	4.0	7.17	15.56	30.42	48.08
G. Personal Growth and Professional Development	3.27	0.81	1.5	6.47	13.37	31.64	49.13
Overall Composite Mean	3.19	0.89		5.83	15.85	32.48	46.21

Although the competencies in content knowledge and pedagogy, learning environment, and diversity of learners are just almost half of the students who need it very much, it can be noted that there is a high to very high level of development needs. The results reveal that the BTLEd program needs to craft and implement varied programs and activities in order to develop the needed competencies of their pre-service teachers in the teaching profession in the future. In similar study conducted by Estubio et al., they found that most of the TVET Pre-Service teachers specializing in home economics and industrial arts only had a few

programs related trainings and earned national certifications⁽³⁴⁾. They also emphasized the need for a targeted enhancement program to strengthen the competence of pre-service teachers.

3.8 Differences on the Competency Development Needs of Students

Table 5 reveals that no significant difference exists on the competency development needs of the students when grouped according to Level of Interest towards the BTLEd program as denoted by the computed p-values which are greater than 0.05 alpha level.

Table 5. Difference on the Competency Development Needs of Students When Grouped According to Level of Interest towards the BTLEd Program

Competency Standard	Mean Rank			Kruskal-Wallis H	p-value	η^2 (Eta Squared)
	Low	High	Very High			
Content Knowledge and Pedagogy	51.14	71.57	77.92	4.751	0.191	0.020
Learning Environment	53.45	73.61	73.42	3.586	0.310	0.110
Diversity of Learners	55.23	73.02	74.12	2.284	0.516	0.002
Curriculum and Planning	57.45	70.45	78.54	3.436	0.329	0.010
Assessment and Reporting	66.95	69.34	78.38	3.702	0.296	0.012
Community Linkages and Professional Engagement	52.68	70.4	79.81	5.088	0.165	0.022
Personal Growth and Professional Development	55.82	70.41	79.02	4.307	0.230	0.016

*Significant (S) at $p\text{-value} < 0.05$ (2-tailed)

The absence of significant differences in competency development needs across different levels of interest suggests that students share similar perceptions of the competencies they need to strengthen, regardless of how interested they are in the BTLE program. Although interest is often associated with motivation and engagement, it did not appear to influence how respondents assessed their readiness for professional practice. This indicates that competency development is likely shaped by factors beyond personal enthusiasm, including the quality of learning experiences, opportunities for authentic teaching practice, and the overall design of the teacher education curriculum.

This finding offers a different perspective from studies that emphasize the positive role of intrinsic motivation in promoting creativity, adaptability, and engagement in learning⁽⁴¹⁾. While motivation remains important for sustaining students' commitment to the profession, the present results suggest that it alone may not be sufficient to address perceived competency gaps. Instead, they support the observations of Thaanyane and Jita⁽³⁶⁾, who emphasized that meaningful teaching practice and reflective experiences are stronger contributors to professional competence than motivation alone. Similarly, Laguador and Dotong⁽³⁹⁾ found that challenging learning experiences encourage students to recognize areas requiring further improvement, regardless of their initial level of interest.

Unlike previous studies that primarily linked motivation to academic engagement⁽³⁶⁾,⁽³⁹⁾, the present study demonstrates that competency development needs remain relatively consistent across students with varying levels of interest. This finding underscores the importance of providing all pre-service teachers with equitable access to competency-based training, mentoring, and authentic classroom experiences, ensuring that professional development is driven by identified learning needs rather than by students' initial motivation alone.

Table 6 reveals the difference in the competency development needs of the students when grouped according to Level of Difficulty Encountered.

Results showed that there is a significant difference on content knowledge and pedagogy ($h=8.058$, $p=0.018$), learning environment ($h=8.483$, $p=.014$), and diversity of learners ($h=8.416$, $p=.015$) as denoted by the computed p-values which are less than 0.05 alpha level. This signifies that those students with high to very high level of encountered difficulty in the BTLEd program have higher level of development needs in the competency standards while those students with low to very low level of difficulty encountered in the program have lesser needs to develop these competency standards because they have almost already acquired these competencies. Understanding the diversity of learners is crucial in maintaining inclusive learning environment in which those students with high level difficulty encountered have expressed higher need on these areas⁽⁴²⁾.

However, there is no significant difference on curriculum and planning ($h=4.943$, $p=.084$), assessment and reporting ($h=5.530$, $p=.063$), community linkages and professional engagement ($h=4.486$, $p=.106$), and personal growth and professional

Table 6. Difference on the competency development needs of the students when grouped according to Level of Difficulty Encountered

Competency Standard	Mean Rank			Kruskal-Wallis H	p-value	Interpretation
	Low	High	Very High			
Content Knowledge and Pedagogy	58.01	79.24	77.38	8.058	.018*	S
Learning Environment	58.95	79.84	72.88	8.483	.014*	S
Diversity of Learners	58.88	79.52	74.25	8.416	.015*	S
Curriculum and Planning	61.29	77.27	77.15	4.943	.084	NS
Assessment and Reporting	61.41	77.67	75.33	5.530	.063	NS
Community Linkages and Professional Engagement	61.74	76.57	78.72	4.486	.106	NS
Personal Growth and Professional Development	62.43	76.31	78.13	3.995	.136	NS

*Significant (S) at $p\text{-value} < 0.05$ (2-tailed); *Not Significant (NS)

development ($h=3.995$, $p=.136$) as denoted by the computed p-values which are greater than 0.05 alpha level. This means that the BTLED students may have low or high level of development needs on the cited competencies regardless of their level of difficulty faced in the program. Pre-service teachers have a high level of interest in the BTLED program but also a high level of difficulty. This means that motivation is not enough to ensure the development of competencies without adequate support and learning experience. This is in line with previous research suggesting that the passion for teaching sustains engagement [15], however the difficulties in skill acquisition, especially in flexible or online learning environments, impede the effective formation of competencies. The low percentage of students with National Certifications further highlights the structural limitations such as lack of resources, financial barriers and lack of exposure to training, in line with the findings on employability and TVET readiness⁽²⁷⁾,⁽²⁹⁾. Overall, the data suggest that competency gaps are not due to lack of interest but are mainly attributed to limited hands-on experiences, lack of practice-based training and contextual barriers. The findings support frameworks such as competence motivation theory and pedagogical content knowledge (PCK) that emphasize the importance of meaningful engagement and applied learning in skill mastery.

3.9 Contextualized Competency-Based Intervention Program

The SKILL Program (Strengthening Knowledge and Improving Lifelong Learning) is a contextualized competency-based intervention and development initiative for pre-service teachers enrolled in the BTLED program. It aims to address identified gaps in pedagogical and technical competencies by providing structured learning experiences, hands-on training, and reflective practice opportunities. The program design is aligned with the competence motivation theory that focuses on intrinsic drive for competence, role of reinforcement, and empowerment domain specific that will be done through workshops, mentoring, industry exposure, and continuous skills development with essential knowledge, teaching strategies, and lifelong learning habits necessary for effective and responsive teaching in TLE courses. The development of this program contributes to the idea of existing knowledge and literature on how competence motivation theory was utilized as framework in crafting such intervention plan to address the specific needs of the students. The study's novelty lies in the integration of psychographic factors (interest and difficulty) with competency development needs and in proposing a contextualized competency-based intervention program (SKILL Program) anchored in competence motivation theory, which offers a targeted and responsive approach to addressing identified gaps.

4 Conclusion

This quantitative research study provides data on how TLE pre-service teachers expressed their competency development needs based on program standards. The TLE students convey a high level of interest towards their enrolled degree program in which they also encountered high level of difficulty. Results showed that Bread and Pastry is the most common national certifications of BTLED Pre-service teachers due to its relevance in preparing graduates for employability in the food industry. But the result also suggests limited financial support, limited resources of schools and lack of interest of the students to take other qualifications are some of the reasons for having limited national certifications obtained by the students. This is also the reason why students showed very high level of competency development needs because professional identity formation is still emerging among students specifically on personal growth and professional development, assessment and reporting, curriculum and planning and community linkages and professional engagement. They have limited exposure to actual school setting, and other training

opportunities outside coursework. According to the Competence Motivation theory, motivation of students increases when they recognize some gaps in their competence and seek for possible opportunities where they can build skills to enhance their sense of efficacy. This also explains that students feel capable and motivated to develop mastery if they are driven to engage in performing relevant tasks. Relatively, students are aware of their development status under early stages of forming their professional identity as future teachers. Developing the full potential of future professional teachers is one of the ultimate roles among institutions of higher learning as part of addressing the Sustainable Development Goal (SDG) #4 in providing quality education. This study contributes to the growing demands in developing the competencies of pre-service teachers before deployment in practice teaching. The proposed contextualized competency-based intervention addresses the identified competency gaps and offers a practical framework for strengthening competency-based teacher education, guiding curriculum enhancement, and supporting the continuous professional preparation of future Technology and Livelihood Education teachers.

This quantitative study is limited to pre-service teachers of Bachelor of Technology and Livelihood Education program in one higher education institution in the Philippines and the design of the intervention program is based on the institution's resources and competency development needs of the respondents. The findings should be interpreted with caution. Firstly, the competency assessment was based on self-reported answers which may be influenced by social desirability and self-perception bias. Secondly, the cross-sectional research design limits the ability to establish causal relationships or examine changes in competency development over time. Future studies may be conducted using qualitative research in identifying the learning experiences and problems encountered of students in the areas related to the delivery of instruction as part of the supporting evidence for curriculum evaluation.

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References

- 1) CMO No. 78, s. 2017, Policies, Standards and Guidelines for Bachelor of Technology and Livelihood Education (BTLEd). 2017. Available from: <https://ched.gov.ph/wp-content/uploads/2017/11/CMO-No.-78-s.-2017.pdf>.
- 2) Marais E. The development of digital competencies in pre-service teachers. *Research in Social Sciences and Technology*. 2023;8(3):134–154. <https://doi.org/10.46303/ressat.2023.28>.
- 3) Darnenova A, Zhumabekova F, Yrymbayeva N, Aubakirova A, Zhussupova R. Digital competence of pre-service teachers in the 21st century: levels, challenges, and developmental pathways. *Frontiers in Education*. 2026;11. <https://doi.org/10.3389/feduc.2026.1744387>.
- 4) Suwono H, Prasetyo SD. Enhancing teacher competencies through innovative professional development practices focusing on sustainable learning environments. *Discover Education*. 2026;5:419. <https://doi.org/10.1007/s44217-026-01451-8>.
- 5) Atienza RD. Attuning Pre-Service Teachers' Competencies in the Context of Philippine Professional Standards for Teachers. *International Journal of Education and Practice*. 2024;14(1). <https://doi.org/10.18488/61.v14i1.4579>.
- 6) Afalla B, Fabelico F. Pre-service teachers' pedagogical competence and teaching efficiency. *Journal of Critical Reviews*. 2020. Available from: <https://ssrn.com/abstract=3655150>.
- 7) Espiritu RD. Awareness and competency of pre-service teachers on the Philippine professional standards for teachers (PPST): A basis for training program. *Journal NX-A Multidisciplinary Peer Reviewed Journal*. 2021;7(11). <https://doi.org/10.17605/OSF.IO/FY8MC>.
- 8) DO 42, s. 2017 – National Adoption and Implementation of the Philippine Professional Standards for Teachers. *Department of Education (depedgovph)*. 2017.
- 9) Bihasa DB. The preparedness of pre-service teachers on the required programs to meet standards. *PUPIL: International Journal of Teaching, Education and Learning*. 2022;5(3):220–237. <https://doi.org/10.20319/pijtel.2022.53.220237>.
- 10) Hashim S, Masek A, Mahtir BN, Rashid AH, Nincarean D. Association of interest, attitude and learning habit in mathematics learning towards enhancing students' achievement. *Indonesian Journal of Science and Technology*. 2021;6(1):113–122. Available from: <https://ijost.upi.edu/index.php/ijost/article/view/290>.
- 11) Golis CM, Sabellina J. Utilization of media skills in teaching technology and livelihood education and academic performance. *Aloysian Interdisciplinary Journal of Social Sciences, Education, and Allied Fields*. 2026;2(6):1413–1425. <https://doi.org/10.5281/zenodo.20535302>.
- 12) Tejano LD, Lagura RT, Dacanay ARA. How well does pre-service teacher preparation align with classroom competency expectations? Evidence from Northern Luzon, Philippines. *International Journal of Learning Teaching and Educational Research*. 2026;25(3):948–967. <https://doi.org/10.26803/ijlter.25.3.42>.
- 13) Napanoy JB, Gayagay GC, Tuazon JRC. Difficulties encountered by pre-service teachers: basis of a pre-service training program. *Universal Journal of Educational Research*. 2021;9(2):342–349. <https://doi.org/10.13189/ujer.2021.090210>.
- 14) Harter S. Effortance Motivation Reconsidered Toward a Developmental Model. *Human Development*. 1978;21(1):34–64. <https://doi.org/10.1159/000271574>.
- 15) Mamayabay MJ, Quilestino MR. Motivations and challenges in specializing technology and livelihood education: A phenomenological inquiry. *European Journal of Education Studies*. 2024;11(2). <https://doi.org/10.46827/ejes.v11i2.5205>.
- 16) Rubio JS, Saenz CR. Pre-service teacher competence in a teacher education institution. *Journal of Multidisciplinary Research and Development*. 2023;10(2):45–60. Available from: <https://pdfs.semanticscholar.org/4b22/cbca6420509c09ddb6f1d0d8b214617d308f.pdf>.

- 17) Alviola JC. Career readiness among senior pre-service teachers: implications for teacher education. *International Journal of Special Education*. 2026;41(3 Suppl):91–105. Available from: <https://www.internationalsped.com/index.php/ijse/article/view/2834>.
- 18) Mwananyama PC, Ngao AI. AI-driven innovations in higher learning institutions: a review of pre-service teachers' pedagogical competence through technology integration. *Cogent Education*. 2026;13(1). <https://doi.org/10.1080/2331186X.2026.2672780>.
- 19) Anwar K, Musa J, Salleh S. A systematic literature review of pre-service teacher technology integration during teaching practice: trends, frameworks, practices and recommendations for future research. *Technology, Pedagogy and Education*. 2025;34(4):515–535. <https://doi.org/10.1080/1475939X.2025.2458615>.
- 20) Young K, Küçük ZD, Delahunty T, Dempsey M, Maglaperidze N. Evaluating the impact of a digital competency-based placement model on STEM pre-service teachers' digital competence and teaching experiences. *Teaching and Teacher Education*. 2026;175:105466. <https://doi.org/10.1016/j.tate.2026.105466>.
- 21) Francisco C, Pedrera J, Madalina MA. Lived Experiences of University Students with Limited Internet Connectivity in Online Distance Learning. *Journal of Interdisciplinary Perspectives*. 2024;2(10). <https://doi.org/10.69569/jip.2024.0412>.
- 22) Curtis P, Carey MD, McMaster N, Martin DA. Advancing digital technology teacher education through the 3C model. *Journal of New Approaches in Educational Research*. 2026;15(1):9. <https://doi.org/10.1007/s44322-026-00056-1>.
- 23) Sheikh T, Nath K. Promoting teacher training with digital technologies on pre-service teachers' digital competence development in India: An experimental study. *Discover Education*. 2026;5:161. <https://doi.org/10.1007/s44217-026-01161-1>.
- 24) Brown AL, Myers J, Collins D. How pre-service teachers' sense of teaching efficacy and preparedness to teach impact performance during student teaching. *Educational Studies*. 2021;47(1):38–58. <https://doi.org/10.1080/03055698.2019.1651696>.
- 25) Mazlan MH, Puteh S, Sulaiman NL, Salleh KM, Mohamad Z. The domains and components of Industry 4.0 talent for TVET students through work-based learning. *Journal of Technical Education and Training*. 2025;17(3):106–117. <https://doi.org/10.30880/jtet.2025.17.03.008>.
- 26) Rohanai R, Othman H, Paimin AN, Ismail A, Razali SS. Exploring teaching strategies for work-based learning in TVET practices: A qualitative study. *Journal of Technical Education and Training*. 2024;16(3):88–100. <https://doi.org/10.30880/jtet.2024.16.03.007>.
- 27) Estubio M, Sarsale M. Exploring the preparedness and competence level of pre-service TVET teachers using knowledge, skills, and attitude model. *Journal of Technical Education and Training*. 2024;16(3):201–215. <https://doi.org/10.30880/jtet.2024.16.03.014>.
- 28) Villanueva J. TESDA gears up tech-voc courses for K to12 program. *tesdagovph*. 2012. Available from: <https://www.tesda.gov.ph/Media/NewsDetail/176>.
- 29) Aquino J. The Level Of Effectiveness Of Bread And Pastry Production Training Program And Graduates Employability In The Province Of Laguna. *Sustainability In Food And Agriculture*. 2023;4(1):46–51. <https://doi.org/10.26480/sfna.01.2023.46.51>.
- 30) Agarpao A. Perceived Competencies of BSHM Students of AIMS toward the National Certification Assessment: Basis for Professional Course Enhancement. *International Journal For Multidisciplinary Research*. 2023;5(5). <https://doi.org/10.36948/ijfmr.2023.v05i05.7456>.
- 31) Basal DV. Instructional competencies of Technology and Livelihood Education (TLE) teachers: Basis for a competency-based module. *International Journal of Research Publications*. 2022;96(1):145–157. <https://doi.org/10.47119/IJRP100961320222948>.
- 32) Zeng M, Abdullah Z, Cheah KS. Pre-service Teachers' Digital Competence: A Systematic Review of Factors, Frameworks, and Global Patterns. *International Journal of Learning, Teaching and Educational Research*. 2025;24(8):218–247. <https://doi.org/10.26803/ijlter.24.8.10>.
- 33) Kılıç E, Almasri F, Çelik HE. Are Pre-Service Teachers Ready to Teach the Alpha Generation? The Impact of Pre-Service Teachers' ChatGPT Literacy Levels on Behavioral Intentions Toward ChatGPT-4.0. *Computers and Education: Artificial Intelligence*. 2025;p. 100486. <https://doi.org/10.1016/j.caeai.2025.100486>.
- 34) Lacuna JR. Exploring the Readiness of Pre-Service Teachers for AI Integration in Philippine Education. *International Journal of Research and Innovation in Social Science*. 2025;9(3):4907–4924. <https://doi.org/10.47772/IJRISS.2025.90300392>.
- 35) Bernardo AB, Wong-Fernandez B, Macalaguino JMD, Navarro RC. Filipino senior high school teachers' continuing professional development attitudes: Exploring the roles of perceived demand amid a national education reform. *Journal of Research, Policy & Practice of Teachers & Teacher Education*. 2020;10(2):63. <https://doi.org/10.37134/jrpptte.vol10.2.5.2020>.
- 36) Thaanyane M, Jita T. The Impact of Teaching Practice on Preservice Teachers' Professional Development in the Lesotho Context. *Pakistan Journal of Life & Social Sciences*. 2025;23(1). <https://doi.org/10.57239/PJLSS-2025-23.1.0058>.
- 37) Bucar JD, Cahulugan EV, Bongato GP, Hernando A, Bongato M. Leading with Confidence: Interplay of Exposure and Self-Efficacy in Student Leadership. *Psychology and Education: A Multidisciplinary Journal*. 2024;23(1):1. <https://doi.org/10.7828/ejournals.ph.2024.28263>.
- 38) Sito LR. Teachers' preparedness for inclusive education. *Mountain Journal of Science and Interdisciplinary Research (formerly Benguet State University Research Journal)*. 2020;80(2):7–21. <https://doi.org/10.53935/2641533x.v8i2.323>.
- 39) Laguador JM, Dotong CI. Engineering Students' Challenging Learning Experiences and Their Changing Attitude towards Academic Performance. *European Journal of Educational Research*. 2020;9(3):1127–1140. <https://doi.org/10.12973/EU-JER.9.3.1127>.
- 40) Yalley CE, Adam M, Sowah ANA, Kumah VA, Zuure DN, Poatob S. Bridging overt and covert curricula: how social studies teacher education inculcates survival skills among trainee teachers. *African Identities*. 2026;p. 1–22. <https://doi.org/10.1080/14725843.2026.2695900>.
- 41) Salipong J, Ubayubay R, Corpuz G. Motivation And Teaching Styles Among Teachers In Claveria District, Misamis Oriental. *American Journal Of Multidisciplinary Research And Innovation*. 2025;4(2):18–23. <https://doi.org/10.54536/ajmri.v4i2.4351>.
- 42) Guo C, Mu M, Chen J, Chen X. Supporting pre-service teachers' TPack development and technology integration in collaborative lesson planning. *Humanities and Social Sciences Communications*. 2026;13(1):322. <https://doi.org/10.1057/s41599-026-06679-1>.