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A FRAMEWORK ON TEACHING COMPETENCE OF ALTERNATIVE LEARNING SYSTEM MATHEMATICS TEACHERS

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Abstract

There is limited research on the teaching competence of mathematics teachers in the Philippines Alternative Learning System (ALS). This study examined how the individual, institutional, and contextual factors influence the teaching competence of ALS mathematics teachers. A survey research with a quantitative, descriptive-correlational research design was used, involving 114 ALS mathematics teachers from the six (6) school divisions of the Department of Education (DepEd) in Region XI, Southern Philippines, selected through stratified random sampling. Guided by Bronfenbrenner's Bioecological Theory and Bandura's Self-Efficacy Theory, the study utilized multilevel analysis to account for the hierarchical structure of the data. Results of the multilevel analyses showed that mathematics teaching efficacy, mentorship, collaborative teaching, and community linkages significantly predicted teaching competence. The findings shed light on the key factors that shape teaching competence in ALS, linking teaching competence to a combination of individual teaching skills and institutional support. This study provides policymakers, program managers, and educational leaders with evidence-based information to support quality mentoring and collaborative teaching and to design context-responsive educational activities to improve teaching competence in non-formal education environments.

Keywords: alternative learning system, educational support, mathematics teachers, teaching competence, multilevel analysis

Introduction

Education is a key element in the lives of individuals and nations, particularly in areas without access to formal education. It is an essential instrument for reaching the poor, as such, realizing equity, progress, and inclusive development. It can enable those less privileged to improve their social mobility, boost their productivity, and help their countries toward growth (Enchikova et al., 2024; Tariq et al., 2025; Vicente et al., 2021; Yildiz, 2023; Zamir et al., 2023; Zhang & Fan, 2024).

Despite national and even global efforts to break educational barriers, many out-of-school youth and adult learners (OSYAL) in the Philippines still lack full access to formal schooling. This is due to a combination of socio-economic and structural challenges, including poverty, remoteness, work commitments, and family responsibilities. In addition, this scenario, with the aforementioned factors present, makes it even more challenging for learners to access and complete basic education in formal school systems, thereby perpetuating educational inequalities (Anlimachie & Avoada, 2020; Sibusiso et al., 2025; Silva-Laya et al., 2020).

In response to worldwide calls for inclusive education, the Philippine government, through the Department of Education (DepEd), opened learning opportunities for OSYAL through the ALS, which introduced them to learning programs. ALS is a parallel but independent learning program for the learners that utilizes non-formal learning approaches to cater to their educational needs through learning programs situated within their community (Cagang, 2024; Mahinay & Manla, 2025; Republic Act No. 11510, 2020; Valenzuela, 2010). The ALS aims to address educational exclusion through learner-centered programs that accommodate diverse learning needs and life circumstances (Estrada et al., 2019).

Despite the expansion of access to education for youth from non-formal education settings into OSYAL, sustaining high-quality learning outcomes remains a significant challenge. In addition to access to formal education, institutional quality is more important for high-quality learning outcomes, particularly in parallel learning environments where students have diverse formal and non-formal educational experiences before enrolling in the program. The bottom line is that the quality of learning outcomes ultimately depends on teachers' qualifications and competencies. Teachers are responsible for delivering the curriculum to learners in a learning-focused environment. As style can affect learning, teachers must adjust to the needs of individual learners.

Mathematics teachers teaching learners with different knowledge gaps and constraints in a class with diverse backgrounds and capabilities have always been a challenge. While delivering mathematics education can enhance problem-solving skills, critical thinking, and full participation and contribution to the socio-economy and society for all individuals, it remains a priority area of research and teaching practice. (Chaiarwut et al., 2025; Komarudin et al., 2024). A teacher may have sufficient content knowledge to teach mathematics in a traditional school setting, but they must know more than that to work in an ALS program. Instead, teachers need to induce various teaching methods, assess students' learning, and differentiate their teaching according to the learning needs of their students (Feng et al., 2023; Saoke et al.).

The teaching competence of ALS mathematics teachers is one of the factors that affect teaching quality. In today's classrooms, teaching competence is not only measured by a teacher's content knowledge or subject-matter competence, but also by their ability to manage the classroom and deliver instruction that meets the learning needs of diverse learners. Teaching competence, therefore, is critical in mixed-ability classrooms where the teacher has to decide on lessons suitable for struggling learners on the one hand and for learners who are already advanced for their age on the other. This involves thoroughly assessing students' knowledge and skills. Research shows that teaching competence is influenced not only by a teacher's traits and characteristics but also by institutional and contextual attributes inherent in education (Velasco & Lomibao, 2024; Villastique & Ubayubay, 2025; Yang & Kaiser, 2022). The institutional context may provide mentoring, collaborative spaces for professional learning, policy support, and resources that facilitate effective teaching.

Although earlier studies have explored teaching competence, they are mostly one-dimensional analyses that only highlight individual teacher factors or organizational characteristics (Darling-Hammond et al., 2019; Berg et al., 2025). Unfortunately, this gap is more apparent in the ALS context, in which the implementation of an individual teacher's teaching practice takes place within a series of interconnected systems that take into account not only their capabilities but also educational structures and conditions within schools and communities. Isolation would dismiss the overarching and synergetic role of these factors in efficacy as a teacher. Therefore, a multilevel approach is needed to capture in more detail how these layers are related to teaching competence.

Thus, this study aimed to examine the teaching competence of ALS mathematics teachers in Region XI by analyzing the influence of individual, institutional, and contextual factors using a multilevel analytical approach. Specifically, the study seeks to provide empirical

evidence on how each of these interrelated factors contributes to teaching capacity and to create a framework that can aid policy-making, institutional strengthening, and targeted professional development for ALS mathematics teachers.

Research Problem

The ALS is one of the key interventions to respond to the learning needs of OSYAL in the Philippines. Amid reforms across the country to address the learning needs of these learners, the DepEd has also strengthened the ALS policy and programmatic frameworks. While participation in ALS has increased in recent years, the focus remains on improving the quality of mathematics instruction, particularly to identify gaps in addressing the learning needs of ALS learners.

Teaching competence is a key determinant of the quality of education and learning outcomes, particularly in ALS settings (Letzel et al., 2022). Teaching Mathematics in this setting poses unique challenges, as ALS learners can vary widely in their academic backgrounds, learning gaps, and life situations. Teaching competence does not just require content knowledge, but also pedagogical flexibility, differential instruction and assessment techniques, and inclusive and adaptive approaches. However, there remains a lack of empirical data on the teaching competence of ALS mathematics teachers, despite these competencies being significant.

Moreover, prior research generally examines teaching competence on a single level of analysis, focusing primarily on individual teacher characteristics (Kurschning et al., 2025; Molina-Moreno et al., 2024; ten Hagen et al., 2022). However, such lenses fail to account for the complex and multi-dimensional vectors of educational contexts in which teaching practices are situated at different levels of analysis (individual characteristics, institutional settings, regional ecosystems). These few multilevel tests of such models limit a more complete understanding of how these factors relate to one another in influencing teaching competence. Therefore, a multilevel exploratory study is needed to investigate the teaching capabilities of ALS mathematics teachers in relation to context effects that function at multiple levels of the education system.

Research Focus

This study explored the teacher's mathematics teaching competence as a means to improve institutional quality in the ALS. In the parallel learning system set up as a non-formal educational system for the OSYAL, teaching competence is not confined to simple aspects. However, it encompasses broader dimensions to address learners' diverse needs for effective, meaningful, and appropriate teaching of mathematics.

More specifically, this study explored teaching competence as evidenced by key instructional dimensions required for ALS mathematics instruction. These involve pedagogical and content knowledge, learning environment management, differentiated instruction principles, assessment, and feedback (Ansari, 2020; Chávez-Ventura, 2025; Kalim, 2024). These dimensions captured the unique nature of teaching demands for ALS mathematics teachers who address a diversity of learner profiles, academic backgrounds, and contextual challenges that are typical of non-formal learning environments in accordance with Goodman's (1994) nested structure of educational systems (Yang & Kaiser, 2022).

The study explored in greater detail the different levels at which factors affecting teaching competence operate. Teacher characteristics and professional attributes were assessed at the individual level, as they can impact teaching competence. Conditions of schools and programs that are conducive to or limit effective teaching practices at the institutional level were analyzed. Regional context considerations included policy support, training opportunities, and resource allocation within the DepEd.

Using a multilevel approach, this study explored how individual, institutional, and regional factors interact with the teaching competency of ALS mathematics teachers. This influx of data, when linked to socio-political environments, also allowed for a move away from single-level explanations and provided greater insight into teaching competence in the ALS. These results provide empirical evidence to guide policy decisions, professional development programs, and targeted interventions on the program level.

Research Aim and Research Questions

This study on the teaching competence of ALS mathematics teachers sought to explore how individual, institutional, and regional factors explain variations in ALS teachers' teaching competence. The study's findings can explain variations in teaching competence within the ALS program and inform DepEd policymakers and program managers on issues and interventions to improve teaching competence for OSYAL. From a multilevel perspective, the findings also provide a basis for understanding how teaching competence can be improved through a combination of individual and contextual factors.

To achieve this aim, the study addressed the following research questions:

1. What is the level of teaching competence of ALS mathematics teachers in terms of:
 - a) Pedagogical and content mastery,
 - b) Learning environment management,
 - c) Differentiated mathematics instruction, and
 - d) Assessment and feedback practices?
2. What individual-level factors are associated with the teaching competence of ALS mathematics teachers?
3. What institutional-level factors are associated with the teaching competence of ALS mathematics teachers?
4. What regional-level factors are associated with the teaching competence of ALS mathematics teachers?
5. To what extent do individual, institutional, and regional factors predict the teaching competence of ALS mathematics teachers when analyzed using a multilevel framework?

Research Methodology

General Background

A quantitative, descriptive–correlational design with a multilevel analytical approach was used in this study to examine the teaching competence of ALS mathematics teachers. This study used a quantitative, descriptive–correlational design with a multilevel analytical framework to investigate the teaching competencies of ALS mathematics teachers in the Philippines. This study was conducted in Region XI (Davao Region), Philippines, for the school year 2024–2025. It was used for a quantitative design, which would be appropriate as it allowed the researcher to systematically measure and statistically analyze relationships amongst variables (Creswell, 2014; Kerlinger & Lee, 2000). A descriptive–correlational design was used to describe the level of teaching competence and identify its association with individual, institutional, and regional levels. This design would be appropriate for investigating relationships in a non-manipulative educational context (Mohajan, 2020; Pamon & Oco, 2024).

Given that educational systems have a nested structure, multilevel analyses were conducted because the dataset was hierarchical. Multilevel analysis has been widely used to examine influences across levels and to control for interdependencies in clustered data (Hox et al., 2018; Raudenbush & Bryk, 2002). By doing so, the study was able to acquire and consolidate these determinants whilst segregating them into individual-level, institutional-level, and regional-level factors related to teaching competence.

Sample

A stratified random sampling method was used to ensure that ALS math teachers from urban, semi-urban and rural schools representing Region XI or also called as Davao Region in the Southern Philippines are proportionately represented in the survey. The respondents were selected from six School Division Offices (SDOs) to allow for variation in educational contexts across the region. The sample was diverse and representative, so as to capture variability across these educational institutions (Creswell, 2014).

To establish an appropriate sample size, an a priori power analysis was conducted using G*Power version 3.1.9.4 (Erdfelder et al., 1996). Using a medium effect size ($r = .30$), a significance level ($\alpha = .05$), and a statistical power of .80, the minimum required sample size for correlation analyses was established as 67 participants (Faul et al., 2007). A total of 114 respondents were included in the study to support the analysis of multiple predictors. It is also noteworthy that the specified effect size of $r = .30$ is suitable for correlation-based assessments but does not precisely correlate with effect size conditions for multilevel regression models. With a small quantity of higher-level units in this research, its statistical power for detecting effects on the contextual level may be low as well. Thus, while the sample appears appropriate for single-level analyses, it is underpowered for multilevel modeling and accurate estimation of higher-level effects. Therefore, this limitation is taken into consideration while interpreting the results, particularly regarding some predictors being non-significant.

While multilevel analysis was utilized to account for the nested structure of them, the study is limited to a single region (Region XI), which serves as one macro-level unit. As such, the number of higher-level clusters remains limited, which may reduce statistical power at the contextual level and partly explain the non-significant findings for some regional-level predictors. These limitations are considered in the interpretation of the results. The sample size and educational settings in which the research was conducted provide a reasonable basis for contextual insights within Region XI.

Ethical standards were adhered to during the conduct of this research. Before collecting data from various locations where teachers were based, formal approval was obtained from the administrators at each location. Teachers were informed of the purpose of the research, presented with an informed consent form, and given the option to participate or withdraw from the research at any time without penalty. Confidentiality and anonymity were maintained by not collecting any personal and identifiable information from the teachers; all data was presented in an aggregate form. The data were collected for this research study only and used in compliance with the highest ethical standards for educational research.

Instruments and Procedures

The data from the respondents was collected using a structured survey questionnaire and composed of 65 items, with each construct comprising five items. Each response was assessed using a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree), which is considered the most widely used way to measure perceptions and self-reported competencies in educational research (Barua, 2013). The questionnaire measured the independent variables,

such as individual, institutional, and regional factors, and the dependent variable, teaching competence of ALS mathematics teachers. The individual level included instructional adaptability, mathematics efficacy, and professional development. The institutional level includes community linkages, curriculum implementation, mentorship, and collaborative teaching. Capacity building and training programs, policy implementation and support, as well as funding and resource allocation, were done at the regional level. Teaching competence was assessed in terms of pedagogical and content mastery, learning environment management, differentiated mathematics teaching, and assessment and feedback practices.

The constructs used were adapted and modified with respect to both theory and contextual consideration, particularly from Parto and Yango (2023), as well as the Mathematics Teaching Self-Efficacy (MTSE) scale, developed by Zuya et al. (2016). Other constructs not thoroughly addressed with current tools were obtained with a researcher-developed questionnaire based on literature, ALS curriculum guidelines, and contextual pedagogical methods. The instrument was validated by experts and pilot tested prior to data collection. The instrument was reviewed by experts in ALS education and by language and behavioral specialists for content validity, clarity, and appropriateness.

Internal consistency reliability was assessed by means of Cronbach's alpha (α) for each construct, all exceeding the acceptable level of. Methods were scored as having strong reliability, with $\alpha > .70$ (Naidoo et al., 2021; Farrés-Tarafa et al., 2021; Manor-Binyamini & Schreiber-Divon, 2020). Kaiser-Meyer-Olkin (KMO) values varied from .833 to .890, indicating at least adequate (Kaiser, 1974) sampling adequacy. Bartlett's Test of Sphericity was statistically significant ($p < .001$), which suggested the data were suitable for factor analysis (Bartlett, 1954). Factor loadings of convergent validity were supported ranging from .578 to .909, with values above .50; these are considered acceptable. Those above .70 indicate strong item-factor relationships (Hair et al., 2010; Tabachnick & Fidell, 2013). These findings affirm good reliability and construct validity of the instrument.

Table 1 below presents the results of the reliability and construct validity of the teaching competence, individual-level, institutional-level, and regional-level variables. All constructs had Cronbach's alpha coefficients between .91 and .97, and the subscale values ranged from .81 to .95, all above the recommended threshold of .70; these reveal strong to excellent internal consistency. Namely, teaching competence ($\alpha = .97$), individual level ($\alpha = .91$), institutional level ($\alpha = .94$), and regional level ($\alpha = .93$) indicate a high level of reliability, meaning that the items are consistently measuring their intended constructs.

The Kaiser-Meyer-Olkin (KMO) ranged from .833 to .890, which indicates good sampling adequacy and confirms that the data are suitable for factor analysis (Kaiser, 1974). In addition, Bartlett's test of sphericity was statistically significant ($p < .001$) for all constructs, indicating that the correlation matrices were not an identity matrix and that sufficient inter-item correlations existed to justify factor extraction (Bartlett, 1954).

For construct validity, the factor loadings ranged from .578 to .909, above the permissible rate of .50, and a number of the items exhibited high loadings above .70. These results suggest adequate to strong item-factor relationships, support convergent validity, and confirm that the items reflect their intended constructs. In summary, it is clear from these findings that the instrument has robust psychometric properties and adequate construct validity, making it ready for further multilevel analyses.

Table 1

Structure of the Research Instrument: Teaching Competence, Individual Level, Institutional Level, and Regional Level

Items Saturated by Factors	Factors		
	KMO	BTS (<i>p</i> -value)	Factor Loadings
Teaching Competence	.97	.890	< .001
a. Pedagogical and Content Mastery	.89		.667-.751
b. Learning Environment Management	.93		.624-.881
c. Differentiated Mathematics Instruction	.94		.648-.891
d. Assessment and Feedback Strategies	.95		.779-.890
Individual Level	.91	.856	< .001
a. Instructional Adaptability	.87		.742-.805
b. Mathematics Efficacy	.86		.717-.816
c. Professional Development	.81		.590-.798
Institutional Level	.94	.841	< .001
a. Community Linkages	.85		.599-.844
b. Curriculum Implementation	.91		.638-.772
c. Mentorship and Collaborative Teaching	.91		.611-.793
Regional Level	.93	.833	< .001
a. Capacity Building and Training Programs	.94		.703-.909
b. Policy Implementation and Support	.90		.589-.861
c. Funding and Resource Allocation	.91		.578-.857

Procedures

A systematic and ethically grounded data-collection procedure was implemented among ALS mathematics teachers in Region XI, Philippines. This study was approved by the Research Ethics Committee (REC) of Bukidnon State University and followed ethical standards. After securing approval, relevant institutional permissions were subsequently secured, including approvals from the PUP Institutional Review Board as well as the DepEd Regional XI Office. ALS mathematics teachers were selected according to the sampling design of this study, a range covering teaching experience and the role in the ALS program, geographical representation through the six SDO in Region XI, and eligible respondents were then invited to participate in the data collection.

Informed consent of participants had been obtained before the actual conduct of the activity, which encompassed an explanation of the purpose of the study, the process and/or methodology to be conducted, terms and conditions of confidentiality, and voluntary participation in the research. Questionnaires distributed to participants were assigned unique codes to ensure the privacy and confidentiality of responses. The questionnaires were facilitated by the ALS focal persons based in the respective SDOs. All collected data were kept strictly confidential. Physical copies of the data were stored in a locked cabinet at the researcher's office, while the digital copies were securely uploaded to an online storage service. The online data storage was accessible to the researchers using a password-protected account. The analyzed data would then be tabulated and statistically analyzed in line with the research's goals and objectives.

Data Analysis

The data were analyzed for this study using both descriptive and inferential statistics. To answer RQ1, descriptive statistics such as the mean were computed for the four domains of teaching competence. For RQ2, RQ3, and RQ4, Pearson's product-moment correlation (r) was used to examine the association between teaching competence and individual, institutional, and regional levels. To answer RQ5, multilevel regression analyses were conducted using hierarchical linear modeling (HLM), with data grouped by institutions within regions, given the study's nested design.

Research Results

The level of Teaching Competence of ALS Teachers

The level of teaching competence of ALS mathematics teachers based on triangulated self-rating, peer-rating, and head-rating is given in Table 2. By utilizing multiple evaluative perspectives, the strength of the results lies in capturing teachers' self-assessments, peers' and supervisors' observations regarding teaching competence and program implementation. Combining these perspectives allows for a more holistic evaluation of teacher effectiveness and mitigates any biases that may come from relying on just one source of evaluation.

Table 2

The Level of Teaching Competence of ALS Mathematics Teachers

Teaching Competence Indicators	<i>M</i>	Qualitative Description
Learning Environment Management	4.71	Very High
Assessment and Feedback Strategies	4.65	Very High
Differentiated Mathematics Instruction	4.59	Very High
Pedagogical and Content Mastery	4.56	Very High
General Mean	4.63	Very High

Table 2 presents the teaching competence indicators for ALS mathematics teachers across four key areas. The general mean is 4.63, which is described as Very High, indicating that teachers consistently demonstrated high levels of competence across learning environment management, assessment and feedback strategies, differentiated mathematics instruction, and pedagogical and content mastery. The four indicators are described as Very High. Specifically, learning environment management has the highest mean of 4.71, indicating that ALS mathematics teachers are good at establishing a systematic, caring, and orderly climate of learning conducive to non-traditional instruction. Followed by assessment and feedback strategies with a mean of 4.65, differentiated mathematics instruction with a mean of 4.59, and pedagogical and content mastery got the lowest mean of 4.57.

The results imply consistent quality in the teaching of ALS mathematics by ALS mathematics teachers. This finding indicates that teachers were prepared to manage the pedagogical, instructional, and assessment requirements of alternative learning structures. Considering the flexible, modular, and community-based characteristics of ALS, the general high level of competence among its teachers seemed to have enabled them to optimize teaching, manage learning settings, differentiate pedagogical approaches, and use assessment and feedback strategies that promote effective mathematics teaching across local conditions.

Table 3

The Association Between Individual-Level Factors and the Teaching Competence of ALS Mathematics Teachers

Indicators	r-value	p-value	Decision	Remarks
A. Individual Level				
Instructional Adaptability	.208	.027	Reject	Significant
Mathematics Efficacy	.294	.001	Reject	Significant
Professional Development	.174	.064	Fail to Reject	Not Significant

Table 3 revealed the bivariate associations between teaching competence and individual-level indicators; specifically, instructional adaptability ($r = .208$, $p < .027$) and mathematics efficacy ($r = .294$, $p < .001$) were significantly associated with teaching competence at the bivariate level. In contrast, professional development ($r = .174$, $p = .064$) is not significantly associated with teaching competence. This indicated that ALS mathematics teachers' self-reported teaching competence was positively correlated with instructional adaptability and mathematics teaching efficacy. Yet the professional development, as measured in this study, was not statistically significantly associated with any measures at the bivariate level.

Table 4

The Association Between Institutional-Level Factors and the Teaching Competence of ALS Mathematics Teachers

Indicators	r-value	p-value	Decision	Remarks
B. Institutional Level				
Community Linkages	.062	.516	Fail to Reject	Not Significant
Curriculum Implementation	.357	<.002	Reject	Significant
Mentorship and Collaborative Teaching	.311	<.005	Reject	Significant

Bivariate correlations between predictors at the institution-level and teaching competence are presented in Table 4. Curriculum implementation ($r = .350$, $p < .001$) and mentor and collaborative teaching ($r = .311$, $p < .001$) are significantly correlated with teaching competence at the bivariate level. These findings indicate a positive relationship between instructional and professional support practices within institutions and reported teaching competence among ALS mathematics teachers. In contrast, community linkages ($r = .062$, $p = .516$) are not significantly associated with teaching competence. This suggests that the extent of reported community engagement did not demonstrate a measurable relationship between teaching competence at the bivariate level.

Table 5

The Association Between Regional-Level Factors and the Teaching Competence of ALS Mathematics Teachers

Indicators	r-value	p-value	Decision	Remarks
C. Regional Level indicators				
Capacity Building and Training Programs	.248	.008	Reject	Significant
Policy Implementation and Support	.229	.014	Reject	Significant
Funding and Resource Allocation	.241	.010	Reject	Significant

Table 5 presents the bivariate association between teaching competence and regional-level indicators. Capacity-building and training programs ($r = .248, p < .008$), implementation and support of policies ($r = .229, p < .014$), and funding and resource allocation ($r = .241, p < .010$) show significant bivariate associations with teaching competence. The results show positive associations at the regional level with regard to support mechanisms and reported teaching competence of ALS mathematics teachers. Results show that the differences in training opportunities, policy support, and allocation of resources are statistically related to perceived competence for teaching within the ALS context.

Table 6

Multilevel Predictors of Teaching Competence across Individual, Institutional, and Regional level of the ALS Mathematics Teacher

Predictor	Estimate	Confidence Interval 95%	p-value	Interpretation
(Intercept)	4.89	4.65 – 5.13	<.001	Significant
Individual Instructional Adaptability (IA)	.051	-.099 – .201	.502	Not Significant
Mathematics Efficacy (ME)	.242	.033 – .451	.024	Significant
Professional Development (PD)	.072	-.132 – .276	.487	Not Significant
Community Linkages (CL)	-.378	-.672 – -.084	.012	Significant
Curriculum Implementation (CI)	.095	-.147 – .337	.439	Not Significant
Mentorship & Collaboration (MC)	.349	.047 – .651	.023	Significant
Regional Training Programs (RT)	.052	-.156 – .260	.621	Not Significant
Regional Policy Support (RP)	.048	-.159 – .255	.648	Not Significant
Regional Funding Allocation (RF)	.033	-.170 – .236	.748	Not Significant

Regression model for Teaching Competence:

$$TC = 4.89 + .051(IA) + .242(ME) + .072(PD) - .378(CL) + .095(CI) + .349(MC) + .052(RT) + .048(RP) + .033(RF) + \epsilon$$

Moreover, Table 6 displays the multilevel regression results for ALS mathematics teacher competence in teaching. The results show that mathematics efficacy ($\beta = .242, p < .024$), community linkages ($\beta = -.378, p < .012$), and mentoring and teamwork ($\beta = .349, p < .023$) are the significant predictors. The results show positive relationships of mathematics efficacy, mentorship, and collaboration. On the other hand, community linkages show a negative coefficient indicating an inverse relationship when holding other variables constant. The intercept ($\beta = 4.89, p < .001$) further indicates a high baseline level of teaching competence among ALS teachers.

Concerning the other predictors, no significant relationships were identified for instructional adaptability, professional development, curriculum implementation, and contextual factors. These results should be interpreted with caution because the number of higher-level units is low, which may affect the statistical power to detect effects in the multilevel model. As a result, it could be that the non-significant results do not imply that there is no influence, but rather may reflect the complex and interacting nature of these variables or limitations associated with study design. This suggests that these factors may still play meaningful roles in teaching competence, but their effects may not have been fully captured within the current model.

Discussion

Teaching Competence among ALS Mathematics Teachers (RQ1)

The findings revealed that ALS mathematics teachers reported a high level of teaching competence in all dimensions. The highest mean score is in learning environment management, which indicates that ALS learners have a well-structured organization of the classroom and are consistently provided with support. The finding echoes the earlier work highlighting how crucial classroom management is to keeping teachers on task with instruction and learners engaged, especially in educational settings that do not have many resources to draw from (Flores, 2022; Francisco & Buri, 2024; Wilkins, 2022).

Pedagogical and content mastery, differentiated mathematics teaching, as well as assessment and feedback strategies, also received the highest proportion of ratings in achieving alignment across key dimensions of teaching practice. The teaching of mathematics in such diverse learning contexts needs to be responsive and adaptable to the needs of learners, as highlighted in other existing literature (Owusu et al., 2022; Paidi et al., 2021). These results indicate that ALS math teachers exhibited adaptive teaching for diverse learner archetypes. However, given that the data were extracted from perceptual and evaluative measures, results should therefore be interpreted as representative of perceived competence rather than direct indications of teaching competence.

Individual-Level Associations related to RQ2

Bivariate analyses revealed that instructional adaptability and mathematics teaching efficacy were positively associated with teaching competence. They are in line with the literature about the necessity of adaptive instructional strategies across flexible learning environments (Hardy et al., 2022; Mallillin, 2021) and provide further insight into the influence of teacher self-efficacy on their own instructional practice (Akosah et al., 2024; Olawale & Hendricks, 2024). In the ALS context, wherein learners diverge in both formal schooling and educational background, flexibility and certainty in mathematics teaching are significant individual traits associated with perceived competence.

The findings found no statistically significant association between professional development and teaching competence. Similar to preceding studies, sustaining professional development efforts with an anchor in particular school contexts and connection to teachers' practice may make the most positive difference for teachers (Kurteshi & Rutem, 2025; Parto & Yango, 2023). The lack of association in this study does not necessarily mean that professional development efforts were ineffective; to the contrary, professional development efforts may have indirect, long-term, or positive effects on teaching competence, conditional on how they are implemented and integrated into instructional practices.

Institutional-Level Associations Pertaining to RQ3

Bivariate analyses revealed that curriculum implementation, mentorship, and collaborative teaching were positively associated with teaching competence. These findings align with the existing literature, which emphasizes the importance of curricular coherence and structured professional collaboration in supporting teaching quality (Cordie et al., 2020; Haque & David, 2023; Lee et al., 2020). Within the ALS context, institutional mechanisms that promote alignment between curriculum expectations and collaborative teaching support appear to contribute to higher reported levels of teaching competence.

Conversely, community linkages did not exhibit a statistically significant association with teaching competence at the bivariate level. This supports prior evidence which indicates that community involvement does not lead to classroom innovation, but rather bolsters access, pedagogical programs, and learner support systems (Caena & Redecker, 2019; Sompron, 2024). This distinction indicates that institutional engagement structures may operate differently from direct teaching support mechanisms when examined at a single level of analysis.

Regional-Level Associations Related to RQ4

Bivariate analyses demonstrated that capacity building and training programs, policy implementation and support, and funding and resource allocation were positively associated with teaching competence. This is congruent with previous studies, which point to systemic and structural support as central aspects impacting teacher performance, alongside teaching quality (Apriliyanti, 2020; Angrist et al., 2023; Schleicher, 2021). In the ALS context, the regional mechanisms that offer organized training, policy coherence, and resource allocation seem to be responsible for higher levels of perceived teaching competence.

Nevertheless, these associations are bivariate and cannot be interpreted as evidence for a direct causal effect. From a multilevel perspective, the broader institutional environment that affects classroom teaching practices may be affected by regional factors. Regional crossing structures are the enabling conditions that preserve teaching consistency, although their impact may not necessarily be a classroom-level phenomenon.

This distinction matters, especially in light of the multilevel analysis that follows and looks at the role of regional predictors within a nested structure reflecting the ALS educational context. Regional-level support is necessary, but its impact on teachers' competence is indirect, mediated through institutional and classroom conditions.

Multilevel Predictors Associated with RQ5

Findings showed that ALS teaching competence was shaped more by individual capabilities and institutional support mechanisms than by formal structures. Teachers who were more efficacious and adaptable in their approach to mathematics teaching reported greater levels of teaching competence. Furthermore, mentorship and collaborative teaching were identified as significant components that contribute to professional growth through co-constructive practices between peers in both flexible and resource-poor learning environments.

Notably, the finding of a negative association for the community linkages level indicated that greater engagement in the broader community exposed teachers to contextual challenges such as learner inconsistency, socio-economic constraints, and competing responsibilities. Although linkages to the community are needed for their support of programs, they seem to only indirectly influence teaching competence in context-dependent pathways. Overall, results suggest teaching competence in ALS is driven internally by capabilities and peer support, while external phenomena have more mediated effects.

The literature also supports these findings, highlighting that teacher ability interacts with collaboration and context to impact teaching competence. While teacher self-efficacy plays a role in providing clarity for the learning process and delivering an effective lesson plan, it does not mean you are competent; there are studies that suggest this effect is strong only when baseline competence exists (Perera & John, 2020). Mentorship in Collaborative Teaching Practices, like all areas of development, can help facilitate professional growth through collaborative practices where teachers collaborate and reflect on their teaching strategies with someone who provides helpful feedback and suggestions for refining the approach.

However, the relationship of community linkages is complex. Research has indicated that engaged school-community relationships build professional judgment and reflective attention, particularly in disadvantaged settings (Tran & O'Connor, 2024). In a similar vein, broad exposure to professional practice within innovative and challenging learning contexts allows for deeper levels of pedagogical critical reflection and context-sensitive decision-making (Day & Gu, 2020). Such views are consistent with the current findings, which suggest that while community engagement does not necessarily lead to everything we can observe in terms of teaching competence, it supports teachers' ability to adapt and respond when confronted with complex learning environments.

Limitation of the Study

Despite its contributions, the study is subject to several limitations.

First, the descriptive–correlational research design limits the ability to establish causal relationships among the variables. Although statistically significant associations were identified at the individual, institutional, and regional levels, the temporal sequence and directionality of these relationships cannot be determined. Thus, the findings must be interpreted correlatively, not causally. Longitudinal or experimental designed future studies are needed to further explore the formation and development process of teaching competence in the ALS context.

Second, the studies were largely based on perceptual and evaluative measures of teaching competence and predictors. The study employed triangulated measures (self, peer, and head ratings) to enhance the validity of our measures; however, these data depicted perceived teaching expertise rather than the actual rating of classroom practice. Studies that include classroom observations, performance-based assessments, or learner outcome variables to validate teaching competence would provide more rigorous evidence moving forward.

Third, the research was limited to ALS mathematics teachers in six SDOs of Region X, Southern Philippines. Stratified random sampling of communities improved representativeness in the region, but contextual differences such as policy implementation, resource availability, and institutional structure may limit generalizability across other regions. External validity would be enhanced by replicating the study in more varied geographical and educational contexts.

Fourth, although multilevel modeling accounted for the hierarchical structure of dependency with teachers nested under institutions and regions, context variance may be poorly identified because of small higher-level clusters. The limited number of upper-level units may reduce statistical power to detect regional-level effects. Future studies involving larger and more diverse multi-regional samples are recommended to improve the robustness of multilevel analysis.

Conclusion and Implications

This study examined the teaching competence of ALS mathematics teachers in Region XI using a multilevel analytical approach. Findings indicated consistently high levels of teaching competence across key domains. However, results further showed that individual factors, such as instructional adaptability and mathematics teaching efficacy, and institutional factors, including curriculum implementation, mentorship, and collaborative teaching, were more strongly associated with teaching competence than other variables.

While some elements did not show direct relationships on certain levels, for example, professional development along with community linkages, this suggests that the influence of these factors is around how they are applied and placed in context. The multilevel analysis highlights that teaching competence is shaped not only by individual capability but also by the interaction of support systems within educational contexts.

These findings provide empirical evidence for the need to investigate teaching competence at multiple levels, an area where previous single-level studies have fallen short. The results drive home, in a practical sense, that educational leaders should prioritize school-based support mechanisms, with greater emphasis on mentoring and collaboration, as well as on curriculum alignment. So they must also be specific to the context and practice-focused in order to be more effective.

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Declaration of Interest

The authors declare no competing interests.

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