



Professional Learning Communities as Predictors of TVET Teachers' Motivation for Professional Development: Evidence from Structural Equation Modeling in Ethiopia

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Abstract

Against the backdrop of profound transformation in the global labor market, developing economies closely linked to labor-force development are experiencing a growing demand for high-quality Technical and Vocational Education and Training (TVET). In Ethiopia, TVET reform has become a core national strategy for enhancing employability, strengthening workforce competencies, and improving the responsiveness of educational institutions to industry needs. Within this context, teachers' motivation to pursue professional development is particularly important because it influences instructional quality, the adoption of innovative teaching practices, collaboration with industry and colleagues, and the overall performance of TVET institutions. Although Professional Learning Communities (PLCs) are widely recognized as an effective framework for teacher learning and school improvement, limited empirical research in Ethiopia—and in sub-Saharan Africa more broadly—has examined the predictive effects of specific PLC dimensions on the professional development motivation of TVET teachers. This original empirical study focuses on Ethiopia's TVET sector and investigates the predictive relationship between PLCs and teachers' motivation to engage in professional development. A quantitative, cross-sectional survey design was employed. Data were collected from 261 teachers recruited through stratified random sampling from public vocational colleges and polytechnic institutes. The data were analyzed using SPSS 27 and AMOS 23 through descriptive statistics, measurement-model assessment, and structural equation modeling. The dimensions of the core constructs were clearly operationalized, and the analysis evaluated both the reliability and validity of the measurement model as well as the predictive relationships within

the structural model. The findings indicate that all examined PLC dimensions significantly predict TVET teachers' professional development motivation. Collaborative learning demonstrates the strongest positive predictive effect ($\beta = 0.41$, $p < 0.001$), followed by supportive leadership ($\beta = 0.32$, $p < 0.001$) and reflective dialogue ($\beta = 0.28$, $p < 0.01$). These results suggest that opportunities for teachers to learn collaboratively, exchange professional experiences, reflect on instructional practices, and receive encouragement from institutional leaders are central to sustaining their motivation for continuous learning. The measurement model demonstrates acceptable convergent and discriminant validity. In addition, the structural model shows satisfactory goodness-of-fit indices: $\chi^2/df = 2.41$, CFI = 0.95, TLI = 0.94, RMSEA = 0.052, and SRMR = 0.046. All reported validity and model-fit indicators meet accepted standards, supporting the adequacy of the proposed research model. The study concludes that TVET teachers' motivation for professional development is strengthened when institutions promote collaborative learning, reflective professional dialogue, collective responsibility, and supportive leadership. Theoretically, the study contributes to the literature by integrating the PLC perspective with social learning theory and self-determination theory to explain teacher motivation in the TVET context. Practically, the findings suggest that Ethiopian TVET policymakers, institutional leaders, and teacher educators should institutionalize PLC-based professional development structures, allocate time and resources for collaborative learning, strengthen instructional leadership, and create mechanisms for ongoing reflection and peer support. Such measures can foster sustainable teacher learning, improve instructional practice, and enhance the quality and relevance of vocational education in Ethiopia.

Subject Areas

Pedagogy

Keywords

Professional Learning Communities, TVET Teachers, Professional Development Motivation, Structural Equation Modeling, Teacher Collaboration, Workplace Learning

1. Introduction

Technical and vocational education and training (TVET) has become increasingly important to national development in sub-Saharan Africa because of the need to align workforce competencies with changing labour-market demands, industrialization, and economic transformation [1]. In Ethiopia, TVET development has been incorporated into national education and development priorities, including the Education Sector Development Programme and the national TVET strategy [2] [3]. The effectiveness of this system depends substantially on the competence, motivation, and professional learning of TVET teachers, who play a central role

in the quality of instruction and institutional performance [4].

Teachers' motivation for professional development is important because it encourages the continuous improvement of pedagogical knowledge, technical expertise, and professional practice [4] [5]. However, research on the factors that stimulate professional development motivation among TVET teachers remains limited, particularly in African contexts where inadequate resources, weak institutional support, and underdeveloped continuing professional development systems may restrict opportunities for professional learning [3] [6]. These challenges highlight the need to examine organizational conditions that can strengthen teachers' engagement in professional development.

Professional Learning Communities (PLCs) provide one potentially important organizational mechanism. PLCs promote shared goals and values, collaborative learning, reflective dialogue, collective responsibility, and supportive leadership [7] [8]. Through regular interaction and knowledge sharing, PLCs can create social and professional conditions that encourage teachers to learn from one another and apply new knowledge in their instructional practice [9] [10]. These processes are consistent with social cognitive theory, which emphasizes learning through observation, interaction, and reciprocal influence [11] [12]. They also correspond with self-determination theory, which proposes that supportive social environments can enhance motivation by satisfying individuals' needs for autonomy, competence, and relatedness [5] [13].

The relationship between PLCs and teachers' professional development motivation is particularly relevant in Ethiopia. Although the country has expanded educational provision and established national frameworks for TVET qualifications and occupational standards, persistent challenges remain in continuing professional development, institutional collaboration, and linkages between education providers and industry [2] [3]. Such conditions may limit teachers' access to meaningful professional learning and reduce their motivation to participate in development activities. Investigating PLCs in this context can therefore provide evidence on how collaborative institutional practices may support teacher motivation and professional growth.

Accordingly, this study examines the relationship between PLCs and professional development motivation among TVET teachers in Ethiopia using structural equation modeling (SEM). It evaluates the direct and indirect relationships among the study variables and integrates insights from social cognitive theory and self-determination theory. The study contributes to the TVET literature by providing empirical evidence from a sub-Saharan African context and by offering practical implications for TVET leaders, institutions, and policymakers seeking to strengthen teacher professional development.

2. Literature Review

2.1. Conceptualizing Professional Learning Communities in TVET

Professional Learning Communities (PLCs) originated in school-improvement

research and have since been applied across various educational contexts [7] [14]. Hord's framework conceptualizes PLCs through five interrelated dimensions: shared and supportive leadership, shared values and vision, collective learning, collaborative practice, and supportive conditions [14]. Subsequent research has refined these dimensions and demonstrated their relevance to teacher collaboration, professional learning, and instructional improvement [7] [15] [16].

PLCs are particularly relevant to TVET because vocational teachers must continuously update both their pedagogical knowledge and technical expertise in response to changing technologies, occupational standards, and industry requirements [4] [17]. In this context, PLCs extend beyond general teacher collaboration by supporting the development of industry-related knowledge, occupational identity, curriculum innovation, and practice-oriented teaching [17] [18]. Collaborative inquiry and reflective dialogue can also help vocational teachers exchange expertise and improve the integration of theory and practical training [19].

However, the operation of PLCs is shaped by institutional culture, leadership practices, available resources, and national education systems. Consequently, findings from high-income education systems may not be directly transferable to African TVET institutions [3] [6]. Research on PLCs in Ethiopian and wider East African TVET settings remains limited, creating a need for context-specific empirical investigation.

2.2. Professional Development Motivation: Theoretical Foundations

Professional development motivation refers to the psychological energy that encourages teachers to acquire new knowledge, improve their skills, and strengthen their professional practice [4] [5] [20]. Self-determination theory (SDT) provides an important framework for understanding this motivation. The theory distinguishes between intrinsic motivation, which involves engagement because an activity is interesting or satisfying; identified regulation, which reflects participation based on the personal value of professional development; and external regulation, which results primarily from external demands or rewards [5] [13].

For TVET teachers, intrinsic motivation and identified regulation may be especially important because professional learning requires sustained effort, adaptation to technological change, and the application of new knowledge in practical teaching environments [21] [22]. Teachers who recognize professional development as personally meaningful and professionally valuable are more likely to engage persistently in learning, instructional innovation, and reflective practice.

Social learning theory complements SDT by explaining how motivation and professional behaviour develop through observation, modelling, feedback, and interaction with others [11]. PLCs provide a social context in which teachers can observe effective practices, exchange technical and pedagogical knowledge, receive feedback, and develop collective confidence [12]. The integration of SDT and social learning theory therefore provides a useful theoretical basis for exam-

ining how collaborative professional environments influence TVET teachers' motivation for professional development.

2.3. PLCs and Teacher Motivation: Empirical Evidence

Existing research generally indicates a positive relationship between teacher collaboration, PLC participation, and professional motivation. A systematic review found that teacher collaboration is associated with improved self-efficacy, professional commitment, and engagement in professional learning [9]. Similarly, research in Singapore and Shanghai showed that PLC participation can strengthen teacher collaboration, professional agency, and motivation [23]. Earlier work also suggests that reflective dialogue, collective responsibility, and shared accountability within PLCs encourage teachers to improve their instructional practice [16].

Recent studies further demonstrate that effective PLCs are associated with stronger professional learning practices and supportive conditions for teacher development [7] [15]. Among vocational teachers, organizational support, collegial interaction, leadership, and opportunities for reflection have been identified as important influences on teachers' engagement in professional learning [18] [24]. These findings suggest that PLCs may motivate teachers not only through formal professional-development activities but also through everyday collaboration and shared problem-solving.

Evidence from African TVET contexts remains comparatively limited. For example, research on TVET trainers in Uganda identified challenges in continuous professional development and highlighted the importance of institutional support for teacher learning [25]. However, existing studies have rarely examined the full range of PLC dimensions or tested the PLC-motivation relationship using structural equation modeling. In Ethiopia, teacher preparation and professional learning have been examined largely from policy and reform perspectives [26], while empirical evidence concerning PLCs and TVET teachers' professional development motivation remains scarce [3] [6]. This gap supports the need for a context-specific study using validated measures and an advanced analytical approach to investigate the direct and indirect relationships between PLCs and professional development motivation among Ethiopian TVET teachers.

2.4. Research Gaps and Hypotheses

Despite growing interest in professional learning communities (PLCs) and teacher professional development, several gaps remain. First, although an Ethiopian study examined the relationship between teachers' professional development motivation and PLCs in school settings, limited research has examined PLC dimensions as predictors of professional development motivation among TVET teachers in Ethiopia or comparable East African contexts [27]. Second, the combined application of self-determination theory and social learning theory to explain TVET teachers' professional development motivation remains underdeveloped, particularly in resource-constrained educational systems [5] [12]. These

theories are nevertheless relevant because they explain how collaborative interaction, professional modelling, social support, and perceived value can influence teachers' engagement in professional learning.

Third, previous research has not sufficiently identified which PLC dimensions are most strongly associated with teachers' professional development motivation. In particular, collaborative learning, reflective dialogue, collective responsibility, shared vision and values, and supportive leadership may influence teachers' motivation in different ways. Recent cross-national research indicates that the relationship between PLC characteristics and teacher outcomes varies according to national and institutional contexts [28]. Therefore, context-specific research is needed to examine these relationships within Ethiopian TVET institutions.

Based on the literature and the identified research gaps, the study proposes the following hypotheses:

H1: Shared vision and values significantly predict TVET teachers' professional development motivation.

H2: Collaborative learning significantly predicts TVET teachers' professional development motivation.

H3: Reflective dialogue significantly predicts TVET teachers' professional development motivation.

H4: Collective responsibility significantly predicts TVET teachers' professional development motivation.

H5: Supportive leadership significantly predicts TVET teachers' professional development motivation.

These hypotheses are grounded in the view that PLCs provide social, organizational, and motivational conditions that can encourage TVET teachers to participate in continuous professional learning [7] [12] [16]. The proposed model can be tested using structural equation modeling, which is appropriate for examining relationships among latent PLC dimensions and professional development motivation [27] [29] [30].

3. Theoretical Framework

This study adopts an integrated framework based on Self-Determination Theory (SDT) [5] [13] and Social Learning Theory (SLT) [11] [12] to explain TVET teachers' motivation for professional development. SDT conceptualizes motivation as a continuum ranging from external regulation to autonomous forms of motivation, including identified regulation and intrinsic motivation [5] [13]. The Basic Psychological Needs Theory within SDT proposes that motivation is strengthened when individuals' needs for competence, autonomy, and relatedness are satisfied. In educational organizations, these needs can be supported through collaborative learning, shared decision-making, constructive feedback, and collegial relationships [5] [22]. Such conditions may encourage TVET teachers to internalize the value of professional development and engage in learning more autonomously.

SLT complements SDT by emphasizing that learning and motivation are

shaped by social interaction, observation, modelling, and reinforcement [11] [12]. Within professional learning communities (PLCs), teachers can observe effective instructional and technical practices, exchange knowledge, receive feedback, and develop shared professional norms. These interactions may strengthen teachers' professional confidence, collective efficacy, and willingness to participate in professional learning [7] [12].

The integration of SDT and SLT provides a comprehensive explanation of how PLCs may influence professional development motivation. PLCs create opportunities for social learning while also supporting teachers' psychological needs. For example, collaborative learning and reflective dialogue may enhance competence, shared decision-making may strengthen autonomy, and collegial interaction may foster relatedness [22] [31]. Together, these processes can encourage more internalized and sustained forms of motivation among TVET teachers.

As illustrated in **Figure 1**, the proposed conceptual model identifies five PLC dimensions—shared vision and values, collaborative learning, reflective dialogue, collective responsibility, and supportive leadership—as predictors of TVET teachers' professional development motivation. Motivation is represented through intrinsic motivation, identified regulation, and professional growth orientation. The model also proposes that perceived competence support, autonomy support, and social relatedness may function as mediating mechanisms linking PLC experiences to teachers' motivational outcomes. In this way, the framework extends existing TVET professional-development models [32] by emphasizing the motivational processes through which collaborative institutional environments may promote continuous professional learning [22].

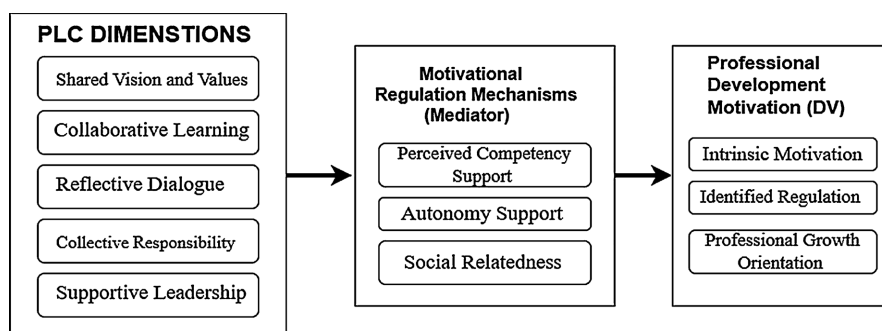


Figure 1. Conceptual Model: PLC dimension predicting professional development motivation through motivational regulation mechanisms.

4. Methodology

4.1. Research Design

This study employed a quantitative, cross-sectional survey design. A cross-sectional design is appropriate for examining relationships and statistically predictive associations among variables at a specific point in time [33]. The design was also suitable for collecting data from a relatively large sample of TVET teachers across multiple institutions.

Structural Equation Modeling (SEM) was used as the primary analytical technique. SEM enables the simultaneous assessment of the measurement properties of latent constructs and the structural relationships among them. It also accounts for measurement error and permits the estimation of direct and indirect effects [29]. The analysis followed a two-stage procedure involving confirmatory factor analysis (CFA) and structural model evaluation.

4.2. Population and Sampling

The target population comprised full-time TVET teachers working in public vocational colleges and polytechnic institutions in Ethiopia. According to an institutional census conducted by the Ministry of Education [34], approximately 12,400 TVET teachers were employed in federally and regionally administered TVET institutions.

A stratified random sampling procedure was used to improve the representation of teachers from different geographical and institutional contexts. Institutions were stratified by region and city, including Oromia, Amhara, Sidama, and Addis Ababa, and by institutional level, covering Level I-V colleges and polytechnic institutes. Within the selected institutions, eligible full-time teachers were invited to participate in the study.

The sample size was determined using the Krejcie and Morgan [35] approach. After allowing for an anticipated non-response rate, the intended sample was 315 teachers. A total of 280 questionnaires were distributed, of which 261 were returned as complete and usable. This represented a usable-response rate of 93.2% and provided an adequate sample for the proposed covariance-based SEM analysis [29].

Of the respondents, 58.6% were male and 41.4% were female. Teaching experience ranged from 1 to 28 years, with a mean of 9.4 years and a standard deviation of 5.2 years. Regarding educational qualifications, 64.3% of participants held a bachelor's degree, while 22.7% held qualifications above the bachelor's level, including master's degrees. The remaining respondents held other recognized professional or academic qualifications. Participants represented several teaching disciplines: engineering and technology (41.2%), business and commerce (28.8%), health sciences (14.3%), and applied arts and natural sciences (15.7%).

4.3. Instrumentation

4.3.1. Professional Learning Communities Scale

Professional learning communities were measured using an adapted and shortened version of the Professional Learning Communities Assessment-Revised (PLCA-R) [10]. Because the original PLCA-R contains 52 items, the 32-item measure used in this study is referred to as an adapted PLCA-R rather than the full instrument. Additional items were adapted from Henseler *et al.* [36] to ensure that the instrument reflected the collaborative, technical, and professional-learning conditions of Ethiopian TVET institutions.

The adapted PLC scale comprised five subscales:

- 1) Shared Vision and Values: seven items, including “Teachers in this institution work together to develop shared educational goals and values”;
- 2) Collaborative Learning: seven items, including “We work collaboratively to analyze and improve our teaching practice”;
- 3) Reflective Dialogue: six items, including “Teachers engage frequently in professional conversations that affect their beliefs about practice”;
- 4) Collective Responsibility: six items, including “In this institution, all teachers feel responsible for the learning outcomes of all students”;
- 5) Supportive Leadership: six items, including “Institutional leaders actively encourage teacher involvement in professional development activities”.

All items were rated on a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

To establish contextual appropriateness, the adapted instrument was reviewed by a panel of experts with knowledge of TVET, teacher education, educational leadership, and educational measurement. A pilot study involving 42 TVET teachers was subsequently conducted to assess item clarity, relevance, face validity, and contextual suitability. Local adaptation was considered necessary because the meaning and expression of PLC practices may vary across institutional and national contexts [7].

4.3.2. Professional Development Motivation Scale

Professional development motivation was measured using items adapted from the Work Tasks Motivation Scale for Teachers [37] and the Academic Motivation Scale [38]. The items were reworded to refer specifically to participation in teacher professional-development activities rather than classroom teaching or student academic learning. The WTMST is theoretically grounded in Self-Determination Theory and has been used to assess motivational forms such as intrinsic motivation and identified regulation among teachers [37].

The adapted scale consisted of 18 items distributed across three subscales:

- 1) Intrinsic Motivation: six items, including “I participate in professional development because it is interesting and personally satisfying”;
- 2) Identified Regulation: six items, including “I participate in professional development because I personally consider it useful for achieving my career goals”;
- 3) Professional Growth Orientation: six items, including “I continue to seek opportunities that help me develop the knowledge and skills required for effective teaching”.

All items were assessed using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The factor structure and construct validity of the adapted motivation scale were assessed using CFA with data from the main study.

4.4. Data Analysis

Data analysis was conducted in two stages. First, descriptive statistics, item-level correlations, and internal-consistency reliability estimates were calculated. Cronbach’s alpha and McDonald’s omega were used to evaluate the reliability of the measure-

ment scales. Omega was reported alongside alpha because it is based on less restrictive assumptions concerning the equivalence of item loadings [39]. Preliminary analyses also included checks for missing data, univariate outliers, and distributional characteristics.

Second, SEM was conducted using AMOS version 24 following the two-step approach proposed by Anderson and Gerbing [40]. In the first stage, CFA was conducted to evaluate the measurement model. The assessment included standardized factor loadings, composite reliability (CR), average variance extracted (AVE), and discriminant validity. Discriminant validity was examined using the heterotrait-monotrait ratio of correlations (HTMT) [41]. Items with weak factor loadings or substantial cross-loadings were considered for removal only when such decisions were theoretically justified.

In the second stage, the structural model was estimated using maximum likelihood estimation. The structural analysis examined the hypothesized effects of the five PLC dimensions—shared vision and values, collaborative learning, reflective dialogue, collective responsibility, and supportive leadership—on TVET teachers' professional development motivation. The statistical significance of the hypothesized paths was evaluated using standardized regression coefficients, standard errors, critical ratios, and probability values. Where appropriate, confidence intervals and effect sizes were also reported.

Model fit was evaluated using multiple indices, including the chi-square statistic, the chi-square-to-degrees-of-freedom ratio (χ^2/df), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). The interpretation of model fit was based on established recommendations, while recognizing that fit-index thresholds should not be treated as rigid or universal decision rules [29].

Because the study relied on self-report data collected at a single point in time, potential common-method variance was assessed using Harman's single-factor test and an unmeasured latent-method-factor approach [30]. Mardia's coefficient was used to assess multivariate normality. Missing-data procedures were specified before the SEM analysis. Where item-level missingness was present and the assumptions of missing completely at random or missing at random were considered reasonable, full-information maximum likelihood estimation was used [30].

Ethical clearance was obtained from the relevant institutional review board. Before completing the questionnaire, all participants received information about the purpose of the study, the voluntary nature of participation, and the confidentiality of their responses. Informed consent was obtained from all participants, and respondents were informed that they could withdraw from the study without penalty.

5. Results

5.1. Descriptive Statistics and Reliability of the PLC Scale

Descriptive statistics and reliability coefficients for the professional learning com-

munity (PLC) subscales are presented in **Table 1**. Mean scores ranged from 3.21 for Collective Responsibility (SD = 0.74) to 3.89 for Supportive Leadership (SD = 0.68). These results indicate that respondents perceived supportive leadership relatively positively, whereas collective responsibility for student learning received the lowest rating. The overall PLC mean was 3.55 (SD = 0.63), suggesting a moderately positive perception of PLC practices among the participating TVET teachers.

The internal-consistency coefficients were satisfactory across all five subscales. Cronbach's alpha ranged from 0.83 to 0.88, while McDonald's omega ranged from 0.84 to 0.89. These values exceeded the commonly accepted minimum of 0.70, indicating adequate to good internal consistency [42] [43]. The overall PLC scale also demonstrated strong reliability, with Cronbach's alpha of 0.91 and McDonald's omega of 0.93.

Table 1. Descriptive statistics and reliability coefficients for PLC subscales (N = 261).

PLC Subscale	Items	M	SD	Cronbach's α	McDonald's ω
Shared Vision and Values	7	3.45	0.71	0.85	0.86
Collaborative Learning	7	3.67	0.69	0.88	0.89
Reflective Dialogue	6	3.54	0.72	0.84	0.85
Collective Responsibility	6	3.21	0.74	0.83	0.84
Supportive Leadership	6	3.89	0.68	0.87	0.88
Overall PLC Scale	32	3.55	0.63	0.91	0.93

The descriptive results indicated no apparent severe deviations from normality. However, formal assessment of distributional assumptions was based on skewness, kurtosis, and multivariate-normality statistics rather than on means and reliability coefficients alone.

5.2. Descriptive Statistics and Reliability of the Professional Development Motivation Scale

Table 2 presents the descriptive statistics and reliability coefficients for the professional development motivation scale. Professional Growth Orientation recorded the highest mean score (M = 4.02, SD = 0.58), followed by Intrinsic Motivation (M = 3.94, SD = 0.61) and Identified Regulation (M = 3.87, SD = 0.66). These findings suggest that the participating TVET teachers generally expressed a strong orientation toward continuous professional learning. Their motivation appeared to reflect both personal interest in professional growth and recognition of the value of professional development for their careers and teaching practice [41].

The reliability coefficients were satisfactory for all three motivation dimensions. Cronbach's alpha values ranged from 0.86 to 0.91, while McDonald's omega values ranged from 0.87 to 0.93. For the complete 18-item scale, Cronbach's alpha was 0.93 and McDonald's omega was 0.94. These coefficients exceeded the com-

monly recommended threshold of 0.70 and indicated strong internal consistency [42] [43].

Table 2. Descriptive statistics and reliability coefficients for professional development motivation subscales (N = 261).

PLC Subscale	Items	M	SD	Cronbach's α	McDonald's ω
Intrinsic Motivation	6	3.94	0.61	0.89	0.90
Identified Regulation	6	3.87	0.66	0.86	0.87
Professional Growth Orientation	6	4.02	0.58	0.91	0.63
Overall PLC Scale	18	3.94	0.63	0.93	0.94

5.3. Measurement Model

The measurement model was evaluated using confirmatory factor analysis (CFA). The model comprised eight latent constructs and 50 observed indicators: five PLC dimensions and three professional development motivation dimensions. Model adequacy was assessed using multiple goodness-of-fit indices. These indices were interpreted collectively rather than as rigid, independent cut-off criteria [44].

Table 3. Confirmatory factor analysis: model-fit indices for the full measurement model (N = 261) [44].

Fit Index	Observed Value	Reference guideline	Interpretation
χ^2	2752.38	—	Sensitive to sample size; interpreted with other indices
df	1,142	—	—
χ^2/df	2.41	<3.00	Acceptable
CFI	0.95	≥ 0.95	Good fit
TLI	0.94	Approximately ≥ 0.95	Acceptable
RMSEA	0.052	≤ 0.06	Good fit
90% CI for RMSEA [0.049, 0.055]		Upper bound < 0.08	Precise estimate
SRMR	0.046	≤ 0.08	Good fit

The CFA results indicated that the hypothesized measurement model provided an acceptable-to-good fit to the observed data, $\chi^2 (1, 142) = 2752.38$, $\chi^2/\text{df} = 2.41$, CFI = 0.95, TLI = 0.94, RMSEA = 0.052, 90% CI [0.049, 0.055], and SRMR = 0.046. Although the TLI was marginally below 0.95, the remaining fit indices indicated satisfactory model fit. The results therefore supported the adequacy of the proposed eight-factor measurement model (See **Table 3**).

All standardized factor loadings were statistically significant ($p < 0.001$) and ranged from 0.61 to 0.84. The loadings exceeded the commonly recommended

minimum of 0.50, indicating that the observed indicators adequately represented their respective latent constructs. Average variance extracted (AVE) values ranged from 0.51 to 0.68, and composite reliability (CR) values ranged from 0.83 to 0.93 (See **Table 4**). These results supported convergent validity and construct reliability [42].

Table 4. Convergent validity and reliability metrics for the latent constructs (N = 261) [42].

Latent Construct	Indicators	Standardized Loadings (Range)	AVE	Composite Reliability (CR)
PLC Dimensions				
Shared Vision and Values	7	0.68 - 0.82	0.58	0.88
Collaborative Learning	7	0.71 - 0.84	0.62	0.9
Reflective Dialogue	6	0.65 - 0.79	0.54	0.86
Collective Responsibility	6	0.61 - 0.77	0.51	0.83
Supportive Leadership	6	0.70 - 0.83	0.60	0.89
Motivation Dimensions				
Intrinsic Motivation	6	0.73 - 0.84	0.65	0.91
Identified Regulation	6	0.67 - 0.80	0.57	0.87
Professional Growth Orientation	6	0.75 - 0.84	0.68	0.93
Overall Ranges	50	0.61 - 0.84	0.51 - 0.68	0.83 - 0.93

5.4. Discriminant Validity and Common-Method Bias

Discriminant validity was assessed using the heterotrait-monotrait ratio of correlations (HTMT). The reported HTMT values ranged from 0.65 to 0.84, with all values below the conservative threshold of 0.85. This finding suggests that the latent constructs were empirically distinguishable from one another [41] [42].

The highest reported HTMT value was observed between Intrinsic Motivation and Identified Regulation (HTMT = 0.83), followed by Collaborative Learning and Reflective Dialogue (HTMT = 0.81). Although these constructs were related, the values remained below the specified threshold (See **Table 5**).

Potential common-method variance was examined using Harman's single-factor test and an unmeasured latent-method-factor approach. The single-factor model accounted for 28.4% of the total variance, which was below the commonly applied 50% reference point. In addition, the unmeasured latent-method-factor analysis did not produce substantial changes in the standardized factor loadings. These findings suggest that common-method variance was unlikely to represent a major threat to the results. Nevertheless, such procedures should be interpreted cautiously because they cannot definitively establish the complete absence of common-method bias [41].

Table 5. Discriminant validity assessment using HTMT (N = 261) [41].

Construct Pair	HTMT Ratio	Criterion	Interpretation
Shared Vision ↔ Collaborative Learning	0.78	<0.85	Discriminant validity supported
Shared Vision ↔ Collective Responsibility	0.72	<0.85	Discriminant validity supported
Collaborative Learning ↔ Reflective Dialogue	0.81	<0.85	Discriminant validity supported
Collective Responsibility ↔ Supportive Leadership	0.69	<0.85	Discriminant validity supported
Intrinsic Motivation ↔ Identified Regulation	0.83	<0.85	Discriminant validity supported
Intrinsic Motivation ↔ Professional Growth Orientation	0.79	<0.85	Discriminant validity supported
PLC Composite ↔ Motivation Composite	0.74	<0.85	Discriminant validity supported
All other pairwise comparisons	0.65 - 0.84	<0.85	Discriminant validity supported

5.5. Structural Model and Hypothesis Testing

The structural model demonstrated an acceptable-to-good fit to the data: χ^2 (1, 142) = 2752.38, χ^2/df = 2.41, CFI = 0.95, TLI = 0.94, RMSEA = 0.052, 90% CI [0.049, 0.055], and SRMR = 0.046. Model-fit indices were interpreted collectively, considering the limitations of relying on isolated cut-off values [29] [44].

As shown in **Table 6**, all five hypothesized relationships between PLC dimensions and professional development motivation were positive and statistically significant. Collaborative Learning was the strongest predictor of professional development motivation (β = 0.41, SE = 0.06, p < .001), followed by Supportive Leadership (β = 0.32, SE = 0.05, p < .001), Reflective Dialogue (β = 0.28, SE = 0.06, p = .002), Shared Vision and Values (β = 0.19, SE = 0.07, p = .008), and Collective Responsibility (β = 0.17, SE = 0.07, p = .014). Therefore, H₁-H₅ were supported. The standardized coefficients were interpreted in relation to their confidence intervals, theoretical relevance, and practical significance rather than by applying universal effect-size classifications [29] [44].

Subscale-level results revealed distinct predictive patterns across the three motivation outcomes. Collaborative Learning was the strongest predictor of Intrinsic

Table 6. Structural model results: PLC dimensions predicting professional development motivation (N = 261).

Hypothesis	Path	Standardized β	SE	p-value	95% CI [LL, UL]	Decision
H ₁	Shared Vision and Values → Professional Development Motivation	0.19	0.07	0.008	[0.05, 0.33]	Supported
H ₂	Collaborative Learning → Professional Development Motivation	0.41	0.06	<0.001	[0.29, 0.53]	Supported
H ₃	Reflective Dialogue → Professional Development Motivation	0.28	0.06	0.002	[0.16, 0.40]	Supported
H ₄	Collective Responsibility → Professional Development Motivation	0.17	0.07	0.014	[0.03, 0.31]	Supported
H ₅	Supportive Leadership → Professional Development Motivation	0.32	0.05	< 0.001	[0.22, 0.42]	Supported

Motivation ($\beta = 0.44$), Supportive Leadership was the strongest predictor of Identified Regulation ($\beta = 0.38$), and Reflective Dialogue was the strongest predictor of Professional Growth Orientation ($\beta = 0.35$) (See **Table 7**).

Table 7. Standardized effects of PLC dimensions on motivation subscales (N = 261) [42].

PLC Predictor	Intrinsic Motivation (β)	Identified Regulation (β)	Professional Growth Orientation (β)
Shared Vision and Values	0.16	0.21	0.18
Collaborative Learning	0.44	0.35	0.31
Reflective Dialogue	0.25	0.29	0.35
Collective Responsibility	0.14	0.19	0.15
Supportive Leadership	0.29	0.38	0.33
Strongest Predictor	Collaborative Learning	Supportive Leadership	Reflective Dialogue

The five PLC dimensions explained 54% of the variance in overall professional development motivation ($R^2 = 0.54$; adjusted $R^2 = 0.53$). They also explained 48% of the variance in Intrinsic Motivation, 52% in Identified Regulation, and 49% in Professional Growth Orientation. These findings indicate substantial explanatory power and suggest that PLC practices are important predictors of TVET teachers' professional development motivation [29] [42] (See **Table 8**).

Table 8. Variance explained in professional development motivation outcomes (N = 261) [29].

Outcome Variable	R^2	Adjusted R^2
Overall Professional Development Motivation	0.54	0.53
Intrinsic Motivation	0.48	0.47
Identified Regulation	0.52	0.51
Professional Growth Orientation	0.49	0.48

5.6. Indirect Effects

Bootstrapping with 5000 resamples and 95% bias-corrected and accelerated (BCa) confidence intervals was used to examine whether psychological need-support mechanisms mediated the relationships between PLC dimensions and professional development motivation. This approach is appropriate for indirect-effect analysis because it does not require the product of regression coefficients to follow a normal sampling distribution [45] [46].

The results in **Table 9** indicated four significant indirect effects. Collaborative Learning predicted Intrinsic Motivation through Perceived Competence Support ($\beta = 0.18$, $p < 0.001$) and Social Relatedness ($\beta = 0.14$, $p < 0.001$). Supportive Leadership predicted Identified Regulation through Autonomy Support ($\beta = 0.21$, $p <$

0.001). Reflective Dialogue predicted Professional Growth Orientation through Relatedness Support ($\beta = 0.09$, $p = 0.032$). Because the corresponding direct effects remained significant, these relationships were interpreted as partial mediation.

Two indirect effects were not statistically significant. The indirect effect of Shared Vision and Values on Intrinsic Motivation through Competence Support was not significant, $\beta = 0.06$, $p = 0.089$, 95% CI $[-0.01, 0.13]$. Similarly, the indirect effect of Collective Responsibility on Identified Regulation through Autonomy Support was not significant, $\beta = 0.05$, $p = 0.142$.

Overall, the findings suggest that PLC practices influence professional development motivation partly by supporting teachers' psychological needs for competence, autonomy, and relatedness. This pattern is consistent with Self-Determination Theory, which proposes that satisfaction of these needs promotes self-determined motivation, internalization, and professional development [5] [47].

Table 9. Bootstrap mediation analysis of PLC effects on motivation outcomes (N = 261).

Hypothesized Mediation Path	Indirect Effect (β)	SE	95% BCa CI [LL, UL]	p-value	Mediation Type
Collaborative Learning → Perceived Competence Support → Intrinsic Motivation	0.18	0.04	[0.11, 0.26]	<0.001	Partial Mediation
Collaborative Learning → Social Relatedness → Intrinsic Motivation	0.14	0.03	[0.08, 0.21]	<0.001	Partial Mediation
Supportive Leadership → Autonomy Support → Identified Regulation	0.21	0.04	[0.14, 0.29]	<0.001	Partial Mediation
Shared Vision → Competence Support → Intrinsic Motivation	0.06	0.03	$[-0.01, 0.13]$	0.089	Not Significant
Reflective Dialogue → Relatedness → Professional Growth Orientation	0.09	0.04	[0.01, 0.18]	0.032	Partial Mediation
Collective Responsibility → Autonomy Support → Identified Regulation	0.05	0.03	$[-0.02, .012]$	0.142	Not Significant

The mediation results support the integrated SDT-SLT framework by showing that PLC dimensions do not operate solely through direct relationships. Rather, collaborative learning, supportive leadership, and reflective dialogue appear to foster motivation by creating conditions that satisfy teachers' psychological needs. Nevertheless, bias-corrected bootstrap intervals may sometimes increase the risk of Type I error. Therefore, future analyses should consider sensitivity checks using percentile bootstrap intervals or other robust methods [46] [48].

6. Discussion

6.1. Collaborative Learning as the Primary Motivational Driver

The findings identify Collaborative Learning as the strongest predictor of profes-

sional development motivation among Ethiopian TVET teachers ($\beta = 0.41$). This result is consistent with evidence from Singaporean TVET teachers, suggesting that collegial collaboration may be an important motivational factor across diverse TVET contexts [49]. From the perspective of Self-Determination Theory and social learning theory, collaborative learning can support motivation by promoting social interaction, professional modelling, knowledge exchange, and psychological need satisfaction [26] [50].

The result further indicates that structured opportunities for teachers to learn from and with their colleagues may remain effective even in institutions facing resource, leadership, and professional development constraints. Collaborative participation, professional dialogue, and supportive learning conditions have been identified as important features of effective teacher development [50] [51]. This finding is particularly relevant to Ethiopia, where limited continuous professional development and weaknesses in leadership preparation remain important challenges in the TVET sector [3]. Accordingly, TVET institutions should strengthen peer-learning groups, team-based lesson planning, joint problem-solving, and communities of practice.

6.2. The Role of Supportive Leadership

Supportive Leadership was the second strongest predictor of teachers' professional development motivation ($\beta = 0.32$). This finding is consistent with distributed and autonomy-supportive leadership perspectives, which view leadership as a relational and shared process involving school leaders, department heads, and teachers [21] [22] [52].

The mediation results further suggest that supportive leadership may influence motivation by strengthening teachers' perceptions of autonomy support. Autonomy-supportive leadership can encourage teacher participation in decision-making, acknowledge professional perspectives, and provide meaningful opportunities for initiative. These conditions are associated with autonomous motivation, psychological need satisfaction, engagement, and positive professional outcomes [22] [52].

The finding also has practical implications for Ethiopian TVET policy. Given continuing concerns regarding limited professional development and unclear leadership standards, leadership-development programs should prepare principals and department heads to use autonomy-supportive practices [3]. Such programs should emphasize participatory decision-making, constructive feedback, professional trust, and teacher involvement in institutional improvement.

6.3. Reflective Dialogue and Professional Growth Orientation

Reflective Dialogue had a significant positive relationship with overall professional development motivation ($\beta = 0.28$) and showed an even stronger association with Professional Growth Orientation ($\beta = 0.35$). This result supports previous research indicating that professional dialogue, collaborative reflection, and

critical examination of teaching practice contribute to teacher learning and instructional improvement [53] [54].

Reflective dialogue may promote professional growth by enabling teachers to interpret experience, exchange perspectives, identify instructional challenges, and develop contextually relevant solutions. However, discussion alone does not necessarily lead to changes in professional practice; it is most effective when connected to evidence, classroom application, feedback, and follow-up reflection [53]. The comparatively smaller effect of Reflective Dialogue than Collaborative Learning may indicate that reflective activities in Ethiopian TVET institutions are not yet consistently linked to instructional decision-making or institutional improvement.

This interpretation is compatible with policy concerns regarding top-down management, inadequate supervision, limited professional development, and weaknesses in instructional delivery [3]. TVET institutions should therefore move beyond informal discussion by institutionalizing lesson-study groups, peer observation, reflective teaching portfolios, and facilitated post-observation conferences.

6.4. Shared Vision, Collective Responsibility, and Contextual Considerations

Shared Vision and Values ($\beta = 0.19$) and Collective Responsibility ($\beta = 0.17$) demonstrated the weakest, although still statistically significant, relationships with professional development motivation. These findings should not be interpreted as evidence that either dimension is unimportant. Rather, their relatively smaller effects may reflect contextual conditions, including hierarchical governance, limited participatory decision-making, and performance systems that emphasize individual rather than collective responsibility.

Previous PLC research identifies shared vision, collaborative learning, supportive leadership, and collective responsibility as interconnected components of effective professional learning communities. However, the strength of their relationships with teacher outcomes may vary according to organizational structure, leadership practices, institutional culture, and the maturity of PLC implementation [48] [51] [55].

The findings therefore highlight the need to strengthen the institutional foundations of PLCs. Shared vision can be promoted through participatory strategic planning, jointly developed institutional goals, and regular communication of professional priorities. Collective responsibility can be strengthened through transparent accountability systems, team-based performance goals, shared instructional planning, and recognition of collaborative contributions.

These recommendations are consistent with Ethiopia's TVT policy priorities, which emphasize improved coordination, institutional collaboration, merit-based leadership, professional development, and stronger systems for developing TVT instructors and leaders [3]. Overall, the results suggest that PLC dimensions operate within a broader institutional context. Collaborative learning and supportive

leadership may generate more immediate motivational benefits, whereas shared vision and collective responsibility may require sustained organizational development before their effects become more pronounced.

7. Conclusions and Implications

7.1. Theoretical Contributions

This study makes three principal theoretical contributions to research on TVET teacher professional development.

First, it extends professional learning community (PLC) research to the Ethiopian TVET context by using an empirically tested structural equation model to examine the relationships between specific PLC dimensions and teachers' professional development motivation. In doing so, the study contributes evidence from a sub-Saharan African TVET setting, which remains underrepresented in the international PLC literature [56]. The findings demonstrate that PLC dimensions are not merely organizational features but are also significant predictors of teachers' motivation to engage in professional learning.

Second, the study provides empirical support for the explanatory value of an integrated Self-Determination Theory-Social Learning Theory framework. The findings indicate that teacher motivation may be shaped through both psychological need-support processes—including autonomy, competence, and relatedness—and social learning processes involving interaction, modelling, collaboration, and contextual participation [5]. The mediation results further suggest that PLC practices may contribute to motivation by creating social and organizational conditions that support teachers' psychological needs.

Third, the study identifies differentiated relationships between PLC dimensions and distinct forms of professional development motivation. Collaborative Learning was the strongest predictor of overall motivation and Intrinsic Motivation, Supportive Leadership was the strongest predictor of Identified Regulation, and Reflective Dialogue was the strongest predictor of Professional Growth Orientation. These findings extend existing theoretical perspectives by showing that PLC dimensions may not influence all forms of motivation equally [22].

7.2. Practical Implications

The findings have implications for policymakers, institutional leaders, and providers of teacher education and professional development.

For policymakers, PLC development should be incorporated into national TVET teacher professional development policies and institutional quality-assurance frameworks [57]. Consistent with Ethiopia's TVET policy priorities, public TVET institutions should be encouraged—or, where appropriate, required—to establish structured and adequately resourced collaborative learning arrangements [2] [3]. These arrangements should include dedicated time, facilitation, monitoring procedures, and institutional support. PLC implementation should also be evaluated through indicators such as teacher participation, collaborative planning, peer learn-

ing, reflective practice, and evidence of instructional improvement.

For institutional leaders, the results emphasize the importance of strengthening collaborative learning and autonomy-supportive leadership. Leaders should establish regular cross-departmental working groups, peer-learning teams, joint lesson-planning activities, and communities of practice. These structures should be supported by leadership practices that involve teachers in decision-making, acknowledge their professional expertise, provide constructive feedback, and allow meaningful discretion in professional learning activities [21] [22]. Such practices may be particularly important because Supportive Leadership was the second strongest predictor of professional development motivation.

For providers of teacher education and continuing professional development, the findings support the integration of structured reflective practices into professional learning programs. These practices may include guided reflection journals, peer observation, lesson-study cycles, post-observation conferences, and facilitated professional inquiry groups [28]. Because Reflective Dialogue was positively associated with Professional Growth Orientation, professional development programs should connect dialogue to classroom evidence, instructional experimentation, feedback, and follow-up reflection rather than treating discussion as an end in itself.

7.3. Limitations and Future Research

This study has several limitations.

First, its cross-sectional design prevents definitive conclusions about temporal order or causality. Although the findings identify significant associations and predictive relationships between PLC dimensions and professional development motivation, they do not establish that PLC participation causes changes in motivation. Future research should use longitudinal, panel, or quasi-experimental designs to examine whether changes in PLC practices precede and contribute to changes in teachers' motivation [57].

Second, the study relied primarily on self-report measures. Consequently, the results may be affected by social-desirability bias, common-method variance, and respondents' perceptions of their institutional environment. Although procedural and statistical remedies were applied, these approaches cannot eliminate such bias completely. Future studies should combine teacher questionnaires with classroom observations, institutional records, peer or leader assessments, interviews, and objective indicators of professional development participation.

Third, the study was conducted within a single national context, which limits the generalizability of the findings. The relationships observed in Ethiopian TVET institutions may differ in other educational, cultural, institutional, or policy environments. Comparative research across TVET systems in East Africa and sub-Saharan Africa would help determine which findings are context-specific and which are more broadly applicable [28] [56].

Future research should also examine potential moderating variables, including

teacher characteristics, institutional conditions, leadership arrangements, and policy or regional context. Such analyses could clarify when and for whom PLC practices are most strongly associated with professional development motivation. In addition, qualitative research involving TVET teachers, department heads, and institutional leaders could provide a deeper understanding of how collaborative structures are experienced and implemented in practice. Mixed-methods research would be particularly valuable because it could combine the explanatory power of structural models with detailed evidence concerning the social, organizational, and cultural mechanisms through which PLCs shape teacher motivation.

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Author Contributions

Asnake Mulushewa Getachew: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Software, Validation, Visualization, Writing—Original Draft, Writing—Review & Editing. **Tian Ligu** and **Zhao Wenping:** Supervision, critical guidance, constructive feedback, and manuscript review for intellectual content and academic rigour. All authors reviewed and approved the final manuscript before submission.

Conflicts of Interest

The authors declare no conflicts of interest.

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