

Senior High Schools Mathematics Teachers' Perception and Readiness for Professional Learning Communities

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Abstract

Professional Learning Communities (PLCs) have gained significant attention globally as a mechanism for enhancing quality teaching and supporting teacher continuous professional development. Ghana has adapted Professional Learning Community as a strategy for teacher continuous professional development and a medium for curriculum implementation. This study examined whether there is a significant difference in their perception and participation about the Professional Learning Community based on teaching experience, and whether mathematics teachers' perceptions are being influenced by their participation in Professional Learning Community. A cross-sectional survey was conducted on a sample of 137 out of the targeted population of 484 Senior High Schools' mathematics teachers in the upper east region of Ghana. The data was collected using a validated likert scale questionnaire. The results from a one-way ANOVA indicated no significant differences in perception, or participation across teachers levels of experience. However, a simple regression analysis results also showed participation significantly influences teachers' perception about Professional Learning Communities ($\beta = .301, p = .001$). The findings of the study highlights that Professional Learning Communities are equally relevant for all teachers regardless of experience levels and that active involvement promotes favorable perception towards the implementation of Professional Learning Communities. Therefore, strengthening school structures, leadership support and creating opportunities for teacher collaboration are crucial to sustaining an effective engagement in Professional Learning Communities.

Keywords: Readiness, Perception, Participation, Professional Learning Communities

Introduction

Professional Learning Communities (PLCs) have gained prominence globally as a strategy for improving teaching effectiveness and enhancing student outcomes. PLCs offer a structured environment for teachers to engage in collaborative learning, reflective practices, and professional growth. In Ghana, the Ministry of Education and the Ghana Education Service (GES) have emphasized the integration of PLCs into the education system as part of the ongoing curriculum reforms, such as the Standards-Based Curriculum and

the Common Core Programme (Ghana Education Service, 2021). These initiatives underscore the critical role of continuous professional development in equipping teachers with the skills necessary to meet evolving educational demands.

PLCs aim to foster a collaborative culture among teachers, enabling them to share best practices, analyze student performance data, and co-develop instructional strategies. For mathematics teachers, PLCs are relevant, given the subject's major role in developing problem-solving and critical-thinking skills essential for students' academic and career success. Despite the potential of PLCs to transform teaching and learning processes, their implementation often faces significant challenges, including teachers' perceptions of and readiness for engaging in such professional communities (DuFour et al., 2016).

In Ghana, PLCs were adapted in 2021 to assist teachers adapt best practices in facilitating the new Standard Based Curriculum at the Senior High School level. The implementation of PLCs in Ghana is led by Ghana Education Services with support from Transforming Teaching Education and Learning (T-Tel). Curriculum leaders at the various schools receive training in order to train teachers on subject areas and teacher standards. Teachers sit together in groups to share knowledge and experiences during PLC sessions weekly. The adaption of PLCs has been met with mixed reactions. While some educators perceive these platforms as opportunities for professional growth, others view them as burdensome and time-consuming activities (Gyamfi & Bofo, 2022). These differing perceptions raise questions about the readiness of mathematics teachers to participate actively in PLCs and the factors influencing their engagement. A thorough understanding of these issues is essential for the effective integration of PLCs into the Ghanaian education system.

The literature highlights that teachers' perceptions, participation, and readiness are interrelated variables that collectively determine the success of PLC implementation. While studies in other contexts have established the benefits of PLCs for professional growth and student achievement (Tam, 2015; Vescio et al., 2008), little empirical evidence exists from Sub-Saharan Africa, particularly regarding mathematics teachers in Ghana. This study addresses this gap by examining how participation influences perception and readiness, offering limited insights that contribute to both theory and practice in professional learning communities.

Research Hypotheses

H₀₁: There is no significant difference in teachers' perception, participation and readiness for PLCs based on teaching experience.

H₀₂: There is no significant influence of participation in PLCs on Mathematics teachers' perception about PLCs.

LITERATURE REVIEW

Theoretical Review

Change Theory

Kurt Lewin's Change Management Model provides a valuable framework for explaining how individuals and organizations transition through change using three stages: unfreeze, change, and refreeze (Cummings, Bridgman, & Brown, 2015). The unfreeze stage emphasizes preparing people for change by breaking existing norms and reducing resistance. In education, Professional Learning Communities (PLCs) are instrumental at this stage, as they encourage collaboration and dialogue among teachers. Such collective engagement enables educators to identify the limitations of existing practices and recognize the

importance of adopting new curricula (Burnes, 2020; Hord & Tobia, 2015). By fostering shared understanding, PLCs help build readiness for change and reduce opposition to reform efforts (Vescio, Ross, & Adams, 2008).

The change stage involves implementing new practices and addressing uncertainties, with PLCs serving as critical support systems that promote professional learning, collaboration, and problem-solving (Fullan, 2016). Teachers are able to share experiences, exchange best practices, and develop effective strategies aligned with the new curriculum. The refreeze stage, which seeks to institutionalize these practices, is sustained by PLCs through ongoing reflection, evaluation, and continuous improvement (Hipp & Huffman, 2010; DuFour, DuFour, & Eaker, 2008). This collaborative structure ensures that reforms become embedded in school culture and prevents regression to outdated methods. Thus, Lewin's model, strengthened by the role of PLCs, highlights the importance of collective effort in achieving successful and lasting curriculum implementation.

Teacher Participation, Perception and Readiness for PLCs

Participation represents the behavioral dimension of readiness, reflected in activities such as attending PLC meetings, contributing to discussions, engaging in collaborative lesson planning, and sharing resources (DuFour et al., 2016). Research suggests that sustained participation fosters professional growth and improved instructional practices (Wan, 2020). However, Hord (2004) cautions that mandated participation may result in superficial compliance without genuine engagement. Structural factors, such as leadership support, resource availability, and school culture, play significant roles in shaping the depth and quality of teacher participation (Stoll et al., 2006).

Besides, teacher perception is central to the success of PLC implementation, as it reflects attitudes, beliefs, and values regarding their effectiveness (Vescio, Ross, & Adams, 2008). Studies have shown that teachers with positive perceptions of PLCs are more likely to view them as opportunities for professional growth and instructional improvement (DuFour, DuFour, & Eaker, 2008). Conversely, negative perceptions—such as viewing PLCs as time-consuming or administratively imposed—may hinder authentic engagement (Gyamfi & Bofo, 2022). This suggests that positive teacher perceptions are essential for meaningful reform, since attitudes directly influence willingness to adopt new practices.

Readiness comprises the psychological and behavioral preparedness of teachers to embrace professional collaboration (Christensen & John, 2025). Caci (2025) described readiness as a multidimensional construct involving attitudinal, behavioral, and structural components. Within this framework, perception reflects attitudinal readiness, while participation represents behavioral readiness. Studies indicate that readiness is influenced by teachers' intrinsic motivation, collaborative norms, and systemic supports (Vangrieken, Meredith, Packer, & Kyndt, 2017). In contexts such as Ghana, systemic constraints—large class sizes, resource limitations, and workload pressures—pose barriers to readiness (Owusu & Addae-Boahene, 2021).

Methodology

This study adopted a positivist philosophical stance, which assumes that reality is objective and measurable, making it suitable for a quantitative investigation of mathematics teachers' perceptions and readiness toward the new curriculum within the framework of Professional Learning Communities (PLCs) (Creswell, 2014; Tashakkori & Teddlie, 2008). Guided by this paradigm, the research employed a quantitative approach to systematically collect and analyze numerical data, enabling the researcher to test hypotheses, identify relationships, and generalize findings (Creswell & Creswell, 2018). A correlational

research design was used to determine the relationships between PLC participation, teachers’ perceptions, and readiness, without manipulation of variables (Creswell, 2005).

The study was conducted in Ghana’s Upper East Region, targeting all 484 mathematics teachers in 35 Senior High Schools (SHS) and Senior High Technical Schools (SHTS) where PLCs operate. A simple random sampling technique was employed to ensure each mathematics teacher had an equal and independent opportunity of participating. Creswell and Creswell (2018) posited that, this sampling technique reduces selection bias and enhances sample representation and generalization. A sample of 137 teachers completed the survey via Microsoft Forms distributed to them through WhatsApp. This method is cost-effective access. Data were collected using a structured closed-ended questionnaire designed on 4-point Likert scale for participation and a 5-point Likert scales for perception. The instrument comprised three sections covering demographics, PLC participation, and perceptions of PLCs. Pre-testing was done in Senior High Schools in Upper West region that share similar socioeconomic characteristics, and educational structures as Upper East region. Conducting the pre-test outside the main study area prevents contamination of final sample for the study. A total of 30 mathematics teachers completed the form which yielded high reliability with a Cronbach’s alpha of 0.951 indicating good internal consistency (Sarantakos, 2012; Dudovsky, 2017).

Ethical considerations were carefully addressed through informed consent, anonymity, and confidentiality, with clearance obtained from the university’s Research and Projects Unit (Patten & Newhart, 2017; Nardi, 2018). Data analysis involved descriptive statistics (means, frequencies, percentages) for demographic variables, and correlation and regression analyses to test relationships among PLC participation, perceptions, and readiness. Analyses were conducted at a 0.05 confidence interval to ensure statistical rigor (Tabachnick & Fidell, 2019). Overall, the methodology provided a robust quantitative framework for understanding how PLCs influence teachers’ readiness for curriculum implementation.

Conceptual Framework

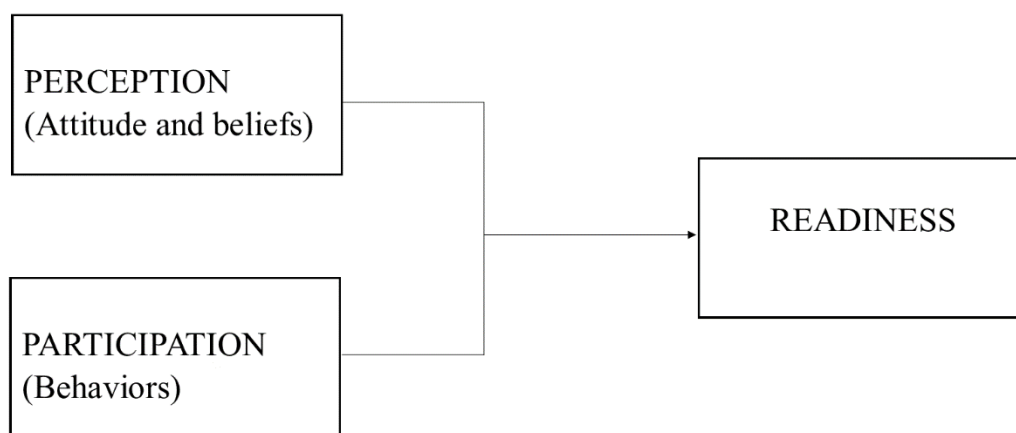


Figure 1: Conceptual Framework of Mathematics Teachers’ Readiness for PLC

Figure 1 illustrates how perception, participation and readiness interrelate. Teachers’ perception and participation are viewed as key indicators of readiness within a broader framework measuring the attitude and behavioral readiness of the teacher towards the implementation of PLCs at the school level. Teacher perception about PLCs is viewed as the attitudinal encompassing their beliefs and value judgment they

have about the importance of PLCs on their professional growth and development. Wan (2020) asserted that positive perception stimulates intrinsic motivation and collaborate to share best practices. On the hand, participation represents the behavioral aspect of teacher readiness for PLCs. According to DuFour et al. (2016), behavioral dimension embodies attendance to PLCs sessions, contribution, and sharing of resources. Sustained PLCs engagement reinforces positive attitude and strengthen teachers’ readiness for professional learning communities. These two dimensions, together provides a more holistic view of teachers overall readiness, psychologically and behaviorally to engage in a sustained PLC.

Results and Discussion

H₀₁: There is no significant difference in teachers’ perception, and participation in PLCs based on teaching experience.

The research question sought to determine whether teachers’ levels of teaching experience made a significant difference in their perception of Professional Learning Communities (PLCs), their participation and how ready they are to engage continually in such collaborative practices.

Table 1: Descriptive Statistics

Variable	Level of Experience	N	Mean	Std. Deviation
Readiness	0--4 years	48	.0566	.93346
	5--9 years	44	-.1760	.74505
	10--14 years	31	.1612	.71336
	15--19 years	7	.0525	.89700
	20 years and more	7	-.0480	.44934
	Total	137	.0000	.80662
Participation in PLC	0--4 years	48	3.5972	.36931
	5--9 years	44	3.5758	.30242
	10--14 years	31	3.6416	.26248
	15--19 years	7	3.6190	.41004
	20 years and more	7	3.6508	.25198
	Total	137	3.6042	.31967
Perception about PLC	0--4 years	48	4.0238	.61680
	5--9 years	44	3.7938	.57127
	10--14 years	31	4.0645	.58912
	15--19 years	7	3.9796	.40135
	20 years and more	7	3.8061	.19217
	Total	137	3.9458	.57780

Source: Field data (2025)

The results from table 1 indicated closeness of the scores as readiness scores ranged from -0.1760 to 0.1612 for teachers with years of experience, 5—9 and 10—14 respectively. This shows minimal variation, suggesting a fair stable readiness of teachers across various levels. Also, teachers’ level of participation in PLCs was consistent in all groups with average scores lying between 3.5972 and 3.6508. This suggest that regardless of number of years of teaching experience, teachers participated in PLC sessions at similar levels. Again, teachers’ perception about PLCs showed modest differences across levels

of teaching experience of teachers. Generally, the descriptive results suggest no significant effect of teaching experience on teacher readiness, participation and perception about PLCs. To show whether there is actually any significant difference in readiness, participation levels and perception based on years of teaching experience, an Analysis of Variance (ANOVA) was run as showed in table 2.

Table 2 ANOVA Results on Differences in participation, Perception and Readiness of Teachers Based on Teaching Experience

		Sum of Squares	df	Mean Square	F	Sig.
Readiness	Between Groups	2.357	4	.589	.903	.464
	Within Groups	86.129	132	.652		
	Total	88.486	136			
Participation in PLC	Between Groups	.098	4	.024	.234	.919
	Within Groups	13.800	132	.105		
	Total	13.898	136			
Perception about PLC	Between Groups	1.890	4	.472	1.433	.227
	Within Groups	43.514	132	.330		
	Total	45.403	136			

Source: Field data (2025)

Before ANOVA test was run, the equality of variance assumption was checked using Levene’s test. The test indicated non-significance for participation ($p = 0.052$) and perception ($p = 0.170$) satisfying the homogeneity condition. Readiness showed significant difference ($p = 0.041$) based on means among various groups of teaching experience, but the median ($p = 0.059$) showed non-significance suggesting that ANOVA could still be used (Field, 2023).

The one-way ANOVA results from table 2 showed no statistically significant differences among teachers of different number of years of teaching experience for readiness [$F(4, 132) = 0.903$, $p = 0.464$], participation [$F(4, 132) = 0.234$, $p = 0.919$] and perception [$F(4, 132) = 1.433$, $p = 0.227$]. The results indicate that whether a teacher taught for very few years or more years (above 20 years), their participation in PLCs, perception of PLCs and readiness for PLCs are largely the same. The post hoc test results supported this conclusion since no pairwise comparison between groups were significant. Therefore, teaching experience has not contributed to any meaningful differences in readiness, participation or perception towards PLCs.

H02: There no significant influence of participation in PLCs on Mathematics teachers’ perception about PLCs

Teacher Participation in PLCs

The participation of teachers in PLC is largely centered on their attendance rate, level of engagement, contribution and collaboration during PLC session. These constructs provide a lens for understanding and measuring the level of participation of mathematics teachers in Professional Learning communities.

Table 3 Teacher Level of Participation in PLCs

Descriptive Statistics				
Statement	N	Minimum	Maximum	Mean

I attend PLC meetings regularly (at least 75% attendance rate).	137	3	4	3.96
I actively contribute to discussions and share my knowledge during PLC meetings.	137	2	4	3.73
I work collaboratively with my colleagues on projects and tasks during PLCs.	137	2	4	3.82
I facilitated or coordinated PLC sessions.	137	3	4	3.80
I actively listen and respond to my colleague teachers during PLC.	137	2	4	3.50
I often ask questions and receive feedback or support from colleagues during PLCs.	137	1	5	3.48
I often share resources or materials with colleagues during PLCs	137	1	4	2.64
Number of sessions attended in PLC handbook one	137	1	4	3.81
Number of sessions attended in PLC handbook two.	137	1	4	3.69
Mean of Means	137			3.60

Source: Field data (2025)

The results from the table was analyzed based on a four point Likert scale ranging from 1, never to 4 (regularly). The attendance of teachers in PLC meetings was quite high, with the mean attendance rate being (Mean = 3.96). Teachers regularly contribute to discussions (Mean = 3.73) and work collaboratively on projects (Mean = 3.82). The results largely suggest that the level of participation of teachers in PLCs was very good with an overall (mean = 3.60). However, there is some variance in how actively teachers share resources (Mean = 2.64), indicating that resource-sharing was not as frequent as other types of engagement.

Perception of Mathematics Teachers about PLC

The study sought to investigate the perceptions of teachers about PLC as they partake in PLC sessions in their various schools. The perception of the teachers in relation to collaboration and teamwork; professional growth and development; PLCs impact on learners and the new curriculum.

Table 4 Mathematics Teachers Perception about PLC

Statement	N	Minimum	Maximum	Mean
I believe PLC can improve learners' academic achievement	137	1	5	4.22
I believe PLC has the ability of addressing my teaching challenges.	137	1	5	4.04

PLC provides adequate support and guidance to me in my professional practice.	137	1	5	3.99
PLC does not add anything new to my professional practices	137	1	5	2.39
PLC sessions provide a supportive environment for teamwork among teachers.	137	1	5	4.21
I believe PLC is a forum I can comfortably share ideas and resources with colleagues.	137	2	5	4.09
I believe PLC is purposely for building the Continuous Professional Development (CPD) points.	137	1	5	3.53
I believe that PLC can help me better understand and address the learning needs of the individual learner.	137	1	5	4.09
PLCs have impact on my professional growth and development.	137	1	5	4.09
I feel that PLC is a valuable use of my time.	137	1	5	3.75
PLC place emphasis on the new curriculum.	137	1	5	4.36
PLC emphasizes on student learning and achievement.	137	2	5	4.28
I would recommend PLC to other teachers.	137	1	5	3.99
PLC provides me the avenue to understand the new curriculum.	137	1	5	4.22
Mean of Means	137	2.43	5.00	3.95

Source: Field data (2025)

The results from table 4 indicate that teachers largely believe in the value of PLCs, especially in terms of improving student achievement (Mean = 4.22) and providing support for addressing teaching challenges (Mean = 4.04). also, the perception that PLCs are valuable for professional development is strong, as indicated by the response to whether PLCs emphasize Continuous Professional Development (CPD) (Mean = 3.53) and influencing their professional practice (mean = 3.99). Teachers also hold the belief that PLCs foster a supportive environment for collaboration among teachers (Mean = 4.21), which aligns with the focus on teamwork. The results showed that teachers have a strong positive perception about PLC (mean = 3.95) in relation to influencing professional practice, promoting collaboration and teamwork, improving learning needs of learners and providing a good avenue for teachers to understand the new curriculum.

The continuous participation of teachers in PLCs hinges on their perceived thought and understanding of the benefits of the PLCs. This objective sought to investigate how mathematics teachers' participation in PLC influences their perception towards PLC. Having run a correlation analysis and established significant relationship between Participation in PLCs and Perception, a simple linear regression analysis was run. Table 5 presents the results of the analysis.

Table 5: Regression analysis on Participation in PLCs and Perception Towards PLC

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	1.983	0.537		3.695	.001
	Participation in PLC	0.545	0.148	0.301	3.671	.001

a. Dependent Variable: Perception about PLC

Source: Field data (2025)

The regression analysis revealed a significant positive relationship between participation in PLC and Senior High School mathematics teachers' perception towards PLC ($B = 0.545$, Std. Error = 0.148, Beta = .301, $t = 3.671$, $p < .001$). This finding refutes the null hypothesis, which stated that there is no significant relationship between participation in PLC and teachers' perception towards PLC. The results suggest that participation in PLC is a significant predictor of teachers' perception towards PLC, with a standardized coefficient (Beta = 0.301) indicating that approximately 30% of the variance in perception can be explained by participation in PLC. This significant relationship indicates that as teachers participate more in PLC, their perception towards PLC becomes more positive.

Table 6: Simple Linear Regression Analysis Results

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson
					F	df1	df2	Sig.	F
					Change			Change	
1	.301 ^a	.091	.084	.55299	13.476	1	135	.000	1.859

a. Predictors: (Constant), Participation in PLC

b. Dependent Variable: Perception about PLC

Source: Field data (2025)

The results of the regression analysis revealed a significant positive relationship between participation in PLC and Senior High School mathematics teachers' perception the professional learning community (PLC) ($R = .301$, R Square = .091, Adjusted R Square = .084, $p < .000$). Specifically, the model indicated that for every one-unit increase in participation in PLC, teachers' perception towards the PLC increased by 0.301 units. The change in R Square (0.091) indicated that participation in PLC accounted for 9.1% of

the variance in teachers' perception towards PLC. These findings suggest that participation in PLC has a modest statistically significant influence on teachers' perception towards PLC, providing support for the objective.

Discussion

H₀₁: There is no significant difference in teachers' perception, and participation in PLCs based on teaching experience

The findings from the study point out that years of experience in teaching at the Senior High level do not have influence on how teachers engage in PLCs contradicting the assumption that novice teachers are more likely to be passionate about collaboration while veteran teachers may be less sensitive to participate in collaborative practices. The results from table 2 showed that there is no significant difference in teachers' readiness, perception and participation in PLCs. This finding resonates with recent studies such as Christensen et al. (2025) and Perlman et al. (2025) that found out that participation in PLCs is closely linked to teachers professional growth and instructional change but were not predicted by teaching experience. Perlman et al. (2025) added that what drives the benefits of PLCs are school support systems such as leadership encouragement, resources availability and collaborative norms but not variables like gender, age and experience.

Also, other scholars such as Vescio, Ross, and Adams (2008) supported this finding. They argued that the effectiveness of PLCs mainly depends on collaboration, shared values, and leadership but no demographic characteristics. Besides, Hord (2004) and Stoll et al. (2006) posited that structural support and school culture are factors that influence and sustain PLCs not the number of years the teacher has been teaching. Therefore, schools management should target both novice and veteran teachers to benefit equally from PLCs (Fullan, 2007; Wan, 2020).

H₀₂: There is no significant influence of participation in PLCs on Mathematics teachers' perception about PLCs

The results from table 5 showed that participation in PLCs is positively related to perception. This means that teachers who participate actively turn to have stronger positive perception about PLCs and perception about PLC has a direct link with teachers' level of participation in the PLC sessions. Having a stronger perception about PLCs (mean=3.95) as shown in table 4 indicates that mathematics teachers attend PLCs sessions regularly and engaged collaboratively in sharing ideas and resources and learning from each other. This influenced the positive perception of mathematics teachers towards it.

The results suggest that participation in PLC is a significant predictor of teachers' perception towards PLC. This significant relationship indicates that as teachers participate more in PLC, their perception towards PLC becomes more positive. This finding of the study is consistent with the study by Tam (2015) who found that teachers, who perceive PLCs as beneficial, engaged more in discussions, collaborative planning, and problem-solving activities within the group. This means that active participation, in turn, enhances the effectiveness of the PLC, as it leads to more meaningful exchanges and the implementation of shared strategies in the classroom.

Vangrieken, Meredith, Packer, and Kyndt (2017) however asserted that teachers' negative perceptions toward PLCs arise from the following factors, seeing PLCs as time-wasting, lacking in relevance to their specific needs, or being compelled by administrative mandates rather than open collaborative effort. All these assertions were perceived positive since few of the respondents agreed that PLCs is time wasting and do not add anything new to their professional development. Based on the findings, PLCs is fostering

continuous professional growth among teachers, promoting collaborative learning and reflective practice, which directly correlates with the findings that active participation in PLCs enhances teachers' pedagogical and content knowledge readiness which resonates the study of DuFour (2016).

Conclusion

The study has indicated no significant differences in readiness, participation, or perception of PLCs across different teaching experience levels. This suggests that teaching experience is not a deciding factor in how teachers view or engage in PLCs. Instead, the emphasis should be on structural and cultural supports that make PLCs meaningful and sustainable across the entire teaching workforce.

In conclusion, Professional Learning Communities (PLCs) play a vital role in enhancing second-cycle school teachers' perception. The findings of this study indicate that active participation in PLCs enhances mathematics teachers' perception towards PLC underscoring the dynamic relationship between engagement and shaping of their attitude. The findings suggest that the more teachers participate in PLCs, the more they appreciate the relevance of PLCs and develop positive perception towards PLCs. The results implies that participation serves as a catalyst for shaping teachers' beliefs. Hence, encouraging active participation through peer mentoring, and shared responsibility would lead to a more positive perception and embolden teachers' readiness for a continuous professional learning communities and improve learning outcomes.

Recommendation

It is recommended based on the findings of the study that school leaders should institutionalize PLCs as core component of teachers professional development by embedding PLC in the structured school, provide logistical support and foster collaborative school culture that will sustain teachers' perception and participation in PLC activities regardless of the level of experience of the teachers since the study found no significant difference in readiness,, perception and readiness for PLCs across all levels of teaching experiences.

Additionally, educational policy makers and school management should encourage active teacher participation since teacher participation in PLCs has a positive influence on their perception about PLCs. The school management and heads of departments should encourage teacher leadership, peer mentorship, and recognize and appraise active teacher engagement to enhance teachers' perception about the importance of PLCs and promote a long-term PLC implementation in the schools.

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