Original Article

Teachers' Perceptions, Challenges, and Engagement in Digital Professional Learning Communities (PLCs) in Ghanaian Public Senior High Schools

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Abstract

This study examined senior high school (SHS) teachers' perceptions of digital professional learning communities (DPLCs) in Ghana. A self-administered online questionnaire was used to conduct a cross-sectional descriptive survey with 76 SHS teachers in the Central Region of Ghana. Three internally reliable Likert-type subscales comprised the instrument: willingness to participate in future DPLCs (7 items, α =.87), perceived challenges (6 items, α =.70), and perceived benefits (8 items, α =.88). Data collected were analysed using descriptive and inferential statistics with the help of SPSS. The results revealed that the teachers perceived DPLCs to be highly beneficial, particularly in improving access to expert colleagues, saving travel time, enhancing flexible scheduling and enabling reflective collaboration through recorded sessions, while unstable internet connectivity, time constraints and inadequate training were identified as major challenges. The results also revealed strong positive correlation between perceived benefit and willingness to participate in future DPLCs (r =.54) and moderate negative correlations between perceived challenges and perceived benefit (r =- .42) and perceived challenges and willingness to participate in future DPLCs (r = –.36). When the groups were compared, male teachers reported significantly greater perceived benefits than female teachers (p = .02). Furthermore, teachers in the rural areas significantly reported facing more challenges than those in urban areas (p = .007). However, no notable differences were found based on teaching experience or subjects taught. These results underscore the need to improve digital infrastructure, offer targeted training, and adopt hybrid PLC models to ensure equitable professional learning across diverse educational contexts in Ghana.

KEYWORDS: digital professional learning communities, teacher engagement, digital PLCs, Ghana, secondary education, technology integration

1.0 INTRODUCTION

Professional Learning Communities (PLCs) are widely recognised as effective frameworks for supporting continuous teacher development through collaboration, shared practice, and reflective dialogue (Yoo & Jang, 2022; Bates et al., 2016; Gonzalez, 2022). In situations where regular in-person meetings are challenging due to scheduling, travel, or resource limitations, digital PLCs provide a flexible and increasingly useful alternative for traditional in-person models (Clark et al., 2023; Liu et al., 2024; Wang et al., 2023).

In the context of this study, digital PLCs are groups of teachers who collaborate on their professional development using digital tools, such as synchronous platforms like Zoom and Google Meet and asynchronous platforms like WhatsApp, Telegram, and Google Classroom. Teachers can use these tools to remotely access expert resources, reflect on their practice, and co-plan lessons. Additionally, through continuous engagement, they improve teaching quality, expand school-to-school networks, and foster professional discourse (Liu et al., 2024; Wang et al., 2022).

Most of the PLC research conducted in Ghana has concentrated on conventional, in-person models, especially in primary schools. For instance, Kankpog et al. (2024) carried out a qualitative case study of 20 district improvement officers, teachers, and headteachers in the Tamale Metropolis. According to them, PLCs greatly improved teachers' subject-matter expertise, professional competencies, and collaborative practices, which improved the outcomes of professional development. Dampson (2021) assessed the application of PLC in five areas from the standpoint of socio-cultural theory and found that, except for shared leadership, PLC activity levels were generally low. He also discovered that demographic factors like age, gender, and years of experience had a significant impact on teachers' participation in PLC activities. Amponsah (2023) also found that successful PLCs were associated with greater classroom effectiveness and teacher openness to teaching change; crucially, this relationship was entirely mediated by teachers' positive attitudinal change.

Despite the scarcity of empirical research conducted on virtual or digitally mediated PLCs, specifically at the SHS level, the aforementioned studies indicate increasing interest in PLCs in Ghana. While Departmental Professional Learning Communities (DPLCs) have been experimented with in SHSs by national initiatives such as T-TEL and the Ghana Society for Education Technology (GSET) (GES/T-TEL, 2023; GSET, 2024), empirical evidence on the attitudes, challenges, and preparedness of SHS teachers to embrace digital PLCs is scarce. Above all, such DPLCs have not entailed synchronous (real-time) or asynchronous (distance) sessions but, instead, face-to-face departmental meetings in which teachers co-construct plans with the help of digital tools. Due to ongoing infrastructure shortages, differential access to the internet, and varying levels of digital literacy in school settings in Ghana, it is particularly important to know how teachers understand and respond to digital PLCs.

This study fills this knowledge gap by investigating how SHS teachers in Ghana's Central Region perceive digital PLCs. It focuses on three main constructs: perceived benefits, perceived challenges, and willingness to take part in future digital PLCs. Additionally, it examines the

relationships between these constructs and provides guidance for creating inclusive, situation-specific professional learning models.

1.1 Literature Review

1.1.1 Theoretical Framework: Communities of Practice (CoP)

This study is based on Wenger's (1998) Communities of Practice (CoP) theory where learning is seen to take place through social interaction between people who have a common vocation or mission. People in these communities learn by ongoing mutual interaction with one another over a period of time — exchanging ideas, resources, and co-construction of meaning through joint practice and shared accountability. Belongingness, common purposes, and participation are fundamental to how individuals form and develop professionally.

Digital PLCs, in this research, can be understood as extensions of CoPs in the digital era. With Zoom, WhatsApp, and group online documents, teachers today have the means to collaborate and deliberate with one another even when distance separates them. Thus, digital leanring environments will enable Ghanaian SHS teachers to engage, assist one another, and engage in professional conversation in ways that reflect the conditions of typical CoP.

This model is particularly helpful since teacher development is increasingly taking place virtually. CoP not only describes what attracts teachers to digital PLCs, for example, purpose or peer support, but also what could deter them, for example, poor institutional support or slower internet connectivity.

In sum, Wenger's theory provides a useful model for considering how teachers engage in digital PLCs and what needs to be there in order for those communities to flourish. Teachers can still collaborate, reflect, and develop a shared professional culture when they are distant from one another — all of which are key to extended, deep learning.

1.1.2 PLCs: Global Perspectives

PLCs are widely recognised as collaborative structures that support ongoing teacher development through reflective dialogue and shared inquiry (DuFour & Eaker, 2009; Christensen & Jerrim, 2025). In practice, these communities involve structured sessions where teachers analyse student work, co-plan lessons, and engage in pedagogical reflection to improve instructional quality (Asterhan & Lefstein, 2024; Hendrickx et al., 2025). Over time, PLCs have evolved from informal professional networks into institutionalised frameworks embedded in school improvement efforts across various educational contexts (Christensen & Jerrim; Mydin et al., 2024).

1.1.3 Benefits of Digital PLCs

Bringing digital technology into PLCs has opened up new opportunities for teachers to connect and learn, especially when meeting in person is not always possible. For example, a study in the Netherlands found that teachers who participated in digital PLCs gained useful knowledge and appreciated being exposed to ideas from other schools, even though they faced some challenges along the way (Prenger et al., 2019). Similarly, Clark et al. (2023) showed that university lecturers who participated in digital PLCs built stronger professional networks across departments and felt these connections helped improve their teaching practices.

Adding to this body of work, Xia et al. (2025) explored a blended professional development model called Lesson Study with Video Clubs (LSVC), which combined face-to-face and online components. The model helped teachers with different levels of experience learn together by using video-supported reflection and collaboration. Their research showed that when teachers are given the tools to work together both in real time and on their own schedules, they are more likely to stay engaged and grow professionally. This points to how useful digital PLCs can be, not just for convenience, but for building stronger professional communities where teachers share, reflect, and learn from one another (Xia et al., 2025; Prenger et al., 2019; Clark et al., 2023).

1.1.4 Barriers to Digital PLCs Implementation

Despite the increasing interest in digital PLCs, implementation challenges persist in many educational contexts. Teachers in under-resourced environments usually face infrastructural challenges such as low-quality internet connectivity, power outages, and a lack of appropriate digital equipment (Dube, 2020; Mustafa et al., 2024). These problems disproportionately occur in rural schools, thus perpetuating existing educational inequalities. Teachers may also lack adequate digital literacy, demonstrate low self-efficacy in performing tasks via digital or online platforms, and receive limited institutional facilitation for virtual collaboration (Sehar & Alwi, 2023).

In Ghana, digital participation in PLCs is still shaped by uneven access to basic infrastructure. It is challenging for teachers working outside of major cities to participate effectively in digital PLCs because of issues like inconsistent internet, power outages, and restricted access to digital resources (Adarkwah, 2021). Adding to this picture, Appianing (2025) noted that science teachers in junior high schools in semi-urban areas had difficulties not only with infrastructure but also with their confidence in using digital tools. While some urban-based teachers found it easier to integrate ICT into their teaching, those in less-resourced areas frequently had to share devices or work around unstable networks. These day-to-day challenges make it harder for teachers in rural or semi-urban schools to take full advantage of digital PLCs, highlighting the need for more targeted and context-sensitive support.

In Ghana, the Ghana Society for Education Technology (GSET, 2024) has raised concerns about how teachers use digital tools in their daily practice. Although many Senior High School (SHS) teachers rely on platforms like Google Docs and WhatsApp for lesson planning and communication, GSET notes that the use of these tools often stays at a basic level. For instance,

teachers may use shared templates without fully engaging with their content or adapting them to promote student understanding. This points to a wider issue: while digital access is improving, deeper forms of collaboration—like joint lesson design, reflective dialogue, or peer mentoring, which are common in well-functioning digital PLCs—are still lacking. According to GSET, limited digital pedagogy training and the absence of structured support make it difficult for many teachers to move beyond routine use of technology.

Furthermore, organisational and cultural expectations of conventional face-to-face professional development continue to shape perceptions of what constitutes "legitimate" or "valuable" learning. Without strong leadership support or institutional endorsement, teachers may view digital PLCs as optional or secondary to mandated in-person sessions. Even in schools where teachers have basic access to digital resources and internet connectivity, several important barriers still thwart active engagement in digital PLCs. Evidence indicates that simply installing infrastructure on the ground does not automatically translate to its actual application in classrooms. Factors such as unstable internet, shared devices, and the lack of continuous training frequently block full engagement (Li, 2025; Miras et al., 2023).

In Sub-Saharan Africa, efforts to integrate digital tools into schools continue to face major obstacles. In a recent study, Ahiaku et al. (2025) described how teachers in rural schools regularly experience problems like power cuts, poor network access, and limited availability of reliable devices. These conditions make it difficult for teachers to rely on digital platforms for instruction or collaboration. Mitchell et al. (2024) also point out that teacher training systems across the region often receive limited funding, which means many teachers are left without the support they need to engage fully with digital methods. Together, these issues highlight the gap between having digital tools available and being able to use them effectively. Without steady investment in infrastructure and teacher support, it is hard to see how digital PLCs can be sustained in the long term.

1.1.5 Teacher Characteristics and Engagement with Digital PLCs

Apart from infrastructure and training, teachers' individual characteristics also impact digital PLC engagement. Pre-service exposure, age, urban–rural school sites, and digital tool knowledge determine a teacher's capacity and readiness to participate in digital PLCs (Kearney et al., 2019; Ottenbreit-Leftwich et al., 2018). For example, urban teachers typically have better access to infrastructure and higher self-efficacy in utilising digital PLCs than their rural counterparts (Appianing, 2025; Asante, 2025). Urban schools often benefit from more stable electricity, better network coverage, and more frequent exposure to digital initiatives, whereas rural teachers often contend with shared devices, intermittent connectivity, and limited institutional support for digital professional learning.

Amponsah (2023) and Dampson (2021) further argue that subject specialisation and teaching experience are important factors in shaping teacher engagement with professional development programmes, including PLCs. Teachers in STEM disciplines often express a greater need for structured support in using digital platforms for collaboration compared to teachers in humanities

subjects, who may find such platforms more adaptable to their existing routines. Moreover, older or more experienced teachers may demonstrate greater resistance to adopting new technologies, often requiring more hands-on, differentiated digital literacy training than their younger peers.

Research shows that teachers' willingness to participate in digital PLCs depends not only on perceived benefits or individual skill, but also on contextual limitations, such as lack of time, absence of school-wide norms around virtual collaboration, and insufficient institutional validation. For example, a South African study of newly qualified teachers found frequent complaints about teaching workloads, travel demands, and meeting overloads, which caused many to disengage or drop out of PLCs (Mabunda & McKay, 2024). Similarly, in Ghana's Builsa South District, quantitative analysis revealed that time constraints, absence of leadership encouragement, and teacher resistance were significant predictors of low willingness to participate in PLC (Suglo et al., 2024). Thus, understanding these individual and contextual differences is essential for designing inclusive and responsive digital PLC models that cater to the diverse needs of Ghanaian SHS teachers.

These individual and contextual factors suggest that digital PLC experiences may vary across different teacher sub-groups. It was for this reason that one of the research questions was designed to assess whether SHS teachers' perceived benefits, challenges, and willingness to participate in digital PLCs differ significantly by gender, years of teaching experience, school location, or subject taught.

1.2 Conceptual Framework

Figure 1 illustrates the conceptual framework that underpins this study, which is informed by Wenger's (1998) CoP theory. This theory provides a solid basis for investigating digital PLCs because it places a strong emphasis on collaborative learning, shared purpose, and mutual engagement. Three main constructs form the framework: teachers' willingness to participate in future digital PLC activities, perceived advantages of taking part in digital PLCs, and perceived obstacles to participation.

It is hypothesised that perceived benefits will have a positive association with willingness to participate, whereas perceived challenges will exhibit a negative association with willingness to engage in future digital PLCs. An inverse relationship may also exist between perceived benefits and perceived challenges, such that greater challenges are linked with lower perceived benefits and vice versa.

The study employed correlational analysis to investigate these relationships empirically. By using this method, the researcher was able to assess the strength and direction of the relationships between the constructs, offering quantitative information about the factors that encourage and discourage teachers from participating in digital PLCs. These interrelationships directly informed the research question, which assessed how these constructs are statistically related.
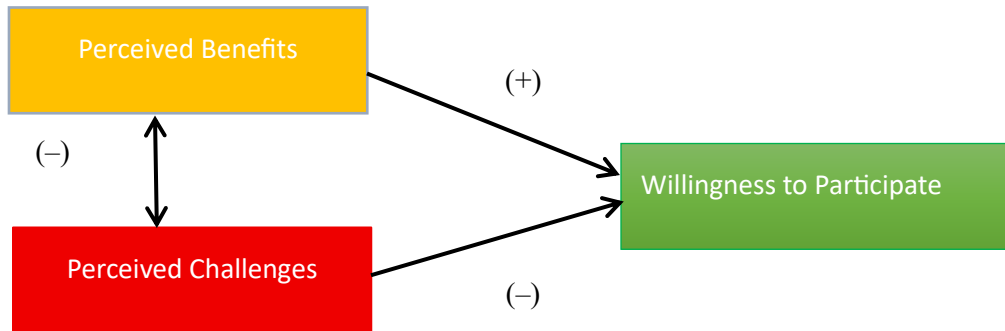
Figure 1: Conceptual Framework of the Study

1.3 Gaps in the Existing Literature

Based on the literature reviewed and the conceptual framework, which was informed by Wenger's (1998) CoP theory, the current study sought to fill the existing gaps in the knowledge base about Ghanaian SHS teachers' perception and engagement with digital PLCs. While earlier research has revealed the potential along with the challenge of digital professional development, particularly in less-resourced contexts, few empirical studies have examined the relationships among perceived benefits, challenges, and willingness to engage in digital PLCs nor investigated how these factors differ across teacher subgroups. To guide this study, the following research questions were crafted:

1. What are SHS teachers' perceptions of the benefits of digital professional learning communities (PLCs)?
2. What challenges do SHS teachers face when engaging in digital PLCs?
3. To what extent are SHS teachers willing to participate in digital PLCs in the future?
4. What is the relationship between perceived challenges, perceived benefits and teachers' willingness to participate in future digital PLCs?
5. Do SHS teachers' perceived benefits, challenges, and willingness to participate in digital PLCs differ significantly by gender, years of teaching experience, school location, or subject taught?

2.0 METHODS

2.1 Research Design

The study used a cross-sectional descriptive survey design to gather data from SHS teachers in the Central Region of Ghana. Data were collected at a single point in time to understand their views on the benefits and challenges of digital PLCs, as well as their willingness to participate in them in the future. This design was appropriate for exploring relationships among variables without manipulating them, and it allowed the researcher to describe patterns across a diverse group of teachers at one moment in time. Unlike experimental designs, it did not manipulate variables but rather focused on answering "what is" rather than "why" (McCombes, 2023).

2.2 Participants

The study involved 76 SHS teachers from the Central Region of Ghana who voluntarily responded to an online survey. Participants were 54 males (71 %) and 22 females (29 %). In terms of teaching experience, 51.3% had more than 10 years, 34.2% had between 6 and 10 years, and 14.5% had 1 to 5 years of teaching experience. These subjects were taught by the teachers, including science (23.7%), arts (22.4%), ICT (14.5%), business (13.2%), mathematics (11.8%), and others (14.4%). The distribution illustrates both the subject range and gender-disbalanced enrolment characteristics in most Ghanaian SHSs.

2.3 Sampling Procedure

A voluntary sampling technique was employed, allowing teachers to opt into the study based on interest and accessibility. This method is especially suited to apply in internet-based research, where motivation and convenience among the participants are bound to influence response tendencies (Etikan et al., 2016; Jager et al., 2017). Though voluntary response sampling generates self-selection bias, in this study, it was found to be suitable due to its exploratory nature and logistical constraints of acquiring information from a distance. Thus, giving participants an opt-in opportunity ensured ethical flexibility and still allowed the study to gather valuable information from teachers with a genuine interest in digital PLCs.

2.4 Instrumentation and Data Collection Procedures

The survey was developed by the researcher after a systematic review of existing studies on PLCs. The survey was divided into four main sections; each aimed at collecting information that aligned with the focus of the study. The first section was on demographic data, focusing on gender, years of teaching experience, school location and subject taught. This provided the background necessary to contextualise subsequent responses and examine how teacher characteristics might relate to their perceptions of digital professional learning. The second section assessed perceived benefits by teachers of digital PLCs. This was an eight-item Likert scale with statements like "Technology-enabled PLCs improve my teaching practice," and rated on a 1 (Strongly Disagree)

to 4 (Strongly Agree) scale. The scale was found to be very internally consistent with a Cronbach's alpha of .88.

The third section focused on the challenges in participating in digital PLCs. Six Likert items were employed to measure issues such as internet unreliability and digital competence, one of which was reverse-coded. Items were rated on a 5-point scale; the scale was also found to be reliable with a Cronbach's alpha of .70. The fourth section centred on teachers' willingness to participate in future digital PLCs. The construct was measured with seven positively worded items, including "I would participate in a digital PLC if given the opportunity," which were rated on a 4-point Likert scale. Internal consistency for this scale was excellent, with a Cronbach's alpha of .87.

The data collection was done with the help of an online questionnaire using Google Forms. Professional networks such as WhatsApp teachers' groups and email circulation lists were accessed to forward questionnaires with the assistance of school administrations. Participation in the survey was completely voluntary, and confidentiality and anonymity of the respondents were ensured. Prior to starting the survey, participants were provided with an informed consent statement outlining the study's purpose, their rights, and data handling procedures.

2.5 Ethical Considerations

Participants were told what the study was about and what it would involve before they filled out the online survey. They gave their permission by ticking a box online. No one was forced to take part. The study followed basic research ethics to protect the participants. To protect privacy, no identifying details were collected, and all responses were kept anonymous and confidential. Participants' data were stored safely on password-protected devices accessible only to the researcher and were utilised for scholarly purposes. By following such ethical codes of conduct, the study sought to ensure the protection of participants' rights, privacy, and well-being throughout the research process.

2.6 Data Analysis

Quantitative data collected through the online survey were analysed using IBM SPSS Statistics Version 27. Descriptive and inferential statistical techniques were used to address the study's five research questions. Descriptive statistics (means, standard deviations, and frequencies) were computed to summarise participants' demographic characteristics and responses to the three Likert-type scales: Perceived Benefits of digital PLCs, Perceived Challenges, and Willingness to Participate in future digital PLCs.

To facilitate interpretation of the results, scale responses were analysed following established guidelines. For the 4-point Likert scales (Perceived Benefits and Willingness), the mean scores were interpreted following Boone and Boone (2012) and Joshi et al. (2015) guidelines: 1.00–1.49 = Strongly Disagree; 1.50–2.49 = Disagree; 2.50–3.49 = Agree; 3.50–4.00 = Strongly Agree. In the part of the survey that looked at perceived challenges, a 5-point Likert scale was used. To help

make sense of the 5-point scale used in the challenges section, the scores were grouped into categories adapted from Vagias (2008). A score close to 1 meant the issue was not really a challenge at all, while scores near 5 pointed to a very severe challenge. In between, the ranges were labelled as minor, moderate, or serious challenges, depending on where they fell.

To explore how the main variables were related, the study used Pearson correlation. This analysis helped show whether there were any relationships between perceived benefits, perceived challenges, and willingness to join digital PLCs (Research Question 4). To make sense of the strength of these relationships, the study used Cohen's (1988) guidelines. Correlation values between .10 and .29 were taken as weak, those from .30 to .49 as moderate, and anything .50 or above as strong. A positive correlation meant that both variables increased together, while a negative one showed that as one goes up, the other goes down. Independent-samples t-tests were also used to examine differences based on gender and school location (Research Question 5). One-way analyses of variance (ANOVA) were conducted to assess differences in the key variables across subject taught and years of teaching experience (also part of Research Question 5).

3.0 RESULTS

3.1 Research Question 1: What are SHS teachers' perceptions of the benefits of digital professional learning communities (PLCs)?

Descriptive statistics were used to analyse teachers' perceptions of the benefits of digital PLCs. The results revealed generally positive attitudes, with a mean score of 3.53 (SD = 0.67) on a 4-point Likert scale. Most of the items possess mean scores above 3.50, reflecting high agreement with the benefits. In particular, high means were found on items like "Using technology for PLCs allows for more flexible scheduling" (M = 3.63, SD = 0.59) and "The option to record PLC sessions helps me revisit discussions" (M = 3.61, SD = 0.64). Descriptive statistics for all items related to a benefit are given in Table 1.

Table 1: *Descriptive Statistics for Perceived Benefits of Digital PLCs (N = 76)*

Statement	M	SD
Using technology for PLCs allows for more flexible scheduling	3.63	0.59
Digital PLCs improve access to expert colleagues	3.59	0.62
Digital platforms make sharing teaching resources easier	3.45	0.68
Digital PLCs save travel time and costs	3.55	0.70
The option to record PLC sessions helps me revisit discussions	3.61	0.64
Digital PLCs strengthen collaboration among teachers	3.43	0.74
Participating in a digital PLC increases my motivation	3.47	0.72
Technology-supported PLCs enhance my instructional practice	3.54	0.66
Scale Mean	**3.53**	**0.67**

Note. Items were rated on a 1 (Strongly Disagree) to 4 (Strongly Agree) scale. *M = Mean; SD = Standard deviation.*

The overall results indicate that the SHS teachers view digital PLCs as being very useful, including flexible scheduling, the ability to replay recorded sessions and the opportunity to collaborate with subject matter experts.

3.2 Research Question 2: What challenges do SHS teachers face when engaging in digital PLCs?

Descriptive statistics were also employed to examine the challenges teachers face in participating in digital PLC. Table 2 presents the mean scores and standard deviations for all individual items on the perceived challenges scale. The mean score on the perceived challenges scale was 3.58 (SD = 0.80) on a 5-point Likert scale, indicating that most of the teachers agreed that there are challenges that impede their continued participation.

The biggest issue, not surprisingly, was access to the internet. The highest mean score (M = 4.47, SD = 0.60) for the statement "Unstable internet connection prevents me from participating in digital PLCs" came with high levels of agreement from participants. This indicates persistent infrastructure problems at those schools that are less funded or have less reliable internet connectivity. Time was another big concern. The response "I frequently do not have time to participate in digital PLCs because of other commitments" had a relatively high mean score (M = 3.86, SD = 0.71), indicating most teachers report having too much to do and could not find time to include digital collaboration in their schedules.

The third concern was regarding confidence with digital tools. The "I find it difficult to use the digital tools required for digital PLCs" scale scored 3.61 (SD = 0.79), indicating moderate agreement. This indicates the need for more specialised digital training and support to enable ease of use by teachers. Surprisingly, the statement that "Digital PLCs do not feel as interactive as face-to-face meetings" received the lowest mean score (M = 2.78, SD = SD = 0.84). This lower score may suggest that many teachers are becoming more used to digital platforms and feel increasingly comfortable using them. As a result, the lack of face-to-face interactivity may not be as much of a concern as it once was.

Overall, the average score of 3.58 indicates that while not all challenges are perceived as severe, there is a clear consensus that infrastructural, institutional, and time-related constraints are significant barriers to effective participation in digital PLCs. These findings highlight the importance of addressing both technical and organisational support systems to enhance the effectiveness and inclusiveness of digital PLCs.

Table 2: *Descriptive Statistics for Challenges in Participating in Digital PLCs (N = 76)*

Statement	M	SD
Unstable internet connection hinders my participation in digital PLCs	4.47	0.60
I find it difficult to use the digital tools required for digital PLCs	3.61	0.79
I often lack the time to engage in digital PLCs due to other responsibilities	3.86	0.71
I do not receive adequate support from school leadership for digital PLCs	3.29	0.95
Digital PLCs do not feel as interactive as face-to-face meetings (reverse-coded)	2.78	0.84
I am not always confident in contributing during digital PLC sessions	3.46	0.88
Scale Mean	**3.58**	**0.80**

Note. Items were rated on a 1 (Strongly Disagree) to 5 (Strongly Agree) scale. Item 5 was reverse-coded.
PLC = Professional Learning Community; M = Mean; SD = Standard deviation.

3.3 Research Question 3: To what extent are SHS teachers willing to participate in digital PLCs in the future?

The teachers' willingness to participate in future digital PLCs was assessed via descriptive statistics. The results were very encouraging, with an overall mean score of 3.48 (SD = 0.71) on a 4-point Likert scale, suggesting a high level of willingness among respondents. Statements like "I would participate in a digital PLC if given the opportunity" (M = 3.58, SD = 0.66) and "I am willing to learn new digital tools to join digital PLCs" (M = 3.57, SD = 0.68) recorded very high mean scores. The results show a strong interest among the teachers towards future participation and being open to learning the necessary digital competencies so that they can contribute meaningfully to digital PLCs. Table 3 shows the mean scores and standard deviations of the willingness to participate in future digital PLCs scale items.

Table 3: *Descriptive Statistics for Willingness to Participate in Future Digital PLCs (N = 76)*

Statement	M	SD
I would participate in a digital PLC if given the opportunity	3.58	0.66
I believe digital PLCs can help improve my teaching	3.55	0.61
I am likely to recommend digital PLCs to colleagues	3.49	0.72
I would participate even if not mandated by GES	3.39	0.77
I prefer digital PLCs over face-to-face PLCs	3.31	0.81
I am willing to learn new digital tools to join digital PLCs	3.57	0.68
I would make time to join a digital PLC during the term	3.44	0.74
Scale Mean	**3.48**	**0.71**

Note. Items were rated on a 1 (Strongly Disagree) to 4 (Strongly Agree) scale.
PLC = Professional Learning Community; GES = Ghana Education Service; M = Mean; SD = Standard deviation.

On the other hand, the item, "I prefer digital PLCs to face-to-face PLCs" (M = 3.31, SD = .081) received the lowest mean; However, this is quite high on the 4-point scale. This indicates that while most teachers are willing to engage with digital PLCs, some still greatly appreciate the real-time communication and relational aspects of face-to-face PLCs. Overall, the results point to a promising future for the adoption of digital PLCs, with teachers indicating willingness to be engaged and the desire to work to develop skills necessary for genuine PLC engagement.

3.4 Research Question 4: What is the relationship between perceived benefits, perceived challenges, and teachers' willingness to participate in future digital PLCs?

Pearson's correlation test was conducted to examine the relationships among the key study variables– perceived benefits, perceived challenges, and willingness to participate in future digital PLCs. The results of the correlational analyses are presented in Table 4.

Table 4: Pearson Correlations Between Study Variables (N = 76)

Variable	1. Perceived Benefits	2. Perceived Challenges	3. Willingness to Participate in Future PLCs
1. Perceived Benefits	–		
2. Perceived Challenges	−.42**	–	
3. Willingness to Participate in Future PLCs	.54**	−.36**	–

Note. p < .01 (2-tailed); *PLC = Professional Learning Community. Correlations represent Pearson product–moment coefficients.*

The correlational analysis revealed a strong positive correlation between perceived benefits and willingness to participate in future digital PLCs (r = .54, p < .01), suggesting that teachers who recognised greater value in digital PLCs were significantly more likely to express interest in future participation. Perceived challenges and willingness to participate in future digital PLCs were moderately negatively correlated (r = -.36, p <.01), suggesting that willingness to participate in future digital PLCs decreases as perceived challenges increase. Additionally, a moderate negative correlation was also observed between perceived challenges and perceived benefits (r = –.42, p <.01), such that those teachers experiencing more challenges were also less likely to experience benefits in digital PLCs. This indicates that the perceived benefits decrease as perceived challenges rise.

Overall, these results indicate that perceived benefits is a stronger predictor of teachers' willingness to participate in future digital PLCs than perceived challenges. However, the statistically significant moderate negative correlations with perceived challenges underscore that infrastructural and technical challenges remain influential and must be addressed to improve teacher engagement in digital PLCs.

3.5 Research Question 5: Do SHS teachers' perceived benefits, perceived challenges, and willingness to participate in future digital PLCs differ significantly by gender, teaching experience, school location, or subject taught?

To examine whether teachers' perceptions differed by demographic factors, independent-samples *t*-tests (for gender and school location) and one-way ANOVAs (for subject taught) were conducted on the three key variables: Perceived Benefits of Digital PLCs, Perceived Challenges to Participation, and Willingness to Participate in future digital PLCs. Table 5 and Table 6 present the descriptive statistics and test results for gender and location comparisons, respectively, while Table 7 summarises the ANOVA results for subject-area differences.

Gender: Male teachers reported significantly higher perceived benefits of digital PLCs than female teachers (M = 3.65 vs. 3.35 on a 4-point scale), $t(74) = 2.38$, $p = .02$, (Cohen's $d = 0.55$, moderate effect). This moderate effect suggests that male teachers, on average, viewed digital PLCs as more beneficial. By contrast, gender showed no significant influence on perceived challenges or on willingness to participate in future digital PLCs (both $p > .05$). Female teachers reported slightly higher challenge scores and similar willingness levels to male teachers, but these gaps were not statistically significant.

Table 5: *Gender Differences in Perceived Benefits, Perceived Challenges, and Willingness to Participate in Future Digital PLCs (N = 76)*

Variable	Male (n = 42) M (SD)	Female (n = 34) M (SD)	$t(74)$	p	Cohen's d
Perceived Benefits	3.65 (0.50)	3.35 (0.60)	2.38*	.02	0.55
Perceived Challenges	3.50 (0.80)	3.70 (0.80)	−1.08	.28	0.25
Willingness to participate in future PLCs	2.60 (0.70)	2.55 (0.70)	0.31	.76	0.07

Note. Higher scores indicate greater agreement with each scale. p < .05.
PLC = Professional Learning Community; M = Mean; SD = Standard deviation.

School Location: A clear location-based difference emerged for perceived challenges. Rural teachers reported significantly greater challenges to participating in digital PLCs (M = 3.90) than urban teachers (M = 3.40), $t(74) = –2.80$, $p = .007$, $d = 0.68$. The results point to a noticeable gap between urban and rural schools when it comes to infrastructure and support—a medium-to-large effect that underscores ongoing disparities (see Table 6).

Table 6: *Urban–Rural Differences in PLC Perceptions (N = 76)*

Variable	Urban (n = 50) M (SD)	Rural (n = 26) M (SD)	$t(74)$	p	Cohen's d
Perceived Benefits	3.55 (0.60)	3.45 (0.70)	0.65	.52	0.16
Perceived Challenges	3.40 (0.80)	3.90 (0.60)	−2.80**	.007	0.68
Willingness to participate in future digital PLCs	2.65 (0.70)	2.50 (0.60)	0.93	.36	0.22

Note. p < .01. Higher scores reflect greater agreement or higher perceived challenges.
PLC = Professional Learning Community; M = Mean; SD = Standard deviation.

Interestingly, though, where a teacher was located did not seem to influence how they viewed the benefits of digital PLCs or their willingness to take part in future digital PLCs ($p > .05$ in both cases). This indicates that regardless of the variation of resources, both urban and rural teachers had similar attitudes towards the benefits and future use of digital PLCs.

Subject Taught: Teachers' perceptions of digital PLCs were generally consistent across different subject areas. A one-way ANOVA revealed no significant differences in perceived benefits, perceived challenges, or willingness to participate in future PLCs based on the subjects they taught (all $p > .05$). Mean scores across disciplines remained moderately high, and the effect sizes were small (partial $\eta^2 \approx .02-.05$), indicating that subject specialization had little influence on how teachers experienced or valued digital PLCs (see Table 7).

Table 7: Differences in PLC Perceptions by Subject Taught (N = 76)

Variable	Math/Sci (n=21) M (SD)	Bus/Soc (n=15) M (SD)	Lang (n=11) M (SD)	Tech/Voc (n=9) M (SD)	Other (n=20) M (SD)	F	p	η^2
Perceived Benefits	3.6 (0.50)	3.5 (0.60)	3.3 (0.55)	3.8 (0.50)	3.5 (0.60)	0.95	.44	.05
Perceived Challenges	3.6 (0.80)	3.7 (0.70)	3.6 (0.80)	3.2 (0.70)	3.6 (0.80)	0.70	.59	.04
Willingness to participate in future digital PLCs	2.6 (0.60)	2.5 (0.70)	2.4 (0.60)	2.7 (0.60)	2.7 (0.60)	0.40	.81	.02

Note. No statistically significant differences were found between subject groups (p > .05).
Math/Sci = Mathematics/Science; Bus/Soc = Business/Social Studies; Lang = Languages; Tech/Voc = Technical/Vocational.
PLC = Professional Learning Community; M = Mean; SD = Standard deviation; η² = partial eta squared.

Years of Teaching Experience: Although the detailed results are not displayed in a tabular form, the analysis revealed that years of teaching experience had no statistically significant influence on perceived benefits, perceived challenges, or willingness to participate in future digital PLCs. Teachers with varying lengths of service (from novices to veteran teachers) reported similar levels of perceived benefits, similar challenges, and comparable willingness to participate in future digital PLCs. These results indicate that teaching experience may not be a critical factor influencing attitudes or readiness towards digital PLC participation.

In sum, apart from the gender difference in perceived benefits and the location difference in perceived challenges noted above, no other demographic differences were statistically significant in influencing teachers' perceptions or their willingness to engage in future digital PLCs.

4.0 DISCUSSION

This study examined SHS teachers' perceived benefits, perceived challenges, and willingness to engage in digital PLCs in the future. Grounded in the Communities of Practice (CoP) theory, the findings contribute to understanding how digital modalities can enhance professional learning among teachers, particularly in resource-constrained settings such as Ghana.

4.1 *Perceived Benefits of Digital PLCs*

The study found that the SHS teachers perceived a wide range of benefits associated with participating in digital PLCs. These include the fact that digital PLCs promote collaboration, enhance instructional planning, and offer opportunities for flexible professional interaction. These benefits are especially significant in settings like Ghana, where access to in-person training may be limited by geography, time, or cost. Teachers viewed digital PLCs as a platform to connect with peers, exchange ideas, and gain new insights to improve their teaching practice.

These findings align with existing studies that have suggested that digital PLCs facilitate peer learning, resource sharing, and curriculum planning through both synchronous and asynchronous modes (Bates et al., 2016; Clark et al., 2023; Xia et al., 2025; Christensen & Jerrim, 2025). These more recent studies emphasise how hybrid digital PLC models and cross-institutional engagement help teachers to co-develop instructional strategies and sustain collaborative reflection, even across school boundaries.

4.2 *Perceived Challenges in Participating in Digital PLCs*

Despite the potential of digital PLCs, the SHS teachers reported familiar issues such as inconsistent school-based connectivity, inadequate digital skills, and a lack of time. These findings are in line with previous research emphasising infrastructure and digital literacies as major concerning factors in low and middle-income nations (GSET, 2024; Suglo et al., 2024). As expected, the school location did contribute significantly to the number of challenges reported, evidencing a perceived urban–rural digital divide that may limit equal access to digital PLC participation.

4.3 *Willingness to Engage and Interrelationships Between Constructs*

Most teachers in the study showed a clear willingness to take part in future digital PLCs. The data revealed a pattern: those who saw more benefits in digital PLCs were more inclined to participate, while those who perceived more challenges tended to be less willing. This shows how important it is to help teachers see the value of digital PLCs while also working to reduce the barriers that can make it hard for them to take part.

When teachers believe that digital PLCs will genuinely help them grow in their profession—and when things like poor internet or packed schedules are not in the way—they are more likely to stay involved. That calls for better access to devices and connectivity, hands-on training, and practical examples of what digital collaboration looks like in action. Similar issues have been raised in other studies from Ghana and parts of Africa, where challenges such as weak leadership support, heavy teaching loads, and unfamiliar digital tools often lead teachers to lose interest in virtual or online collaboration (Suglo et al., 2024; GSET, 2024; Mitchell et al., 2024).

4.7 *Demographic Patterns in Teachers' Perceptions and Engagement*

The results of this study revealed that most demographic characteristics did not strongly influence how the SHS teachers perceived digital PLCs. However, there were two clear exceptions: gender and school location. In terms of gender, male teachers tended to report slightly greater appreciation for the benefits of digital PLCs than their female colleagues. This might be linked to differences in exposure to or confidence with digital tools. Indeed, recent research from Ghana and comparable settings shows that male teachers often report higher digital literacy or more confidence in using ICT (Adeoye, 2023; Mathrani et al., 2023). That said, gender did not appear to influence the kinds of challenges teachers faced or their willingness to take part in future PLCs. This suggests that, as long as the necessary support and resources are in place, both male and female teachers are just as likely to embrace digital collaboration.

Location had a stronger influence, particularly on perceived challenges. Rural teachers reported significantly more challenges than their urban counterparts, especially in the areas of internet access, high workloads, and limited digital skills. This underscores the continuing digital divide in education—a pattern consistently reported in rural–urban comparisons across sub-Saharan Africa (Appianing, 2025; Adeoye, 2023). Despite these obstacles, rural and urban teachers showed similar levels of willingness and perceived benefits, suggesting broad enthusiasm for digital PLCs across different school settings.

No significant differences were found based on the subject taught or years of teaching experience. Teachers from various disciplines—whether STEM, humanities, or vocational—shared comparable views and levels of engagement. This indicates that strategies promoting digital PLCs do not need to be heavily tailored by subject area. The findings of this study reflect the ideas behind Wenger's (1998) Communities of Practice theory, which emphasises learning through shared goals, active involvement, and collaboration. When teachers recognise real value in digital PLCs, such as improved access to resources or support from colleagues, they are more likely to participate

and stay involved, even in virtual spaces. At the same time, the difficulties highlighted by some participants, especially those teaching in rural areas, show how unreliable internet access and a lack of support can limit involvement. For digital PLCs to work well and feel like true professional communities, all teachers need fair access and the right support to take part fully.

4.8 Practical Implications

The results of this study have policy implications for education policymakers, teacher education stakeholders, and school administrators who are trying to design effective professional learning through digital platforms in Ghana.

First, improving teacher participation in digital PLCs requires a serious investment in infrastructure and training. Teachers continue to face real barriers such as poor internet connectivity, limited digital skills, excessive workloads, and a lack of support from school leadership. These are not isolated issues but signs of deeper structural challenges that prevent many from fully engaging in digital learning spaces. To address this, the Ministry of Education, the GES, and district authorities must take practical steps. Expanding broadband access, especially in rural areas, is crucial.

Teachers also need subsidised data packages and access to shared devices to reduce the cost of participation. Equally important is digital training to help teachers feel confident using online tools. Schools should also make time within teachers' schedules for digital PLCs and provide the administrative backing to make participation possible. The GES can play a central role in institutionalising these supports by formally recognising digital PLC participation as part of teachers' professional development workloads and appraisal systems. Bridging these gaps is not just about access, but about fairness. All teachers, no matter where they work, deserve the chance to benefit from digital collaboration and professional growth.

Second, value-centred and context-sensitive professional development programmes are required. That is, training should focus on what teachers actually value in their work—practical support, relevance to their subjects, and improved teaching outcomes. Teachers' digital literacy should be enhanced, but more importantly, the visible teaching benefits of digital PLCs should be exemplified. If teachers are made aware that technology can save time, improve lesson planning, and allow for effective collaboration, they are more likely to engage voluntarily and continuously. Peer-led training and subject-domain customisation are also means of making it relevant and acceptable.

Third, the Ghana Education Service (GES) and the heads of senior high schools (SHSs) should encourage the use of well-designed hybrid PLC models, as these offer a practical and flexible way to boost teacher participation. By combining live online sessions (e.g., Zoom, Google Meet) with asynchronous platforms (e.g., WhatsApp, Google Classroom), teachers with different schedules and connectivity challenges can still engage meaningfully. This blended approach is especially

useful for teachers with heavy workloads or limited access to infrastructure, as it allows them to participate at their own pace without missing out on key interactions.

Finally, the role of school leadership is key in making digital PLCs sustainable. GES and heads of SHSs should work together to integrate digital PLCs into school improvement plans, allocate protected time for participation, and offer incentives such as certificates or career progression points. When they lead by example and make time on the school timetable for professional learning, it sends a strong message. Recognising teachers' efforts—whether through certificates, public acknowledgement during staff meetings, or reducing their workload—can encourage participation and help sustain digital collaboration over time.

4.9 Strengths, Limitations and Future Directions

This study contributes to the growing body of literature on digital professional learning in sub-Saharan Africa by offering empirical insights into how SHS teachers in Ghana engage with digital PLCs. One notable strength of the research lies in its use of a literature-informed instrument that demonstrated solid internal consistency across all three subscales: perceived benefits, perceived challenges, and willingness to participate in future PLCs. Furthermore, the study's effort to examine multiple aspects of teachers' experiences—and to test perceptions through correlational analysis—provides a more integrated picture of how digital PLCs operate within the Ghanaian educational context.

Nonetheless, the study has a few limitations. First, the sample size (n = 76), while diverse in terms of gender, teaching experience, and subject area, limits the generalisability of the findings to the broader SHS teaching population in Ghana. Second, as with many studies relying on self-reported data, there is a risk of social desirability bias, where participants may present themselves more favourably. To address this, future research could incorporate observational data or platform usage logs to triangulate what teachers say with what they actually do in the digital environment. Third, the study's cross-sectional design only provides a snapshot in time. Longitudinal research could explore how teacher attitudes and participation patterns shift as they gain more exposure to digital PLCs.

The last but not the least, this study did not investigate the influence of key contextual factors such as school leadership, institutional culture, or policy enforcement, variables that may significantly shape how digital PLCs are implemented and sustained. Future research could adopt mixed methods approaches, including interviews or focus groups, to uncover the subtle dynamics at play in different school environments. Experimental or quasi-experimental designs that measure the impact of specific digital PLC models on teaching practice and student learning would also be valuable in advancing this area of work.

4.10 Conclusion

The study examined SHS teachers' perceptions of the benefits and challenges of participating in digital PLCs, as well as their willingness to take part in such initiatives in the Central Region of Ghana. The results indicate that the teachers generally have positive attitudes towards the potential of digital PLCs to improve collaboration, save time, and support their teaching. At the same time, infrastructural issues, especially unstable internet connections and low digital literacy levels, were identified as key barriers to equal participation.

What stood out was the high number of teachers who expressed interest in future digital PLC sessions. This shows clear potential for increased uptake, provided that enabling conditions are in place. The results support the idea that digital PLCs can offer a scalable alternative to traditional professional learning, particularly in environments where face-to-face models are limited by cost, distance, or time. With adequate infrastructure, continuous professional development, and supportive school leadership, all aligned with teachers' evolving needs, digital PLCs can help make professional learning in Ghana more flexible, inclusive, and relevant.

DECLARATION

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