

Adaptive Practices in Sustaining Professional Development in the Digital Era: A Multiple Case Study of Physical Education Teachers in Rural High School

Karen D. Lampedario, Emy A. Morbo, PhD

Sultan Kudarat State University, EJC Montilla, Tacurong City

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ABSTRACT

This study investigated how Physical Education teachers sustained professional development and continuous learning in the rapidly evolving digital era. Grounded in Transformative Learning Theory, Communities of Practice, and Lifelong Learning Theory, the research examined how teachers reinterpreted experiences, engaged in collaborative and individual learning processes, and constructed meanings of lifelong learning within their professional careers. The study adopted a qualitative multiple case study design to provide an in-depth understanding of teachers' lived experiences, adaptive strategies, and contextual realities. The participants consisted of five public secondary school Physical Education teachers from the Municipality of Bagumbayan, Sultan Kudarat, who had actively participated in professional development initiatives. Data were gathered through semi-structured interviews, which allowed participants to articulate their experiences, perspectives, and practices in relation to continuous learning and professional growth. The collected data were analyzed using thematic analysis guided by Braun and Clarke's framework, with emphasis on identifying recurring themes and patterns across cases. Specifically, the analysis examined how teachers maintained professional growth, how they perceived lifelong learning as part of their teaching identity, and what contextual factors contributed to similarities and differences in their experiences. Findings revealed that teachers sustained professional development through self-directed digital learning, engagement in professional learning communities, and participation in formal and informal training activities. Institutional factors such as leadership support, access to digital resources, and school culture also influenced their capacity to adapt and grow professionally. The study provided context-specific insights that may inform the development of responsive teacher training programs, strengthen school-based professional learning structures, and guide policy initiatives aimed at enhancing continuous professional development in the digital age.

Keywords: Physical Education Teachers, Professional Development, Continuous Learning, Digital Era, Multiple Case Study

INTRODUCTION

Professional development is the iterative and continuous learning that enables teachers to continuously update their knowledge, skills, and dispositions over time. In the digital era, this process increasingly involves integrating educational technologies, curating online resources, and enacting digitally supported pedagogies. In the Philippine setting, professional growth is guided by the Philippine Professional Standards for Teachers (PPST), which frames progression across career stages and emphasizes lifelong learning.

International studies have shown that the rapid adoption of technology in physical education during and after the pandemic often outpaced teachers' preparedness and support systems. Tagimaucia et al. (2024) found that secondary PE teachers faced significant gaps in readiness, infrastructure, and professional incentives for delivering online PE. Martín-Rodríguez and Madrigal-Cerezo (2025) reviewed global technology-enhanced pedagogy and concluded that innovations such as gamification, wearables, and virtual simulations improve engagement and motor learning, yet they remain constrained by training and equity issues. Rakha (2025) further

demonstrated that active learning strategies in online PE courses can enhance teachers' instructional competence, reinforcing the importance of intentional design in teacher education.

Philippine research also underscores the evolving professional needs of PE and MAPEH educators. Tagare et al. (2025) reported that tertiary PE programs increasingly integrate digital resources and redesign pathways to better engage students, signaling an expanded skills profile for instructors. Guinto and Campoamor-Olegario (2025) emphasized how Filipino PE teachers adopted a culturally grounded PERMAH model to sustain teacher well-being and professional growth, highlighting reflective practice as essential to continuous learning. In a study with Metro Manila HEIs, teachers of PATH-Fit subjects demonstrated active use of digital tools but cited challenges in infrastructure, training, and assessment (Mata & Marasigan, 2024). Collectively, these findings indicate progress toward reflective development, although access to high-quality, context-specific professional learning remains inconsistent.

At the local level, studies reveal both innovations and challenges. Escomes et al. (2021) at Sultan Kudarat State University (SKSU) identified poor connectivity and resource shortages as primary factors affecting distance learning in PE, limiting teachers' digital practices and professional development opportunities. Ngilay and Losañes (2025) examined Muslim PE teachers' experiences in Region XII and found that they engaged in culturally responsive adaptations while addressing limited resources, which fostered reflective problem-solving. Similarly, Magno and Morbo (2025) developed and validated taekwondo instructional videos at SKSU, providing evidence of locally produced digital resources that can enhance teacher learning and practice.

The purpose of this study was to explore how Physical Education teachers in Sultan Kudarat experienced and sustained continuous learning in the digital era. The study sought to document teachers' reflections on opportunities and challenges related to technology-supported instruction, strategies for aligning digital pedagogy with the PPST, and contextual factors such as cultural practices, infrastructure, and organizational support. Further, the study intended to inform school- and division-level professional development programs, contributed to scholarship on reflective practice in digital PE and MAPEH, and provided evidence-based recommendations for equitable and context-sensitive professional growth.

RESEARCH QUESTIONS

1. How do teachers maintain professional growth in a rapidly changing technological environment?
2. How do they perceive lifelong learning as part of their teaching career?
3. What explains the similarities and differences of each case?

Professional Growth in a Rapidly Changing Technological Environment

Professional growth refers to the continuous and structured process through which teachers expand their knowledge, refine instructional practices, and strengthen professional competencies to improve teaching and learning outcomes. Contemporary literature emphasizes that professional development includes both formal and informal learning experiences such as workshops, mentoring, peer collaboration, and reflective practice that enable educators to remain responsive to curricular reforms and evolving pedagogical demands. Guskey (2022) explained that professional learning becomes effective when teachers actively engage in experiences that connect theory with classroom practice. Similarly, Desimone and Garet (2021) highlighted that high-quality professional development supports teachers in responding to changing instructional demands and technological innovations, while Darling-Hammond et al. (2020) emphasized its role in improving instructional quality and student achievement.

Moreover, professional growth is widely recognized as a long-term and iterative process that extends throughout teachers' careers. Avalos (2021) noted that continuous professional development fosters a culture of lifelong learning and professional responsibility among educators. In support of this, OECD (2021) emphasized that effective systems of professional learning promote collaboration, coherence, and relevance to ensure meaningful changes in teaching practices. Schleicher (2020) further argued that sustained professional learning enhances

teachers' adaptability and resilience, particularly in rapidly evolving educational contexts. These perspectives reinforce the idea that professional development is not a one-time event but a continuous process embedded in teachers' daily practice.

In the digital era, professional growth has increasingly been supported through online platforms, blended learning environments, and technology-driven initiatives. Gu et al. (2025) found that web-based professional development programs significantly increased teacher participation, although disparities in access remain evident, especially in rural areas. Similarly, Trust and Whalen (2020) and König et al. (2020) emphasized that digital professional learning environments play a critical role in enhancing teachers' readiness for technology integration. Zou et al. (2025) further argued that emerging technologies are redefining the competencies teachers must acquire, while Tondeur et al. (2021) stressed that sustained professional development is necessary for translating technological knowledge into meaningful classroom practice.

Teacher Adaptation and Digital Pedagogies

Teachers' ability to adapt to digital pedagogies has become essential in contemporary education. Wallace et al. (2023) demonstrated that digital competence enhances student engagement in Physical Education, although teachers often encounter challenges related to infrastructure and access. Tondeur et al. (2021) emphasized that meaningful technology integration requires alignment between technological knowledge, pedagogy, and curriculum goals, while Scherer et al. (2021) highlighted that teachers' readiness significantly influences their capacity to adopt digital teaching practices. These findings suggest that adaptation to digital pedagogies requires both competence and institutional support.

Research further shows that teachers' perceptions of their digital competence shape how they implement technology in instruction. Martínez-Rico et al. (2022) found that while many teachers are confident in basic technological skills, they often struggle with advanced pedagogical applications. Instefjord and Munthe (2020) emphasized that effective professional development must integrate both technological and pedagogical training, while König et al. (2020) noted that institutional support plays a critical role in enhancing teachers' confidence in digital instruction. These studies highlight that adaptation is not merely technical but also pedagogical in nature.

The shift to online learning during the pandemic further accelerated the need for adaptation. Tagimaucia et al. (2024) and Varea and González-Calvo (2020) reported that teachers faced significant challenges in delivering Physical Education in online environments, requiring them to redesign instruction and assessment strategies. Similarly, Jeong and So (2020) emphasized the need for innovative approaches such as video demonstrations and flexible activity tracking. These findings illustrate that teacher adaptation involves creativity, resilience, and continuous learning in response to changing educational demands.

Strategies for Maintaining Professional Growth

Self-directed learning has emerged as a key strategy for sustaining professional growth in resource-constrained environments. Zhang (2023) found that teachers increasingly rely on open educational resources to guide their professional learning, while Trust et al. (2021) emphasized the role of digital networks in enhancing teacher autonomy. Philipsen et al. (2022) further noted that self-directed online learning enables teachers to construct personalized learning pathways that respond to their specific needs. These findings highlight the importance of teacher agency in professional development.

In addition to individual efforts, collaborative learning structures such as professional learning communities play a crucial role in supporting teacher development. Liu et al. (2024) found that participation in professional learning communities enhances teachers' use of digital instructional practices, while Vangrieken et al. (2020) emphasized that collaboration fosters reflective dialogue and shared problem-solving. Stoll and Louis (2021) further argued that collaborative environments strengthen professional growth by promoting collective reflection and peer support.

Reflective practice also serves as a critical mechanism for sustaining professional growth. Novoa-Echaurren et al. (2025) demonstrated that structured reflection enables teachers to evaluate and refine their use of digital tools, while Korthagen (2021) emphasized the importance of linking theory and practice through reflection. Schön (2020) further argued that reflective practitioners continuously adapt their knowledge through cycles of action and reflection, allowing them to respond effectively to evolving challenges.

Teachers' Perceptions of Lifelong Learning in Their Teaching Career

Lifelong learning has been widely recognized as a fundamental component of teachers' professional development. Koç (2024) described lifelong learning as a continuous process that extends beyond formal education and supports both personal and professional growth. Similarly, Bolat and Kıyak (2024) emphasized that teachers view lifelong learning as essential for maintaining instructional effectiveness in changing educational environments. OECD (2021) further highlighted its importance in helping teachers adapt to technological and curricular changes.

Studies also indicate that teachers perceive lifelong learning as both a professional responsibility and a personal commitment. Ilgaz (2024) found that teachers prioritize ongoing development in subject knowledge and technology integration, while Darling-Hammond et al. (2020) emphasized that continuous learning enhances teachers' responsiveness to student needs. Korucu and Şahan (2024) further showed that teachers with strong lifelong learning orientations demonstrate more reflective teaching practices.

Lifelong learning is also associated with professional well-being and adaptability. Yıldırım and Çatak (2025) found that teachers with strong lifelong learning skills experience higher job satisfaction, while Schleicher (2020) emphasized that continuous learning enhances resilience. Caena (2021) further argued that lifelong learning competencies enable teachers to respond effectively to educational changes, reinforcing its importance in sustaining professional growth.

Contextual and Institutional Factors Affecting Teacher Development

Teacher development is significantly influenced by broader systemic and policy conditions. Popova et al. (2022) found that while many systems provide professional development, few incorporate sustained and evidence-based features. Darling-Hammond et al. (2020) emphasized the need for alignment between professional development and curriculum reforms, while Prudente et al. (2024) highlighted the role of Learning Action Cells in the Philippine context.

However, structural challenges often limit teachers' participation in professional learning. Prudente et al. (2024) identified barriers such as financial constraints and limited internet access, while OECD (2021) noted that policy gaps hinder implementation. Desimone and Garet (2021) further emphasized the need for integrating professional development within teachers' workload structures.

At the institutional level, factors such as infrastructure, leadership, and school culture play a crucial role. Amemasor (2025) and Jomezai et al. (2023) highlighted the importance of digital preparedness and leadership support, while Raban and Dhurumraj (2023) emphasized collaborative school cultures. These findings suggest that teacher development is shaped not only by individual effort but also by organizational conditions.

Digital Tools and Programs for PE Development

Digital professional development has expanded learning opportunities for Physical Education teachers beyond traditional formats. Griffiths et al. (2022) found that MOOCs are effective when aligned with practice and include peer interaction, while Anghel et al. (2025) emphasized the importance of active learning in digital courses. Parker et al. (2022) further noted that collaborative professional learning enhances instructional practice in PE.

Research during the pandemic highlights how digital tools became central to teacher learning. Tagimaucia et al. (2024) and Papageorgiou et al. (2023) found that teachers relied on online platforms, webinars, and learning

management systems to sustain professional development. Ha et al. (2025) further observed that the use of digital tools remained elevated even after the pandemic.

Beyond platforms, technologies such as wearables and social media also support teacher development. Almusawi et al. (2021) and Wort et al. (2021) highlighted the role of wearable technologies, while Chen and Xie (2024) emphasized social media-based learning communities. These tools create interconnected learning environments that enable continuous professional growth in Physical Education.

Theoretical Lens

This qualitative study is anchored on four theoretical perspectives that collectively explain how Physical Education teachers learn, adapt, and sustain professional development in the digital era. First, Mezirow (1991) introduced Transformative Learning Theory, which explains how individuals critically reassess experiences and reconstruct meaning. Second, Wenger (1998) proposed Communities of Practice, which frames learning as a social and collaborative process. Third, Candy (2002) articulated Lifelong Learning Theory, which emphasizes continuous and self-directed learning across the lifespan. Together, these frameworks provide a multidimensional lens for understanding teachers' professional growth as reflective, socially mediated, continuous, and contextually influenced within broader socio-political structures.

Mezirow (1991) explained that Transformative Learning Theory centers on the idea that adult learners develop new perspectives through critical reflection on their experiences, leading to shifts in beliefs, assumptions, and practices. In the context of Physical Education teachers navigating a rapidly evolving digital environment, this theory becomes relevant in explaining how teachers reinterpret technological changes and adapt their instructional approaches (Mezirow, 2000; Cranton, 2006). As teachers encounter new digital tools, platforms, and pedagogical demands, they engage in reflective processes that challenge established practices and encourage innovation. Through this process, teachers reconstruct their understanding of teaching and learning, enabling them to respond effectively to the demands of the digital era (Taylor, 2008).

In addition, Wenger (1998) described Communities of Practice as groups of individuals who share a concern or passion and learn how to do it better through regular interaction. This perspective highlights that professional learning is inherently social and occurs through collaboration, shared activities, and collective problem-solving (Lave & Wenger, 1991; Wenger-Trayner & Wenger-Trayner, 2015). In the case of Physical Education teachers, learning often takes place within formal and informal networks such as Learning Action Cells, peer mentoring, and online communities. This framework is relevant to the study because it explains how teachers develop expertise through engagement with others, exchange resources, and support one another in adapting to technological changes in their teaching environments (Wenger, 1998).

Meanwhile, Candy (2002) emphasized that Lifelong Learning Theory views learning as a continuous, self-directed process that extends throughout an individual's life and career. Within the teaching profession, particularly in Physical Education where instructional strategies and technologies are constantly evolving, lifelong learning becomes essential for maintaining professional relevance (Jarvis, 2007; Billett, 2011). This theory is relevant to the study as it explains teachers' motivation to continuously upgrade their knowledge, skills, and competencies. Teachers who embrace lifelong learning demonstrate adaptability and a sustained commitment to professional growth, which are critical in responding to the challenges posed by rapid technological advancements (Candy, 2002).

METHODOLOGY

Research Design

The study utilized a qualitative research design to explore in depth the reflections, learning processes, and professional growth experiences of Physical Education teachers in the digital era. This approach was appropriate because it emphasized meaning, context, and lived experiences rather than numerical data, allowing for a deeper understanding of how teachers interpreted and responded to technological changes (Creswell & Poth, 2018). Within this qualitative framework, a multiple case study approach was employed, where each teacher was treated

as an individual case. This design enabled both within-case and cross-case analysis, allowing the study to capture individual experiences while also identifying patterns and variations across different contexts (Yin, 2018).

Research Participants

The participants of the study were five secondary school Physical Education teachers from public schools in Bagumbayan, with each teacher representing one case in the multiple case study design. The participants were selected to reflect diverse teaching experiences across grade levels and school contexts, providing a broad perspective on professional growth. Inclusion criteria required participants to have at least three years of teaching experience, be actively teaching, and have engaged in professional development activities in the past two years. Exclusion criteria removed newly hired teachers, those on leave, and those not involved in professional learning. This selection ensured that participants could provide relevant and meaningful insights into continuous learning and professional development.

Research Instruments

The primary research instrument used in the study was a semi-structured interview guide designed to elicit in-depth responses regarding teachers' experiences with professional growth and continuous learning. This type of interview allowed the researcher to follow a set of guiding questions while remaining flexible to explore emerging ideas during the conversation (Kallio et al., 2016). Semi-structured interviews were appropriate because they enabled participants to express their thoughts, beliefs, and experiences in their own words, capturing the complexity of their professional journeys. The instrument also supported consistency across cases while allowing for the exploration of unique contextual experiences, making it suitable for a multiple case study design.

Data Gathering Procedure

The data gathering process began with securing necessary approvals from the Schools Division Superintendent and university authorities, followed by coordination with school heads for participant access. An orientation was conducted to explain the study's purpose, procedures, and ethical considerations, and informed consent was obtained from all participants. The interview guide underwent expert validation and pilot testing to ensure its reliability. Data were collected through in-depth semi-structured interviews, which were recorded and later transcribed for analysis. After data collection, member checking was conducted to validate the accuracy of interpretations, ensuring credibility and trustworthiness of the findings (Lincoln & Guba, 1985).

Sampling Technique

The study employed purposive sampling to select participants who possessed specific characteristics relevant to the research objectives. This technique was appropriate for qualitative research as it focused on identifying information-rich cases that could provide deep insights into the phenomenon under investigation (Palinkas et al., 2015). Participants were chosen based on their experience, active involvement in professional development, and ability to articulate their learning experiences. By selecting participants with varied backgrounds and teaching contexts, the study was able to capture a range of perspectives on professional growth, ensuring that the data generated were rich, contextualized, and aligned with the research questions.

Data Analysis

Data analysis followed Braun and Clarke's thematic analysis framework, which involved familiarization with the data, coding, theme development, and refinement (Braun & Clarke, 2019). Within-case analysis was first conducted to examine each teacher's experiences individually, particularly in relation to maintaining professional growth and perceptions of lifelong learning. This was followed by cross-case analysis to identify patterns, similarities, and differences across participants, consistent with Yin's (2018) multiple case study approach. The analysis also identified activities that enriched professional growth, such as collaboration, training, and reflective practices. Through iterative coding and constant comparison, the study generated

meaningful themes that provided a comprehensive understanding of teachers’ professional development in the digital era.

Trustworthiness of the Study

Trustworthiness was essential in ensuring the rigor and quality of this qualitative multiple case study, as it demonstrated that the findings were credible, consistent, and grounded in participants’ experiences rather than researcher bias (Lincoln & Guba, 1985). The study addressed four key criteria, namely credibility, transferability, dependability, and confirmability, which guided the entire research process from data collection to interpretation. Credibility was established through member checking, triangulation, and prolonged engagement, ensuring that interpretations accurately reflected participants’ perspectives. Transferability was achieved through rich and detailed descriptions of the context, participants, and settings, allowing readers to assess applicability to other contexts. Dependability was ensured through systematic documentation and the use of an audit trail, while confirmability was maintained through reflexive journaling and transparent reporting of analytic decisions. These combined strategies ensured that the findings were reliable, valid, and reflective of the lived experiences of Physical Education teachers in the digital era.

Ethical Considerations

Ethical considerations were integral to the conduct of this study, particularly because it involved human participants within educational contexts. The research adhered to key ethical principles such as social value, informed consent, vulnerability, risks and benefits, privacy and confidentiality, justice, transparency, and adequacy of facilities. The study ensured that participation was voluntary, with informed consent obtained through clear communication of the study’s purpose, procedures, and participants’ rights, including the right to withdraw at any time (Israel & Hay, 2006). Ethical safeguards were implemented to protect participants from potential risks, including emotional discomfort, by maintaining a respectful and supportive interview environment. Confidentiality and anonymity were strictly observed through the use of pseudonyms and secure data storage. The study also ensured fairness and equity in participant selection and maintained transparency throughout the research process. These ethical measures ensured the protection of participants’ rights, dignity, and well-being while maintaining the integrity of the research.

RESULTS AND DISCUSSION

Table 1 presents the demographic and professional profiles of the five cases, highlighting their age, teaching experience, grade level assignments, and distinctive characteristics that shape their perspectives on professional growth in the digital era.

Table 1. Participant’s Profile

Case Unit	Case Description
Case 1	Case 1 is a 30-year-old male teacher currently handling Grade 8 and Grade 9, with seven years of teaching experience and approaching his eighth year in service. As a mid-career educator, he demonstrated a reflective and experience-based view of professional growth, often describing teaching as a daily learning process shaped by student interaction. Teaching in the junior high school level, he encountered adolescents in critical developmental stages, which appeared to influence his emphasis on attention, guidance, and continuous adjustment of strategies. His relatively young age combined with several years of service positioned him as a teacher who was still actively shaping his professional identity while sustaining commitment to growth in the digital era.
Case 2	Case 2 is a 41-year-old male Senior High School teacher with 14 years of teaching experience. As the most senior among the cases in terms of years in service, he brought substantial professional exposure to his role. Teaching at the senior high school level likely required him to address more specialized and academically demanding content, which aligned with his

	emphasis on continuous knowledge acquisition and professional advancement. With over a decade in the profession, Case 2’s background suggested a seasoned educator who balanced experience with the need to remain updated amid evolving educational standards and technological integration.
Case 3	Case 3 is a 31-year-old female teacher assigned to Grade 7, with eight years and seven months of teaching experience. Handling early junior high school students, she worked with learners transitioning into secondary education, which might have explained her strong emphasis on encouragement, inclusivity, and adaptability. Being in her early thirties and already with significant teaching experience, she represented a teacher who was both professionally established and still highly growth-oriented. Her background suggested resilience and commitment, particularly in managing classroom discipline and resource limitations while sustaining lifelong learning.
Case 4	Case 4 was a 33-year-old female teacher teaching Grades 8 and 9, with eight years of service. Her professional background reflected a balance between experience and continued enthusiasm for innovation, particularly in integrating digital tools into MAPEH instruction. Teaching middle junior high school learners, she emphasized creativity, adaptability, and responsiveness to technological trends. With nearly a decade of teaching experience, Case 4 demonstrated confidence in her instructional strategies while remaining open to professional development opportunities such as webinars, INSET trainings, and collaborative learning. Her profile suggested a teacher who valued structured growth and institutional support in sustaining professional competence.
Case 5	Case 5 was a 32-year-old male teacher handling Grades 7, 8, 9, and 10, with nine years and six months of experience in service. Teaching across multiple grade levels indicated a broad instructional responsibility, which likely required flexibility and familiarity with diverse learner needs. With almost a decade of teaching experience, P5 appeared to rely on self-study, observation, and peer discussions to sustain growth. His background suggested a committed educator who valued hands-on learning and mentoring but also navigated the realities of balancing family responsibilities with professional aspirations.

Teachers Maintain Professional Growth in a Rapidly Changing Technological Environment

Case 1

Case 1 demonstrates that professional growth is sustained through a blend of self-directed learning, hands-on practice, and participation in trainings. The teacher exhibits strong technological confidence and initiative, often learning through exploration and everyday teaching experiences. This is evident in the statement, “*Sometimes hindi ko talaga alam kung paano gawin pero ine-explore ko lang para at least malaman ko*” (Sometimes I really do not know how to do it, but I explore it so I can learn). In addition, the teacher values formal development, particularly hands-on seminars, as reflected in “*Mas maganda talaga yung seminars... yung meron ka talagang ginagawa, hands-on.*” These responses indicate that professional growth is maintained through a dynamic interplay of experiential learning, reflective practice, and selective engagement in formal training opportunities.

Case 2

Case 2 reflects a more structured and institutionally supported approach to professional growth. The teacher relies heavily on formal mechanisms such as seminars, Learning Action Cell sessions, and official resources to remain updated. This is shown in the response, “*What specific strategy I used... is to attend various seminars... and LAC sessions, mentoring, online webinars.*” At the same time, the teacher supplements formal learning with peer support and self-study, as indicated by “*I go with my peers... and I also use YouTube tutorials.*” These findings suggest that professional growth is maintained through a combination of institutional structures and collaborative learning, with less emphasis on independent experimentation compared to other cases.

Case 3

Case 3 highlights experiential and context-responsive learning as central to professional growth. The teacher adapts strategies based on resource availability and student needs, demonstrating flexibility and creativity. This is evident in the statement, *“Most of our students... do not have cellphones... so what we do is we group them.”* The teacher also engages in continuous learning through self-investment and inquiry, as reflected in *“Instead na matakot ako... nagtatanong ako sa kanila”* (Instead of being afraid, I ask them). Furthermore, the teacher invests in professional growth through graduate studies and personal resources, indicating a strong commitment to long-term development. These responses suggest that professional growth is sustained through adaptability, learner-centered strategies, and continuous self-improvement.

Case 4

Case 4 demonstrates a balanced approach that integrates formal professional development, self-learning, and collaboration. The teacher actively participates in webinars, INSET trainings, and online communities, as shown in *“Uma-attend ako ng webinars and INSET trainings... nagjo-join din ako sa online teacher communities.”* Additionally, the teacher engages in self-directed learning through tutorials and practical application, particularly in using tools such as Google Forms for assessment. Resourcefulness is also evident in managing constraints, as the teacher noted, *“Kailangan maging resourceful at creative... especially sa limited equipment.”* These findings indicate that professional growth is maintained through a combination of structured learning, technological integration, and adaptive problem-solving.

Case 5

Case 5 presents a predominantly self-driven and experience-based approach to professional growth. The teacher relies on prior knowledge, self-study, and informal learning due to limited access to formal training. This is reflected in the statement, *“Self learning... tingin sa YouTube... how to create a better presentation.”* The teacher also highlights the absence of institutional support, stating, *“Wala talagang training... wala din proper training.”* Despite these limitations, the teacher sustains growth through observation, peer discussion, and practical application, as seen in *“We gathered ourselves... to discuss how to make our lessons more attractive.”* This suggests that professional growth is maintained through resilience, self-initiative, and collaborative effort in resource-constrained environments.

The findings across the five cases indicate that teachers maintain professional growth through a combination of formal professional development, self-directed learning, collaboration, and adaptive practices. These results align with recent studies emphasizing that teacher professional development in the digital era is increasingly hybrid, integrating both institutional and informal learning pathways. For instance, Transformative Learning Theory explains that adults develop professionally through critical reflection and experience, which is evident in Cases 1, 3, and 4 where teachers learn through experimentation and classroom practice. Similarly, research by Haleem et al. (2022) and Amemasor (2025) supports the finding that continuous engagement with digital tools and professional learning opportunities enhances teachers' adaptability and instructional competence. However, the findings also contradict the assumption that formal training alone is sufficient, as Cases 3 and 5 demonstrate that teachers often rely on self-initiative and contextual adaptation when institutional support is limited.

Furthermore, the results highlight the importance of social and contextual learning processes in sustaining professional growth. The role of collaboration observed in Cases 2, 4, and 5 supports Communities of Practice, which posits that learning occurs through interaction and shared practice among professionals. At the same time, the emphasis on continuous self-directed learning across all cases reflects Lifelong Learning Theory, where professional competence is maintained through ongoing engagement with new knowledge and experiences. Recent studies such as Gu (2025) and Nagel (2025) further affirm that teachers who actively engage in both collaborative and independent learning are better equipped to navigate technological changes. Overall, the findings suggest that sustaining professional growth in the digital era is not a linear process but a dynamic

interaction between institutional structures, personal initiative, and contextual realities, where teachers actively construct their development through multiple learning pathways.

Teachers' Perception Lifelong Learning as Part of their Teaching Career

Case 1

Case 1 perceives lifelong learning as an experiential, continuous process embedded in daily teaching practice. The participant framed learning as routine and iterative, stating, *"everyday ka gumagawa... everyday ka din natututo"* (every day you do your work, and every day you also learn), and identified students as the primary motivator, noting that *"yung mga estudyante talaga ang naga-motivate sa akin."* Lifelong learning is thus construed as practice-based, reflective, and student-driven, with emphasis on character development and adaptive pedagogy. The teacher also highlighted concrete impacts on learners, recounting how increased attention to a disengaged student led to improved outcomes. Time management was identified as the key mechanism for sustaining learning alongside workload. Overall, lifelong learning is perceived as inseparable from classroom interaction and continuous adjustment of strategies.

Case 2

Case 2 conceptualizes lifelong learning as continuous knowledge acquisition oriented toward professional advancement and competence. The participant defined it as *"a continuous seeking of knowledge to improve professional and personal development,"* and explicitly linked motivation to *"personal development and... promotion,"* acknowledging occasional pressure. Engagement in LAC sessions, mentoring, and webinars illustrates a structured pathway for learning, while prioritization is used to manage competing demands. Hindrances such as workload and paperwork were salient. Lifelong learning, in this case, is perceived as strategic and career-linked, with benefits extending to classroom effectiveness but grounded in institutional expectations and professional mobility.

Case 3

Case 3 views lifelong learning as formal, goal-directed engagement with professional opportunities such as graduate study, trainings, and module development. The participant emphasized active involvement—*"pag-undergo mo sa master's... pag-attend ng trainings... involve yourself in all activities"*—and identified motivation in terms of *"financial stability"* and improving what is not yet known. Lifelong learning was associated with positive shifts in teaching disposition—*"mas naging positive ako... turuan ko ang estudyante ko nang maayos"*—and targeted support for struggling learners. Time management and help-seeking behaviors were central to balancing demands, while fatigue and discipline issues were cited as constraints. Overall, lifelong learning is perceived as structured, aspirational, and closely tied to both professional growth and improved learner support.

Case 4

Case 4 perceives lifelong learning as continuous, purposeful development aimed at improving teaching effectiveness and responsiveness to change. The participant stressed that it is *"hindi lang para sa promotion, kundi para maging effective teacher,"* and reported gains in confidence and adaptability through ongoing learning. Students serve as the main motivator—*"ang biggest motivation ko is ang mga students ko"*—with visible links to practice, such as adopting digital assessment tools that made grading *"mas organized"* and criteria clearer to learners. Essential activities include webinars, INSET, peer collaboration, self-directed tutorials, and hands-on application, implemented through incremental goal setting (e.g., one webinar per month). Constraints include time, resources, and fatigue, yet the teacher maintains commitment by aligning learning with lesson preparation. Lifelong learning is thus perceived as both intrinsically meaningful and practically transformative.

Case 5

Case 5 conceptualizes lifelong learning as a continuous, self-driven commitment characterized by persistence and practice. The participant asserted that *“lifelong learning... never stop... we need to grow on our own,”* emphasizing self-study and the pursuit of training opportunities. Motivation derives from responding to changing student needs and high expectations, especially in STEM contexts where *“their expectations are high... sometimes they are even better than you.”* The teacher highlighted learning by doing, observation of demonstrations, and mentoring as essential, while noting constraints such as limited formal training and competing family priorities. Despite these, the participant underscored dedication and hands-on competence—teachers should *“be more active... performer”*—as indicators of growth. Lifelong learning is therefore perceived as resilient, practice-oriented, and sustained despite structural limitations.

Across cases, teachers consistently perceive lifelong learning as a continuous process that enhances teaching practice, though the pathways vary from experiential (Case 1) and student-driven (Case 4) to career-oriented (Case 2), formal and aspirational (Case 3), and persistence-based (Case 5). These findings align with recent evidence that ongoing professional learning strengthens instructional quality and teacher efficacy in digitally evolving contexts (Gu, 2025; Stringer, 2025; Amemasor, 2025). The cases illustrate how reflective engagement with experience—evident in P1’s daily learning cycle and P4’s iterative tool adoption—supports the tenets of Transformative Learning Theory, where critical reflection leads to shifts in pedagogical perspectives. At the same time, collaborative elements reported by P2, P3, and P4 (e.g., LAC, mentoring, peer exchange) resonate with Communities of Practice, indicating that professional learning is socially situated and reinforced through shared practice. The sustained, self-directed orientation described by P5 and P1 further reflects Lifelong Learning Theory, where continuous learning extends beyond formal programs and is embedded in professional identity.

However, the data also nuance and, in part, complicate prior claims. While literature often foregrounds structured professional development as the primary driver of improved practice, the present cases show that impactful learning frequently emerges from self-directed exploration and classroom-based reflection (e.g., P1, P5), especially under constraints—an observation consistent with studies highlighting teacher agency in digital integration (Haleem et al., 2022; Nagel, 2025). Conversely, the prominence of career motives in P2 and P3 supports work showing that promotion and professional recognition shape participation in learning activities (Richter, 2025; Fidalgo, 2025), yet does not diminish instructional gains, suggesting that intrinsic and extrinsic drivers can co-exist productively. Taken together, the findings indicate that perceptions of lifelong learning are multi-layered: they are simultaneously relational (student-centered), strategic (career-oriented), and adaptive (practice-focused). This synthesis underscores that effective professional growth in the digital era depends on the interplay between reflective practice, collaborative learning, and sustained individual initiative.

Table 2. Cross Case Analysis on Maintaining Professional Growth in a Rapidly Changing Technological Environment

Table 2 presents the cross-case analysis of how teachers maintain professional growth in a rapidly changing technological environment, highlighting three major themes: engagement in trainings, adaptation to learners’ needs, and resourcefulness in overcoming challenges. The table shows that while most cases share common strategies such as participating in formal trainings and adapting instruction, variations exist in learning approaches, levels of initiative, and reliance on institutional support.

Emerging Themes	Case Unit		Remarks
Engaging in trainings, seminars, and formal learning	Similarities	Differences	Almost all participants rely on seminars, INSET, and workshops as primary ways to stay updated. P3 focuses more on experiential learning and adaptation rather than formal programs, showing variation in learning pathways.
	Case 1, Case 2, Case 4,	Case 3	

	Case 5		
Adapting teaching to students' needs and context	Case 1, Case 3, Case 4, Case 5	Case 2	Almost all participants emphasize adjusting strategies to learners' realities. P2 focuses more on structured learning activities rather than explicit student-driven adaptation.
Resourcefulness and initiative in overcoming challenges	Case 1, Case 3, Case 4	Case 2, Case 5	Some participants actively modify strategies or provide personal resources, while others highlight reliance on existing support or express need for more institutional training.

Theme 1: Engaging in Trainings, Seminars, and Formal Learning

The cross-case findings show that Case 1, Case 2, Case 4, and Case 5 commonly rely on seminars, INSET, and workshops as primary mechanisms for maintaining professional growth, while Case 3 demonstrates a more experiential and adaptive pathway. This pattern aligns with recent evidence that formal professional development remains a dominant avenue for enhancing teachers' digital competence and pedagogical skills (Amemasor, 2025; Gu, 2025; Stringer, 2025). However, the divergence seen in Case 3 supports studies that argue professional growth is not exclusively dependent on structured programs but can also emerge from practice-based and self-directed learning (Haleem et al., 2022; Nagel, 2025). This variation reflects Transformative Learning Theory, where learning is shaped through reflection on experience rather than solely through formal instruction. At the same time, participation in seminars and institutional learning spaces resonates with Communities of Practice, as these environments allow teachers to engage in shared learning and professional discourse. Thus, while formal training provides structured knowledge, experiential learning highlights teacher agency in constructing professional growth, suggesting that both pathways are complementary rather than mutually exclusive.

Theme 2: Adapting Teaching to Students' Needs and Context

The findings reveal that Case 1, Case 3, Case 4, and Case 5 emphasize adapting instruction based on learners' needs and contextual realities, while Case 2 leans toward structured and standardized approaches. This supports research indicating that effective teaching in the digital era requires contextual responsiveness and learner-centered adaptation (Zhang, 2025; Huang, 2024; Surikova, 2025). In a related local study, Barroga and Tampus (2023) found that teachers who tailor instructional strategies to learners' socio-cultural and technological contexts demonstrate more meaningful engagement and improved learning outcomes, particularly in linguistically and socially diverse classrooms. Teachers who modify strategies based on students' access to technology, learning styles, and socio-economic conditions demonstrate higher instructional effectiveness, particularly in diverse classrooms. However, the more structured orientation of Case 2 reflects contrasting findings where adherence to formal frameworks and standardized practices can also support consistency and accountability in instruction (Richter, 2025; Fidalgo, 2025). These patterns are consistent with Lifelong Learning Theory, which posits that professional learning is continuous and shaped by contextual demands, requiring teachers to adapt knowledge to real-world situations. Moreover, the emphasis on adapting to learners aligns with Communities of Practice (Wenger, 1998), as teachers refine their practices through interaction with students and colleagues. Overall, the findings suggest that while structured approaches provide guidance, adaptability remains critical for meaningful and inclusive teaching.

Theme 3: Resourcefulness and Initiative in Overcoming Challenges

The cross-case analysis further indicates that Case 1, Case 3, and Case 4 demonstrate strong resourcefulness and initiative by modifying strategies, exploring tools independently, and even providing personal resources, whereas Case 2 and Case 5 rely more on institutional support or express the need for additional training. This finding is supported by studies emphasizing teacher agency and self-directed learning as key drivers of professional growth in technologically constrained environments (Osorio Vanegas et al., 2025; Stevens, 2025;

Imran, 2025). Teachers who actively experiment with digital tools and seek alternative solutions are better able to sustain instructional effectiveness despite limited resources. Conversely, the reliance on institutional support observed in some cases aligns with research highlighting the importance of systemic provision, such as access to training, infrastructure, and leadership support, in enabling teacher development (Christensen, 2025; Lomos et al., 2025). These differences can be interpreted through Transformative Learning Theory (Mezirow, 1991), where initiative and critical reflection drive learning, and through Lifelong Learning Theory (Candy, 2002), which emphasizes self-directed growth beyond formal structures. Overall, the findings suggest that while institutional support remains important, resourcefulness and initiative are critical competencies that enable teachers to navigate challenges and sustain professional growth in the digital era.

Table 3. Cross Case Analysis on Teachers’ Perception Lifelong Learning as Part of their Teaching Career

Table 3 presents the cross-case analysis of teachers’ perceptions of lifelong learning as part of their teaching career, highlighting three key themes: students as motivation, career advancement motives, and improvement of teaching practice. The table shows both shared perspectives and variations across cases, particularly in the sources of motivation and how lifelong learning is conceptualized in relation to professional growth.

Emerging Themes	Case Unit		Remarks
	Similarities	Differences	
Students as motivation for learning	Case 1, Case 4, Case 5	Case 2, Case 3	Some Participants highlight students as the main driver, while others emphasize personal or career advancement motivations.
	Case 2, Case 3	Case 1, Case 4, Case 5	
Career advancement and professional growth motives	Case 1, Case 2, Case 3, Case 4	Case 5	Participants emphasize becoming flexible and open-minded, whereas P5 stresses perseverance and dedication instead of adaptability language

Theme 1: Students as Motivation for Learning

The cross-case analysis shows that students function as a primary motivator for lifelong learning in Case 1, Case 4, and Case 5, while Case 2 and Case 3 emphasize personal and career-oriented motivations. Teachers who foreground students tend to frame learning as relational and practice-oriented, aligning professional growth with improving learner engagement and outcomes. This pattern is consistent with recent studies showing that student-centered motivation enhances teacher commitment to continuous learning and instructional improvement (Huang, 2024; Gu, 2025). At the same time, contrasting evidence suggests that external motivators such as promotion and institutional expectations also significantly influence teacher learning behavior (Fidalgo, 2025). These findings can be interpreted through Transformative Learning Theory, where teachers’ reflections on student needs and classroom experiences reshape their perspectives and practices. Thus, while some teachers are driven by intrinsic, student-centered purposes, others respond to broader professional demands, indicating that motivation for lifelong learning is both personal and contextually constructed.

Theme 2: Career Advancement and Professional Growth Motives

The second theme reveals that Case 2 and Case 3 perceive lifelong learning as a pathway toward career advancement, professional competence, and stability, whereas Case 1, Case 4, and Case 5 frame it more as intrinsic commitment to teaching. This supports studies indicating that teachers often engage in professional development to meet promotion requirements, improve credentials, and enhance job security (Richter, 2025;

Rajput & Sharma, 2025). However, other research argues that intrinsic motivation, such as commitment to teaching quality and student success, plays a more sustainable role in lifelong learning engagement (Zhou, 2025). The coexistence of these motivations reflects the dual nature of professional development, where teachers balance institutional expectations with personal values. This dynamic aligns with Communities of Practice, as teachers' motivations are shaped by participation in professional communities that define norms of competence, recognition, and growth. Consequently, lifelong learning is not solely an individual pursuit but is influenced by shared professional cultures and systemic structures.

Theme 3: Lifelong Learning Improving Teaching Practice

The third theme indicates that Case 1, Case 2, Case 3, and Case 4 perceive lifelong learning as improving teaching practice through increased flexibility, openness, and innovation, while Case 5 emphasizes perseverance and dedication rather than adaptability. This finding is supported by studies demonstrating that continuous professional learning enhances instructional effectiveness, pedagogical innovation, and responsiveness to students' needs (Amemasor, 2025; Stringer, 2025). Conversely, some research suggests that not all teachers explicitly articulate adaptability, instead framing professional growth in terms of effort, persistence, and commitment (Nagel, 2025), which aligns with Case 5's perspective. These variations can be explained through Lifelong Learning Theory, which posits that professional learning is continuous, self-directed, and shaped by individual experiences and contexts. Overall, the theme demonstrates that while teachers commonly recognize the impact of lifelong learning on teaching practice, they differ in how they conceptualize this improvement, whether as adaptability, innovation, or sustained effort.

CONCLUSION

The study concludes that Physical Education teachers sustain professional development in the digital era through a dynamic interplay of formal learning, self-directed initiative, and context-responsive pedagogy. Teachers maintain growth by engaging in trainings and collaborative activities while also adapting strategies to learners' needs and exercising resourcefulness under constraints. Lifelong learning is perceived as continuous and essential, functioning both as an intrinsic commitment to improving teaching practice and, for some, as a pathway to career advancement. Implications for Teaching and Pedagogy suggest that instruction benefits when teachers integrate reflective practice, flexible strategy use, and technology-enhanced methods aligned with students' contexts, indicating the need for professional development programs that are practical, sustained, and learner-centered rather than purely compliance-driven.

Implications for Transferability indicate that while the findings are grounded in specific cases, the patterns of adaptability, collaboration, and self-directed learning may be applicable to similar educational settings, particularly in resource-constrained or rapidly changing technological environments. These insights may inform school leaders and policymakers in designing context-sensitive professional development frameworks that acknowledge diverse teacher motivations and conditions. Implications for Future Research suggest the need for broader studies across disciplines and regions, as well as longitudinal and mixed-method designs to examine how lifelong learning practices evolve over time and influence student outcomes, thereby deepening understanding of sustainable professional development in the digital age.

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