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The Impact of Technology Induced Professional Development Model on Coaching and Mentoring of Teachers

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ABSTRACT

The paper assessed the impact of technology-enhanced coaching and mentoring on the Continuous Professional Development (CPD) of teachers. It examined leveraging technology to build mentors' capacity, support mentees, and improve learning outcomes even with limited resources. The study explored the feasibility and effectiveness of a technology-enhanced training model in promoting CPD for mentors and enhancing teacher competencies in low-performing schools. A cross-sectional survey design was used, with questionnaires collecting data from 500 school improvement support officers (SISOs) in Ghana, selected through quota sampling. The data was analyzed using descriptive statistics. The results indicated that technology stimulates teachers' curiosity, intrinsic motivation, learning quality, and creative thinking. The study also found that technology-induced CPD is cheaper in the long term compared to traditional face-to-face models. However, many teachers face issues with internet connectivity and high data consumption, hindering access to online content despite having smart devices. The study recommends deliberate capacity building for teachers to improve their skills in accessing technology-enhanced CPD. It also suggests collaboration between governments, educational institutions, telecommunication companies, and internet service providers to make internet connectivity accessible and affordable. Exploring zero-rated data for teachers to access relevant content is also recommended.

Keywords: Technology, motor learning outcome, teacher professional development, model

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INTRODUCTION

In recent years technology has become such an indispensable tool in many spheres of human endeavour, including education. Technology has become so critical in knowledge sharing that the traditional means of teaching cannot stand the test of time if teachers do not apply technology in their

line of work. Technology can provide accessible, relevant, and high-quality education, especially in underdeveloped countries.[1] While there are benefits to employing technology in education, it is vital to realize that technology is not the answer; rather, it is a tool that requires training, resources, pedagogical instruction, and long-term planning.[2] Today, technology integration has extended and revolutionized our society, drastically changing how people process information, work, and socialize.[3]

Businesses in the educational technology sector are always looking for new ways to increase access to education for individuals who do not have suitable educational facilities. Social networking and video conferencing apps are widely recognized and used as teaching and learning aids. According to Kausar et al., traditional classroom training falls short of providing an immediate learning environment, faster evaluations, and increased involvement.[4] In contrast, digital learning tools and technologies bridge the gap. Traditional learning approaches just cannot keep pace with some of the productivity advantages provided by technology. The use of technology in education has a significant impact on pedagogical aspects since ICT facilitates and supports successful learning through the usage of ICT elements and components.[5] Given the widespread adoption of smartphones and other wireless technology devices, it stands to reason that educational institutions and schools make effective use of them by incorporating technology into the classroom. The versatility and unobtrusiveness of modern technology make learning more enticing to the next generation. Technology-based teaching and learning offers a variety of interesting methods, such as educational videos, stimulation, data storage, database usage, mind-mapping, guided discovery, brainstorming, music, and the World Wide Web (www), all of which contribute to a more fulfilling and meaningful learning experience.

The study aims to investigate how technology-enhanced coaching and mentoring can contribute to the continuous professional development of educators. Specifically, the research seeks to explore the effectiveness of technology-induced coaching and mentoring in enhancing teachers' competencies, improving the quality of professional development, and addressing challenges associated with these models. By utilizing digital tools and resources, the study aims to profer support to teachers in their ongoing professional growth and enhance learning outcomes in educational settings. To guide the research, the following questions are posed:

1. In what ways do technology-embedded continuous professional development programs enhance mentor competencies?
2. How does technology-enhanced coaching and mentoring compare to traditional face-to-face methods in terms of effectiveness and satisfaction?
3. What are the main challenges associated with technology-induced coaching and mentoring models, and how can these challenges be addressed effectively?

By addressing these research questions, the study aims to shed light on the impact of technology on coaching and mentoring practices, providing valuable insights for policymakers, educational institutions, and teachers looking to integrate technology into professional development initiatives effectively.

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[1] M. Jalbout and S. Farah, "Exploring the Potential of Technology to Deliver Education and Skills to Syrian Refugee Youth," Global Business Coalition for Education & Their World, 2016, http://gbc-education.org/wp-content/uploads/2016/02/Tech_report_online3.pdf.

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[4] Fahd Naveed Kausar, Sara Abid, and Khoshnud Javeed, "Effect of Classroom Management Techniques on Secondary Students' Performance in District Narowal," *Annals of Human and Social Sciences* 3, no. 3 (2022): 168–78.

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LITERATURE REVIEW

Perceptions of Technology in Teaching

Information Communication Technology (ICT) has a tremendous impact on all aspects of human existence.[6] Likewise, ICT has reshaped the education sector by increasing the interactivity and productivity of instructional practices,[7] providing a variety of tools for use in conventional and online teaching spaces, and assisting in the development of a forward-thinking learning setting.[8] Modern tools such as the Internet, e-mail, smart boards, and any other modern technology available today were simply unavailable to improve their learning experience.[9] Currently, media is both unique and forward-thinking. The explosion of technology in today's culture has revolutionized education on many levels, but many industrial-age teachers remain resistant to incorporating technology in the classroom. Both expectations and educational standards have evolved because of technology's entrance into the classroom. In the classroom, technology is now considered a need rather than a luxury. Technology-integrated instructional approaches not only improve teaching quality,[10] but also enable learners to develop their talents, raise motivation, and efficiently extend their knowledge and information.[11]

There are numerous opportunities available now, and technological breakthroughs are constantly increasing.[12] Indeed, the learning curve for technology doubles every 18 months, necessitating the need for instructors to be lifelong learners in the industry. Several older digital natives who have used computers in and out of the classroom for the previous two decades would understand and respect the necessity for an informal and critical approach to computer use in education.[13] Despite significant developments in computer technology, it is often held that computers and the Internet are the only relevant technologies for education.[14] Nevertheless, educational technology includes a broad variety of technologies, such as those used in "design making, problem-solving technological systems, resources and materials, controls, optimization and trade-offs, invention, and many other aspects dealing with human creativity."[15] Davis identified two criteria that influence how likely a person is to use information technology.[16] One component of that prediction is "perceived usefulness", which refers to how much a potential user believes the technology will improve some part of their daily tasks and operations.[17] The other element of this assumption is "perceived ease of use," which relates to how much effort the potential user believes it will take to use the technology.[18] Teachers are opposed to implementing technology in the classroom for several reasons. The most common reason is a fear of

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[6] Timo Gnambs, "The Development of Gender Differences in Information and Communication Technology (ICT) Literacy in Middle Adolescence," *Computers in Human Behavior* 114 (2021): 106533.

[7] Jie Lin et al., "A Survey on Internet of Things: Architecture, Enabling Technologies, Security and Privacy, and Applications," *IEEE Internet of Things Journal* 4, no. 5 (2017): 1125–42.

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[11] Shih-Yeh Chen et al., "A Study on Integrating Augmented Reality Technology and Game-Based Learning Model to Improve Motivation and Effectiveness of Learning English Vocabulary," in *2018 1st International Cognitive Cities Conference (IC3)* (IEEE, 2018), 24–27, https://doi.org/10.1109/IC3.2018.00015.

[12] Sandra Kay Plair, "Revamping Professional Development for Technology Integration and Fluency," *The Clearing House: A Journal of Educational Strategies, Issues and Ideas* 82, no. 2 (2008): 70–74.

[13] Avril Loveless, "Perception versus Use: Technology in Education," *Convergence* 5, no. 4 (1999): 126–28.

[14] Kenneth E Lyle, *Teachers' Perceptions of Their Technology Education Curricula* (Immaculata College, 2009).

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[16] Fred D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," *MIS Quarterly* 13, no. 3 (September 1989): 319, https://doi.org/10.2307/249008.

[17] Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," 320.

[18] Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," 320.

"looking stupid" in front of tech-savvy students because they are unable to use technology in the classroom.

Technology Enhanced Professional Development

The term "technology integration" is always evolving because new technologies arise, as do ideas about what students will need to prosper in the digital age. Studies on technology integration PD emphasize mentoring,[19] coaching, modeling and scaffolding, adult learner principles, and sensitivity to the relationship of technology, pedagogy, and content knowledge are frequently referred to as the TPACK framework.[20] The Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler in 2006, is a theoretical framework that emphasizes the complex interplay between technology, pedagogy, and content knowledge in educational settings. TPACK consists of three main components:

1. Technological Knowledge (TK): Knowledge about specific tools, software, and hardware.
2. Pedagogical Knowledge (PK): Knowledge about instructional strategies, classroom management, and student engagement.
3. Content Knowledge (CK): Knowledge about the subject matter being taught.

TPACK represents the intersection of these three types of knowledge, highlighting the importance of understanding how they interact and influence each other in teaching and learning contexts. The framework emphasizes the need for educators to integrate technology effectively into their pedagogical practices while considering the specific content being taught. Context plays a central role in TPACK, influencing how technology, pedagogy, and content knowledge are applied in educational settings.[21]

Digregorio and Sobel-Lojeski, observed that technology integration for professional development is most effective when teachers have the opportunity to collaborate and share ideas with their colleagues.[22] They stressed the significance of providing instructors with continuing assistance and resources to ensure their confidence and competence in using technology tools. Technology integration is a vital component of education today, and professional development (PD) is an essential tool for assisting educators in this area. Literature on Technology Integration PD helps educators understand how to effectively integrate technology into their teaching techniques, as well as how to build PD programs that match their needs. One major result is that effective technology integration professional development should be continuous and tailored to the individual needs of educators. According to Fishman et al., one-time PD sessions are insufficient to promote sustained technology integration, and continuing support is required to ensure that educators can incorporate technology in a meaningful way.[23] These studies reveal that effective technology integration professional development should be targeted to the requirements of individual teachers, offer hands-on experiences with digital tools, offered in a collaborative and supportive setting, and include continuing support and evaluation. Schools and educators may ensure that technology integration efforts improve student

[19] Helga Dorner and Andrea Kárpáti, "Mentoring for Innovation: Key Factors Affecting Participant Satisfaction in the Process of Collaborative Knowledge Construction in Teacher Training.," *Journal of Asynchronous Learning Networks* 14, no. 4 (2010): 63–77; Lisa M Hebgen, "Examining the Effectiveness of a Professional Learning Opportunity Focused on Student-Centered Coaching: Perceptions from Instructional Coaches" (Capella University, 2017); Cynthia Carter Ching and Anthony W Hursh, "Peer Modeling and Innovation Adoption among Teachers in Online Professional Development," *Computers & Education* 73 (2014): 72–82.

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[23] Barry Fishman et al., "Comparing the Impact of Online and Face-to-Face Professional Development in the Context of Curriculum Implementation," *Journal of Teacher Education* 64, no. 5 (2013): 426–38.

learning outcomes by adhering to these best practices. Quality teacher professional development has also been associated with student progress.[24]

Coaching and Mentoring

Coaching and mentoring are managerial approaches and skill sets for developing employees and delivering results. Hobson et al., suggest that coaching and mentoring are among the most effective ways to promote teachers' professional growth, even though their quality varies greatly in practice.[25] Coaching and mentoring are approaches to teacher development and school reform that generate new knowledge, challenge teacher beliefs, strengthen classroom practice, promote student learning, and improve students' learning outcomes.[26] Mentoring can be crucial in preparing new teachers for the challenges of a profession that is frequently acquired on the job. Coaching and mentoring aid in inspiring, pushing, and urging employees or mentees to focus on their specific goals, create action plans, and implement the plans with more self-discipline. According to the 2015 Pre-Tertiary Teacher Professional Development and Management document, teacher competencies are critical for improving teaching and learning outcomes at the pre-tertiary level, which is why the Coaching and Mentoring Framework for Pre-Tertiary Teachers has been introduced at the In-Service level.

In recent years, there have been major programs aimed at institutionalizing coaching and mentoring at the pre-service level by improving teaching and learning through teacher support and resources. These focused initiatives through the Ghana Accountability for Learning Outcome Project are critical to altering coaching and mentoring at the pre-service level. According to Hawkins and Smith, transformational coaching enables coaches to know and understand not only the facts, but also how behaviors, personal sentiments, beliefs, and values interact to influence how the coach grows and evolves.[27] The study focuses on the impact of technology-induced coaching and mentoring on educators' continual professional development. It considers how technology can be utilized to assist mentors in understanding how to identify their instructors' scope of work, strengths, and limitations, as well as how to collaborate with the teacher within the framework of limited resources to improve learning results. Digital learning is an effective way to cut expenses, make better use of resources, promote sustainability, and expand student and teacher reach and impact. This holds true for everything, from the environmental implications of using less paper for handouts and books to the time savings and convenience of research. Many aspects of modern life and society rely largely on technology.

METHODOLOGY

The study employed a cross-sectional questionnaire design to achieve objectives. This is a suitable research design considered effective in providing data given the population attributes such as current behaviours, attitudes, and beliefs.[28] The sample comprised of School Support and improvement officers sampled from the sixteen regions in Ghana using quota sampling. In all, 500 SISOs from all the regions in Ghana were selected as shown in fig.1.

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[24] Collins and Liang, "Examining High Quality Online Teacher Professional Development: Teachers' Voices."; Nienke M. Moolenaar, Peter J.C. Sleegers, and Alan J. Daly, "Teaming up: Linking Collaboration Networks, Collective Efficacy, and Student Achievement," *Teaching and Teacher Education* 28, no. 2 (February 2012): 251–62, https://doi.org/10.1016/j.tate.2011.10.001.

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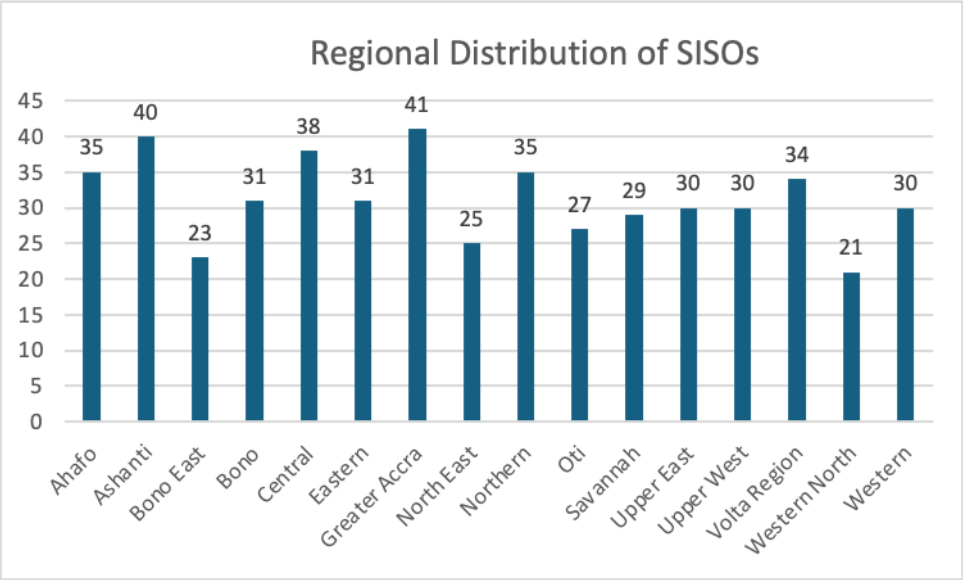

Fig1: Regional Distribution of SISOs in Ghana

Instrumentations

To achieve the aim of the study questionnaire was developed to collect data since it was found suitable to provide insight into the nature of the problem under study.[29] A combination of closed and open questions was used to facilitate analysis and it allowed respondents more freedom to respond to the questions. Questionnaires were distributed where all respondents were asked to read the statements given and choose their answers based on a 4-Likert scale ranging from 4= Strongly Disagree, 3= Disagree, 2= Agree and 1= Strongly Agree. The questionnaires consisted of 4 sections A, B, C, and D. Section A of the questionnaire requested the biographical data of respondents while the others highlighted the perception and views of respondents on CPD and technology-induced coaching and mentoring model, its challenges as against the face-to-face model.

Data Collection

After piloting, the researchers modified the questionnaire before administering it to the respondents. The information was gathered within a week. Respondents were given 3-5 days to complete and return the questionnaire. After one week, all completed questionnaires were collected and collated for analysis.

Data Analysis

All acquired data was processed using the Statistical Package for the Social Sciences (SPSS) version 21. The analysis comprised descriptive statistics. The demographic data were displayed as frequencies and percentages using descriptive analysis.

Ethical Considerations

In the study on the impact of technology-induced coaching and mentoring on teachers' professional development, ethical considerations played a crucial role in guiding the research process. Prioritizing the principles of voluntary participation and informed consent, all educators involved were provided with clear information about the study's objectives, data collection methods, and the use of their information. Obtaining explicit consent from participants ensured that they willingly contributed to the

[29] A. Seidu, *Modern Approaches to Research in Educational Administration*, Revised Edition (Kumasi: Payless Publication Limited, 2007).

research, understanding the implications of their involvement and maintaining autonomy over their decision to participate.

Measures were implemented to ensure that all data collected remained confidential and that participants' identities were protected throughout the study. Adhering to data security protocols and anonymizing responses helped maintain the trust and confidentiality of participants, reinforcing the ethical responsibility to uphold the integrity and privacy of individuals involved in the research.

PRESENTATION OF FINDINGS

The findings of this study will provide the researchers with the necessary output to answer the research questions from 500 valid respondents. The results are organized based on the sections of the questionnaire.

Table 1. Demographic background of respondents

Factors	**Frequency**	**Percentage (%)**
Gender		
Female	250	50
Male	250	50
Years served as SISO		
<1 year	4	0.8
1-5 years	79	15.8
6-10 ears	349	69.8
>10 years	68	13.89
Highest Academic Qualification		
Diploma	0	0
Degree	379	75.8
Master	121	24.2

From the overall population (n=500) based on years served as a SISO, most of the respondents have 6-10 years of experience as a SISO with 349 (69.8%) followed by 1-15 years of experience with 79 (15.8%), then < 1 year of experience 4 (0.8%) and 68 respondents with > 10 years of teaching experience with 13.89%.

From the overall population based on the preference of teaching style, more respondents preferred the contemporary teaching style 292 (58.42%) as compared to respondents who preferred the traditional method of teaching with 208 (41.58%). From the overall population based on highest academic qualification, most of the respondents come with degree qualification with 379 (75.8%), and master qualification with 121 (24.2%).

Table 2: In which ways does technology-embedded CPD enhance mentors' competencies?

NO	**ITEMS**	**Strongly agree**	**Disagree**	**Agree**	**Strongly disagree**
		Frequency and Percentage (%)			
1.	It makes me creative	0	12 (2.4%)	138(27.6%)	350 (70%)
2.	It arouses my curiosity	3 (0.6%)	7 (1.4%)	100 (20%)	390 (78%)
3.	The quality of my teaching is improved.	10(2%)	20 (4%)	270 (54%)	200(40%)
4.	I think that technology-supported teaching makes learning more effective.	1 (0.2%)	10 (2%)	90 (18%)	400 (80%)

5.	It promotes the intrinsic motivation of teachers	19(3.8%)	61(12.2%)	200 (40%)	230 (46%)
6	It enhances e-learning	0	0	10 (0.2%)	490 (98%)
7	It promotes reflective practices	0	0	50 (10%)	450 (90%)

The results from Table 2 suggest that the technology embedded in CPD has a significant impact on the mentors' competencies. This is explained by the fact that most of the respondents indicated that they have benefited from the technology embedded in CPD. For example, the teachers confirmed that it makes them more creative, arouses their curiosity, improves their quality of teaching, and promotes their reflective practices as indicated in Table (1). 2.4% of the respondents disagreed that technology embedded in CPD makes them creative. On this same item, 27.6% agreed and the remaining 70% strongly agreed. This indicates that most of the teachers strongly agree with the statement. In addition, 390 of the respondents representing 78% strongly agreed with the statement that technology embedded in CPD arouses their curiosity. Most of the teachers confirmed that technology-supported teaching makes learning more effective, promotes the intrinsic motivation of teachers, enhances e-learning, and promotes reflective practices.

Table 3: How is technology-induced coaching and mentoring compared to traditional face-to-face in terms of effectiveness and satisfaction?

NO	ITEMS	Strongly agree	Disagree	Agree	Strongly disagree
		Frequency and Percentage (%)			
1.	It is cheaper to enroll	12 (2.4%)	25 (5%)	63(12.6%)	400 (80%)
2.	It is easier to scale	13 (2.6%)	59(11.8%)	57 (11.4%)	321(64.2%)
3.	It is more interactive	67 (13.4%)	121(24.2%)	212 (42.4%)	100 (20%)
4.	It enhances time management	0	0	11 (2.2%)	489 (98%)
5.	It promotes self-motivation	0	0	50 (10%)	450 (90%)

From Table 3, 12 out of 500 respondents strongly disagreed that technology-induced coaching and mentoring is cheaper to enrol as compared to face-to-face in terms of effectiveness and satisfaction. 25 respondents disagreed with the statement whilst 400 teachers (80%) strongly agreed with the statement. Time management was another factor, furthermore, it was the item that had the highest rating from the respondents 98%. On the other hand, two statements recorded the highest strong disagreement from the respondents which are: It is easier to scale" and "It is more interactive" with 2.6% and 13.4%. Analytically, the data shows that technology-induced coaching and mentoring are cheaper to enrol, easier to scale, more interactive, time management, and self-motivation.

Table 4: What are the perceived challenges associated with the technology-induced coaching and mentoring model?

NO	ITEMS	Strongly disagree	Disagree	Agree	Strongly disagree
		Frequency and Percentage (%)			
1.	Data challenges	0	0	7 (1.4%)	493 (98.6%)
2.	Poor internet connectivity	0	0	40 (8%)	460 (92%)
3.	Poor digital literacy	0	0	13(2.6%)	487 (97.4%)
4.	Online distractions	0	73 (14.6%)	115 (23%)	312 (62.4%)
	Time management	18 (3.6%)	50 (10%)	232(46.4%)	200 (40%)

The data provided in Table 4 about the challenges associated with the technology-induced coaching and mentoring model, shows that most of the teachers strongly agreed that data is one of the major challenges associated with the model with 493 (98.6%). Poor internet connectivity was also revealed from the data with 460 (92%) strongly agreeing and 40(8%) agreeing. This shows that most of the teachers perceived poor internet connectivity as one of the challenges. It also shows that 487 out of the 500 respondents strongly agree that poor digital literacy is a challenge associated with the model. Again, Table 4 shows that online distraction and time management are part of the challenges. It can be deduced from Table 4 that all the items stated in the table are challenges associated with technology-induced coaching and mentoring.

DISCUSSION

The findings of the study highlight the significant role of technology in fostering continuous professional development among educators. The research revealed that technology-embedded continuous professional development programs have a positive impact on mentor competencies by stimulating teachers' curiosity, enhancing intrinsic motivation, improving learning quality, and fostering creative thinking abilities. This aligns with existing literature emphasizing the importance of technology in enhancing teaching and learning outcomes in educational settings.

Comparing technology-enhanced coaching and mentoring to traditional face-to-face methods, the study indicated that the former offers benefits such as cost-effectiveness and accessibility. However, challenges related to internet connectivity and high data consumption were identified as barriers to accessing online content, particularly for teachers in areas with limited resources. These challenges underscore the need for infrastructure improvements and support mechanisms to ensure equitable access to technology-induced professional development opportunities.

Overall, the study underscores the potential of technology-induced coaching and mentoring models to enhance teachers' competencies and improve learning outcomes. By addressing challenges and leveraging digital tools effectively, educators can benefit from tailored support and resources to advance their professional growth and ultimately enhance student learning experiences.

RECOMMENDATION

The study recommends that teachers' capacity should be developed to make it easy for them to use technology in their continuous professional development. It further recommends that governments and educational institutions should collaborate with telecommunication companies and internet service providers to make internet connectivity accessible and affordable to all teachers. It recommends that teachers should have zero-rated data to access content from education-related sites in Ghana. Policymakers should provide support and encouragement for CPD opportunities provided by various sources and increase support for practitioners using technology in contexts. The study also recommends that teachers consider using more ICT tools/applications, such as Edmodo, blogs, and Wikis, to address access restrictions and concentrate development on contributing to educatio. They should not use ICT for the sake of using it.

CONCLUSION

In conclusion, the study emphasizes the importance of integrating technology into coaching and mentoring practices to support teachers' continuous professional development. The findings underscore the positive impact of technology-enhanced programs in enhancing mentor competencies and improving teaching quality. While technology offers cost-effective and accessible professional development opportunities, challenges related to connectivity and data consumption must be addressed to ensure equitable access for all educators. Moving forward, it is essential for policymakers, educational institutions, and stakeholders to prioritize infrastructure improvements and support mechanisms to facilitate the effective implementation of technology-induced coaching and mentoring models. By leveraging digital tools and resources strategically, educators can enhance their

competencies, drive innovation in teaching practices, and ultimately improve learning outcomes for students.

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