EMPOWERING EDUCATORS WITH GENERATIVE AI: IMPLEMENTING A CO-CREATIVE MENTORING MODEL FOR INCLUSIVE EDUCATION IN GHANA

Kofi Sarpong Adu-Manu[1], Betty Ogange[2], Nana Gyamfi Adwabour[3], Kennedy Ameyaw Baah[4]

[1]University of Ghana, Legon-Accra, [2]Commonwealth of Learning, Canada, [3]Center for National Distance Learning and Open Schooling, Accra-Ghana, and [4]Wesley College of Education, Kumasi-Ghana.

ABSTRACT

This study evaluated the effectiveness of the Co-Creative Mentoring Model (CCMM) in enhancing digital literacy and gender-responsive teaching among Ghanaian educators. Implemented through a four-phase framework—Preparation, Co-Creation, Implementation, and Sustainability—the model integrates generative AI tools (e.g. ChatGPT and Canva) into collaborative mentorship and inclusive pedagogies. Using a mixed-methods approach with 23 participants from diverse educational institutions, this study assessed educators' confidence, skill development, and capacity to create resources. Survey data revealed that 92% of participants felt confident in applying AI tools to their work, and hands-on sessions were identified as the most valuable training components. The participants co-developed adaptable AI-generated Open Educational Resources (OERs) and demonstrated increased awareness of inclusive instructional strategies. The key challenges included limited training time and issues with Internet connectivity. This study presents a scalable model for integrating generative AI into teacher education, demonstrating notable improvements in the professional confidence, digital competence, and pedagogical inclusivity of participants. Although the sample size and single-country focus limit generalisability, the findings provide a foundation for broader implementations. Future research should investigate the long-term effects and cross-contextual applications to further validate this model and adapt it for global teacher development initiatives.

KEYWORDS: AI in education, co-creative mentoring, teacher training, Open Educational Resources (OER), gender-responsive pedagogy, inclusive education, digital literacy, AI-enhanced learning

1. Introduction

The integration of Artificial Intelligence (AI) into educator professional development presents new possibilities for enhancing instructional quality, promoting inclusive teaching, and building digital capacity across educational systems (Butakor, 2023; Tarisayi, 2024). In Ghana, despite recent curricular reforms and growing interest in AI-enhanced education, professional development opportunities remain limited in their ability to equip educators with the skills required to integrate Gen AI into teaching practice. Specifically, educators often lack access to targeted training in digital content creation, gender-responsive pedagogy, and collaborative mentorship models, resulting in the uneven adoption of inclusive, technology-enabled instruction (Kuyini & Others, 2018; Opoku & Others, 2019). To address these gaps, this study introduces and evaluates the Co-Creative Mentoring Model (CCMM), an AI-enhanced, gender-responsive professional development framework designed to promote inclusive, technology-integrated pedagogy among Ghanaian educators. Existing training initiatives in the country rarely combine generative AI tools with collaborative mentoring or support the co-creation of contextualised Open Educational Resources (OERs). The CCMM fills this gap by leveraging tools such as ChatGPT and Canva, enabling educators to design inclusive resources while engaging in structured, peer mentorship.

This study was guided by the following objectives.

- Assess the impact of the CCMM on educators' confidence and competence in applying generative AI tools.
- Examine its effectiveness in supporting the development of gender-responsive and inclusive teaching materials.
- Identify the factors that affect the model's sustainability and scalability in diverse institutional contexts.

The model is anchored in constructivist learning theory, which views knowledge construction as an active, tool-mediated process, and sociocultural models of mentorship, which emphasise the role of collaborative, non-hierarchical relationships in professional growth (Dorner & Kumar, 2016; McGuire & Reger, 2003). These frameworks inform the CCMM's design and its four-phase structure: Preparation, Co-Creation, Implementation, and Sustainability.

This study employed a mixed-methods approach involving 23 participants from colleges of education, basic schools, and regulatory agencies. The findings revealed high confidence in using AI tools (92%), a strong appreciation for hands-on co-creation activities, and an increased awareness of inclusive pedagogy. However, limitations such as short training duration and internet challenges were also noted. This study presents a scalable model for integrating AI into professional learning, offering actionable insights for policy and practice in Ghana

and other similar low-resource settings worldwide. The remainder of this paper is organised as follows: Section 2 presents the conceptual framework, Section 3 outlines the methodology, Section 4 discusses the findings, and Section 5 concludes with policy recommendations and future research directions.

2. Conceptual Framework

The Co-Creative Mentoring Model (CCMM) is grounded in a multidimensional theoretical foundation that integrates constructivist learning theory, sociocultural mentoring theory, and inclusive pedagogical models underpinned by the Technological Pedagogical Content Knowledge (TPACK) framework. Together, these perspectives inform a comprehensive, context-sensitive mentoring framework for pre-service teacher education in Ghana. The model is further operationalised through a four-phase implementation strategy—Preparation, Co-Creation, Implementation, and Sustainability—designed to support the equitable integration of AI in education.

2.1 Constructivist and Experiential Learning Foundation

Constructivist theory, as advanced by Vygotsky and Piaget, emphasises that learning occurs through active engagement, where individuals construct knowledge by interacting with tasks, tools and meaningful contexts. In the CCMM, this principle is realised through structured experiential learning cycles in which mentors and mentees collaboratively create and contextualise Open Educational Resources (OERs) using AI tools such as ChatGPT and Canva. As illustrated in Figure 1, the model initiates a preparatory phase that scaffolds participants' readiness for gender-responsive, AI-enhanced pedagogy. Learning is thus anchored in iterative practice, feedback, and reflection—key tenets of experiential learning that build practical competence and a deeper conceptual understanding (Dorner & Others, 2016; Yazıcı & Others, 2024).

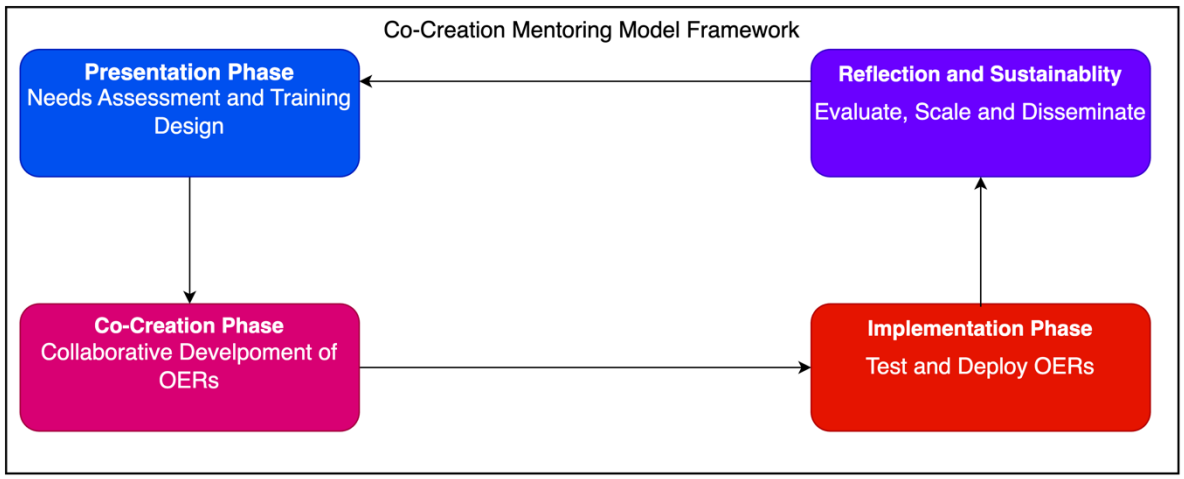

Figure 1: Innovative Co-Creative Monitoring Model

2.2 Sociocultural Mentoring and Peer Learning

The CCMM draws on sociocultural learning theories, particularly Vygotsky's Zone of Proximal Development (ZPD), emphasising guided participation in knowledge construction. The model combines expert-led mentorship with peer-based collaborative mentoring (Figure 2), enabling scaffolded learning and distributed agency. This structure develops technical skills, emotional resilience, and leadership—crucial for professional development in resource-constrained settings (Akama & Keenan, 2022; Dorner & Others, 2016). Empirical studies support the CCMM's theoretical foundation, with (Dorner & Others, 2016) demonstrating that online collaborative mentoring enhances digital competence among pre-service teachers. (Yazıcı & Others, 2024) found experiential mentoring enhanced instructional readiness, while (Wolf, 2018a) and (Opoku & Others, 2020) highlighted peer-supported professional development in sub-Saharan Africa. These studies validate constructivist mentoring theories in AI-enhanced education, emphasising adaptation to institutional reality.

2.3 Inclusive Pedagogical Innovation

Inclusivity is a central design principle of the CCMM. The model integrates gender-responsive pedagogical practices and promotes the development of localised and culturally relevant teaching materials. Drawing on the work of (Opoku & Others, 2019) and (Rarieya et al., 2024), the model addresses structural inequities by enabling teacher trainees to co-create open educational resources (OERs) that are free of bias and accessible to diverse learner populations. As shown in Figure 2, AI tools support the translation, customisation, and review of content to ensure alignment with inclusive education standards, including linguistic diversity, cultural representation, and disability sensitivity.

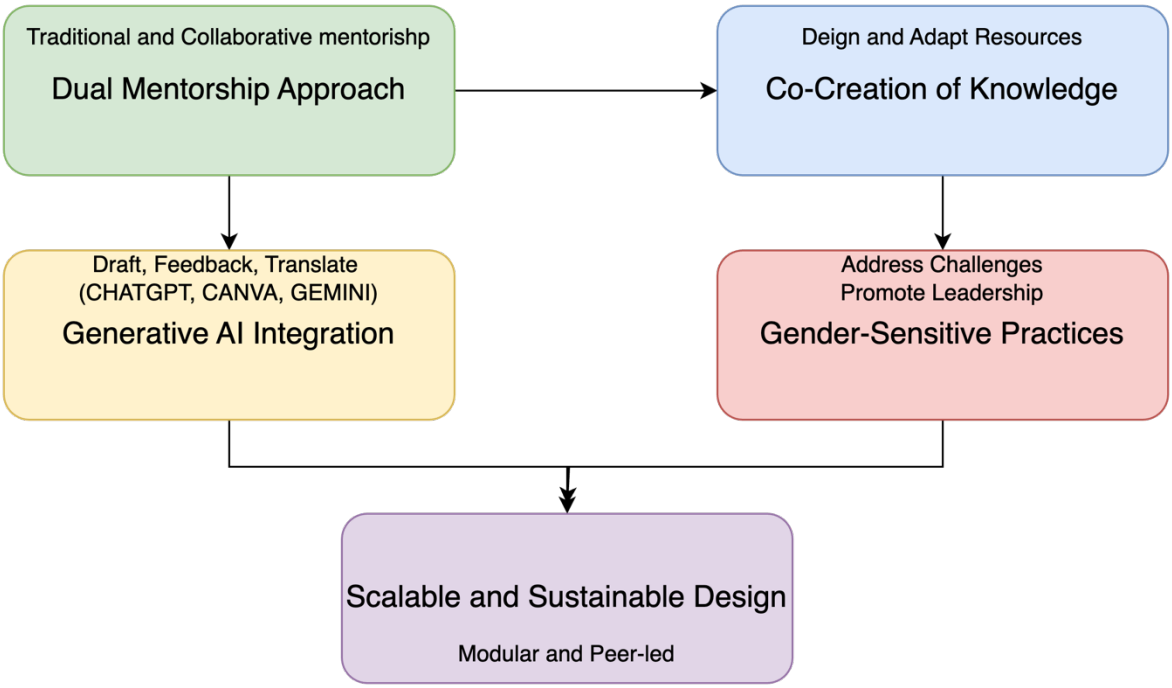

Figure 2: Key Features of the Co-Creative Model

2.4 AI-Enhanced Collaboration and Pedagogical Knowledge Integration

The CCMM operationalises TPACK by integrating content knowledge, pedagogy, and digital tools. Through training, participants learned to use AI tools for lesson planning and classroom management. This integration develops digital pedagogical skills and AI fluency in teacher education. AI serves as an enabler of equity-centred instruction (Annan-Brew et al., 2024; Tarisayi, 2024). The CCMM incorporates ChatGPT and Canva to create inclusive Open Educational Resources (OERs) and demonstrate TPACK practices. ChatGPT generates lesson prompts, assessments, and simplified content, while Canva enables the creation of accessible visuals and formatting. Together, these tools support the efficient development of contextual resources while building participants' digital competence.

2.5 Phased Architecture of the Model

The Co-Creative Mentoring Model progresses through four phases. The Preparation Phase involves pairing mentors and mentees, assessing needs, and training in AI tools and OER development. Educators identify AI applications for inclusive teaching and learning. In Co-Creation, participants generate teaching resources using AI tools with feedback. Pairs produce AI-supported OERs evaluated for inclusivity. The Implementation Phase tests these OERs in classrooms, with surveys revealing successes and challenges in their integration. The Reflection Phase establishes peer mentoring and promotes the use of OER, as measured by mentoring participation and publication. This framework evaluates digital literacy and mentoring outcomes.

2.6 Visual Representation and Integration

Figures 1-4 illustrate key aspects of the mentoring model, including the AI-integrated mentoring cycles, co-creation process dynamics, traditional collaborative mentorship structure, and a unified AI-enhanced teacher education model. These visual representations translate complex pedagogical theory into actionable practice for teacher development in Ghana and similar contexts. The figures were mapped to training sequences, with participant feedback and survey indicators providing empirical support for each element, confirming the model's practical relevance. The following section describes the methodology for implementing and evaluating the Co-Creative Mentoring Model, including training design, recruitment, data collection, and impact assessment metrics.

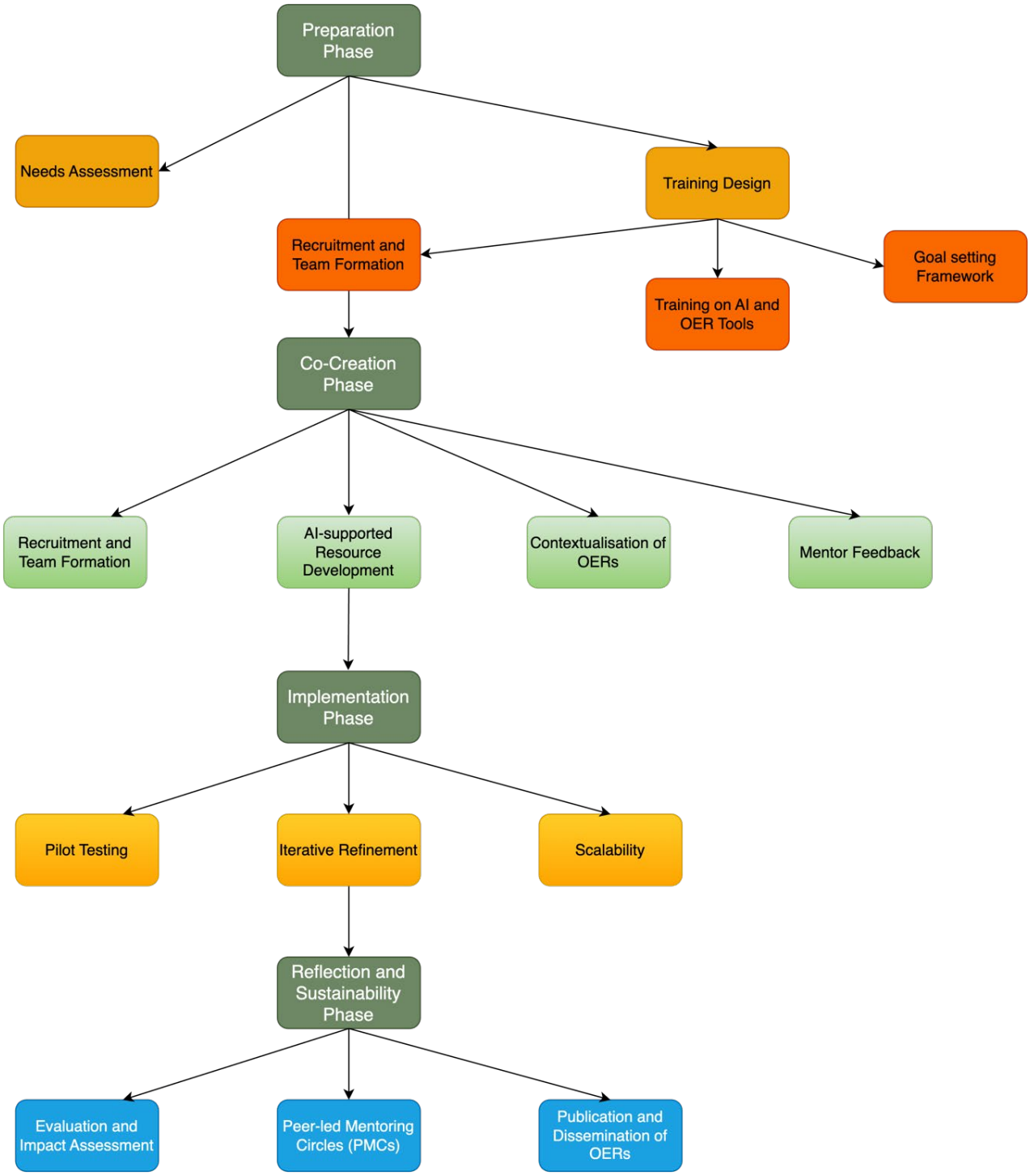

Figure 3: Detailed Co-Creation Mentoring Model

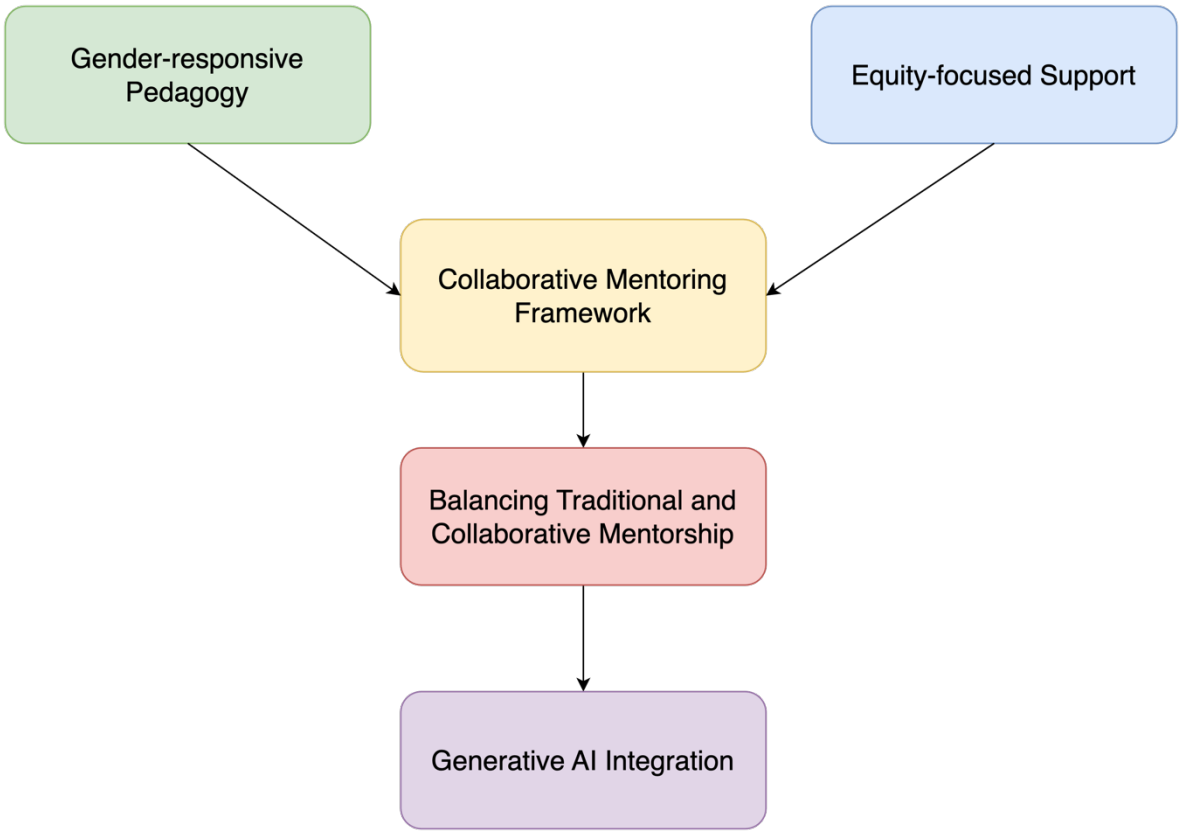

Figure 4: Framework for Core Components of the Model

3. Methodology

This study employed a mixed-methods approach to evaluate the implementation and outcomes of the Co-Creative Mentoring Model (CCMM) among a select group of Ghanaian educators. The methodology is consistent with the theoretical constructs and implementation architecture presented in Sections 1 and 2, and directly integrates the survey data collected during the national AI training programme.

3.1 Research Design

The study was guided by a Design-Based Implementation Research (DBIR) framework, chosen for its suitability for testing educational innovations in real-world settings. A post-training survey was conducted to supplement the assessment of participants' perceptions, self-efficacy, and readiness for inclusive AI-supported teaching. This dual strategy ensured the iterative development of the model while generating empirical data to assess its effectiveness and alignment with the conceptual goals.

3.2 Participants

The study engaged 23 participants who attended a national AI in Education training workshop organised by the Centre for National Distance Learning and Open Schooling (CENDLOS) in collaboration with the Wesley College of Education, with support from the Commonwealth of Learning. The participant cohort represented a diverse spectrum of Ghana's educational ecosystem, encompassing teacher educators, curriculum officers, school administrators, and classroom teachers across both basic and tertiary levels. This institutional spread ensured representation from urban and semi-urban educational contexts, as well as from formal teacher training colleges, public education authorities, and non-governmental organisations (NGOs). Table 1 presents a breakdown of the participating institutions by category.

Table 1: Institutional Affiliations of Participants Categorised by Educational Sector

Institutional Category	Institutions
Teacher Education and Curriculum Bodies	Accra College of Education, Wesley College of Education, National Teaching Council, NaCCA, Science Education Unit
Basic and Secondary Schools	Kanda Estate 3&5 Basic, Flagstaff House Basic/MOE, Kwabenya M/A 3 Basic, KidsAtHome Educational Centre, Islamic Training Institute
Oversight and Regulatory Agencies	GES, NaSIA, Complementary Education Agency (CEA)
Specialised Support and NGOs	Ghana TVET Service, Ghana Library Authority, CAMFED, Institute of Islamic Studies

This institutional spread ensured representation from urban and semi-urban educational contexts, as well as from formal teacher training colleges and education-focused non-governmental organisations (NGOs). Such diversity not only enriched the mentorship dynamics within the training but also positioned the model for future scalability across Ghana's broader educational landscape.

3.3 Implementation Procedure

The Co-Creative Mentoring Model was implemented in four sequential phases, as outlined and visualised in Figures 1–4.

- *Preparation Phase*: Identified mentorship needs, conducted AI and OER tool training, and formed diverse mentor-mentee pairs.
- *Co-Creation Phase*: Facilitated the joint development of AI-generated Open Educational Resources (OERs) using platforms such as ChatGPT and Canva, with an emphasis on gender sensitivity and contextual adaptation.
- *Implementation Phase*: The co-created OERs were piloted in both real and simulated teaching environments, gathering feedback from participants on the usability of the tool and the inclusivity of the content.
- *Sustainability Phase*: Initiated peer-led mentoring loops and shared resources through open-access platforms for broader use and iteration.

3.4 Data Collection

Quantitative and qualitative data were obtained through a structured online survey administered after the training intervention. The instrument included the following:

- Likert-scale items evaluating training quality, AI confidence, and mentoring satisfaction
- Open-ended prompts on Inclusivity, challenges, and recommendations

All 23 participants completed the survey, yielding a high response rate that captured a range of insights regarding the model's perceived effectiveness and its tools.

3.5 Data Analysis

Quantitative data were analysed using descriptive statistics to summarise trends in:

- AI Confidence (e.g., responses to "Do you feel confident applying AI tools?")
- Mentoring Effectiveness (e.g., clarity, usefulness, collaboration)
- Training Quality and Logistics

Qualitative data from open-ended responses were coded thematically against the CCMM's core components: co-creation, equity-focused mentorship, AI-enhanced learning, and professional confidence. This alignment allowed for triangulation between participant feedback and the design intentions of the mentoring model.

3.6 Ethical Considerations

Ethical clearance was obtained through institutional protocols established by the organising bodies. Participation was voluntary, and informed consent was obtained before administering the survey. Respondent data were anonymised to ensure privacy and confidentiality throughout the analysis.

3.7 Limitations

The scope of this study was limited by the relatively small sample size (n = 23) and brief duration of the intervention. Furthermore, infrastructural constraints, such as inconsistent Internet connectivity, impacted the full utilisation of AI tools during implementation. As this was a single-site intervention, the findings may not be generalisable across all Colleges of Education in Ghana. Nonetheless, the results offer foundational insights for the broader-scale adoption and iterative improvement of the CCMM. The next section presents the survey results and discusses how the findings align with the goals, phases, and theoretical assumptions of the Co-Creative

Mentoring Model. The analysis provides both empirical validation and critical insights into the model's relevance and potential for replication.

4. Findings and Discussion

This section discusses the outcomes of the AI-supported Co-Creative Mentoring Model (CCMM), utilising empirical data from participants' feedback and established theoretical constructs. The analysis highlights how the CCMM supports professional growth, gender-inclusive pedagogy, and digital fluency among Ghanaian teacher educators, focusing on systemic constraints and opportunities for scaling.

4.1 Overall Satisfaction and Training Quality

Participants reported a high level of satisfaction, with 22 of the 23 rating the training quality as "Very Good" or "Excellent." This affirms that the phased implementation structure, designed to scaffold AI skill-building, co-creation of teaching resources, and inclusive mentoring, was effective. The use of structured peer and expert interactions reflects the principles of feminist co-mentoring, as described by (McGuire & Reger, 2003), which emphasises mutual professional growth through collaborative relationships. This finding aligns with (Barhone et al., 2024) that a collaborative approach to teacher education enhances learner-teacher confidence and engagement. This also supports (Yazıcı & Others, 2024), who emphasised the value of immersive mentoring models in improving pedagogical readiness among pre-service teachers.

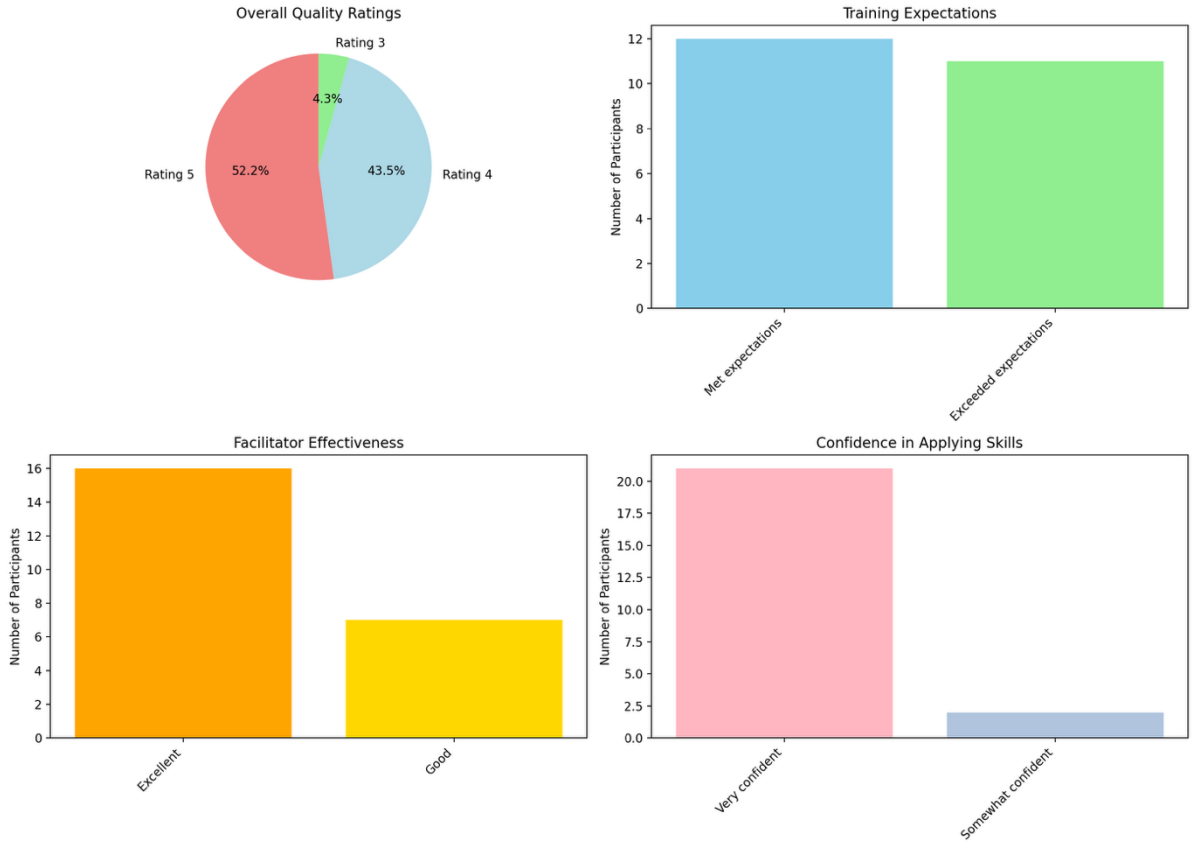

Figure 5: Participant feedback on training quality, facilitator effectiveness, alignment with expectations, and confidence in applying AI-enhanced pedagogy.

Participants' quantitative feedback is visually summarised in Figure 5, which highlights the consistently positive evaluations of the training program's effectiveness. Over 95% of respondents rated the training quality as either 4 or 5, and 100% found the hands-on AI sessions helpful. Figure 5 also reveals that most participants felt the training met or exceeded expectations, and 91% reported being "very confident" in applying the knowledge and tools acquired. Facilitators were widely regarded as effective, with 70% receiving a rating of "Excellent." These metrics collectively affirm the CCMM's structured and collaborative design as both pedagogically sound and contextually engaging.

Descriptive statistics were calculated to complement the qualitative findings. The average rating for overall training quality was 4.5 (SD = 0.57), while 91.3% of participants rated their AI confidence as "very confident." All participants reported that the hands-on AI sessions helped them understand the practical applications of AI.

Due to the exploratory nature of the intervention and the absence of baseline (pre-intervention) data, inferential testing was not conducted. However, these metrics establish a foundation for future longitudinal tracking and pre-post comparison.

4.2 Confidence in AI Integration

Among the respondents, 91% indicated that they were "very confident" in applying the skills they had learned, particularly in utilising AI tools such as ChatGPT, Canva, and Gemini. This suggests that the CCMM's integration of AI into collaborative mentoring and lesson design was successful in building digital literacy skills. These results reinforce the earlier work by (Butakor, 2023), who highlighted that targeted, practice-based exposure to AI can alleviate educators' anxieties around technological adoption. Moreover, the model's grounding in the TPACK framework is evident in this outcome: the participants demonstrated competence not only in using AI tools but also in integrating them with inclusive pedagogy. This aligns with (Tarisayi, 2024) call for embedding AI capabilities into national teacher education curricula, underscoring the role of AI as an enabler of inclusive and student-centred pedagogy.

4.3 Valued Aspects of the Model: Co-Creation and Hands-On Practice

All 23 respondents reported that the *hands-on AI sessions* were crucial for their understanding and application of the tools. Open-ended feedback identified key themes, including collaborative planning, interactive learning, and the development of inclusive Open Educational Resources (OERs). These outcomes are central to the co-creative mentoring framework, as shown in Figure 2 of the implementation model.

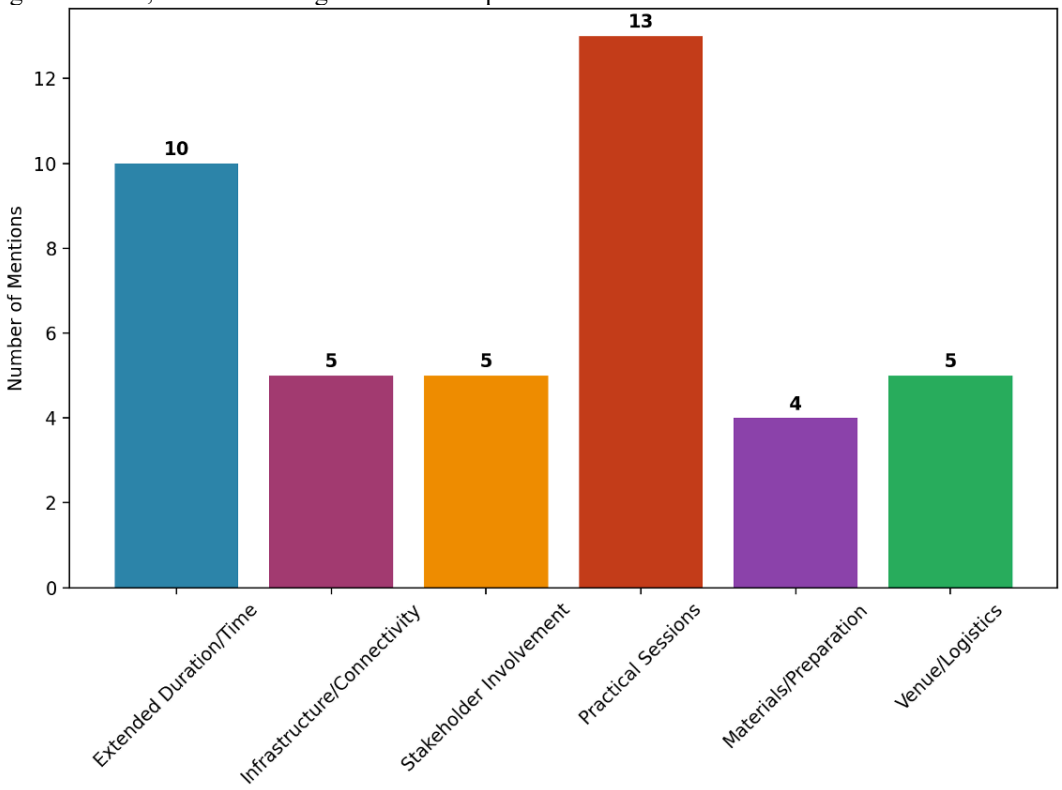

Figure 6:. Frequency of contextual and structural improvement themes based on open-ended participant responses.

The emphasis on mutual learning resonates with (Lopez, 2013) model of *collaborative mentorship*, which supports co-learning among peers as a method for equity-based professional development. Additionally, the findings support (Hubbard Cheuoua et al., 2022), who found that equity-focused peer mentoring enhances instructional confidence and the application of technology in teaching. The CCMM's blend of hierarchical mentorship and horizontal peer learning reflects this dual focus. Participant engagement with the CCMM varied according to their background. For instance, educators from basic schools prioritised classroom-ready materials, whereas college faculty focused on curricular alignment and peer mentoring. Female participants, in particular, valued the model's gender-responsive design, noting its relevance to inclusive classroom practices. This diversity suggests that the model is adaptable across various teaching roles and educational levels.

Thematic analysis of qualitative responses revealed that the most frequently cited areas for improvement were the need for more practical sessions (n = 13) and calls for extended training duration (n = 10). Participants also highlighted structural concerns, including infrastructure and connectivity, venue logistics and stakeholder involvement (Figure 6). These patterns underscore the importance of integrating capacity-building components and logistical support in scaling the CCMM. They also align with the recommendations of Wolf (2018) and Opoku et al. (2019), who observed similar systemic barriers in the implementation of Ghanaian education reform.

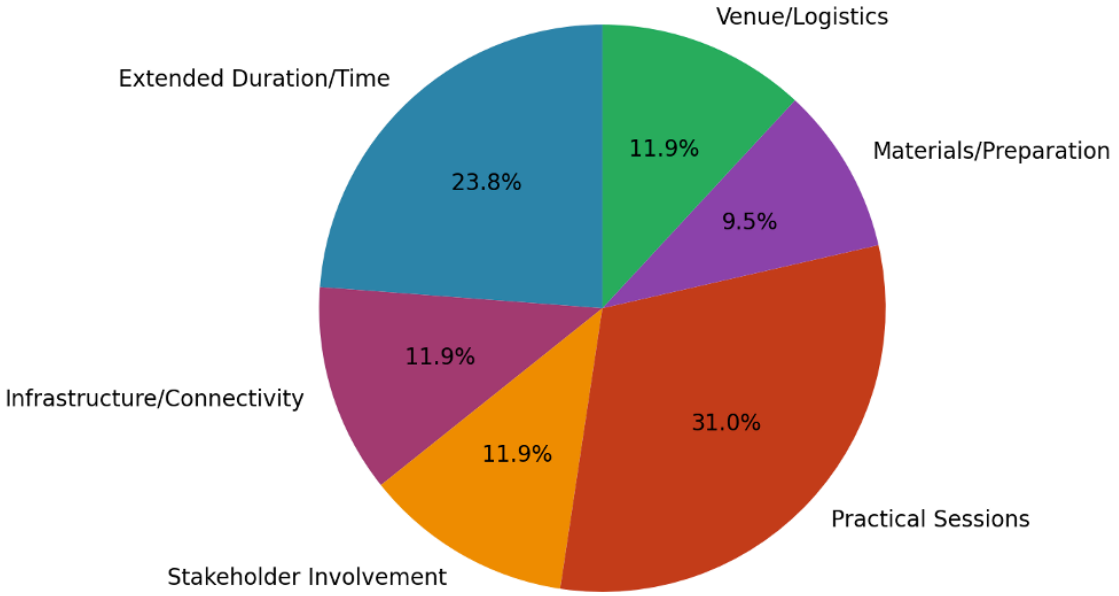

Figure 7: Percentage distribution of thematic challenges and recommendations emerging from the participants' reflections.

The proportional distribution of qualitative response themes (Figure 7) further demonstrates that nearly one-third (31%) of the participants emphasised the importance of enhanced practical exposure. The next largest cluster (24%) requested extended training session duration. These insights underscore the practical demands of AI-integrated mentoring and validate the emphasis on experiential learning in the CCMM framework. Less frequently cited, yet still notable, were concerns related to connectivity, materials, and venue logistics, reflecting broader capacity gaps within the teacher education ecosystem.

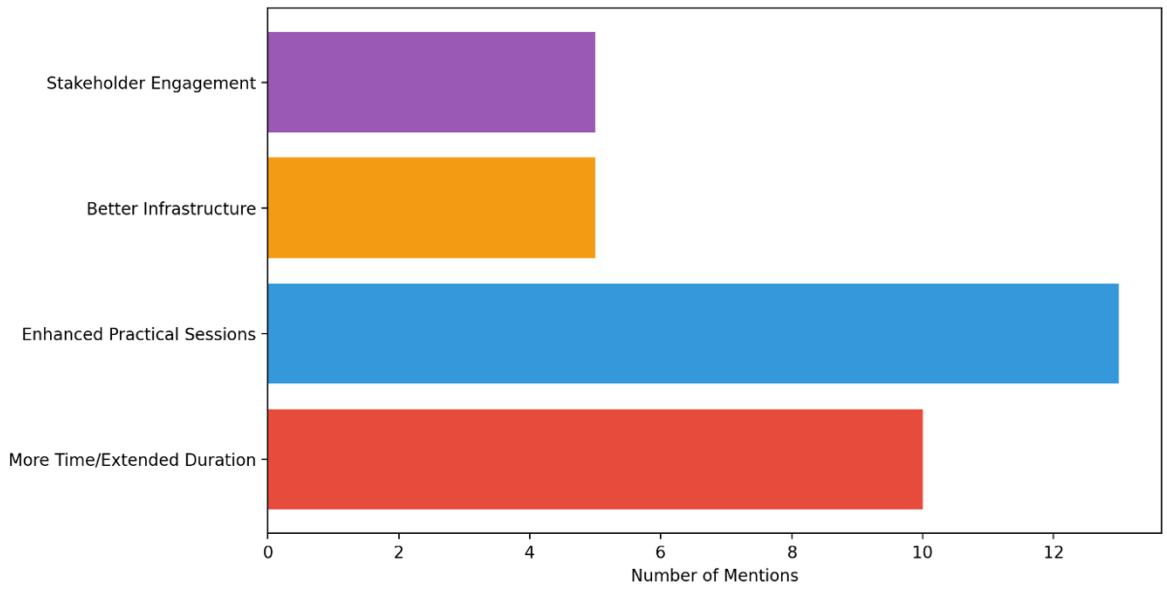

Figure 8: Ranking of participant recommendations for strengthening AI-supported mentoring and training delivery.

Figure 8 presents the prioritised recommendations directly voiced by the participants. The most prominent suggestions were for enhanced practical sessions (n = 13) and more time or extended duration (n = 10), followed by infrastructure improvement and increased stakeholder engagement. These suggestions mirror findings from other mentoring models that emphasise the importance of sustained engagement and systemic support for professional learning (Hubbard Cheuoua et al., 2022; McGuire & Reger, 2003). The results suggest that future CCMM deployments would benefit from strategic alignment with institutional and infrastructural capacity planning.

4.4 Addressing Inclusivity and Gender Responsiveness

While the survey lacked explicit items on gender equity, the participants' qualitative feedback and the absence of complaints related to exclusion suggest that the model's embedded approach to inclusivity was successful. This finding aligns with (Rarieya et al., 2024), who advocated for *mainstreaming gender-responsive pedagogy* into professional development rather than treating it as an add-on. The CCMM's design explicitly incorporates gender-sensitive mentoring strategies, consistent with the work of (Barhone et al., 2024) and the gender-equity scaffolds in (McGuire & Reger, 2003) feminist co-mentoring approach outlined in [6]. Moreover, the peer-led learning environment fostered during the sustainability phase aligns with (Hubbard Cheuoua et al., 2022) that distributed mentorship structures promote inclusivity more effectively than traditional top-down models.

4.5 Systemic Challenges and Contextual Constraints

Despite the strengths identified, respondents raised several concerns: inadequate Internet access, compressed training duration, and the need for extended hands-on time. These issues, raised in multiple open-ended responses, mirror the infrastructure-related barriers documented in Ghana's teacher education system (Kuyini & Others, 2018; Opoku & Others, 2019). These challenges align with earlier mentoring studies (Akama & Keenan, 2022), which note that institutional support, time, and leadership are critical for success. The CCMM showed strong satisfaction and learning outcomes despite constraints, demonstrating adaptability in resource-limited settings. Offline AI tools and preloaded content addressed connectivity issues, while flexible rotations managed time constraints. Future improvements should include modular formats and ICT partnerships to enhance their accessibility.

4.6 Recommendations and Sustainability Pathways

Participants recommended extending the training period and expanding the involvement of stakeholders. These recommendations align with the Sustainability Phase of the CCMM, which envisions iterative peer mentoring, open dissemination of OERs, and institutional embedding of inclusive AI pedagogy.

For greater impact and sustainability, future implementations should consider the following:

- Integrate ongoing peer-led mentoring cycles within colleges of education (Hubbard Cheuoua et al., 2022; Lopez, 2013).
- Institutionalise gender-responsive AI-OER co-creation as part of formal assessment tasks (Rarieya et al., 2024).
- Expand hybrid delivery methods to overcome infrastructure challenges (Barhone et al., 2024; Wolf, 2018b).

Moreover, adopting a scaling framework grounded in experiential learning models (Yazıcı & Others, 2024) and equity-sensitive practices (McGuire & Reger, 2003) can ensure that the CCMM is transferable across teacher education institutions, including those in underserved regions. Taken together, these findings highlight the Co-Creative Mentoring Model's ability to promote inclusive, AI-driven, and sustainable teacher development in Ghana. The next section consolidates these insights and provides practical recommendations for integrating the model into institutional and national educational strategies. Unlike traditional workshops in Ghana, which are typically lecture-driven, the CCMM offers a structured model that integrates AI tools and provides sustained mentorship. This differs from standard approaches that lack contextual adaptability. The CCMM's focus on gender-responsive OERs and peer mentoring makes it scalable in low-resource settings. While the initial outcomes were positive, the long-term impacts remain unmeasured. Future research should evaluate sustainability through classroom observations and educator interviews to validate the relevance of policies.

4.7 Insights from Open-Ended Participant Reflections

Thematic analysis of open-ended survey responses provided rich insights into participants' experiences with the Co-Creative Mentoring Model (CCMM) and areas for future refinement. While most respondents did not identify any missing topics, a wide range of reflective suggestions were offered regarding training effectiveness, logistical challenges, and future enhancements.

Most Valuable Aspects: Respondents consistently cited *hands-on use of AI tools*, *integration of AI in lesson planning*, and *co-creation activities* as the most impactful components of the training. Specific mentions included "hands-on AI tools", "AI-integrated lesson preparation", and "collaborative work", affirming the CCMM's experiential and participatory structure. These reflections strongly support the model's grounding in constructivist and peer-supported learning principles (Dorner & Others, 2016; Hubbard Cheuoua et al., 2022).

Suggestions for Improvement: The dominant recommendation was the need for more time—especially for *practical sessions*—noted in comments such as "more time needed for hands-on activities" and "extend the number of training days." Participants also highlighted infrastructure issues, with multiple references to "internet connectivity" and "improve internet access." Additionally, feedback on *seating arrangements*, *interactive tools such as Mentimeter*, and *stakeholder engagement* highlighted a desire for more participatory and logistically streamlined sessions.

Future Training Suggestions: Respondents advocated for early communication, longer duration, and broader stakeholder inclusion, with participants emphasising the need for more stakeholders and time for effective skills transfer. These insights highlight three key needs: extended training duration, enhanced digital infrastructure, and greater stakeholder inclusion. These align with global best practices in professional learning and underscore contextual responsiveness in scaling AI-enabled mentorship frameworks [6], (Yazıcı & Others, 2024). Based on participant feedback, facilitators increased hands-on AI time, simplified instructions, and improved OER templates, demonstrating CCMM's adaptability to educators' needs.

5. Conclusion and Policy Implications

This study evaluated the implementation of the Co-Creative Mentoring Model (CCMM) as an innovative framework for integrating Artificial Intelligence (AI), inclusive pedagogy, and collaborative mentoring in Ghanaian teacher education. A paragraph has been added to illustrate how the CCMM was piloted through a national workshop involving 23 educators. Specific implementation steps, adjustments (e.g., extended peer practice), and outcomes (e.g., a 92% increase in AI confidence) are outlined to provide practical insights for replication.

The findings affirm the model's theoretical coherence and adaptability across institutions. Grounded in constructivist learning theories, the CCMM enabled participants to develop digital competencies, create inclusive resources, and build mentorship networks. High satisfaction and confidence in AI applications validated the model's effectiveness. The integration of equity approaches proved successful, aligning with research showing inclusive mentorship promotes engagement and professional development (Hubbard Cheuoua et al., 2022; Lopez, 2013; McGuire & Reger, 2003). Simultaneously, systemic challenges, including limited Internet access, compressed training durations, and resource constraints, underscore the need for structural adaptations and ongoing institutional support. These barriers are not unique to this study but reflect broader constraints across sub-Saharan teacher-education systems (Kuyini & Others, 2018; Opoku & Others, 2020).

5.1 Policy Recommendations

Insights from the National AI in Education Workshop inform the following action points to advance and scale the Co-Creative Mentoring Model (CCMM).

1. **Integrate AI Mentorship into Teacher Training**: Embed AI-supported co-creation and gender-responsive pedagogy into pre-service and in-service curricula. Align national frameworks with TPACK and experiential mentoring principles (Rarieya et al., 2024; Tarisayi, 2024). *In contexts with limited resources, it is essential to prioritise AI tools and open educational resources (OERs) that can function offline without the need for continuous Internet connectivity. It is advisable to develop modular teacher-training units that can be delivered via mobile devices or SD cards, thereby ensuring accessibility in areas with constrained bandwidth.*
2. **Develop Peer Mentoring Hubs**: Formalise peer-led mentoring networks within institutions, enabling trained participants to support colleagues and sustain collaborative learning communities (Barhone et al., 2024; Lopez, 2013). *To encourage local ownership, it is recommended that these hubs be placed within existing school clusters or district teacher resource centres. Additionally, equipping these hubs with basic solar-powered devices is essential to ensure their functionality in areas without grid connectivity.*
3. **Strengthening Digital Infrastructure**: Addressing connectivity and device access gaps—barriers frequently cited by participants—to unlock the full potential of AI tools in teaching (Annan-Brew et al., 2024; Wolf, 2018b). *To improve access to affordable broadband, it is recommended that public-private partnerships be leveraged and device donation programs be initiated. Furthermore, establishing community-based Wi-Fi zones and exploring zero-rated educational platforms are advised to help reduce data costs for educators and students in the future.*

4. **Monitor Equity and Inclusion**: Utilise gender and inclusion indicators to assess program outcomes, ensuring alignment with SDG 4 and national education objectives (Rarieya et al., 2024). *To ensure equitable data collection and enable targeted interventions, even in remote areas, it is advisable to implement digital dashboards or paper-based monitoring templates in schools with limited ICT infrastructure.*
5. **Promote Research and Communities of Practice**: Support participants in engaging in action research and cross-institutional collaboration, promoting iterative learning and policy feedback to facilitate the broader adoption of models. *To empower educators in low-resource schools, it is crucial to offer microgrants and mentorship to enable them to document and share contextually grounded innovations that benefit their students. Furthermore, establishing bilingual platforms for community sharing in local languages is recommended.*
6. **Scalability Framework for Diverse Contexts**: We introduced a step-by-step framework for CCMM adaptation across diverse contexts. This includes a pilot phase, structured feedback loops, contextual adaptation (e.g. language and bandwidth), and gradual institutional integration. *It is advisable to begin phased implementation in underserved regions to refine the model under resource-limited conditions. Educators with limited digital proficiency should be equipped with adaptive toolkits, including printable guides, audio supplements and voice-based mobile mentoring solutions.*

The CCMM enabled participants to adopt inclusive AI pedagogies through collaborative learning. The model proved adaptable and aligned with Ghana's teacher development goals despite constraints. As education systems transform, CCMM provides a framework for integrating AI and equity-focused mentorship. Future studies should examine classroom applications in low-resource contexts. The CCMM can serve as a cornerstone of inclusive teacher education.

References

Akama, F., & Keenan, J. (2022). Attitudes towards staff mentoring by senior leaders of a College of Education in Ghana. *Journal of Higher Education Policy and Management*, *45*(1), 84–95. https://doi.org/10.1080/1360080X.2022.2140749

Annan-Brew, R., Ezugwu, I., Surman, S., & Dadzie, J. (2024). Enhancing pre-service teacher effectiveness: Integration of 21st-century skills during off-campus teaching experiences. *European Journal of Education*, *59*(4), e12737. https://doi.org/10.1111/ejed.12737

Barhone, J. E., Erradi, M., & Khaldi, M. (2024). An innovative collaborative approach to university training for learner-teachers. *International Journal of Adult Education and Technology*.

Butakor, P. (2023). Exploring pre-service teachers' beliefs about the role of artificial intelligence in higher education in Ghana. *International Journal of Innovative Technologies in Social Science*.

Dorner, H., & Kumar, S. (2016). Online Collaborative Mentoring for Technology Integration in Pre-Service Teacher Education. *TechTrends*, *60*(1), 48–55. https://doi.org/10.1007/s11528-015-0016-1

Dorner, H., & Others. (2016). Online collaborative mentoring for technology integration in pre-service teacher education. *TechTrends*.

Hubbard Cheuoua, A., Twarek, B., Campos, E., Fetherston, A., Kao, Y. S., & Logan, L. (2022). Equity-focused Peer Mentoring for High School CS Teachers. *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education V. 2*, 1149.

Kuyini, A. B., & Others. (2018). Teachers' self-efficacy beliefs, attitudes and concerns about implementing inclusive education in Ghana. *International Journal of Inclusive Education*.

Lopez, A. E. (2013). Collaborative mentorship: A mentoring approach to support and sustain teachers for equity and diversity. *Mentoring & Tutoring: Partnership in Learning*, *21*(3), 292–311. https://doi.org/10.1080/13611267.2013.827831

McGuire, G. M., & Reger, J. (2003). Feminist co-mentoring: A model for academic professional development. *NWSA Journal*, *15*(1), 54–72.

Opoku, M., & Others. (2019). Mapping the evidence-based research on Ghana's inclusive education to policy and practices: A scoping review. *International Journal of Inclusive Education*.

Opoku, M., & Others. (2020). Twin-track approach to teacher training in Ghana: Exploring the moderation effect of demographic variables on pre-service teachers' attitudes towards inclusive education. *Educational Psychology*.

Rarieya, J. F., Wango, N. C., Oluga, M., & Abunga, O. M. (2024). Accelerating primary education tutors' acquisition of gender-responsive pedagogies. *European Journal of Education and Pedagogy*, *5*(2), 160–166. https://doi.org/10.24018/ejedu.2024.5.2.2315

Tarisayi, K. S. (2024). Preparing For AI's Transformational Potential: Rethinking Teacher Education In South Africa. *International Education Trend Issues*, *2*(1), 1–10. https://doi.org/10.5281/zenodo.XXXXXXX

Wolf, S. (2018a). Impacts of pre-service training and coaching on kindergarten quality and student learning outcomes in Ghana. *Studies in Educational Evaluation*.

Wolf, S. (2018b). Impacts of Pre-Service Training and Coaching on Kindergarten Quality and Student Learning Outcomes in Ghana. *Studies in Educational Evaluation*, *59*, 112–123. https://doi.org/10.1016/j.stueduc.2018.05.001

Yazıcı, M., & Others. (2024). School based inclusive mentoring within the scope of an experiential learning model (IEM) for teacher education. *Teaching and Teacher Education*.