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EFFECT OF FLIPPED CLASSROOM ON PRESERVICE TEACHERS' CRITICAL THINKING IN MICROTEACHING

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Abstract

Microteaching remains a foundational practice in Nigerian Colleges of Education, yet many preservice teachers continue to struggle with practical classroom delivery because of underdeveloped critical thinking, limited ICT integration, and resistance to innovative pedagogies. This paper examines the effect of the Flipped Classroom (FC) strategy embedded within the Microteaching Augmented Learning Activities (MTALA) framework a design developed using the ADDIE model and mediated by the Moodle Learning Management System on preservice teachers' critical thinking development and microteaching competency acquisition. Anchored in Constructivist Learning Theory, Cognitive Load Theory, and the RED Model of critical thinking (Recognize Assumptions, Evaluate Arguments, Draw Conclusions), the study employed a convergent mixed methods quasi experimental design. Sixty NCE II preservice teachers from the Federal College of Education, Yola, were assigned to either an experimental group (taught using the flipped, technology mediated MTALA approach) or a control group (taught using the traditional teach reteach cycle). Quantitative data were gathered through the Microteaching Observation Rubric (MOR) and the Critical Thinking Descriptive Observation Rubric (CTDOR), and analysed using the Wilcoxon Signed Rank Test, the Quade Test, and Spearman's correlation in IBM SPSS version 27. Qualitative data from semi structured interviews with six participants were analysed using Braun and Clarke's

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(2006) six phase thematic framework. Findings revealed statistically significant improvements across all three critical thinking dimensions and all three microteaching competency domains, with the experimental group outperforming the control group by approximately 119–130% in key microteaching skills. Spearman's correlation produced a weak, non significant association (ρ = 0.097, p = 0.611) between critical thinking and microteaching performance scores, suggesting that the two competencies develop along parallel, non-linear progressions. Thematic analysis yielded nine validated themes that substantiated the quantitative results. The study concludes that the flipped classroom approach, when systematically embedded within a technology mediated instructional design, offers a scalable and replicable strategy for narrowing the theory practice gap in Nigerian teacher education.

Introduction

Educational technology has evolved into advanced hardware, software, and pedagogical models that are reshaping global education (Rof et al., 2022). Central to this evolution is the invention of Learning Management Systems (LMS), which have shifted from mere content repositories to dynamic environments capable of mediating complex instructional strategies. Countries such as the United States, China, Canada, the United Kingdom, Japan, and Malaysia have prioritised such technological infrastructures to advance educational outcomes (Alamin et al., 2015; World Bank, 2019; Zainol et al., 2021). In the twenty first century, the integration of LMS platforms supports a paradigm shift from teacher centred to learner centred approaches, empowering students to think critically, solve problems, and take ownership of their learning (Darsih, 2018; Nestory & Thaddeus, 2017).

Blended Learning Approaches (BLA), a key twenty first century pedagogical innovation, integrate online and face to face instruction to promote flexible and autonomous learning. Their relevance increased markedly during the COVID 19 pandemic, when digital platforms became central to sustaining education (Iyer & Jain, 2021; Malasari et al., 2021). Among the various BLA models, the Flipped Classroom has been particularly recognised for advancing learner centred education by reversing the traditional sequence of instruction: learners first encounter content asynchronously online, freeing face to face time for higher order engagement (Adiwisastra et al., 2020; Cabi, 2018; Wibawa & Kardipah, 2018). This reversal is especially valuable for skills-based training such as microteaching, where classroom time is scarce and must be devoted to practice rather than content delivery.

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Critical thinking remains a vital skill for effective decision making and problem solving in education. It involves analysing and evaluating information to reach valid conclusions (Chukwuyenum, 2013; Fisher, 2001; Tahira et al., 2019). Yet studies consistently show that preservice teachers struggle with evaluating arguments and drawing conclusions, which undermines lesson preparation and teaching effectiveness (Hariyanto et al., 2022; Kanwal & Butt, 2021). Microteaching, a strategy originally developed at Stanford University to train preservice teachers, relies heavily on critical thinking for both skill acquisition and effective classroom practice (Srivastava, 2017; Ojo, 2021; Bada & Akinbobola, 2022).

Microteaching has long been a cornerstone of teacher education in Nigeria, having been introduced in the 1970s through a UNESCO grant at Alvan Ikoku College of Education. Because it improved the performance of preservice teachers, the National Commission for Colleges of Education (NCCE) mandated its nationwide adoption in the 1990s (Onwuagboke et al., 2017; Udo, 2019). Despite this policy support, serious gaps remain: many student teachers still lack essential teaching skills, largely because of inadequate training methods and facilities (Makafane, 2020; Maryam & Ishola, 2019; Sani et al., 2018). The current training environment in many Nigerian Colleges of Education relies heavily on traditional lecture methods, producing a "performative" style of microteaching in which students imitate teaching behaviours without understanding the underlying reasoning (Ibeneme & Izundu, 2023; Izuchukwu Kanu et al., 2024). This passive approach fails to challenge preservice teachers intellectually, leaving graduates ill equipped for the unpredictable nature of real classrooms and widening the gap between theory and practice (Gambo et al., 2024). The Flipped Classroom has been identified by several scholars as an "enabler" capable of addressing this gap: by requiring learners to internalise foundational content before class, FC frees classroom time for active, higher order engagement (Malasari et al., 2021; Mariani & Dewi, 2025).

Problem Statement

Despite the structured nature of microteaching, a persistent disconnect remains between training and actual classroom performance. Preservice teachers often fail to adequately demonstrate essential teaching skills during practice exercises (Barkindo & Bambi, 2020), and frequently lack confidence in classroom management when facing real students (Mkhasibe, 2020). This shortfall is directly linked to a limited capacity for critical thinking during the acquisition and practice of microteaching skills (Kanwal & Butt, 2021), producing a pedagogical gap in which trainees understand the content of teaching but struggle with the reasoning required to adapt lessons to dynamic classroom realities (Kazeem et al., 2024).

The Flipped Classroom model has been recognised for enhancing skill acquisition by allowing learners to engage with content before class (Mamman et al., 2022; Şentürk,

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2021); however, its integration with structured, technology mediated microteaching training remains largely unexplored within the specific context of Nigerian Colleges of Education. Existing studies have focused predominantly on general classroom settings or subject specific applications such as nursing, science, and mathematics education (Aşıksoy & Sorakin, 2018; Barranquero Herbosa et al., 2022; Wang et al., 2025), leaving a notable gap in evidence regarding how the Flipped Classroom can enhance the performance based critical thinking required in microteaching laboratories. This paper therefore examines the effect of the Flipped Classroom strategy, operationalised through the MTALA framework and mediated by the Moodle LMS, on preservice teachers' critical thinking development within microteaching training in Northeastern Nigeria.

Research Objectives

The study was guided by the following objectives:

1. To design flipped classroom-based learning activities for preservice teachers' microteaching training (MTALA).
2. To investigate the effect of the Flipped Classroom approach on preservice teachers' critical thinking development in terms of: (a) recognizing assumptions, (b) evaluating arguments, and (c) drawing conclusions.
3. To determine the effect of the Flipped Classroom approach on preservice teachers' microteaching performance in terms of: (a) knowledge acquisition, (b) skill acquisition, and (c) skill transfer.
4. To examine the relationship between preservice teachers' critical thinking and their microteaching performance.

Research Questions

1. What is the effect of the Flipped Classroom approach on preservice teachers' critical thinking development?
2. What is the effect of the Flipped Classroom approach on preservice teachers' microteaching performance?
3. What is the relationship between preservice teachers' critical thinking scores and their microteaching performance scores?

Significance of the Study

This study contributes to the growing literature on microteaching, blended learning, and critical thinking in teacher education. For preservice teachers, it offers a structured, technology mediated pathway to acquiring fundamental teaching skills while developing the critical thinking dispositions needed to adapt instruction to real classroom conditions. For supervisors, it demonstrates how flipping instructional delivery can free classroom

time for practice based engagement, feedback, and differentiated support. For Colleges of Education and policymakers, the study offers empirical evidence to inform curriculum reform, technology adoption policy, and faculty development initiatives consistent with the standards of the National Commission for Colleges of Education (NCCE).

The Flipped Classroom Model

The Flipped Classroom is an instructional strategy and a form of blended learning designed to increase student engagement by having learners complete content-based activities at home while devoting class time to live problem solving and practice (Flipped Learning Network, 2014; Zainuddin et al., 2019). Grounded in the foundational work of Baker (2000) and elaborated by Bergmann and Sams (2023), the Flipped Classroom structures learning into three distinct phases: pre class (asynchronous engagement with digital content), in class (collaborative, practice oriented engagement), and post class (reflective consolidation). This reordering of instructional activity ensures that class time traditionally spent on passive content delivery is instead dedicated to higher order cognitive engagement, feedback, and skill practice (Harvard, 2023; Ozdamli & Asiksoy, 2016).

A growing body of research demonstrates that the Flipped Classroom enhances learner autonomy, motivation, and self-directed study (Cabi, 2018; Varghese & Ranjith, 2019). Within teacher education specifically, FC allows preservice teachers to internalise theoretical content such as lesson planning principles or the mechanics of set induction before applying that knowledge under supervision, thereby narrowing the theory practice gap that has long characterised microteaching training (Adiwisastra et al., 2020; Wibawa & Kardipah, 2018). However, scholars caution that FC implemented in isolation may emphasise content delivery and learner autonomy without sufficiently exposing learners to complex, authentic problem solving; consequently, several researchers recommend pairing FC with problem oriented, in class activities to maximise its effect on higher order thinking (Malasari et al., 2021; Mariani & Dewi, 2025).

Critical Thinking and the RED Model

Critical thinking has been widely conceptualised as an intellectually disciplined process of actively and skilfully conceptualising, applying, analysing, synthesising, and evaluating information gathered from observation, reflection, and reasoning as a guide to belief and action (Sanders & Moulenbelt, 2011). Building on the Watson–Glaser Critical Thinking Appraisal tradition, Wyn et al. (2019) proposed the RED Model, which operationalises critical thinking through three interconnected dimensions: Recognizing Assumptions (identifying underlying beliefs or biases present in classroom situations and feedback), Evaluating Arguments (critically analysing the validity and strength of pedagogical claims

or feedback), and Drawing Conclusions (synthesising evidence and feedback into logical, well supported instructional decisions). This study adapts the RED Model as the guiding framework for assessing preservice teachers' cognitive development during microteaching.

Microteaching and the Theory Practice Gap

Microteaching is a teacher training technique that allows a preservice teacher to apply clearly defined teaching skills to a carefully prepared lesson in a brief, structured encounter with peers or a small group of learners, typically followed by supervisor and peer feedback (Azrai et al., 2020; Thangaraju & Medhi, 2023). Globally, microteaching is credited with fostering twenty first century skills such as creativity, collaboration, and communication (Chiruguru, 2020). In Nigeria, however, graduates frequently enter the workforce unable to demonstrate these competencies (Barkindo & Bambi, 2018; Udo, 2019), a shortfall attributed to reliance on traditional, lecture dominated training that leaves limited room for reflective, higher order engagement (Ghanizadeh, 2017; Ishika et al., 2024).

Technology Mediated Instruction: The Role of Moodle

Moodle, an open source Learning Management System, has been widely acknowledged for supporting innovative pedagogical approaches in teacher education (Fidan, 2023). In this study, Moodle served as the technological backbone of the MTALA framework, providing a structured digital environment in which preservice teachers accessed instructional materials, video demonstrations, and collaborative tasks. Moodle's interactive features facilitated pre class preparation, in class engagement, and post class reflection through resources, discussion forums, and feedback mechanisms, and its collaborative tools supported problem based engagement by fostering communication and teamwork among trainees (Ruslan et al., 2024).

Theoretical Framework

This study is anchored in Constructivist Learning Theory, which holds that learners actively construct knowledge through engagement, reflection, and collaboration rather than passively receiving information (Piaget, 1952; Vygotsky, 1978). The Flipped Classroom operationalises this constructivist premise by requiring learners to engage actively with pre class materials, while classroom time is reserved for socially mediated, scaffolded application consistent with Vygotsky's Zone of Proximal Development (Hmelo Silver, 2004). Cognitive Load Theory (Sweller, 1988) further explains FC's pedagogical value: by allowing learners to process foundational content at their own pace before class, FC reduces extraneous cognitive load during complex in class practice, freeing cognitive

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resources for germane, schema building activity (Abeysekera & Dawson, 2015). Finally, Bloom's Revised Taxonomy (Anderson, 2001) informed the alignment of pre class materials with lower order cognitive skills and in class activities with higher order skills analysing, evaluating, and creating that are central to critical thinking development (Gilboy et al., 2015).

Taken together, this literature establishes a clear rationale for examining the Flipped Classroom's effect on critical thinking within microteaching: while FC has demonstrated benefits for autonomy and content mastery across diverse disciplines, its specific contribution to the cognitive dimensions of critical thinking within Nigerian teacher education microteaching laboratories has not been empirically established. This study addresses that gap.

Research Design

This study adopted a convergent mixed methods quasi experimental design, grounded in the pragmatist philosophical tradition associated with Peirce, James, and Dewey, which holds that thought and action should be oriented toward solving practical problems (Maarouf, 2019). Quantitative and qualitative data were collected concurrently and subsequently triangulated to answer the research questions (Creswell, 2012; Schoonenboom & Johnson, 2017). For the quantitative strand, a quasi-experimental design with non equivalent groups was used, in which participants were conveniently assigned to an experimental (Flipped Classroom / MTALA) group and a control (traditional teach reteach) group. For the qualitative strand, semi structured interviews were conducted with a purposively selected subset of the experimental group to elicit their perceptions of how the Flipped Classroom approach influenced their critical thinking development.

Population and Sample

The target population comprised NCE II preservice teachers at the Federal College of Education (FCE), Yola, of whom approximately 1,766 had registered for the Microteaching course (EDU 221) in the 2024/2025 academic session. A convenience sample of sixty preservice teachers was drawn, with thirty participants from the School of Secondary Education Arts and Social Sciences assigned to the experimental group and thirty from the School of Languages assigned to the control group. This sample size is consistent with recommendations for quasi experimental educational research, where thirty participants per group is generally regarded as sufficient to detect moderate treatment effects (Creswell, 2012; Fraenkel, Wallen, & Hyun, 2019).

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The MTALA Flipped Classroom Intervention

The experimental group engaged with a fourteen week intervention structured around the three phases of the Flipped Classroom: pre class, in class, and post class. During the pre class phase, learners accessed instructional videos, readings, and worked examples via Moodle, building theoretical understanding of specific microteaching skills (articulating SMART learning outcomes, set induction, explanation, and use of instructional materials) at their own pace. The in class phase then shifted classroom time entirely to practice: learners presented microteaching lessons that applied the pre class content, received structured feedback from peers and supervisors, and engaged in problem oriented discussion of that feedback. The post class phase consolidated learning through online reflection and revised documentation of the lesson strategy. The control group covered the same content and the same fourteen week calendar, but all activity content delivery, practice, and feedback occurred exclusively in class, following the traditional teach reteach cycle.

Table 1 summarises the comparative structure of the two conditions.

Week	Experimental Group (Flipped Classroom)	Control Group (Traditional)
1–2	Basic Readiness Training and Pretest	Basic Readiness Training and Pretest
3–4	Online pre class content on SMART outcomes; in class practice and feedback	In class delivery, practice, and feedback
5–6	Online pre class content on set induction; in class practice and feedback	In class delivery, practice, and feedback
7–8	Online pre class content on explanation skills; in class practice and feedback	In class delivery, practice, and feedback
9–13	Online pre class content on instructional materials; in class practice and feedback	In class delivery, practice, and feedback
14	Consolidation, observation, interview, and posttest	Consolidation, observation, and posttest

Research Instruments

Two principal instruments were used to generate quantitative data. The Microteaching Observation Rubric (MOR), adapted from FCE Yola in line with NCCE minimum standards, assessed four microteaching competencies articulating SMART learning outcomes, set induction, explanation, and use of instructional materials across the domains of knowledge acquisition, skill acquisition, and skill transfer. The Critical Thinking Descriptive Observation Rubric (CTDOR), adapted from the RED Model (Wyn et al., 2019), enabled direct observation of critical thinking behaviours recognizing assumptions, evaluating

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arguments, and drawing conclusions as they emerged in authentic microteaching practice. Qualitative data were gathered through twelve semi structured interview questions developed following Wengraf's (2011) Semi Structured Depth Interview framework and administered to six purposively selected members of the experimental group.

Validity and Reliability

Both rubrics and the interview protocol were reviewed by a panel of four experts in Educational Psychology and Curriculum and Instruction, each with more than ten years of microteaching supervision experience. Inter rater reliability was assessed using Cohen's Kappa with twelve NCE III students and two independent raters, yielding predominantly moderate to substantial agreement (Kappa values ranging from 0.40 to 1.00 across rubric components). Qualitative data were validated through member checking and independent review by two experts, ensuring the credibility and trustworthiness of the thematic findings.

Data Analysis

Prior to hypothesis testing, all variables were assessed for normality using the Shapiro Wilk test ($\alpha = .05$); 37 of 40 variables (92.5%) exhibited significant departures from normality, necessitating non parametric analysis throughout. The Wilcoxon Signed Rank Test was used to assess within group pre test to post test change for each group. The Quade Test, with Kendall's W as the effect size, was used to compare performance across the control and experimental conditions while controlling for pre test scores. Spearman's Rank Order Correlation was used to examine the relationship between post test critical thinking scores and microteaching performance scores in the experimental group. All quantitative analyses were conducted in IBM SPSS Statistics Version 27 at $\alpha = .05$. Qualitative interview data were analysed using Braun and Clarke's (2006) six phase thematic analysis framework, combining deductive coding derived from the RED Model with inductive, data driven codes.

Effect of the Flipped Classroom on Critical Thinking

Within group analysis using the Wilcoxon Signed Rank Test revealed statistically significant improvements in recognizing assumptions, evaluating arguments, and drawing conclusions for both the control group ($Z = -3.615$, $p < .001$) and the experimental group ($p < .001$), indicating that both traditional and flipped instructional approaches produced measurable gains in critical thinking. However, the between group Quade Test which controlled for pre test differences revealed that the magnitude of improvement was substantially greater for the experimental group. For recognizing assumptions, the

Quade statistic was 42.85 (df = 3), exceeding the critical value of 7.815 and indicating a statistically significant difference across the four assessment conditions, with an associated Kendall's W of 0.48, denoting a large effect size.

Comparable patterns emerged for evaluating arguments and drawing conclusions, with the experimental group consistently recording higher post test ranks than the control group across all three RED Model dimensions. These findings indicate that while conventional teach reteach cycles do foster some critical thinking growth, the Flipped Classroom's reallocation of class time toward practice, feedback, and reflective discussion produced markedly larger gains in preservice teachers' capacity to recognise assumptions, evaluate pedagogical arguments, and draw sound instructional conclusions.

Effect of the Flipped Classroom on Microteaching Performance

Analysis of the Microteaching Observation Rubric data showed statistically significant within group improvements in knowledge acquisition, skill acquisition, and skill transfer for both groups. Between group comparisons using the Quade Test again favoured the experimental group, which outperformed the control group by approximately 119–130% across the four assessed microteaching skills articulating SMART learning outcomes, set induction, explanation, and use of instructional materials. These gains suggest that separating content delivery (assigned to the pre class, asynchronous phase) from skill practice (reserved for in class, supervised engagement) allowed experimental group participants considerably more classroom time for iterative practice, feedback, and refinement than their control group counterparts.

Relationship Between Critical Thinking and Microteaching Performance

Spearman's Rank Order Correlation conducted on post test scores of the experimental group (n = 30) revealed a weak, statistically non significant relationship between total critical thinking scores and total microteaching performance scores ($\rho = 0.097$, $p = 0.611$). This finding suggests that although both competencies improved substantially under the Flipped Classroom intervention, they appear to develop along largely independent, non linear trajectories rather than a tightly coupled linear progression, a pattern further explored in thematic analysis of participants' interview responses.

Qualitative Findings

Thematic analysis of interviews with six experimental group participants yielded nine validated themes organised around three broad categories consistent with the research questions: critical thinking development, microteaching skill acquisition, and the relationship between the two. Participants frequently described the pre class Moodle materials as enabling them to identify gaps in their own understanding before facing a

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live class a pattern coded as diagnostic thinking. Several participants described how feedback received during in class presentations functioned as a form of evaluative reasoning, prompting them to reconsider or defend their pedagogical choices a theme labelled strategy selection. A third cluster of themes centred on informed instruction, wherein participants described how the discussion phase of MTALA required them to justify and finalise their instructional decisions based on synthesised feedback. Collectively, these themes corroborate the quantitative results, illustrating how the Flipped Classroom's structured separation of content acquisition from practice created recurring opportunities for diagnostic reasoning, reflective analysis, and strategy selection throughout the fourteen-week intervention.

DISCUSSION

The findings of this study provide strong empirical support for the proposition that the Flipped Classroom, when systematically embedded within a technology mediated instructional design, meaningfully enhances preservice teachers' critical thinking and microteaching performance. Consistent with Cognitive Load Theory (Sweller, 1988), the separation of foundational content delivery from in class practice appears to have reduced extraneous cognitive load during microteaching sessions, freeing cognitive resources for the germane, schema building work of evaluating feedback and refining instructional decisions (Abeysekera & Dawson, 2015). This aligns with prior findings that flipped approaches enhance germane cognitive load through authentic, practice-oriented engagement (Lo & Hew, 2017).

The substantially larger gains observed in the experimental group relative to the control group despite both groups showing statistically significant within group improvement suggest that the Flipped Classroom did not simply replicate the benefits of traditional teach reteach cycles but rather amplified them, primarily by reallocating scarce classroom time away from content transmission and toward practice, feedback, and reflective discussion. This is consistent with the argument advanced by Malasari et al. (2021) and Mariani and Dewi (2025), who characterise the Flipped Classroom as an "enabler" that maximises the value of face to face instructional time for higher order engagement.

The weak, non significant correlation between critical thinking and microteaching performance scores constitutes a noteworthy and somewhat counterintuitive finding. One plausible explanation, informed by the qualitative data, is that critical thinking and microteaching skill acquisition while both enhanced by the Flipped Classroom are governed by partially distinct developmental processes: microteaching performance may depend more heavily on repeated behavioural practice and procedural refinement, whereas critical thinking growth may depend more on the quality and depth of reflective engagement with feedback, which does not necessarily scale linearly with the number of

teaching repetitions performed. This interpretation is consistent with constructivist accounts of teacher development that treat cognitive and behavioural competencies as related but non identical outcomes of instructional experience (Vygotsky, 1978; Hmelo Silver, 2004).

Practically, these findings suggest that Colleges of Education seeking to strengthen preservice teachers' critical thinking and instructional competence should consider adopting flipped, technology mediated designs for microteaching training, supported by adequately configured Learning Management Systems, trained facilitators, and manageable group sizes. Institutionally, embedding RED Model competencies within teaching methods courses and revising NCCE policy to accommodate flipped delivery formats would help translate the gains observed in this study into broader systemic improvement.

Conclusion

This study set out to determine the effect of the Flipped Classroom approach on preservice teachers' critical thinking in microteaching. The findings demonstrate that a fourteen week, technology mediated flipped intervention produced statistically significant improvements in all three dimensions of critical thinking recognizing assumptions, evaluating arguments, and drawing conclusions and in all three domains of microteaching performance knowledge acquisition, skill acquisition, and skill transfer with substantially larger gains than those achieved through traditional teach reteach instruction alone. Although critical thinking and microteaching performance did not correlate strongly at the individual level, both improved markedly under the flipped approach, underscoring its value as a scalable, replicable strategy for narrowing the persistent theory practice gap in Nigerian teacher education.

Recommendations

Based on the findings, the following recommendations are proposed:

1. Colleges of Education should consider institutionalising flipped classroom based microteaching training, supported by a properly configured Learning Management System such as Moodle, to maximise classroom time for practice and feedback.
2. Faculty development programmes should train microteaching supervisors in designing effective pre class digital content and facilitating reflective, feedback driven in class sessions.
3. The National Commission for Colleges of Education (NCCE) should consider revising microteaching curriculum guidelines to formally accommodate flipped and other technology mediated delivery formats.

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4. Future research should explore the mechanisms underlying the observed non significant correlation between critical thinking and microteaching performance, potentially through longitudinal or qualitative designs that track the two competencies over extended periods.
5. Institutions considering adoption should ensure manageable cohort sizes, reliable internet connectivity, and adequately trained facilitators, as these factors were identified as prerequisites for the successful replication of flipped, technology mediated microteaching training.

Limitations

This study was limited to sixty preservice teachers at a single institution the Federal College of Education, Yola using a convenience sample and quasi experimental, non equivalent group design; findings should therefore be interpreted with appropriate caution regarding generalisability to other institutional or regional contexts. Additionally, the fourteen week intervention period, while aligned with the academic calendar, may not fully capture longer term developmental trajectories in critical thinking or microteaching competence.

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