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Innovative teacher and innovative learner in the contemporary 21st Century Rwanda: Possibilities and challenges

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Abstract

This study investigates the possibilities and challenges encountered by tutors and students in implementing the Competence-Based Curriculum (CBC), with particular emphasis on its capacity to foster creativity, innovation, and 21st-century skills. In response to global educational reforms, many countries have shifted from content-driven instruction to competence-oriented pedagogies. Rwanda is among these reform-oriented systems, having adopted the CBC to produce learners who are adaptable, skilled, and globally competitive. Using a qualitative case study design, the research explores tutors' and students' experiences at a Teacher Training College (TTC) in applying innovative teaching and learning approaches under the CBC framework. The study is theoretically anchored in Vygotsky's Sociocultural Theory, which emphasises learning as a socially mediated process. Five tutors and thirty students were purposively selected. Data were generated through face-to-face interviews and focus group discussions and analysed using inductive thematic analysis. The findings were triangulated against relevant literature and the guiding theory. The results reveal that CBC-oriented pedagogies offer substantial pedagogical benefits when effectively implemented. These include enhanced learner confidence, active participation, collaboration, and the development of critical and reflective thinking skills aligned with contemporary global demands. However, the study also identifies persistent structural and institutional constraints that undermine effective implementation. Key challenges include inadequate physical infrastructure, limited and underutilised teaching and learning resources, shortages of instructional materials, and overcrowded classrooms. The study concludes that without targeted systemic support, the transformative potential of the CBC risks being compromised. It therefore recommends that the Rwanda Basic Education authorities prioritise infrastructural expansion, resource provision, continuous upgrading of smart classrooms, and intensified Continuing Professional Development (CPD) for tutors to ensure sustainable and effective CBC implementation.

Keywords: Competency Based Curriculum, Innovation, pedagogical skills, teacher training colleges, 21st century skills.

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Introduction

The rapid evolution of the 21st-centur education systems continues to challenge traditional models of teaching and learning worldwide, necessitating a critical re-examination of pedagogical practices within competence-oriented frameworks. In Rwanda, the adoption of the Competency-Based Curriculum (CBC) represents a deliberate policy shift aimed at equipping learners with creativity, innovation, and transferable skills required in a globalised knowledge economy. However, emerging evidence suggests that significant implementation challenges persist, particularly within Teacher Training Colleges (TTCs), where tutors and students are central to the realisation of CBC objectives (UNDP, 2023; Kizito, Telesphore & Rukundo, 2018; Nsengimana, 2021).

Despite the policy emphasis on innovation, insufficient application of innovative teaching and learning practices remains a constraint to effective CBC implementation. This limitation is largely attributed to inadequate institutional support systems, shortages of teaching and learning materials, and constrained infrastructure (Nsengimana, 2021). The present study is informed by the conviction that the successful development of 21st-century skills under the CBC is fundamentally dependent on tutors' and students' capacity to adopt and sustain innovative pedagogical practices. The study is particularly relevant within the broader global transition towards skills-based education and contributes to existing scholarship by examining both the possibilities and challenges of innovative teaching and learning within Rwanda's CBC at TTC level. By identifying benefits, limitations, and context-specific interventions, the study aligns with Rwanda's Vision 2050 and the United Nations 2030 Agenda for Sustainable Development, particularly Sustainable Development Goal 4 on quality education. Notably, while prior studies have examined CBC opportunities and constraints within Rwanda's education system, there remains a dearth of research focusing specifically on innovative teaching and learning practices in TTCs, thus justifying the present inquiry.

Description of the problem

Although innovation is widely recognised by governments and policymakers as a catalyst for transforming education systems and developing 21st-century skills, notable innovation gaps persist in the practical enactment of the CBC. This study contends that the expectations of producing innovative tutors and learners have not been fully realised within TTCs. While Rwanda's transition

from a Knowledge-Based Curriculum to the Competency-Based Curriculum in 2015 was intended to develop skilled human capital for national development (REB, 2015), sustained pedagogical innovation remains uneven and, in some cases, superficial (Nsengimana, 2021).

Furthermore, despite substantial investments in educational infrastructure through initiatives such as World Bank–supported school construction projects, institutions continue to experience unanticipated implementation challenges (Ngao & Xiaohong, 2020; Nsengimana, 2021). Although safe and modern learning environments are essential for effective teaching and learning, available infrastructure is not always fully utilised to promote innovation (Barrett et al., 2019). Similarly, initiatives such as the One Laptop per Child programme, innovation awards, smart classrooms, and robotics competitions signal strong policy intent; however, questions remain regarding equitable access, consistent utilisation, and pedagogical integration at TTC level (MINEDUC, n.d.; *Express News Team*, 2019).

While innovative practices are formally embedded across Rwanda's education system, including TTCs, their translation into meaningful classroom practice appears to lag policy expectations. Tutors and students are expected to function as active creators of knowledge through collaborative, problem-based, and project-driven learning approaches (Cachia et al., 2010; Kim et al., 2019). However, the extent to which these expectations are realised within CBC-driven TTC contexts remains insufficiently explored.

Guided by Vygotsky's Sociocultural Theory (1978), this study seeks to examine how tutors and students navigate innovative teaching and learning practices within Rwanda's CBC at TTCs and to identify actionable intervention strategies to strengthen implementation. The study is timely and necessary, as it offers empirical insights that may inform policy refinement, institutional practice, and stakeholder engagement in advancing innovation-driven teacher education in Rwanda.

Literature Review

The concephesises existing and emerging ideas to generate new products, practices, or systems (Kostoff, 2003; Mitchell & Coles, 2003). Baskaran and Mehta (2016) further associate innovation with scientific and technological advancement, particularly in contemporary knowledge-driven societies. In the context of this study, innovation is conceptualised as any pedagogical strategy or learning practice that enhances skills development, productivity,

adaptability, and learner versatility within the demands of the 21st-century global environment.

The Competence-Based Curriculum (CBC) is widely recognised as a pedagogical framework that fosters such innovation. It is regarded as a strategic approach for enhancing employability, productivity, and international competitiveness while addressing structural unemployment (Smith & Blake, 2005). Within Rwanda, the CBC emphasises the integration of transversal competences, including the effective use of information and communication technologies (ICTs), learner-centred methodologies, and the application of knowledge to real-world contexts (Rwanda Education Board [REB], 2015). Consequently, CBC is promoted as an innovative curriculum model capable of producing graduates whose skills align with both national development priorities and global labour market demands (REB, 2015; Nsengimana, 2021).

Furthermore, CBC foregrounds the development of higher-order competences such as critical thinking, problem-solving, creativity, innovation, research capability, lifelong learning, collaboration, and effective communication in official languages (Ngendahayo & Askell-Williams, 2016; Shaikhah et al., 2009). By requiring learners to demonstrate competence within authentic contexts, CBC positions education as a strategic instrument for socio-economic transformation (Mbarushimana & Kuboja, 2016). This study, therefore, interrogates the possibilities and challenges encountered by tutors and students when they engage with innovative teaching and learning practices within a competence-based framework.

Innovative Teaching and Learning Practices in Teacher Training Colleges

Traditional teacher-centred pedagogies have increasingly been criticised for their inability to respond to the demands of 21st-century education, particularly the need for adaptability, creativity, and learner agency (Shah & Kumar, 2020). Educational theorists such as Dewey (1997), Rousseau (1762), and Vygotsky (1978) have long advocated learner-centred approaches that emphasise experiential, flexible, and self-directed learning. In contemporary contexts, these pedagogical traditions have converged with advances in ICT to produce innovative, student-centred teaching and learning strategies (Muianga et al., 2018).

In Rwanda, concerns surrounding the persistence of traditional instructional methods prompted the Ministry of Education and the Rwanda Education Board to formally adopt learner-centred pedagogies aligned with CBC principles (MINEDUC, 2013; REB, 2015). Innovative teaching approaches

within this framework aim to create meaningful learning opportunities that enable students to deepen expertise, apply knowledge across contexts, and flourish academically and professionally (Bromley et al., 2011). Competence-based, student-centred pedagogies allow learners to mobilise knowledge, skills, values, and attitudes in ways that respond to global challenges (UNESCO, 2015; Rieckmann & Hericks, 2016; Boahin, 2018).

Within such approaches, the role of the tutor shifts from that of a transmitter of knowledge to a facilitator and guide of learning processes. Dialogue, collaboration, and language-mediated interaction become central to knowledge construction, reflecting core principles of sociocultural learning theory (Mascolo, 2009). ICT-supported student-centred strategies commonly include role-play, problem-solving, case studies, project-based learning, personalised learning, and collaborative learning (Griffith & Lim, 2014; Patel-Junankar, 2017; Bhattacharya, 2021).

Project-based learning has gained prominence globally and within Rwanda for its effectiveness in cultivating 21st-century skills (Griffith & Lim, 2014). Through inquiry-driven tasks such as investigations, surveys, site visits, and applied analysis, learners actively construct knowledge and develop evidence-based reasoning skills (Braun, 2017; Hadiyanto et al., 2021). Working individually or collaboratively, students gather, analyse, and present findings, thereby strengthening cognitive, social, and emotional competencies. International experiences from countries such as Finland and Tanzania highlight the value of project-based learning in fostering reflective, authentic, and contextually grounded learning (Shear et al., 2011; Nsengimana, 2021). However, this approach can be time-intensive and demands strong learner preparedness and tutor facilitation.

Personalised learning represents another critical dimension of innovative pedagogy within CBC. Defined as instruction tailored to individual learner needs, interests, and abilities, personalised learning promotes learner autonomy and self-initiation (Hughey, 2020). Rwanda's CBC explicitly encourages personalised learning as part of its broader commitment to active and inclusive education (MINEDUC, 2019). Effective implementation relies on tutors' ability to design flexible learning pathways and to act as facilitators rather than content deliverers (Pane, 2018; Shaikh & Khoja, 2012). ICT plays a crucial enabling role by supporting progress monitoring, targeted support, and differentiated instruction (Ferrero, 2018). Nevertheless, limited technological resources and

insufficient pedagogical modelling remain significant constraints in developing contexts.

Collaborative learning further complements competence-based pedagogy by enabling students to co-construct knowledge through shared tasks and collective problem-solving (Barkley et al., 2014; Kuwabara et al., 2020). Within collaborative environments, tutors design intellectual experiences, guide inquiry, and facilitate reflection, while learners actively engage in discussion, critique, and presentation. Evidence suggests that collaborative learning enhances communication skills, critical thinking, creativity, and learner confidence (Laal & Ghodsi, 2012; Bughin et al., 2018). Despite its recognised benefits, the transition from traditional to collaborative pedagogies remains uneven in some Rwandan institutions.

Competence-Based Curriculum in Rwanda's Teacher Training Colleges

In alignment with global curriculum reforms, Rwanda transitioned from a KBC a CBC to address labour market needs and societal expectations of the 21st-century teacher (REB, 2015; REB, 2020). CBC prioritises the holistic development of knowledge, skills, attitudes, and values, emphasising application rather than rote acquisition. It is underpinned by constructivist, learner-centred, and criterion-referenced approaches aligned with international best practice (REB, 2020).

Empirical studies within Rwanda demonstrate mixed outcomes. While evidence suggests increasing use of innovative teaching tools, particularly at the secondary level (Nkundabakura et al., 2023), persistent challenges such as inadequate teaching and learning materials, limited laboratory resources, and infrastructural deficits continue to constrain effective implementation (Nsengimana, 2021). Although competence-based approaches have shown positive effects on learning outcomes (Marcel & Cyprien, 2022), there remains a notable gap in empirical research examining how tutors and students experience innovative teaching and learning practices within TTCs.

This study, therefore, addresses a critical gap by exploring both the possibilities and challenges of innovative teaching and learning within Rwanda's CBC at TTCs, contributing evidence to inform policy, practice, and the broader discourse on competence-based education in developing contexts.

Methodology

This study adopted a qualitative research approach to explore the lived experiences of tutors and students engaged in innovative teaching and learning practices within Rwanda's CBC. A qualitative approach was considered appropriate as it enables an in-depth examination of meanings, practices, and contextual realities that shape curriculum innovation, particularly where complex social interactions and pedagogical processes are involved (Maree, 2016). The study was theoretically grounded in Vygotsky's Sociocultural Theory (1978), which is constructivist in orientation and conceptualises learning as a socially mediated process. From a social constructivist perspective, knowledge is actively constructed and shared through interaction, collaboration, and participation in culturally situated activities (Mvududu & Thiel-Burgess, 2012). This theoretical lens was particularly relevant to the study, as innovative and competence-based pedagogies require tutors and students to co-construct knowledge through learner-centred methods, group work, dialogue, and experiential learning.

A case study design was employed, focusing on a public TTC (pseudonymised as Eastern TTC) located in Rwanda's Eastern Province. The case study approach enabled the generation of rich, contextualised insights into how innovative teaching and learning practices are enacted, negotiated, and constrained within a real-world CBC implementation context.

Purposive sampling was used to select information-rich participants with direct experience of CBC implementation. The sample comprised five tutors and thirty students organised into five focus group discussions of six participants each. Tutors were selected because of having a minimum of three years' teaching experience at the institution, while students were drawn from final-year (Year Three) cohorts to ensure sustained exposure to competence-based teaching and learning practices. Tutors, as curriculum implementers, and students, as primary beneficiaries of CBC pedagogy, were regarded as key informants. The combination of individual tutor interviews and student focus groups enabled triangulation of perspectives and facilitated data saturation.

Data were collected using semi-structured face-to-face interviews and focus group discussions (Nieuwenhuis, 2007). These instruments were selected to allow flexibility while maintaining alignment with the study's research focus. Interview and discussion guides were designed to elicit participants' experiences, perceptions, and practices relating to innovative teaching and

learning within the CBC framework (Marshall & Rossman, 2006). The semi-structured format enabled participants to articulate their views in depth and allowed the researchers to probe emerging issues relevant to innovation and curriculum implementation.

Data analysis followed an inductive thematic analysis approach guided by Creswell's (2009) analytical procedures. Audio-recorded interviews and focus group discussions were transcribed verbatim and repeatedly read to achieve familiarisation. Initial coding was undertaken to identify patterns, similarities, and divergences across the dataset. Codes were subsequently clustered into coherent themes and sub-themes through systematic data condensation and abstraction (Miles, Huberman, & Saldaña, 2014). The emergent themes were interpreted through iterative comparison with existing literature and the guiding sociocultural theoretical framework, enabling the identification of areas of convergence, divergence, and novel contribution.

Rigour and trustworthiness were ensured through several strategies. Credibility was enhanced through prolonged engagement in the field, member checking, and crystallisation of data sources and perspectives. Participants were provided with clear explanations of the study's purpose, context, and procedures before data collection, ensuring informed participation. Dependability was addressed through collaborative data analysis, whereby the researchers initially analysed the data independently and subsequently engaged in joint interpretation to refine themes and interpretations. An audit trail comprising interview transcripts, field notes, and coding decisions was maintained to enhance transparency and consistency of the analytical process.

Ethical considerations were observed throughout the study. Formal permission to conduct the research was obtained from the college, and informed consent was sought from all participating tutors and students. Participants were assured of confidentiality and anonymity, and pseudonyms were used in reporting the findings. Participation was voluntary, and participants were informed of their right to withdraw from the study at any stage without penalty.

Findings

Data generated through face-to-face interviews and focus group discussions revealed that both tutors and students experienced clear possibilities and challenges in implementing innovative teaching and learning practices within Rwanda's Competency-Based Curriculum (CBC) at Teacher Training Colleges (TTCs). The findings were organised into three overarching themes: benefits

of innovative teaching and learning, drawbacks constraining innovation, and proposed strategies for strengthening innovative practice (Creswell, 2009; Miles et al., 2014). These findings are interpreted through Vygotsky's Sociocultural Theory, which emphasises learning as a socially mediated and collaborative process (Vygotsky, 1978) and are situated within existing empirical literature.

Benefits of Innovative Teaching and Learning

Participants consistently reported that CBC-oriented pedagogies offer substantial pedagogical benefits when supported by adequate resources and institutional conditions. These benefits included learner-centredness, learning beyond classroom boundaries, collaboration, and enhanced learner motivation and engagement (REB, 2015; UNESCO, 2015; Tabaro, 2018).

Learner-centred teaching and learning emerged as a core benefit of CBC implementation. Tutors highlighted that students are afforded autonomy to construct knowledge at their own pace, a finding strongly aligned with sociocultural and constructivist principles. One tutor noted that:

> *…students have a chance of improving their skills and creating knowledge as individuals in their own time. They are not given deadlines, but they work on schedule (Tutor D).*

This reflects Vygotsky's (1978) assertion that learning is optimised when learners actively engage with tasks within meaningful contexts. Tutors further emphasised the role of ICT in promoting deep learning rather than rote memorisation. As one participant explained:

> *CBC is student-centric, and it allows students to use information communication technology, and they learn in depth instead of memorising" (Tutor A). Another tutor added that "competence-based teaching and learning caters for learners who show different learning styles. This assists learners to learn in depth (Tutor E).*

These findings corroborate earlier studies that identify learner-centredness and ICT integration as defining features of competence-based education (Guthrie, 2009; Hattie, 2009; Boahin, 2018; Kivunja, 2015).

The data also revealed that innovative pedagogies enable learning beyond the physical classroom, largely through the integration of ICT. Tutors emphasised that learning is no longer confined to institutional spaces:

> *The beauty of CBC is that it encompasses the use of information and communication technology. This has made learning easier for students as they can learn and research from anywhere (Tutor B).*

The findings align with Taddei (2009) and Joseph and Mathew (2019), who argue that innovative teaching extends learning across multiple physical and virtual

spaces, with digital tools functioning as mediational artefacts in sociocultural learning processes (Vygotsky, 1978; Bernikova, 2017).

Collaboration was identified as another significant benefit of innovative teaching and learning. Tutors observed that collaborative activities promote open discussion and peer engagement:

> *When students are given a topic to work on, they freely discuss and give their opinions without fear F (Tutor C).*

while another noted that:

> *Innovative teaching assists students to deliberate on given topics with their peers in depth (Tutor E).*

These findings resonate strongly with sociocultural theory, which posits that knowledge is co-constructed through social interaction (Vygotsky, 1978) and is supported by studies demonstrating that collaborative learning enhances critical thinking, creativity, and communication skills (Laal & Ghodsi, 2012; Bughin et al., 2018; Joseph & Mathew, 2019).

Participants also reported that innovative teaching practices were motivating and engaging, enabling students to discover and nurture their talents. One tutor observed that:

> *…innovative teaching and learning make lessons more interesting, especially when we give them group work (Tutor A).*

while another remarked that:

> *…students are encouraged to discover their talents, and once they do so, they get motivated (Tutor C).*

The findings align with social constructivist perspectives, which suggest that learner engagement and motivation are enhanced through interaction and self-discovery (McKernan, 2013; Kimario & Otieno, 2022).

Drawbacks Constraining Innovative Teaching and Learning

Despite these benefits, participants reported several constraints that undermine effective implementation of innovative pedagogies, including limited tutor pedagogical competence, large class sizes, inadequate instructional time, and insufficient infrastructure and learning resources (Makunja, 2015; Kizito et al., 2019; Nsengimana, 2021).

Tutors acknowledged gaps in pedagogical expertise required for effective CBC implementation. One tutor noted that:

> *…the disadvantage of a competence-based curriculum is that if you are not creative, you may fail to make activities that provoke the students' critical thinking skills (Tutor A).*

Another added that

> *…as a tutor, I set the goals, and if I fail to set the goals, I may not accommodate other students' level of learning levels (Tutor B).*

The reflections highlight limitations in pedagogical scaffolding, a key concept in sociocultural theory where tutors act as *more knowledgeable others* (Vygotsky, 1978). The need for enhanced Continuous Professional Development (CPD) was explicitly articulated: *"There should be more Continuous Professional Development (CPD) for us to perfect our knowledge and experience"* (Tutor E), reinforcing findings by Bedanta (2020), Berdir (2019), and Banik and Saha (2023).

Large class sizes emerged as a major structural barrier to innovation. Tutors reported that overcrowded classrooms hinder individual mentoring and assessment:

> *We have large classes of between 65 and 70, and this makes it difficult for us to mentor students at an individual level" (Tutor A).*

Another tutor explained that:

> *…as a tutor, my class is too big, such that I fail to get time to scrutinise students' individual work (Tutor C),*

while a third noted that:

> *When I give tasks to my students, I find it difficult to mark their work and give them feedback (Tutor D).*

The findings align with Tabaro (2018) and Kalyani and Rajasekaran (2018), who argue that large class sizes undermine learner-centred and competence-based pedagogies.

Participants further highlighted inadequate instructional time, exacerbated by congested timetables and limited infrastructure. One tutor remarked that:

> *…there is a need for more hours on the timetable to accommodate the various teaching strategies that require more time (Tutor B).*

This constraint limits students' ability to learn at their own pace, contradicting the core principles of CBC (Griffith & Lim, 2014; Sullivam & Downey, 2015).

Inadequate infrastructure and learning resources emerged as the most pervasive challenge. Tutors reported shortages of classrooms and laboratories:

> *There are 11 classrooms at this TTC, which are not enough. We have large class sizes of about 60 students (Tutor C).*

Students echoed similar concerns:

> *The one computer science laboratory available at this TTC cannot accommodate a class of about 65 students at a time (Focus Group A).*

Participants also highlighted limited ICT resources and unreliable connectivity:

> *There are not enough computers, and students end up sharing… we only access the computers during ICT lessons (Focus Group A), and we find it difficult to access the modules because sometimes there is weak WIFI connectivity (Focus Group A).*

The findings reinforce previous studies that identify inadequate infrastructure and resources as major impediments to CBC implementation in Rwanda (Rutayuga, 2014; Nsengimana, 2021; Barrett et al., 2019).

Proposed Strategies for Strengthening Innovation

Participants proposed several strategies to enhance innovative teaching and learning, including investment in infrastructure, reduction of class sizes, recruitment of ICT and library staff, improved access to learning resources, and strengthened CPD programmes. Students emphasised the need for expanded facilities:

> *For CBC to be effective, there is a need to ensure the computer laboratories have adequate computers" (Focus Group B).*

Tutors similarly argued that:

> *…more Science and computer laboratories should be built to help decongest students during learning" (Tutor A).*

Calls for reduced class sizes were explicit:

> *The institution should reduce the class sizes to 30 students or below (Tutor D).*

The need for additional ICT and library personnel was also emphasised:

> *More staff for ICT and library should be recruited to pave the way for day and evening shifts in opening the laboratories (Tutor C).*

Finally, participants stressed the importance of sustained professional learning:

> *Continuous professional development (CPD) activities about innovative ideas in the CBC should be increased (Focus Group C).*

These recommendations align closely with empirical literature emphasising infrastructure investment, manageable class sizes, and continuous professional development as prerequisites for effective CBC implementation (Ayeni & Olowe, 2016; Barrett et al., 2019; Yang, 2011; Banik & Saha, 2023).

Discussion

This study set out to explore the possibilities and challenges of innovative teaching and learning within Rwanda's CBC at TTCs, drawing on qualitative insights from tutors and students and interpreting these through Vygotsky's Sociocultural Theory. The findings reveal a nuanced and contextually grounded picture in which CBC-oriented innovation is both pedagogically promising and structurally constrained. This duality underlines a central tension in contemporary curriculum reform in developing contexts: while competence-based and learner-centred pedagogies are theoretically sound and empirically beneficial, their effective enactment is highly contingent on institutional, pedagogical, and material conditions.

From a sociocultural perspective, the reported benefits of innovative teaching and learning, particularly learner-centredness, collaboration, learning beyond the classroom, and enhanced motivation, reflect core principles of socially mediated learning. Vygotsky (1978) conceptualises knowledge as co-constructed through interaction with more knowledgeable others, cultural tools, and social practices. The study's findings strongly align with this view, as tutors and students described learning environments characterised by dialogue, peer interaction, ICT mediation, and experiential engagement. Innovative practices such as collaborative learning, project-based tasks, and ICT-supported inquiry functioned as mediational mechanisms through which learners actively constructed meaning rather than passively received content. This finding reinforces prior research that positions CBC as inherently constructivist and capable of cultivating higher-order competences when appropriately implemented (Guthrie, 2009; Boahin, 2018; Tabaro, 2018).

The prominence of learner-centred pedagogies in the findings further affirms the theoretical coherence between CBC and sociocultural learning theory. By allowing learners to progress at their own pace, draw on ICT resources, and engage in self-directed inquiry, CBC operationalises the constructivist assumption that learning is most effective when anchored in learners' prior knowledge, interests, and social contexts (Mvududu & Thiel-Burgess, 2012). The emphasis on deep learning rather than rote memorisation reported by participants echoes Hattie's (2009) assertion that meaningful learning occurs when students are cognitively and socially engaged. In this regard, the study provides empirical support for claims that competence-based curricula, when

enacted through innovative pedagogies, can shift epistemic authority from the tutor to the learner, thereby fostering autonomy and lifelong learning.

However, the study also demonstrates that sociocultural learning processes are fragile and easily undermined by contextual constraints. The reported challenges, particularly limited tutor pedagogical competence, large class sizes, inadequate time, and insufficient infrastructure, collectively disrupt the social, material, and instructional conditions required for effective scaffolding and interaction. Within Vygotsky's framework, tutors are expected to function as more knowledgeable others who guide learners through their zones of proximal development. The finding that many tutors possess content knowledge but lack pedagogical confidence suggests a breakdown in this scaffolding function, with direct implications for learner competence development. This observation aligns with earlier studies that identify inadequate teacher preparation as a major bottleneck in CBC implementation (Makunja, 2015; Kizito et al., 2019; Nsengimana, 2021).

The methodological choice of a qualitative case study proved critical in revealing these layered dynamics. By privileging the voices of tutors and students, the study captured lived experiences that quantitative evaluations of CBC implementation often obscure. The use of interviews and focus group discussions allowed participants to articulate how innovation is negotiated in practice rather than assumed in policy. This methodological approach strengthens the credibility of the findings and supports calls in the literature for context-sensitive evaluations of curriculum reform, particularly in resource-constrained environments.

Large class sizes and congested timetables emerged as structural constraints that significantly limit opportunities for interaction, feedback, and individualised support, elements that are central to both CBC and sociocultural learning theory. When classes exceed manageable sizes, the dialogic and collaborative processes through which knowledge is constructed are weakened, forcing tutors to revert to teacher-centred practices that contradict the epistemological foundations of CBC. This finding resonates with international and regional studies that identify class size as a critical determinant of pedagogical innovation (Ayeni & Olowe, 2016; Kalyani & Rajasekaran, 2018). The persistence of such conditions suggests a misalignment between curriculum aspirations and systemic capacity, raising questions about the readiness of TTCs to function as incubators of innovative teachers.

Similarly, inadequate infrastructure and learning resources, particularly ICT facilities, laboratories, libraries, and reliable internet connectivity, were shown to constrain the mediational role of technology in learning. Sociocultural theory emphasises the importance of cultural tools in extending cognitive activity; where such tools are scarce or inaccessible, opportunities for innovation diminish. The findings, therefore, reinforce Barrett et al.'s (2019) argument that physical and digital learning environments are not peripheral but central to pedagogical transformation. In the Rwandan TTC context, the underutilisation of existing resources further suggests that innovation is not solely a matter of availability but also of institutional organisation, staffing, and policy coherence.

The solutions proposed by participants, enhanced infrastructure investment, reduced class sizes, expanded ICT and library staffing, and intensified Continuous Professional Development, reflect an intuitive understanding of the systemic nature of educational innovation. These recommendations align closely with the literature, which emphasises that sustainable curriculum reform requires simultaneous attention to teacher capacity, learning environments, and institutional support structures (Bedanta, 2020; Banik & Saha, 2023; Yang, 2011). From a sociocultural standpoint, such interventions would strengthen the social and material conditions necessary for effective mediation, collaboration, and knowledge co-construction.

Overall, this study contributes to the CBC discourse by demonstrating that innovation in teaching and learning is not an automatic outcome of curriculum reform, but a socially situated practice shaped by pedagogical competence, institutional conditions, and access to mediational tools. By integrating empirical findings with sociocultural theory, the study advances a more holistic understanding of why CBC implementation succeeds in principle yet falters in practice. It further underscores the strategic importance of TTCs as foundational spaces where innovative pedagogies must be modelled if future teachers are to enact CBC effectively in schools. Without addressing the structural and pedagogical constraints identified in this study, the transformative promise of CBC risks remaining aspirational rather than realised.

Conclusion

The findings and discussions on the possibilities and challenges of innovative teaching and learning within Rwanda's Competency-Based Curriculum (CBC) at Teacher Training Colleges (TTCs) demonstrate that many of the constraints faced by tutors and students are not insurmountable. Rather, these challenges can be transformed into opportunities when deliberate investment is made in enabling conditions that support innovation. Central to these possibilities is the strengthening of resource support to TTCs, which is critical for sustaining innovation-friendly learning environments and for nurturing the development of 21st-century competences among both tutors and students.

The study revealed that CBC offers substantial pedagogical opportunities, particularly through collaborative and learner-centred approaches. Tutors and students highlighted that collaboration enables peer learning, shared problem-solving, and meaningful engagement with content, while the integration of information and communication technology (ICT) extends learning beyond the physical classroom. The ability for students to learn from multiple locations reinforces the CBC principle of flexible and continuous learning, reducing dependency on limited textbooks and traditional instructional spaces. These findings suggest that when tutors and students intentionally leverage the affordances of CBC, they are better positioned to realise the competencies envisioned by Rwanda's education reforms, including critical thinking, creativity, collaboration, and digital literacy.

However, the study also identified persistent structural and institutional constraints that limit the effective enactment of innovative pedagogies. Inadequate infrastructure, shortages of teaching and learning materials, underutilisation of existing resources, limited Continuous Professional Development (CPD) for tutors, congested timetables, and large class sizes collectively undermine learner-centred practices. These constraints restrict tutors' capacity to employ diverse instructional strategies and weaken opportunities for interaction, feedback, and personalised learning. The findings further underscore that the innovative capacity of students is closely linked to the innovative competence of their tutors. Consequently, sustained investment in tutor capacity development and institutional support is indispensable.

Overall, the study concludes that strengthening innovation in TTCs requires a systemic approach that aligns curriculum intentions with pedagogical capacity,

infrastructure, and resource availability. Intensifying support for innovative teaching and learning practices is therefore essential not only for effective CBC implementation but also for advancing Sustainable Development Goal 4 on quality education and for preparing graduates who can respond to the demands of the global knowledge economy.

Recommendations

Informed by the study's findings, the following recommendations are proposed:

- *Rwanda Education Board should scale up innovation efforts by increasing investment in teaching and learning materials and expanding physical infrastructure, particularly classrooms, ICT laboratories, and science laboratories, to support competence-based and learner-centred pedagogies.*
- *Continuous Professional Development (CPD) programmes for TTC tutors should be intensified and institutionalised, with a specific focus on innovative pedagogies, ICT integration, and competence-based assessment, to strengthen tutors' pedagogical competence and confidence.*
- *Teacher Training Colleges should improve access to ICT laboratories and digital devices by extending operating hours and ensuring that available ICT resources are fully utilised to support research, collaboration, and independent learning.*
- *TTC libraries should be accessible beyond normal teaching hours and adequately stocked with diverse and up-to-date reading materials. The provision of computers and reliable internet connectivity within library spaces is essential to promote self-directed learning, research, and innovative practices among students.*

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