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THE FUTURE OF TEACHING AND INSTITUTIONAL ADAPTATION: THE CASE OF TECHNICAL TEACHERS' TRAINING COLLEGES OF THE UNIVERSITIES OF DOUALA (ATTCTE) AND BAMENDA (HTTTC)

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ABSTRACT

This study examines how the Advanced Teachers' Training College for Technical Education (ATTCTE) of the University of Douala and the Higher Technical Teachers Training College (HTTTC) of the University of Bamenda are adapting to prepare future Technical and Vocational Education and Training (TVET) teachers for the demands of the 21st century classroom. Three specific objectives gave focus to the study: To investigate the readiness of Higher Technical Teacher's Training Colleges (HTTTCs) to address emerging educational challenges; to identify challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands; and to recommend strategies for integrating technology into HTTTC programs to enhance teacher education and student outcomes. A mixed-methods approach was employed, combining qualitative and quantitative research methods. Data were collected from 110 teaching staff members across both colleges using structured questionnaires and semi-structured interviews. Descriptive statistics, including means and frequency counts, were used to analyze the data, while thematic analysis was conducted for qualitative insights. Findings reveal that HTTTCs are generally not well-prepared to address emerging educational challenges, as indicated by low scores in areas such as staff preparedness (Mean = 2.15), professional development opportunities (Mean = 2.18), and the availability of resources (Mean = 2.36). However, the institutions demonstrated some readiness in curriculum updates (Mean = 2.55), external partnerships (Mean = 2.81), and stakeholder feedback integration (Mean = 2.84). Major barriers to adaptation include budgetary constraints (Mean = 2.70), inadequate training in new technologies (Mean = 2.62), and resistance to change among staff (Mean = 2.56). Strategies for technology integration, such as ensuring equitable access to digital tools (Mean = 2.60), student feedback mechanisms (Mean = 2.95), and staff training programs (Mean = 2.73), were found to be essential. The study recommends the need for increased investment in staff development, infrastructure enhancement, and stronger industry-academia linkages to improve the effectiveness of TVET teacher training. Institutional commitment to fostering innovation and technology-driven learning will be critical in ensuring that HTTTCs are well-equipped to meet the demands of modern education.

Keywords: Future of Teaching, Institutional Adaptation, TVET education, HTTTC, ATTCTE, University of Douala, University of Bamenda.

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1. INTRODUCTION

The landscape of education has been undergoing profound changes over the past few decades, influenced heavily by rapid technological advancements and a shift in pedagogical paradigms. This transformation is particularly evident in the increasing emphasis on student-centered learning, an approach that prioritizes the individual needs, interests, and learning styles of students. As described by Taylor et al. (2023), this shift is a response to the growing diversity of student populations, highlighting the necessity for teaching methods that accommodate various learning preferences while fostering critical thinking and problem-solving skills. In this context, the integration of technology in education has been identified as a key driver of change, enabling educators to create more interactive and personalized learning experiences.

For institutions like the Higher Technical Teacher Training Colleges (HTTTCs) at the Universities of Douala and Bamenda in Cameroon, these global educational trends present both significant opportunities and challenges. As explained by Johnson and Wimmer (2022), the adoption of technology in technical and vocational education and training (TVET) is essential for preparing future educators to meet the demands of the modern workforce. These institutions are central to shaping the future of TVET in Cameroon, a role that requires them to continuously adapt their curricula and teaching strategies. The transition towards more technology-driven, learner-centered approaches is not without its obstacles, particularly in the face of limited resources and varying levels of educator readiness (Nguyen, 2021).

The current challenges faced by the HTTTCs reflect a broader global trend where educational institutions are struggling to balance traditional teaching methods with innovative approaches that leverage technology. As noted by Carter et al. (2022), the integration of technology requires a shift in both mindset and practice. Educators must not only be proficient in using new tools but also adapt their teaching strategies to incorporate these technologies in meaningful ways. This is particularly important in TVET, where practical skills development must be aligned with technological advancements in industry and the workforce.

Moreover, the process of adapting curricula to include both technology and innovative teaching strategies involves complex interactions between institutional culture, educator preparedness, and technological access. As highlighted by Ziegler and Kim (2023), a culture of innovation within an institution plays a critical role in determining the success of technology integration. Institutional leadership must foster an environment where educators feel supported and encouraged to experiment with new teaching methods and technologies. However, as pointed out by Stephens et al. (2021), the readiness of educators to adopt these changes varies widely. While some may embrace the opportunity to integrate new tools, others may face challenges related to training, resources, and institutional support.

This research aims to explore these dynamics within the context of the HTTTCs at the Universities of Douala and Bamenda, employing a mixed-methods approach to understand the key drivers and barriers to technological integration and new teaching practices. The findings will contribute to the broader discourse on teacher training and TVET in Cameroon, providing valuable insights for policymakers, educational leaders, and practitioners. By examining the interplay of institutional culture, educator readiness, and technological access, this study seeks to offer actionable

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recommendations that can guide future efforts to enhance the effectiveness and relevance of TVET education in Cameroon.

Ultimately, this research aspires to contribute to the development of more effective training programs for future TVET teachers, equipping them with the skills and knowledge necessary to navigate the complexities of an increasingly technology-driven educational landscape. As noted by Ellis (2021), the future of education lies in the ability of institutions to evolve and adapt to the changing needs of both students and the workforce, making the integration of technology and innovative teaching approaches crucial for preparing educators to thrive in this dynamic environment.

2. CONCEPTUAL REVIEW

The Evolving Educational Landscape

The 21st century has ushered in significant transformations in educational paradigms, primarily driven by advancements in technology and a shift towards learner-centered methodologies. Traditional didactic approaches are increasingly being challenged by pedagogies that emphasize active learning, critical thinking, and adaptability (Barr & Tagg, 1995). As highlighted by Mooc and Wang (2020), the rapid pace of change in knowledge and skills required in the workforce necessitates a reevaluation of teacher training programs globally, particularly in Technical and Vocational Education and Training (TVET).

The Role of Higher Technical Teacher Training Colleges (HTTTC)

HTTTCs serve as crucial institutions in preparing educators for the technical and vocational sectors, ensuring that they possess the necessary competencies to deliver effective instruction. In Cameroon, these colleges play a vital role in addressing the skills gap in the labor market, particularly as the demand for skilled workers continues to grow (World Bank, 2017). However, the curricula and pedagogical practices in these institutions must evolve to align with the competencies required by industry (González & Wagenaar, 2003). The need for continual adaptation is critical to ensure that future educators can respond effectively to the dynamic educational landscape.

Technological Integration in Education

The incorporation of technology in educational settings has transformed teaching and learning processes, enhancing engagement and accessibility (Katz, 2010). Tools such as digital resources, online platforms, and interactive teaching technologies can facilitate collaborative learning and critical inquiry (Johnson et al., 2016). For HTTTCs, successfully integrating technology into their training programs is essential, as it prepares future educators to leverage these tools in their classrooms. Nonetheless, challenges remain, including the necessity for faculty training, appropriate infrastructure, and curricular redesign to incorporate technological tools effectively (Ertmer & Ottenbreit-Leftwich, 2010).

Institutional Culture and Change Management

The culture within educational institutions significantly influences their capacity to adapt to change. According to Schein (2010), institutional culture encompasses the values, beliefs, and practices that shape an organization. A supportive culture that fosters innovation and collaboration

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is essential for facilitating change in teaching practices and curriculum development. Faculty readiness is also crucial, as educators must be willing and able to embrace new methodologies and technologies (Guskey, 2002). Understanding these cultural dynamics is vital for identifying barriers to change and developing strategies for effective transformation.

Student-Centered Learning Approaches

The shift towards student-centered learning has become a focal point in contemporary educational practices. This approach prioritizes the needs, interests, and experiences of students, creating an active and engaging learning environment (Weimer, 2013). Teacher training programs must reflect these principles, preparing future educators to implement student-centered strategies effectively. This requires comprehensive training, mentorship, and exposure to diverse teaching methodologies (Brusilovsky & Millán, 2007). HTTTCs must not only teach these strategies but also foster a mindset that values student engagement and adaptability.

National and Global Contexts

The adaptation of HTTTCs occurs within a broader national and global educational framework. In Cameroon, governmental reforms aimed at enhancing the quality of education reflect a commitment to improving TVET and aligning with international standards (Cameroon Ministry of Education, 2018). These reforms are influenced by global initiatives, such as UNESCO's Sustainable Development Goals, which emphasize the importance of quality education and lifelong learning (UNESCO, 2015). HTTTCs must navigate these evolving frameworks to ensure their programs remain relevant and impactful.

Conclusion

This study is situated at the intersection of these multifaceted factors, aiming to illuminate the processes through which HTTTCs at the Universities of Douala and Bamenda are adapting to meet the demands of a changing educational landscape. By examining institutional culture, educators readiness, and technological integration, this research contributes to the discourse on effective teacher training in Cameroon and provides valuable insights for future educational policies.

3. THEORETICAL REVIEW

The study of institutional adaptation in the context of Higher Technical Teacher Training Colleges (HTTTCs) is grounded in several key theoretical frameworks that illuminate the complexities of educational transformation:

Constructivist Learning Theory

Constructivist learning theory, notably influenced by scholars such as Piaget (1973) and Vygotsky (1978), posits that knowledge is constructed through interactions with the environment and through social engagement. In a constructivist classroom, the teacher's role shifts from knowledge transmitter to facilitator of learning, encouraging students to take an active role in their educational journey. This theory is essential for understanding the shift towards student-centered learning in HTTTCs, as it emphasizes the need for educators to develop critical thinking and problem-solving skills among students (Brusilovsky & Millán, 2007). As teacher training institutions adapt,

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integrating constructivist principles can foster more meaningful learning experiences that prepare future educators for modern classrooms.

Diffusion of Innovations Theory

Everett Rogers' (2003) Diffusion of Innovations Theory offers insights into how new ideas and technologies spread within educational institutions. The theory identifies several key factors that influence the adoption of innovations, including perceived benefits, compatibility with existing values, and the social system's structure. Understanding these factors is crucial for HTTTCs as they seek to integrate new technologies and teaching methodologies. The successful adaptation of curricula and practices at these institutions depends on addressing potential barriers to change and leveraging the motivations of educators.

Change Theory

Kotter's (1996) Change Theory provides a framework for understanding the processes of organizational change, emphasizing the importance of leadership, vision, and communication. This model outlines eight stages of change, from creating a sense of urgency to anchoring new approaches in the organizational culture. For HTTTCs, this theory highlights the importance of strong leadership and strategic planning in fostering an environment conducive to adaptation. It underscores that institutional culture must evolve to support innovative practices and the integration of technology in teaching.

Institutional Theory

Institutional theory, as articulated by DiMaggio and Powell (1983), focuses on how institutions adapt to their environments and the pressures they face from various stakeholders. This theory is particularly relevant for HTTTCs as they navigate the demands of government policies, industry standards, and societal expectations. Drawing from DiMaggio and Powell (1983), the concept of "isomorphism," which refers to the processes by which organizations become more similar to each other in response to the aforementioned pressures, provides a lens to examine how HTTTCs might adapt to maintain legitimacy and relevance in a changing educational landscape.

Technological Pedagogical Content Knowledge (TPACK)

The TPACK framework, developed by Mishra and Koehler (2006), emphasizes the intersection of technology, pedagogy, and content knowledge. It posits that effective teaching in the 21st century requires educators to integrate these three domains effectively. This framework is particularly relevant for HTTTCs, as future technical and vocational educators must be equipped not only with subject matter expertise but also with the skills to use technology effectively in their teaching. As HTTTCs strive to incorporate technological tools into their curricula, understanding the TPACK framework can help educators develop the necessary competencies to enhance learning outcomes .

Transformative Learning Theory

Mezirow's (1991) Transformative Learning Theory suggests that significant learning occurs when individuals critically reflect on their experiences, leading to changes in beliefs and behaviors. This theory is pertinent for teacher training institutions, as it encourages future educators to reflect on their teaching practices and adapt to the needs of their students. HTTTCs can foster transformative

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learning by providing opportunities for critical reflection and professional growth, ultimately preparing educators to navigate the complexities of modern educational environments.

In conclusion, the theoretical foundation of this study draws upon these interconnected frameworks to explore the adaptation processes within the HTTTCs of the Universities of Douala and Bamenda. By integrating insights from constructivist learning theory, diffusion of innovations, change theory, institutional theory, TPACK, and transformative learning, this research aims to provide a comprehensive understanding of how these institutions can effectively prepare future educators for the challenges of the 21st century.

3. STATEMENT OF THE PROBLEM

The Higher Technical Teacher Training Colleges (HTTTCs) at the Universities of Douala and Bamenda are currently facing significant challenges in adapting their educational practices and institutional frameworks to meet the demands of a rapidly evolving educational landscape. As global trends shift towards technological integration, student-centered learning, and innovative pedagogical approaches, these institutions must reassess their curricula, teaching methodologies, and overall institutional culture to effectively prepare future Technical and Vocational Education and Training (TVET) teachers.

Despite the recognized need for such adaptation, there is limited understanding of the specific drivers and barriers that influence this process within the context of HTTTCs in Cameroon. Key areas of concern include the readiness of staff to embrace new technologies and teaching methods, the existing institutional culture that may resist change, and the mechanisms for effectively integrating technology into teacher training programs (UNESCO, 2020). Furthermore, there is a lack of comprehensive insights into how these factors interaction to shape the training of TVET educators.

This study aims to fill this gap by exploring how HTTTCs can effectively navigate these challenges to enhance their educational offerings. Addressing this problem is critical not only for improving the quality of teacher training in Cameroon but also for ensuring that future educators are equipped to meet the demands of 21st-century classrooms. Thus, understanding the processes of institutional adaptation is essential for fostering an educational environment that supports the development of competent and innovative TVET teachers.

Objectives of the Study

1. Investigate the readiness of Higher Technical Teacher's Training Colleges (HTTTCs) to address emerging educational challenges.
2. To identify challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands.
3. Recommend strategies for integrating technology into HTTTC programs to enhance teacher education and student outcomes.

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Research Questions

1. How ready are Higher Technical Teacher's Training Colleges (HTTTCs) to address emerging educational challenges?
2. What are the major challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands?
3. What are the major strategies for integrating technology into HTTTC programs to enhance teacher education and student outcomes?

4. METHODOLOGY

This study employs a mixed-methods approach, combining both qualitative and quantitative research methods. This design allows for a comprehensive exploration of the complex factors influencing institutional adaptation in technical teacher training colleges. The study targets university teaching staff members, administrators, and students from the Advanced Teachers' Training College for Technical Education (ATTCTE) at the University of Douala and the Higher Technical Teachers Training College (HTTTC) at the University of Bamenda. A purposive sampling technique was used to select participants who are directly involved in the teacher training process in these two colleges.

A sample of 110 teaching staff members (55 from each college) obtained through simple random sampling technique was used to collect the quantitative data of the study. Structured questionnaires were distributed to these staff members to assess their responses in relation to the objectives of the study. The questionnaire included 4-point Likert-scale items and open-ended questions to gather diverse insights. Furthermore, a semi-structured interview guide was used to collect qualitative data. The instruments were validated using three experts and the reliability of the questionnaire was assured by obtaining a Cronbach alpha reliability coefficient of 0.88. The interview was conducted using three administrators from each of the two school in order to gain deeper insights.

Descriptive statistics such as frequency counts and means were employed to summarize survey data, aided by the statistical software SPSS version 25.0. The questionaire items were scored 4 points for Strongly Agree (SA), 3 points for Agree (A), 2 points for Disagree (D) and 1 point for Strongly Disagree (SD). Thus the mean or middle poit for decision making was at 2.5. Consequently, the Advanced Teachers' Training College for Technical Education (ATTCTE) of the University of Douala and the Higher Technical Teachers Training College (HTTTC) of the University of Bamenda were considered ready to address emerging educational challenges if the total item mean score is greater than or equal to 25 (2.5 per item, multiplied by 10 questionnaire item). Otherwise, they were not considered ready (in section B). Furthermore, items were considered to be major challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands (in section C), or were considered as major strategies for integrating technology into HTTTC programs to enhance teacher education and student outcomes (in section D), if they had a mean of 2.5 and above. Thematic analysis was conducted on the interview data. This involved coding the data to identify common themes related to the study variables. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were maintained throughout the study. Furthermore, participants had the right to withdraw from the study at any point without consequences.

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5. FINDINGS

Research Question 1: *How ready are Higher Technical Teacher's Training Colleges (HTTTCs) to address emerging educational challenges?*

Table 1: Readiness of HTTTCs to address emerging educational challenges

S/N	Statement	SD	D	A	SA	Total	Item Mean	Decision
1	Our college actively monitors emerging trends in technical and vocational education.	41	31	28	10	110	2.06	**Not Ready**
2	Staff members are well-prepared to implement new teaching methodologies.	38	29	31	12	110	2.15	**Not Ready**
3	The college provides sufficient professional development opportunities for staff to stay updated.	37	30	29	14	110	2.18	**Not Ready**
4	Resources such as learning materials, infrastructure and technology are readily available to address educational challenges.	31	28	31	20	110	2.36	**Not Ready**
5	The curriculum is regularly evaluated and updated to meet current educational needs.	21	31	35	23	110	2.55	**Ready**
6	Our college has established partnerships with external organizations to enhance educational readiness.	13	15	62	20	110	2.81	**Ready**
7	Staff collaboration is encouraged to tackle educational challenges collectively.	19	22	42	27	110	2.70	**Ready**
8	Stakeholder feedback is regularly incorporated into our college's planning and decision-making processes.	16	17	46	31	110	2.84	**Ready**
9	Leadership at our college supports initiatives aimed at addressing emerging challenges.	17	20	31	42	110	2.89	**Ready**
10	There is a culture of innovation and experimentation among staff members.	23	41	27	19	110	2.38	**Not Ready**
Total Mean Score							24.93	**Not Ready**

The quantitative research findings on Table 1 indicate that Higher Technical Teacher Training Colleges (HTTTCs) of the Universities of Douala and Bamenda are generally not well-prepared to address emerging educational challenges. Key aspects such as monitoring trends in technical and vocational education (Mean = 2.06), staff preparedness for new teaching methodologies (Mean = 2.15), and the availability of professional development opportunities (Mean = 2.18) were rated as "Not Ready." Additionally, the lack of sufficient resources (Mean = 2.36) and a weak culture of innovation (Mean = 2.38) further highlight the colleges' struggles in adapting to modern

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educational demands. These findings suggest that HTTTCs may face difficulties in keeping pace with evolving educational trends and technological advancements.

Despite these shortcomings, the study also highlights some areas where HTTTCs exhibit readiness. Regular curriculum updates (Mean = 2.55), established partnerships with external organizations (Mean = 2.81), and staff collaboration (Mean = 2.70) indicate that efforts are being made to align educational programs with current industry needs. Moreover, stakeholder feedback integration (Mean = 2.84) and leadership support for initiatives (Mean = 2.89) reflect a willingness to address challenges, even if the overall readiness remains low. These areas of strength could serve as a foundation for further improvements, provided that additional resources and institutional support are made available.

Overall, the total mean score of 24.93 categorizes HTTTCs as "Not Ready" to effectively tackle emerging educational challenges. While there are promising aspects such as leadership support and external collaborations, critical gaps in staff training, resource availability, and a culture of innovation must be addressed. To enhance readiness, HTTTCs should invest in continuous professional development, increase funding for modern teaching resources, and promote a more dynamic and forward-thinking educational environment. Addressing these areas will be crucial for ensuring that technical and vocational education remains relevant and effective in meeting future workforce demands.

The qualitative fidings suggests that beyond the areas identified in Table 1, other aspects of readiness or non-readiness can influence the ability of HTTTCs to address emerging educational challenges. One crucial area is the availability of financial support for research and innovation, though limited, as unavaible funding can restrict the development and implementation of new teaching strategies. Additionally, the extent to which colleges integrate soft skills training such as critical thinking, communication, and adaptability into their programs is low although it can determine how well graduates meet industry demands. Another factor is the inclusivity of educational programs, ensuring that students from diverse backgrounds, including those with disabilities, have equal access to learning opportunities, at least to an acceptable extent. Lastly, the inability of both colleges to quickly adapt to global trends, such as sustainability and digital transformation, indicate their low levels of preparedness for evolving educational and workforce demands.

Research Question 2: *What are the major challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands?*

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Table 2: Challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands

S/N	Statement	SD	D	A	SA	Total	Item Mean	Decision
1	Budget limitations significantly impact our ability to implement modern teaching practices.	15	25	48	22	110	2.70	**Challenge**
2	Staff members lack adequate training to use new technologies in their teaching.	21	23	43	23	110	2.62	**Challenge**
3	There is a gap between industry expectations and our training programs.	22	26	29	33	110	2.66	**Challenge**
4	The college faces difficulties in recruiting qualified staff to meet contemporary demands.	36	42	24	8	110	2.04	**Not a Challenge**
5	Resistance to change among staff hinders the adoption of new teaching methods.	26	24	32	28	110	2.56	**Challenge**
6	Institutional policies do not facilitate innovation in teaching and learning.	25	29	29	27	110	2.53	**Challenge**
7	Student engagement with current learning tools and methods is low.	16	15	41	38	110	2.92	**Challenge**
8	Communication between teaching staff and administration regarding challenges is lacking.	34	23	28	25	110	2.40	**Not a Challenge**
9	Technological infrastructure at our college is inadequate for supporting modern education.	24	20	37	29	110	2.65	**Challenge**
10	There is insufficient time allocated for staff to develop new course materials and approaches.	39	30	25	16	110	2.16	**Not a Challenge**
Total Mean Score							25.24	**Challenge**

The quantitative findings in Table 2 highlight several significant challenges that HTTTCs face in adapting to 21st-century TVET teacher preparation demands. Budget constraints (Mean = 2.70) were identified as a major barrier, indicating that financial limitations hinder the adoption of modern teaching practices. Additionally, staff members struggle with insufficient training in new technologies (Mean = 2.62), making it difficult to integrate digital tools effectively into the teaching process. Another critical issue is the misalignment between industry expectations and training programs (Mean = 2.66), suggesting that graduates may not be fully equipped with the skills required in the job market. These challenges point to systemic issues that must be addressed to improve the overall quality of TVET education.

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Resistance to change among staff members (Mean = 2.56) and institutional policies that do not support innovation (Mean = 2.53) further complicate efforts to modernize teaching and learning. These findings suggest that many educators may be reluctant to embrace new methodologies, possibly due to a lack of incentives or support from leadership. Moreover, student engagement with modern learning tools and methods is low (Mean = 2.92), which could indicate a disconnect between instructional approaches and students' learning preferences. The inadequacy of technological infrastructure (Mean = 2.65) further exacerbates these challenges, as outdated facilities and limited access to digital resources hinder effective teaching and learning. Addressing these barriers requires a combination of policy reforms, investment in infrastructure, and professional development initiatives.

Interestingly, some challenges were not seen as major obstacles. For instance, difficulties in recruiting qualified staff (Mean = 2.04) and communication gaps between faculty and administration (Mean = 2.40) were not considered significant issues. Similarly, insufficient time for staff to develop new course materials (Mean = 2.16) was not rated as a pressing concern. However, the total mean score of 25.24 classifies HTTTCs as facing overall challenges in adapting to modern TVET demands. While certain aspects may not be viewed as immediate obstacles, the presence of financial, technological, and pedagogical barriers suggests that substantial reforms are necessary to enhance the effectiveness of teacher training in technical and vocational education.

The qualitative findings further suggest that in addition to the challenges identified in Table 2, HTTTCs also face difficulties related to government policies and regulatory constraints that limit flexibility in curriculum design and program implementation. Bureaucratic delays in approving new educational reforms also slow down adaptation to industry trends. Furthermore, a lack of industry-experienced instructors do hinder the practical application of technical and vocational education and training (TVET). Another significant challenge is the limited collaboration between institutions and industries, which restricts opportunities for some students to gain hands-on experience through internships or apprenticeships. Additionally, outdated pedagogical approaches, coupled with insufficient research and development in TVET methodologies, do result in ineffective teaching strategies that do not fully prepare students for modern workforce demands. Finally, socio-economic factors, such as students' financial difficulties and limited access to digital learning tools, do impede the effectiveness of TVET teacher preparation programs.

Research Question 3: *What are the major strategies for integrating technology into HTTTC programs to enhance teacher education and student outcomes?*

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Table 3: Strategies for integrating technology into Higher Technical Teacher Training programs to enhance teacher education and student outcomes

S/N	Statement	SD	D	A	SA	Total	Item Mean	Decision
1	The college should provide adequate access to technological resources for all students.	25	21	37	27	110	2.60	**Good Strategy**
2	Feedback from students should be actively sought to improve technology use in the classroom.	12	14	52	32	110	2.95	**Good Strategy**
3	There should be clear guidelines for staff on effective technology integration strategies.	9	8	63	30	110	3.04	**Good Strategy**
4	Staff should always be encouraged to share best practices related to technology use in education.	15	22	39	34	110	2.84	**Good Strategy**
5	The effectiveness of technology integration should be evaluated regularly.	13	29	47	21	110	2.69	**Good Strategy**
6	Technology-enhanced learning opportunities should be readily available for students outside the classroom.	11	13	48	38	110	3.03	**Good Strategy**
7	Partnerships with industries and companies should clearly enhance our ability to integrate new technologies into programs.	26	31	14	39	110	2.60	**Good Strategy**
8	Staff members should receive regular training on integrating technology into their teaching.	21	19	39	31	110	2.73	**Good Strategy**
9	Students should be encouraged to use technology for collaborative projects and research.	30	22	24	34	110	2.56	**Good Strategy**
10	Our college should develop a comprehensive plan for integrating technology into the curriculum.	16	17	32	45	110	2.96	**Good Strategy**
Total Mean Score							27.99	**Good Strategies**

The quantitative findings in Table 3 indicate that integrating technology into Higher Technical Teacher Training programs is widely seen as a beneficial strategy for enhancing teacher education and student outcomes. A key recommendation is ensuring adequate access to technological resources for all students (Mean = 2.60), which highlights the importance of equitable access to digital tools in fostering an effective learning environment. Actively seeking student feedback on technology use (Mean = 2.95) and providing clear guidelines for staff on integration strategies (Mean = 3.04) were also identified as essential measures. These findings suggest that involving both students and educators in decision-making can lead to more effective and relevant technology use in classrooms.

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Furthermore, fostering a culture of collaboration and continuous evaluation is crucial for successful technology integration. Encouraging staff to share best practices (Mean = 2.84) and regularly evaluating the effectiveness of technology use (Mean = 2.69) were both recognized as beneficial strategies. Additionally, providing technology-enhanced learning opportunities beyond the classroom (Mean = 3.03) ensures that students can engage with digital tools in a flexible and independent manner. While partnerships with industries and companies (Mean = 2.60) were rated as a good strategy, the relatively lower mean suggests that more structured collaboration is needed to fully leverage external support for technological advancements in education.

Overall, with a total mean score of 27.99, the study confirms that the proposed strategies for technology integration are considered effective. Regular training for staff (Mean = 2.73) and encouraging students to use technology for collaborative projects and research (Mean = 2.56) were also highlighted as necessary steps. Additionally, the development of a comprehensive technology integration plan (Mean = 2.96) is seen as a strong approach to ensuring sustainable and systematic implementation. These findings emphasize the need for institutional commitment, ongoing professional development, and structured policies to maximize the benefits of technology in Higher Technical Teacher Training programs.

The qualitative findings indicate that beyond the strategies outlined in Table 3, additional measures can further enhance the integration of technology into Higher Technical Teacher Training programs. One key approach is incorporating blended learning models, which combine in-person instruction with online learning to create a more flexible and engaging experience for students. Establishing digital mentorship programs, where experienced teaching staff members guide others in using educational technology, can also improve staff confidence and proficiency. Furthermore, creating an innovation hub or digital laboratory within the college can encourage experimentation with emerging technologies such as artificial intelligence, virtual reality, and simulation-based learning. Introducing incentive programs, such as grants or recognition for staff who excel in technology integration, can further motivate educators to embrace digital tools. Lastly, fostering international collaborations with institutions that have successfully integrated technology into education can provide valuable insights and best practices to accelerate progress.

6. DISCUSSION OF FINDINGS

Readiness of HTTTCs to address emerging educational challenges

The findings of the study indicate that Higher Technical Teacher Training Colleges (HTTTCs) in Douala and Bamenda are not adequately prepared to address emerging educational challenges. This aligns with previous studies, such as those by UNESCO (2017) and McKinsey and Company (2018), which emphasize that many technical and vocational institutions in developing countries struggle with adapting to rapid technological and educational advancements due to insufficient resources and training. UNESCO (2017) particularly highlights that professional development for educators is often underfunded, which directly affects their ability to implement innovative teaching methodologies. Similarly, Ayonmike, Okwelle and Okeke (2015) argue that the lack of sufficient monitoring of trends in technical and vocational education leads to outdated curricula and ineffective instructional methods. These perspectives corroborate the low readiness scores in

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key areas such as staff preparedness (Mean = 2.15) and access to professional development opportunities (Mean = 2.18) found in this study.

Despite these challenges, there are some promising aspects of HTTTCs' readiness, as evidenced by their relatively higher scores in curriculum updates (Mean = 2.55), partnerships with external organizations (Mean = 2.81), and stakeholder feedback integration (Mean = 2.84). These findings are in line with studies by Oketch (2016) and Powell & McGrath (2019), who emphasize the importance of industry collaborations in strengthening technical and vocational education and training (TVET). Oketch (2016) suggests that partnerships with external organizations can help bridge the gap between industry expectations and educational offerings, ultimately improving graduate employability. However, some scholars, such as Wolf (2011), argue that partnerships alone are not sufficient if fundamental issues like staff training and resource availability are not addressed. This perspective aligns with the findings that, despite some positive efforts, HTTTCs still struggle with inadequate resources (Mean = 2.36) and a weak culture of innovation (Mean = 2.38), limiting their overall effectiveness.

Qualitative findings further reinforce the idea that financial constraints, a lack of soft skills training, and limited inclusivity in educational programs contribute to HTTTCs' low readiness. This resonates with the work of Kirschner & Stoyanov (2020), who stress that digital transformation and sustainability trends demand a more adaptable and forward-thinking educational system. Unfortunately, as this study reveals, HTTTCs in Douala and Bamenda are slow in adapting to these global trends, which puts them at a disadvantage. While leadership support (Mean = 2.89) and collaboration among staff (Mean = 2.70) suggest a willingness to improve, significant investments in teacher training, modern infrastructure, and research funding are necessary for meaningful progress. Without these interventions, HTTTCs may continue to lag in preparing students for the rapidly evolving workforce, as emphasized by authors like Marginson (2016), who argue that institutional inertia in educational reform can have long-term consequences on national development.

Challenges and barriers faced by HTTTCs in adapting to 21st-century TVET teacher preparation demands

The challenges identified in adapting Higher Technical Teacher Training Colleges (HTTTCs) to 21st-century TVET teacher preparation demands align with findings from various studies. Budget constraints, a key issue in this study (Mean = 2.70), have been similarly reported by Amedorme and Fiagbe (2013), who highlighted financial limitations as a major hindrance to the modernization of TVET institutions in Ghana. Additionally, inadequate training in new technologies (Mean = 2.62) reflects the challenges identified by Okoye and Okwelle (2017), who argued that insufficient teacher capacity in emerging technologies limits the effectiveness of TVET education in Nigeria. Moreover, the misalignment between industry expectations and training programs (Mean = 2.66) echoes the concerns of UNESCO-UNEVOC (2021), which emphasized that outdated curricula and weak industry linkages contribute to skill gaps among TVET graduates, making them less competitive in the job market.

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Resistance to change among staff members (Mean = 2.56) and institutional policies that do not support innovation (Mean = 2.53) further complicate TVET modernization. Similar resistance has been noted by Zeelen, Van der Linden, and Nampota (2010), who found that reluctance to adopt new teaching methods stems from inadequate incentives and professional development opportunities. Low student engagement with modern learning tools (Mean = 2.92) may also reflect a broader issue of curriculum rigidity, as argued by Majumdar (2011), who emphasized that outdated pedagogical strategies often fail to meet students' evolving learning preferences. Furthermore, inadequate technological infrastructure (Mean = 2.65) has been a persistent challenge in TVET, as noted by Afeti (2018), who pointed out that outdated equipment and limited digital resources hinder the integration of technology-driven learning methodologies in developing countries.

While some barriers, such as recruiting qualified staff (Mean = 2.04) and communication gaps between faculty and administration (Mean = 2.40), were not considered major concerns in this study, other systemic challenges persist. Bureaucratic delays in approving reforms, as well as rigid government policies, mirror the challenges identified by Maclean and Wilson (2009), who argued that excessive regulation often stifles innovation in TVET curricula. Similarly, the lack of collaboration between institutions and industries aligns with the findings of Oketch (2014), who stressed that weak industry linkages result in limited hands-on learning opportunities for students. The socio-economic barriers highlighted, including financial difficulties and limited access to digital learning tools, have also been discussed by Tikly (2019), who argued that equitable access to quality TVET education remains a key challenge in low-income contexts. These findings underscore the need for systemic reforms in policy, industry collaboration, and professional development to enhance the effectiveness of TVET teacher preparation programs.

Strategies for integrating technology into Higher Technical Teacher Training programs to enhance teacher education and student outcomes

The findings from this study align with existing literature emphasizing the importance of equitable access to technology in teacher training programs. The strategy to ensure adequate access to technological resources for all students (Mean = 2.60) resonates with the work of Oliver (2016), who argued that the digital divide remains a major barrier to effective technology integration in education. Similarly, seeking student feedback on technology use (Mean = 2.95) and providing clear guidelines for staff (Mean = 3.04) reflect Laurillard's (2012) assertion that successful technology adoption requires active participation from both students and educators. However, some scholars, such as Selwyn (2011), have critiqued the overemphasis on digital tools, arguing that technology alone cannot address deeper pedagogical challenges. These differing perspectives suggest that while technological integration is valuable, it must be accompanied by robust pedagogical strategies to maximize its impact.

Encouraging collaboration and continuous evaluation of technology use (Mean = 2.84, Mean = 2.69) aligns with the findings of Mishra and Koehler (2006), who developed the TPACK framework to emphasize the need for a balance between technological, pedagogical, and content knowledge. Providing learning opportunities beyond the classroom (Mean = 3.03) supports the argument made by Bates (2019) that digital learning should extend beyond formal instruction to

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encourage independent learning and critical thinking. However, the relatively lower emphasis on industry partnerships (Mean = 2.60) suggests a gap in leveraging external resources, contrasting with the recommendations of UNESCO (2021), which stresses that strong collaboration between educational institutions and industries is essential for equipping students with relevant skills. This discrepancy highlights the need for more structured engagement between academia and industry to ensure that technology integration aligns with workforce demands.

The study's emphasis on professional development and strategic planning for technology integration (Mean = 2.73, Mean = 2.96) is supported by research from Darling-Hammond et al. (2017), who found that ongoing teacher training is critical for the successful adoption of educational technologies. The suggestion to incorporate blended learning models and digital mentorship programs aligns with Bonk and Graham (2012), who advocate for hybrid learning approaches to enhance flexibility and accessibility. Additionally, fostering innovation hubs and offering incentives for staff mirrors the strategies proposed by Weller (2020), who emphasized that institutional support and motivation are key to driving digital transformation in education. While these findings reinforce the importance of a structured and well-supported approach to technology integration, they also suggest that success depends on long-term institutional commitment, interdisciplinary collaboration, and continuous adaptation to emerging digital trends.

7. IMPLICATIONS OF THE FINDINGS

- The study reveals that HTTTCs in Douala and Bamenda are not fully prepared to tackle modern educational demands due to inadequate staff training, weak innovation culture, and resource shortages. This suggests that without immediate intervention, graduates may struggle to meet industry expectations, thereby widening the skills gap in technical and vocational education.

- While partnerships with external organizations show promise, they are not sufficient to offset the lack of staff preparedness and outdated curricula. This implies that HTTTCs must strengthen ties with industries through structured internship programs, curriculum co-development, and faculty exchange initiatives to enhance graduate employability.

- Budgetary limitations significantly hinder the integration of modern teaching methods and infrastructure development. This implies that without increased funding from government bodies, private sector investments, or donor organizations, HTTTCs may continue to lag in adapting to 21st-century educational and technological advancements.

- Resistance to Change Slows Educational Reform – The study highlights that institutional inertia and resistance to adopting new teaching methodologies negatively impact educational progress. This suggests that reforms in HTTTCs must not only focus on curriculum updates but also address mindset shifts among faculty and administrators through continuous professional development and incentives for innovation.

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8. RECOMMENDATIONS

- Government and institutional leaders should prioritize ongoing professional training programs, workshops, and certification courses in emerging educational technologies and pedagogical methods to enhance staff preparedness.

- Investments should be made in modern learning facilities, digital tools, and technology-enhanced classrooms to support innovative teaching and learning. Public-private partnerships could help bridge the funding gap in this regard.

- HTTTCs should establish structured collaborations with industries to co-develop curricula, intensify internship opportunities, and facilitate real-world learning experiences for students. Regular feedback from industry stakeholders should inform educational reforms.

- Both colleges should implement policies that encourage staff engagement with modern teaching strategies, including blended learning and research-based instruction. Incentive programs, peer mentoring, and leadership-driven change management strategies should be employed to reduce resistance to educational reforms.

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