# Teacher Training and Technology Integration for Supporting 21st-Century Skills: A Case of Government Secondary School Teachers in Mfoundi Division, Yaounde, Cameroon

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## ABSTRACT

The rapid advancement of technology and globalization has transformed the skills required for effective participation in the 21st-century knowledge economy. Education systems, including that of Cameroon, are increasingly expected to support the development of learners' critical thinking, creativity, collaboration, communication, and digital literacy skills. Achieving this goal largely depends on teachers' professional capacity to integrate technology into instructional practices. However, limited teacher preparation in information and communication technology (ICT) remains a major challenge in many public secondary schools. This study examines the role of teacher training and technology integration in enhancing the development of 21st-century skills in government secondary schools in the Mfoundi Division of Yaounde, Cameroon. Guided by Human Capital Theory and Track Theory, the study conceptualizes teacher training as a strategic investment that enhances pedagogical and technological competencies necessary for skill-oriented teaching. A survey research design was adopted, involving 380 teachers drawn from six government secondary schools. Data were collected using validated questionnaires and analyzed using descriptive statistics and Pearson product–moment correlation. Findings indicate that while teachers demonstrate strong competence in lesson planning, reflective practice, and instructional strategies, their level of technology integration remains relatively low. The results further reveal a statistically significant relationship between teacher training and technology-supported practices associated with 21st-century skills. The study underscores the need for systematic and sustained professional development programs that emphasize digital literacy, learner-centered pedagogy, and collaborative professional learning communities. Strengthening teacher training is therefore essential for supporting 21st-century skills development and advancing human capital development in Cameroon.

**Keywords:** Teacher Training, 21st-Century Skills, Technology Integration, Human Capital, Secondary Education

The rapid advancement of technology and globalization has transformed the skills required for effective participation in the 21st-century knowledge economy. Education systems, including that of Cameroon, are increasingly expected to support the development of learners' critical thinking, creativity, collaboration, communication, and digital literacy skills. Achieving this goal largely depends on teachers' professional capacity to integrate technology into instructional practices. However, limited teacher preparation in information and communication technology (ICT) remains a major challenge in many public secondary schools. This study examines the role of teacher training and technology integration in supporting the development of 21st-century skills in government secondary schools in the Mfoundi Division of Yaounde, Cameroon. Guided by Human Capital Theory and Track Theory, the study conceptualizes teacher training as a strategic investment that enhances pedagogical and technological competencies necessary for skill-oriented teaching. A survey research

design was adopted, involving 380 teachers drawn from six government secondary schools. Data were collected using validated questionnaires and analyzed using descriptive statistics and Pearson product–moment correlation. Findings indicate that while teachers demonstrate strong competence in lesson planning, reflective practice, and instructional strategies, their level of technology integration remains relatively low. The results further reveal a statistically significant relationship between teacher training and technology-supported practices associated with 21st-century skills. The study underscores the need for systematic and sustained professional development programs that emphasize digital literacy, learner-centered pedagogy, and collaborative professional learning communities. Strengthening teacher training is therefore essential for supporting 21st-century skills development and advancing human capital development in Cameroon.

# INTRODUCTION

The 21st century has transformed the global landscape, with rapid technological advancement, globalization, and the expansion of knowledge economies demanding new sets of skills for learners. Globally, successful education reforms have demonstrated that teacher training is a decisive factor in equipping educators with the skills to use technology effectively for instructional purposes. For instance, nations that invested heavily in continuous professional development improved on student outcomes in areas such as problem-solving, digital collaboration, and information management (Kafyulilo & Fisser, 2019; Schleicher, 2020). Conversely, in countries where teacher preparation remains largely traditional and content-driven, schools struggle to adapt to the needs of 21st-century learners (Voogt et al., 2015). In Cameroon, education policies increasingly highlight the importance of ICT integration and digital skills as part of national development strategies (MINEDUB, 2021). The government has acknowledged that education must serve as a vehicle for employability and innovation in a digital economy. However, persistent challenges such as insufficient infrastructure, overcrowded classrooms, limited access to ICT tools, and weak teacher preparation constrain these aspirations (Nachuah, 2019; World Bank, 2020). As one of the most populated educational divisions in Cameroon, Mfoundi Division of Yaounde accommodates a large number of government secondary schools that serve diverse student populations. Despite policy efforts, teachers in Mfoundi often rely on conventional methods due to insufficient training and support in technology integration. This situation restricts students' ability to acquire critical 21st-century skills such as digital literacy, collaborative problem-solving, and critical thinking, which are increasingly required in both local and global labor markets (Knight & Yorke, 2014; OECD, 2018). Given these gaps, this study seeks to examine how teacher training influences the technological development of 21st-century skills among secondary school students in Mfoundi Division. By focusing on teachers' skills, practices, and professional development experiences, the study provides evidence that can guide education stakeholders in improving training frameworks. Strengthening teacher capacity is not only an educational reform priority but also a socio-economic strategy for Cameroon, as it directly contributes to human capital development and long-term national growth (Becker, 1974; UNESCO, 2022). Engozo'o et al. (2023) emphasized that teacher training is essential for successful ICT integration in Cameroon's education system. Using the Education and Training Sector Strategy (2013–2020), they argued that improving educational quality depends on building the professional capacity of teachers and supervisory staff. The strategy highlights the need for solid training in digital tools and pedagogic resources, making teacher capacity-building a central element of educational modernization. Overall, Engozo'o et al. (2023) view teacher training as a transformative process necessary for implementing curriculum reforms, promoting digital literacy, and achieving nationwide ICT generalization.

## Statement Of the Problem

In Cameroon, teachers are expected to play a central role in equipping learners with 21 first century skills by making use of digital technology in modern pedagogy. However, this expectation is dented by the lack of training and professional development to meet these demands (Darling-Hammond et al., 2017; Schleicher, 2020). Despite the importance of ICT and 21st-century skills to students, educational policies and teacher training programs remain limited in scope and ineffective in its approaches. Predominantly, pre-service education often lay emphasis on content mastery and in-service professional development opportunities are inadequately resourced (Tchombe, 2020). Consequentially, teachers frequently rely on traditional lecture-based approaches that restrict technology in active learning and cultivation of higher-order thinking skills (Nachuah, 2019). Inevitably, pre-

service education programs often fail to equip graduates with skills needed to foster critical thinking, problem-solving, and collaborative learning among students. This deficiency in teacher training directly constrains the development of 21st-century skills in secondary school classrooms (Ertmer & OttenbreitLeftwich, 2010; Hennessy et al., 2005). This situation creates a pressing educational and socio-economic concern. If secondary school teachers in Mfoundi Division continue to lack adequate training in ICT to make use of modern pedagogical approaches, students will remain underprepared for employability and competitiveness in this 21st-century.

**Objectives Of the Study**

The following research objectives guided the study:

1. To assess how teacher training programs influence the technological development of 21st-century skills in Government Secondary Schools.

2. To determine the relationship between teacher professional development and effective implementation of 21st-century skills within classroom practices.

**Research Questions**

The following research questions guided the study:

1. How do teacher training programs influence technological development of 21st-century skills in Government Secondary Schools?

2. What is the relationship between teacher professional development and effective integration of 21stcentury skills into classroom practice?

**Research Hypotheses**

Ha: Teacher training programs influences technological development of 21st-century skills in Government Secondary Schools.

Ho: Teacher training programs does not influence technological development of 21st-century skills in Government Secondary Schools.

## LITERATURE REVIEW

Empirical studies across different contexts have consistently shown that teacher training significantly influences the integration of 21st-century skills in schools. In developed education systems, research highlights that, continuous professional development enhances teachers' confidence in using ICT to support interactive and learner-centered pedagogies (Darling-Hammond et al., 2017; Schleicher, 2020). For instance, Kafyulilo and Fisser (2019) found that teachers who participated in structured ICT training programs demonstrated greater proficiency in digital literacy and in fostering collaborative learning compared to those without such exposure. Similarly, Voogt et al. (2015) observed that sustained professional support enabled teachers to design problembased learning activities that promoted creativity and critical thinking among students. In sub-Saharan Africa, however, evidence suggests that weak professional training structures remain a barrier to ICT integration. Ngussa and Kuboja (2021) reported that Tanzanian teachers often lacked the skills to effectively incorporate digital tools in classroom instruction due to inadequate pre-service preparation and limited access to in-service training. A more recent study by Tchombe (2020) in Cameroon emphasized that teacher capacity development is pivotal for equipping students with relevant skills, yet many teacher education programs remain content-focused rather than skills-oriented. This mismatch constrains the development of higher-order skills such as problem-solving and teamwork. Another recent study by Yuomeyse and Ngamaleu (2020) in Cameroon indicates that teachers' pedagogical understanding of technology is a key factor influencing effective classroom application. Their findings show that although teachers generally expressed positive attitudes toward using ICT, their actual

integration of technology in classroom practice remained moderate. This reveals a clear gap between teachers' stated intentions and their practical use of technology for instructional purposes.

Similarly, Young, R. (2008) conducted a study to examine the impact of classroom computer technology use on students' grades, motivation, attitudes, and attendance. The study highlighted that schools that fail to keep pace with technological advancements risk produce students who lack the skills necessary to succeed in further education or the job market. Among the major barriers identified by the author, inadequate teacher training and knowledge was a significant impediment to the effective adoption of technology. Findings indicated that while teachers' effective use of technology positively influenced students' engagement, it did not lead to significant improvements in grades or attendance, including among "at-risk" students. Moreover, teachers in the sample used technology infrequently, further limiting its potential impact.

Furthermore, UNESCO (2022) highlights that in African contexts, teachers' digital readiness is closely tied to the availability of professional learning communities and access to ongoing support. Teachers who are exposed to collaborative training environments not only integrate technology more effectively but also adopt innovative practices that foster 21st-century skills. For example, Muwonge et al. (2021) demonstrated that Ugandan teachers who engaged in ICT-based peer-learning networks exhibited improved skills in facilitating critical thinking and creativity in secondary schools. In Cameroon, empirical data reflect similar patterns. Nachuah (2019) documented that many secondary school teachers lacked confidence in integrating ICT, particularly because professional development opportunities were sporadic and unsystematic. More recently, the World Bank (2020) reported that although ICT policies exist at the national level, their impact at the school level is minimal due to weak teacher training frameworks. As such, the technological development of students' 21stcentury skills remains limited. Collectively, these studies underscore the centrality of teacher training in bridging the gap between educational policy goals and classroom realities, particularly in resource-constrained contexts like the Mfoundi Division of Yaounde.

## THEORETICAL FRAMEWORK

This study made used of Human Capital Theory and Track Theory, both of which provide a lens to understand the relationship between teacher training, technology integration, and the acquisition of 21st-century skills in secondary education. Human Capital Theory (Becker, 1993; Schultz, 1961) posits that investment in education and training enhances the knowledge, skills, and competencies of individuals, thereby increasing their productivity and contributions to economic growth. Applied to the current study, teacher training represents a crucial investment in human capital, as it equips educators with the pedagogical and technological skills necessary to foster students' creativity, critical thinking, digital literacy, and collaboration. In the context of Cameroon, limited teacher preparation undermines this investment, thereby restricting the capacity of students to acquire employable skills that align with the demands of a knowledge-based economy (World Bank, 2020). From this perspective, enhancing teacher training is not only an educational imperative but also a socio-economic strategy to strengthen Cameroon's human capital base.

Track Theory in education emphasizes how institutional pathways, such as curriculum structures, teacher training programs, and professional development opportunities, significantly shape students' learning outcomes and career trajectories (Gamoran, 1992). The effectiveness of these "tracks" depends on how well they align with contemporary societal and labor market demands. In the Mfoundi Division, pre-service and in-service teacher training programs often emphasize traditional content delivery rather than technology-enhanced, skilloriented pedagogies (Tchombe, 2020). Consequently, students are placed on an educational track that limits their exposure to 21st-century skills. Strengthening teacher training and aligning it with technology-driven pedagogical practices can therefore redirect students toward more empowering educational tracks, enabling them to thrive in digitally competitive economies. By integrating these two theoretical perspectives, the framework underscores that teacher training is both an investment in human capital and a structuring track that shapes students' educational and economic futures. The study, therefore, examines how improved teacher preparation in ICT integration and modern pedagogy can enhance the acquisition of 21st-century skills among students in government secondary schools in Mfoundi Division, Yaounde.

# METHODOLOGY

A survey research design using a structured questionnaire was employed to collect data from teachers. This design enabled the study to examine teacher training and technology integration practices that support the development of 21st-century skills among students, rather than directly measuring students' skills. The approach is appropriate for capturing teachers' perceptions, experiences, and professional practices within government secondary schools. The study was conducted in Mfoundi Division, Centre Region of Cameroon, which comprises of 43 public secondary schools and 7,722 teaching staff (MINESEC, 2024). Six government secondary schools were randomly selected to represent diverse school contexts. A sample of 380 teachers was drawn from these schools using simple random sampling techniques to ensure representativeness of the teaching staff population. The questionnaire was validated for face and content validity by experts in educational research. Reliability was assessed through a test-retest procedure involving 30 respondents over a two-week interval, which demonstrated high consistency of responses. Cronbach's alpha values indicated good internal consistency (r = 0.85 for teacher training; r = 0.75 for technology integration practices that support 21st-century skills).

**Data Analysis**

Data were analyzed using descriptive and inferential statistical methods. Descriptive statistics, including frequencies, percentages, means, and standard deviations, summarized teachers' perceptions of training and technology integration practices. Pearson's product-moment correlation coefficient was used to examine the strength and direction of the relationship between teacher training and technology integration practices that support 21st-century skills.

# RESULTS AND DISCUSSIONS

Table 1: Distribution of respondents' opinions on teacher training

| Items | Mean | Std. Deviation |
|---|---|---|
| I am confident in my ability to design and deliver engaging lesson plans. | 3,42 | ,60 |
| I effectively use a variety of instructional strategies to meet the diverse needs of my students. | 3,32 | ,62 |
| I regularly assess and adjust my teaching methods based on student feedback and performance. | 3,33 | ,64 |
| I am able to create a positive and inclusive learning environment for all students. | 3,07 | ,79 |
| I incorporate technology into my teaching in ways that enhance student learning. | 2,92 | ,67 |
| I am skilled at managing classroom behavior and maintaining student focus during lessons. | 3,23 | ,67 |
| I regularly reflect on my teaching practice and identify areas for personal growth. | 3,32 | ,63 |
| I am proficient in differentiating instruction to meet the needs of students with varying abilities. | 3,13 | ,61 |
| I actively seek out and participate in professional development opportunities to improve my teaching skills. | 3,22 | ,66 |
| Teacher Training (overall scale) | 3,22 | ,44 |
| Note : N = 380 | | |

Source: field data (2024)

The results reveal that respondents demonstrated high confidence in designing engaging lesson plans (mean = 3.42). This suggests that educators possess strong foundational skills in planning and preparation, which are essential for fostering student engagement and motivation. Additionally, moderate agreement was recorded for regularly assessing and adjusting teaching methods (mean = 3.33) and reflecting on teaching practices (mean =

3.32). These findings highlight teachers' commitment to continuous improvement and responsiveness to student needs, thereby promoting adaptive and reflective teaching practices.

A moderate level of agreement was also observed for creating inclusive learning environments (mean = 3.07). This indicates that educators recognize the importance of equity and accessibility in the classroom, although sustained efforts are needed to ensure all students feel valued and supported. Similarly, the relatively low agreement regarding the incorporation of technology into teaching (mean = 2.92) underscores challenges such as inadequate resources and limited digital literacy among teachers. Enhancing technological proficiency through targeted professional development and improved access to ICT resources is therefore essential.

Furthermore, the lower level of agreement concerning proficiency in differentiating instruction (mean = 3.13) suggests that teachers may struggle to effectively address the diverse learning needs of students. Focused training in differentiated instruction could significantly enhance teachers' ability to provide inclusive and personalized learning experiences. In terms of classroom management, the moderate agreement (mean = 3.23) points to variability in teachers' skills, with some educators demonstrating stronger competencies than others do. Strengthening classroom management strategies would likely contribute to improved student engagement and reduced behavioral disruptions.

In summary, the analysis reveals that while educators in Mfoundi Division display competence in core instructional practices particularly lesson planning and reflective teaching, significant challenges persist in the areas of technology integration, differentiated instruction, and classroom management. To address these gaps, policymakers and school administrators should prioritize sustained professional development, resource provision, and supportive systems that empower teachers to cultivate 21st-century skills among students effectively.

**Verification Of Research Hypotheses**

**Ha:** Teacher training significantly influences technological development of 21st-century skills in secondary schools.

**Ho:** Teacher training does not significantly influence technological development of 21st-century skills in secondary schools.

The research examined the relationship between teacher training and technological development of twenty-first century skills. The findings demonstrated that teacher training significantly influences the development of these skills among secondary school students. That is, there was significant positive correlation between teacher training and technological skill development with a Pearson's correlation value of ($r = 0.0504$, $p < .001$), Furthermore, the coefficient of determination ($R^2$) was calculated to be 0.4844, indicating that teacher training can explain 48.44% of the variability in technological development of twenty-first century skills. This finding highlights the inadequate substantial impact of professional development initiatives, suggesting that investments in teacher training are likely to yield significant improvements in the acquisition and integration of twenty-first century skills among secondary school students.

## DISCUSSION OF FINDINGS

Teacher training plays a critical role in enhancing technological development of twenty-first century skills., The findings show that, there exist is a significant relationship between teacher training and technological development of twenty-first century skills. This finding shows that; teacher training might have a meaningful and positive influence on the development of 21st century skills. Furthermore, the findings align with earlier research done by Nicole in (2015) showing how teachers' ability to integrate technology into instruction is increasingly becoming important to help students develop digital skills for the global society. Similarly, Newbill and Baum (2013) emphasized that technology is a constant evolving component of education and modern life, while Rose (2008) and Kleyn-Kennedy (2001) underscored that the exponential growth of technology has transformed every sector of society. Basset (2005) further argued that without adequate technological integration, schools risk producing graduates unprepared to thrive in higher education or the global labor market.

The results of this study also correspond with previous scholarship showing that the extent to which teachers integrate technology directly shapes students' technological engagement and skill acquisition (Lee & Spires, 2009; Ritzhaupt, Dawson, & Cavanaugh, 2012). However, systemic barriers such as inadequate resources, insufficient professional development, and a lack of technical support continue to hinder effective implementation. For instance, Ngajie and Ngo (2016) observed that while some Cameroonian schools possess computers, access remains limited due to poor infrastructure and lack of permanent technical support staff (Mbangwana, 2008; Nangue, 2010; Karsenti & Harper-Merrett, 2012; Fouda et al., 2013). Intermittent electricity and unreliable internet further exacerbate these challenges (Mbangwana, 2008).

These findings are strongly supported by Human Capital Theory, which posits that investing in human resources enhances productivity and fosters economic development (Becker, 1974). Teachers, as a central category of human capital, directly influence students' acquisition of technological and 21st-century skills. Equipping teachers with modern pedagogical and technological expertise not only prepares students for the knowledge economy but also supports national development goals (Knight & Yorke, 2014).

Nevertheless, the literature also reveals contradictory perspectives. Rose (2008) noted that while technology integration often stimulates students' interest, it does not always translate into improved academic outcomes. Similarly, Mohamed et al. (2014) reported that many instructors remain underprepared for 21stcentury classrooms due to outdated curricula and limited adaptability of learning environments. These findings suggest that reforms in teacher training curricula are essential. A baseline ICT proficiency should be established as a prerequisite for teacher certification, ensuring educators are adequately prepared to meet the demands of digital learning environments.

In summary, this study's results provide strong evidence that teacher training plays a pivotal role in shaping students' acquisition of technological and 21st-century skills. However, persistent challenges including limited infrastructure, inadequate training, and resource constraints must be addressed through targeted policy interventions, ongoing professional development, and curriculum reform to fully realize the potential of digital education.

## CONCLUSION

The study examines the relationship between teacher training and technological development of twentyfirst century skills among secondary school students in government schools in Mfoundi Division, Yaounde, Cameroon. The findings demonstrated that teacher training significantly contributes to the acquisition of critical 21st-century skills, including digital literacy, problem-solving, creativity, and collaborative learning. The positive correlation observed between teacher training and technological skill development indicates that nearly half of the variability in students' technological skill acquisition can be attributed to the quality and scope of teacher training. The study highlighted both strengths and challenges within the current educational landscape. Teachers exhibited confidence in core instructional practices such as lesson planning, reflective teaching, and assessment adjustments. However, moderate or lower performance was observed in areas such as technology integration, differentiated instruction, and classroom management. These gaps suggest that while foundational teaching competencies are present, targeted interventions are necessary to enhance teachers' capacity to deliver digital, student-centered instruction.

Empirical evidence from interviews corroborated these findings, emphasizing the importance of structured professional development programs, mindset shifts towards digital adoption, and the inclusion of practical ICT training in pre-service education. The results align with Human Capital Theory, which underscores that investment in teacher training enhances human resource productivity, ultimately benefiting students and national development. In conclusion, strengthening teacher training programs and providing adequate resources for technological integration are critical for equipping students with the competencies required to thrive in a knowledge-based economy. Policy interventions should prioritize continuous professional development, curriculum reform to incorporate 21st-century skills, and the provision of necessary technological infrastructure. By doing so, Cameroon can ensure that its secondary school graduates are not only academically competent but also digitally literate, innovative, and ready to meet the demands of a rapidly evolving global workforce.

## RECOMMENDATIONS

Based on the study's findings, several steps are recommended to improve the development of 21st-century skills among secondary school students in Mfoundi Division.

1. Teacher training should be improved at both the pre-service and in-service levels. Preservice programs should include ICT-focused courses that teach teachers how to use technology to support student-centered learning. In-service teachers should attend regular workshops on digital skills, instructional technology, and modern teaching methods. This ongoing training equips teachers to promote critical thinking, creativity, collaboration, and problem-solving among students.
2. Teachers should take part in collaborative networks for peer learning, mentoring, and sharing best practices in ICT use. Schools can support this by organizing regular meetings and training sessions where teachers discuss challenges, demonstrate effective lesson plans, and develop joint strategies. Such collaboration will help teachers to continuously improve their skills and teaching practices.
3. Schools need reliable access to computers, projectors, tablets, stable internet, and consistent electricity. Technical support should also be available to help teachers overcome problems with technology. Good infrastructure allows teachers to use interactive and student-centered methods that enhance 21st-century skills.
4. Teachers should design lessons that develop students' digital literacy, creativity, collaboration, critical thinking, and problem-solving. Using project-based, inquiry-based, and group activities supported by technology can make learning more engaging. Teachers should also use assessments to monitor students' skill development and adjust lessons when needed.
5. The Ministry of Secondary Education should prioritize ICT training in teacher education policies and set ICT proficiency standards for teacher certification. Schools should receive funding, resources, and incentives to support training programs and provide ICT equipment.
6. Regular assessments of teachers' ICT skills, classroom practices, and students' learning outcomes should be conducted. Feedback from teachers, administrators, and students should guide improvements in training programs.

By implementing these measures, secondary schools in Cameroon can strengthen teacher skills, improve technology use in classrooms, and better equip students with essential 21st-century competencies.

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