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Critical Modern Competency Skills for Building Technology Educators (BTEs) for Enhanced Pedagogical Effectiveness in Technical Colleges, Southwest Nigeria

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Abstract

This study explores the modern competency skills required by Building Technology Educators (BTEs) in technical colleges across Southwest Nigeria. It identifies a mismatch between current instructional practices and evolving industry standards. Using a descriptive survey design, data were gathered from 30 BTEs via a validated 30-item questionnaire (Cronbach's Alpha = 0.81). Results revealed significant competency gaps in areas such as Building Information Modelling (BIM), Virtual Reality (VR), and Construction Management Software (CMS), with a grand mean of 2.69. Educators also showed deficiencies in digital literacy and project-based learning (grand mean = 2.65). Key strategies for addressing these gaps include Continuous Professional Development (mean = 4.57), curriculum alignment (mean = 4.50), and industry collaboration (mean = 4.47). Other recommended measures include mentorship, infrastructure improvement, and global exposure. The study concludes that targeted interventions are essential to enhance teaching quality and align BTE competencies with international construction standards.

Keywords: *Building Technology, Modern Competency skills*

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Background to the Study

Technical and Vocational Education (TVE) equips students with practical knowledge and skills essential for workforce integration across various industries, particularly through technical colleges (NBTE, 2013). As integral components of Nigeria's educational and economic development strategy, technical colleges are tasked with producing skilled craftsmen and master craftsmen in applied sciences, technology, and business (FRN, 2013). These institutions not only cultivate vocational skills but also drive self-reliance, entrepreneurship, and economic growth, underscoring their significance in national development initiatives (FRN, 2013). Within this framework, technical colleges prepare students for sub-professional careers by blending theoretical instruction with hands-on training across diverse trades, including Building Design and Construction, Land Surveying, Block Laying, Bricklaying, Construction Management, Woodwork Design and Construction, Carpentry, Automobile Design, Automobile Assembling, Automobile Repair, Automobile Diagnosis, and Welding (Okwelle, 2013; Imogie, 2014).

However, as industry demands evolve, the relevance of these trades depends on the integration of modern technologies and digital competencies into curricula. Digital methodologies and emerging construction technologies now serve as critical drivers for enhancing instructional quality, ensuring graduates possess the adaptability and technical expertise required to thrive in an ever-changing industrial landscape. In the digital age, fostering modern competency skills is indispensable for addressing complex challenges and driving innovation within the building industry. Wang (2018) defines modern competencies as a comprehensive blend of knowledge, skills, and attributes that empower individuals to excel in a rapidly evolving society. Isa et al. (2024) classify these competencies into three domains: digital proficiency, learning and innovation skills (creativity, critical thinking, communication, collaboration), and essential career attributes such as leadership, accountability, and productivity. Mastery of these competencies enables students to harness technological advancements, positioning them as competitive contributors to the global workforce (Partnership for 21st Century Skills, 2015; Larson & Miller, 2011).

Globally, education systems are undergoing transformative shifts to align with 21st-century technological advancements, accentuating the need to equip students with digital and technical skills (Isa et al., 2020). This shift highlights the crucial role of Educators, particularly in Building Technology Education (BTE), who must possess and impart relevant competencies reflective of contemporary industry standards. Olugboyega et al. (2024) emphasize that developing student competencies is contingent upon Educators' proficiency in modern pedagogical frameworks and technologies. In Nigerian technical colleges, Building Technology Educators (BTEs) play a pivotal role in shaping the future of students by integrating cutting-edge technologies such as Building Information Modelling (BIM), Virtual Reality (VR), Augmented Reality (AR), Construction Management Software (CMS), and innovative teaching strategies into their practices.

Effective pedagogical frameworks for teaching digital skills in Building Technology Education (BTE) focus on experiential, collaborative, and technology-driven approaches that enhance

hands-on learning and real-world applications. These approaches form the foundation for equipping students with the competencies needed to navigate and excel in the digital transformation of the building construction industry. For instance, Project-Based Learning (PBL) engages students in real or simulated construction projects, using digital tools like BIM, VR, and CMS to address design and engineering challenges (Abdulmumin et al., 2024). Similarly, experiential learning provides hands-on experience with emerging tools such as 3D printing, drones, IoT sensors, and robotics, fostering a deeper understanding through direct application (Besiktepe, 2024). Collaborative learning strategies, which encourage teamwork and problem-solving, often employ cloud-based platforms for real-time design and management tasks (Elgewely et al., 2021). In addition, flipped classroom models enable students to engage with video tutorials, software demonstrations, and interactive online modules at home, applying those skills during in-class workshops or labs (Ebekozien et al., 2024).

Moreover, immersive technologies such as VR and AR provide simulation-based environments where students can practice complex construction tasks without the risks associated with physical work (Ghanem, 2022). Case-based learning introduces real-world projects that require students to analyze and solve industry challenges using advanced technologies like AI, BIM, and digital twins (Hajirasouli, 2024). Hackathons and innovation challenges further enhance student engagement by fostering creativity and collaboration, as participants design solutions for construction problems using digital tools (Olugboyega et al., 2023). Complementing these strategies, mentorship and partnerships with industry professionals provide students with insights into emerging trends, aligning educational curricula with national and international building codes, sustainability standards, and industry demands (Besiktepe, 2024).

Despite these advancements, a persistent competency skill gap exists among Building Technology Educators (BTEs) in Nigerian technical colleges. Besiktepe et al. (2024) reveal that many educators lack proficiency in 21st-century educational frameworks and construction technologies, which hampers students' ability to acquire industry-aligned skills. Addressing this gap requires a shift from traditional observational teaching methods to active, participatory learning approaches. By adopting advanced technologies such as VR and complementary digital tools, Building Technology Educators (BTEs) can create dynamic learning environments that simulate real-world workflows, equipping students to navigate complex construction scenarios. This holistic approach aligns with broader efforts to integrate smart construction technologies, BIM, and automated design systems into building technology curricula, transforming technical education into a platform for industry leadership and innovation.

To bridge the competency skill gap among Building Technology Educators (BTEs), professional development strategies must prioritize equipping educators with relevant skills in digital tools, pedagogical innovations, and industry-specific technologies. According to Osinem (2023), targeted training programs designed to upskill Educators in emerging construction technologies—including BIM, VR, and the Internet of Things (IoT)—are

critical for aligning teaching practices with global industry trends. Workshops, short courses, and certification programs tailored to Building Technology Educators (BTEs) offer practical exposure, fostering confidence in utilizing modern tools and methodologies. Furthermore, sustained engagement with industry professionals strengthens Educators' understanding of real-world applications of these technologies. Partnerships between technical colleges and construction firms provide avenues for internships, mentorship programs, and knowledge-sharing sessions, where educators can learn firsthand about technologies such as drone surveying, automated design systems, and digital twins (Edozie et al., 2022).

Mentorship-based professional development promotes peer learning, enabling experienced educators to guide their colleagues in adopting innovative teaching techniques like PBL, collaborative problem-solving, and gamification (Adesina, 2024). Peer-led workshops and teacher learning communities offer supportive platforms for exchanging knowledge and building teaching capacity. Additionally, incorporating flipped classroom models into teacher training can help educators become familiar with blended instructional approaches, where theoretical lessons are delivered online while practical aspects are carried out in laboratories or at construction sites (Olawale et al., 2024).

The creation of digital teaching resource hubs and specialised online learning platforms for technical education can further support professional growth. These platforms, which may include video demonstrations, interactive learning materials, and training on simulation software, allow Building Technology Educators (BTEs) to learn flexibly and develop proficiency in using modern digital tools (Akintunde, 2023). Government-supported programmes that offer free or subsidized access to advanced construction software can also help ensure equal learning opportunities for teachers across various technical institutions (Ajayi et al., 2024). Integrating Continuous Professional Development (CPD) into the professional paths of Building Technology Educators guarantees regular upskilling through scheduled training, participation in international seminars, and exposure to global standards in construction education (Okolie & Eboh, 2023).

Motivating educators through career progression incentives and financial rewards can promote active participation in skill enhancement programmes. Recognition mechanisms such as certifications, merit awards, and promotions linked to demonstrated competence in new technologies help foster a culture of ongoing development and excellence (Onuoha et al., 2024). Tackling persistent issues such as inadequate infrastructure and limited financial support in technical colleges remains crucial for the success of professional development initiatives. Investments in smart classrooms, VR labs, and BIM software licenses, alongside curriculum revisions to reflect 21st-century industry requirements, are crucial for enabling practical, technology-driven teacher training (Okoro, 2023; Adeyemi, 2024).

Regular evaluation of professional development programs is necessary for assessing their impact and identifying areas for improvement. Feedback from Educators, students, and industry stakeholders can inform the refinement of training initiatives (Ebekozien et al., 2024). By implementing these comprehensive strategies, Nigerian technical colleges can

empower Building Technology Educators (BTEs) to bridge the competency skill gap, transform instructional practices, and align technical education with the demands of a rapidly evolving construction industry. This alignment is not only essential for producing a workforce capable of meeting industry expectations but also for fostering innovation and driving sustainable economic growth in Nigeria's building sector.

Ultimately, the effectiveness of BTE instruction in Nigerian technical colleges hinges on the continuous development of Educators' competencies. Addressing the existing skills gap through targeted training and capacity-building initiatives is essential for aligning instructional practices with industry demands and fostering the next generation of skilled professionals. This study seeks to identify the critical modern competencies necessary for Building Technology Educators (BTEs) to enhance instructional effectiveness, focusing on technical colleges across Southwest Nigeria and the country at large. By examining current competency levels, pinpointing areas for improvement, and recommending strategies for professional development, this research aims to drive educational excellence and industry alignment within Nigeria's technical education landscape.

Statement of the Problem

The increasing complexity and technological advancement in the global construction industry underscore the urgent need for Building Technology Educators (BTEs) in Nigeria's technical colleges to possess and impart modern competencies that align with 21st-century industry demands. However, significant gaps persist in the digital proficiency, pedagogical skills, and technological adaptability of Building Technology Educators (BTEs), particularly in technical colleges across the South-West region of Nigeria. Many Educators lack the necessary expertise to integrate emerging technologies such as Building Information Modelling (BIM), Virtual Reality (VR), Augmented Reality (AR), and Construction Management Software (CMS) into instructional frameworks. This deficiency reflects broader systemic challenges, including insufficient professional development opportunities, limited access to digital tools, and outdated curricula that fail to reflect the realities of modern construction practices.

The consequence is a widening disconnect between educational outcomes and industry expectations, contributing to the production of graduates ill-equipped to navigate the complexities of contemporary building environments. As global economies increasingly adopt digital technologies and automation in the construction industry, the inability of Building Technology Educators (BTEs) to impart these essential skills to students poses a serious threat to Nigeria's broader goals of promoting innovation, self-reliance, and economic development through Technical and Vocational Education (TVE). This gap in educator competency contributes to rising youth unemployment and limits the country's ability to compete effectively in the construction sector.

In addition, although progressive teaching methods such as Project-Based Learning (PBL), experiential learning, and simulation-based instruction are recognised for their potential to build practical skills, their application in Nigerian technical colleges remains inadequate. This shortfall is largely due to limited institutional backing and weak collaboration between

training institutions and industry stakeholders. As a result, many Building Technology Educators continue to depend on traditional lecture-based approaches, which are often ineffective in developing the digital competencies and innovative thinking now essential in the field.

To address these issues, there is a clear need for deliberate efforts to equip Building Technology Educators with the necessary tools and expertise to deliver education that reflects current industry standards. This study focuses on identifying the modern competency skills that Building Technology Educators (BTEs) require to enhance teaching effectiveness in technical colleges across South-West Nigeria and, by extension, the nation. By uncovering current gaps, evaluating effective digital teaching practices, and proposing actionable strategies for professional development, the research aims to help close the skills gap and raise the standard of technical education in the country.

Research Questions

Three research questions were formulated for the study;

1. To what extent have Building Technology Educators (BTEs) acquired modern competency skills required for instructional effectiveness in technical colleges?
2. What is the current level of modern competency skills among Building Technology Educators (BTEs) in technical colleges?
3. What professional development strategies can be implemented to equip Building Technology Educators (BTEs) with the modern competency skills needed to align technical education with industry demands in Nigeria?

Methodology

This study utilized a descriptive survey design, selected for its effectiveness in collecting and analyzing participants' abilities in the subject under investigation. The research was conducted in South-West Nigeria, targeting technical colleges that offer Building Technology Education (BTE). The study population comprised thirty (30) Basic Technology Educators (BTEs) from technical colleges (NTCs) across the South West region. Due to the small population, there was no sample size.

A structured questionnaire served as the primary tool for data collection, designed to gather comprehensive responses through a 5-point modified Likert scale. The response options were categorized as: Extensively Acquired (EA) – 5, Well Acquired (WA) – 4, Moderately Acquired (MA) – 3, Marginally Acquired (MA) – 2, and Not Acquired at All (NAA) – 1. Competency level were similarly rated as: Very High (VH) – 5, High (H) – 4, Moderate (M) – 3, Low (L) – 2, and Very Low (VL) – 1. and finally, strategies for enhancing competency skills were rated by: Strongly Agree (SA)-, Agree (A)-4, Disagree (D)-3, Strongly Disagree (SD)-2, Undecided (U)- 1

To enhance the validity and relevance of the questionnaire, it was reviewed by two experts in Technical and Vocational Education and Training (TVET). Their input led to refinements that ensured the questionnaire accurately reflected the research objectives. A pilot study was

conducted at the Government Technical College, Osogbo, Osun State, to test the instrument's reliability. The results from the pilot study were analyzed using Cronbach's Alpha in IBM SPSS version 24, yielding a reliability coefficient of 0.81, which demonstrated strong internal consistency.

Following validation and pilot testing, the finalized 30-item questionnaire was distributed directly to Building Technology Educators (BTEs) in technical colleges across South-West Nigeria. The researcher, accompanied by an assistant, conducted in-person visits to administer the questionnaires, maximizing the response rate and addressing any potential ambiguity during the process. Data collected from the survey were analyzed using SPSS version 24, where the mean and standard deviation were calculated to interpret the results. Items with mean scores of 3.50 or higher were classified as acquired and high, while those below this threshold were considered not acquired and low.

Data Analysis

Research Question 1:

To what extent have Building Technology Educators (BTEs) acquired modern competency skills required for instructional effectiveness in technical colleges?

Table 1: Modern Competency Skills Acquired by Building Technology Educators (BTEs) in Technical Colleges
(Mean values below 3.50 indicate competencies not adequately acquired, while those above reflect moderate to extensive acquisition.)

S/N	Items	5 EA (%)	4 WA (%)	3 MA (%)	2 MA (%)	1 NAA (%)	Total Responses (30 = 100%)	Mean	SD	Decision
1	Application of Building Information Modelling (BIM)	3 (10.0)	5 (16.7)	8 (26.7)	9 (30.0)	5 (16.7)	30 (100%)	2.73	1.12	Not Adequately Acquired
2	Virtual Reality (VR) for site simulation and safety training	2 (6.7)	4 (13.3)	6 (20.0)	11 (36.7)	7 (23.3)	30 (100%)	2.40	1.08	Not Adequately Acquired
3	Augmented Reality (AR) for project visualization	1 (3.3)	3 (10.0)	7 (23.3)	12 (40.0)	7 (23.3)	30 (100%)	2.30	1.06	Not Adequately Acquired
4	Project-Based Learning (PBL)	3 (10.0)	6 (20.0)	9 (30.0)	8 (26.7)	4 (13.3)	30 (100%)	2.87	1.11	Not Adequately Acquired
5	Experiential Learning (IoT, 3D Printing, drones)	2 (6.7)	4 (13.3)	9 (30.0)	10 (33.3)	5 (16.7)	30 (100%)	2.60	1.10	Not Adequately Acquired
6	Construction Management Software (CMS)	2 (6.7)	3 (10.0)	8 (26.7)	12 (40.0)	5 (16.7)	30 (100%)	2.40	1.09	Not Adequately Acquired
7	ICT for design, CAD, and drafting	4 (13.3)	6 (20.0)	10 (33.3)	6 (20.0)	4 (13.3)	30 (100%)	3.00	1.08	Not Adequately Acquired
8	Smartboard utilization for instruction	3 (10.0)	5 (16.7)	8 (26.7)	9 (30.0)	5 (16.7)	30 (100%)	2.73	1.09	Not Adequately Acquired
9	Internet/cloud-based collaboration	4 (13.3)	6 (20.0)	10 (33.3)	7 (23.3)	3 (10.0)	30 (100%)	3.03	1.06	Not Adequately Acquired
10	Flipped Classroom techniques	3 (10.0)	5 (16.7)	9 (30.0)	8 (26.7)	5 (16.7)	30 (100%)	2.80	1.07	Not Adequately Acquired
Grand Mean							***2.69***			

Source: SPSS 2024

Table 1 presents an analysis of the extent to which Building Technology Educators (BTEs) in technical colleges have acquired modern competencies necessary for effective instruction. A total of ten competencies were evaluated, with the mean scores indicating the levels of acquisition. The findings reveal that none of the competencies achieved a mean score above the benchmark of 3.50, suggesting that not all the skills were adequately acquired. For instance, the application of Building Information Modelling (BIM) recorded a mean score of 2.73, indicating that this skill is not adequately acquired. Similarly, Virtual Reality (VR) for site simulation and safety training scored 2.40, and Augmented Reality (AR) for project

visualization scored 2.30, both falling below the threshold. These scores demonstrate limited proficiency in the adoption of advanced digital tools.

Competencies such as Project-Based Learning (PBL) and Experiential Learning (IoT, 3D Printing, drones) also showed low levels of acquisition, with mean scores of 2.87 and 2.60, respectively. Construction Management Software (CMS) recorded one of the lowest mean scores at 2.40, reflecting minimal utilization of this essential tool in modern construction education.

Furthermore, ICT for design, CAD, and drafting had a mean score of 3.00, indicating moderate acquisition but still below the required benchmark. The utilization of smartboards for instruction and internet/cloud-based collaboration scored 2.73 and 3.03, respectively, showing similar trends of insufficient acquisition. Flipped classroom techniques also exhibited inadequate acquisition, with a mean score of 2.80.

The grand mean score of 2.69 further highlights that, overall, the modern competencies required by Building Technology Educators (BTEs) are not adequately acquired. This underscores the need for targeted professional development and training programs to equip Educators with the necessary skills to enhance instructional effectiveness in technical colleges.

Research Question 2:
What is the current level of competency skills among Building Technology Educators (BTEs) in technical colleges?

Table 2: Current Level of Competency Skills Among Building Technology Educators (BTEs) in Technical Colleges
(Mean values below 3.50 indicate competency skills requiring significant improvement, while those above reflect satisfactory competency levels.)

S/N	Items	5 VH (%)	4 H (%)	3 M (%)	2 L (%)	1 VL (%)	Total Responses (30 = 100%)	Mean	SD	Decision
11	Application of Building Information Modelling (BIM)	2 (6.7)	5 (16.7)	8 (26.7)	9 (30.0)	6 (20.0)	30 (100%)	2.60	1.12	Needs Improvement
12	Virtual Reality (VR) for site simulation and safety training	1 (3.3)	3 (10.0)	6 (20.0)	12 (40.0)	8 (26.7)	30 (100%)	2.23	1.08	Needs Significant Improvement
13	Augmented Reality (AR) for project visualization	1 (3.3)	2 (6.7)	7 (23.3)	13 (43.3)	7 (23.3)	30 (100%)	2.20	1.07	Needs Significant Improvement
14	Project-Based Learning (PBL)	3 (10.0)	6 (20.0)	9 (30.0)	8 (26.7)	4 (13.3)	30 (100%)	2.87	1.11	Needs Improvement
15	Experiential Learning (IoT, 3D Printing, drones)	2 (6.7)	4 (13.3)	9 (30.0)	10 (33.3)	5 (16.7)	30 (100%)	2.60	1.10	Needs Improvement
16	Construction Management Software (CMS)	1 (3.3)	3 (10.0)	8 (26.7)	11 (36.7)	7 (23.3)	30 (100%)	2.33	1.09	Needs Significant Improvement
17	ICT for design, CAD, and drafting	s					30 (100%)	3.10	1.08	Needs Improvement
18	Smartboard utilization for instruction	2 (6.7)	5 (16.7)	9 (30.0)	9 (30.0)	5 (16.7)	30 (100%)	2.67	1.09	Needs Improvement
19	Internet/cloud-based collaboration	3 (10.0)	7 (23.3)	10 (33.3)	7 (23.3)	3 (10.0)	30 (100%)	3.00	1.06	Needs Improvement
20	Flipped Classroom techniques	3 (10.0)	6 (20.0)	9 (30.0)	8 (26.7)	4 (13.3)	30 (100%)	2.87	1.07	Needs Improvement
				Grand Mean	***2.65***					

Source: SPSS 2024

Table 2 examines the current competency levels of Building Technology Educators (BTEs) in technical colleges, highlighting areas that require improvement to meet educational and industry standards. With a grand mean score of 2.65, the findings indicate that, overall, Building Technology Educators (BTEs) lack adequate competency in key modern skills.

Among the competencies assessed, the lowest mean scores were recorded for Virtual Reality (VR) for site simulation and safety training (2.23) and Augmented Reality (AR) for project visualization (2.20). These results suggest that Building Technology Educators (BTEs) are significantly deficient in these advanced digital skills, which are increasingly vital for modern construction education. Similarly, Construction Management Software (CMS) scored 2.33, reflecting a critical need for improvement in this area as well.

Moderately better performance was observed in areas such as Project-Based Learning (PBL) (mean = 2.87), Experiential Learning (IoT, 3D Printing, drones) (mean = 2.60), and Internet/cloud-based collaboration (mean = 3.00). However, these scores still fall short of satisfactory competency, indicating that further training and development are required to fully integrate these practices into teaching methods.

Competencies such as ICT for design, CAD, and drafting showed relatively higher levels of competency, with a mean score of 3.10, but even this result remains below the benchmark of 3.50 for satisfactory competency. Smartboard utilization for instruction (2.67) and Flipped Classroom techniques (2.87) also reflects moderate levels of effectiveness but highlight the need for enhancement to achieve industry-aligned competency levels. Ultimately, the findings underscore the urgent need for targeted professional development programs to address the gaps in competencies among Building Technology Educators (BTEs). By focusing on areas such as digital tools, advanced construction technologies, and modern instructional methods, technical colleges can better prepare Educators to meet the evolving demands of education and industry.

Research question 3: What professional development strategies can be implemented to equip Building Technology Educators (BTEs) with the modern competencies needed to align technical education with industry demands in Nigeria?

Table 3: Professional Development Strategies for Equipping Building Technology Educators (BTEs) with Modern Competency Skills

S/N	Items	5 SA (%)	4 A (%)	3 D (%)	2 SD (%)	1 UD (%)	Total Responses (30 = 100%)	Mean	SD	Decision
21	Technology-focused training (BIM, VR, IoT)	15 (50.0)	10 (33.3)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.33	0.71	Agree
22	Industry partnerships for hands-on exposure	18 (60.0)	8 (26.7)	4 (13.3)	0 (0.0)	0 (0.0)	30 (100%)	4.47	0.73	Strongly Agree
23	Mentorship and learning communities	16 (53.3)	9 (30.0)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.37	0.76	Strongly Agree
24	Continuous Professional Development (CPD)	20 (66.7)	7 (23.3)	3 (10.0)	0 (0.0)	0 (0.0)	30 (100%)	4.57	0.63	Strongly Agree
25	Digital resource hubs and online platforms	15 (50.0)	10 (33.3)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.33	0.71	Agree
26	Gamification and simulation-based teaching methods	12 (40.0)	13 (43.3)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.23	0.74	Agree
27	Incentives for professional development (certifications, etc.)	16 (53.3)	9 (30.0)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.37	0.76	Strongly Agree
28	Infrastructure upgrades (VR labs, smartboards)	14 (46.7)	10 (33.3)	6 (20.0)	0 (0.0)	0 (0.0)	30 (100%)	4.27	0.77	Agree
29	Curriculum alignment with global best practices	18 (60.0)	9 (30.0)	3 (10.0)	0 (0.0)	0 (0.0)	30 (100%)	4.50	0.68	Strongly Agree
30	International exchange programs	15 (50.0)	10 (33.3)	5 (16.7)	0 (0.0)	0 (0.0)	30 (100%)	4.33	0.71	Agree
			Grand Mean		***4.38***					

Source: SPSS 2024

Table 3 underscores the professional development strategies identified as crucial for equipping Building Technology Educators (BTEs) with the modern competencies needed to align technical education with industry demands in Nigeria. All the listed strategies received positive agreement, reflecting their importance and effectiveness in addressing the competency gaps among Building Technology Educators (BTEs). Continuous Professional Development (CPD) emerged as the most favored strategy, with the highest mean score of 4.57, signifying the respondents' strong belief in the necessity of structured and regular

capacity-building programs to enhance Educators' skills and ensure alignment with industry trends. Similarly, curriculum alignment with global best practices (mean = 4.50) and incentives for professional development, including certifications, were highly rated (mean = 4.37), emphasizing the importance of structured approaches to upskilling educators.

Mentorship and collaborative learning communities (mean = 4.37) were also perceived as highly effective strategies, reflecting the value placed on peer learning and knowledge-sharing platforms. Additionally, technology-focused training covering tools like Building Information Modelling (BIM), Virtual Reality (VR), and Internet of Things (IoT), along with the establishment of digital resource hubs, received significant agreement, with mean scores ranging from 4.23 to 4.33. These findings highlight the crucial importance of incorporating modern technology into teaching methods to ensure that educators are well-equipped to prepare students for the demands of today's rapidly changing construction industry. Infrastructure improvements—such as providing technical colleges with smart classrooms, virtual reality (VR) laboratories, and up-to-date teaching tools were also seen as highly necessary. Respondents strongly agreed that such facilities are vital for improving teaching quality and student engagement.

In addition, international exchange programmes and collaborations with professionals and organisations in the construction industry were identified as key strategies for strengthening teacher competence. These approaches, with mean scores of 4.33 and 4.47, respectively, are instrumental in exposing educators to global standards and practical industry knowledge. Similarly, the use of gamification and simulation-based teaching methods received strong support (mean = 4.30), reflecting a preference for teaching styles that are interactive, learner-centred, and suitable for modern students. The grand mean score of 4.38 represents a strong overall agreement among respondents on the value of the proposed strategies. This level of consensus highlights the need for a well-structured professional development plan that includes continuous professional development (CPD), integration of technology into classroom practice, curriculum reforms that reflect international trends, and closer links with industry. These combined strategies are essential for addressing existing skill gaps among Building Technology Educators. By implementing them, Nigerian technical colleges can significantly enhance the quality of education, improve teaching performance, and produce graduates who are better prepared to compete in the global construction workforce.

Discussion of Findings

The findings from this study reveal critical insights into the competencies required by Building Technology Educators (BTEs) in Nigerian technical colleges, the current competency levels, and the professional development strategies necessary for equipping these Educators to meet industry demands. These findings are discussed below concerning credible scholarly works.

Competency Requirements for Building Technology Educators (BTEs)

The study highlighted the essential competencies required by Building Technology Educators (BTEs) to align their instruction with the demands of modern technical education and industry practices. These competencies include digital proficiency, familiarity with Building

Information Modelling (BIM), and the ability to use Virtual Reality (VR) applications for site simulations. Adebayo et al. (2023) emphasized that such digital tools are indispensable for modernizing technical education and preparing students for the rapidly evolving construction industry.

Additionally, critical thinking, creativity, and collaboration were identified as core competencies, reflecting the need to prepare students for innovative problem-solving. This finding aligns with the work of Ezenwaji and Onuoha (2022), who stressed that these skills are vital for addressing the complexities of real-world construction challenges. The importance of adopting experiential and project-based learning methods was also emphasized, supporting Ajayi and Fasakin's (2021) assertion that these approaches bridge the gap between theoretical instruction and practical application.

Current Competency Levels of Building Technology Educators (BTEs)
The competency levels of Building Technology Educators (BTEs) revealed significant gaps in areas such as BIM, VR, and Augmented Reality (AR) applications. Okonkwo et al. (2022) highlighted similar challenges, noting that many technical educators in Nigeria lack adequate training in these advanced technologies. Moreover, the study found deficiencies in the use of construction management software and cloud-based collaboration tools, corroborating Anene and Ekeocha's (2021) findings that technological training for technical Educators remains insufficient. The study also identified limitations in experiential teaching tools like IoT devices and 3D printing, as well as flipped classroom methodologies. Adedokun and Adekunle (2022) argued that comprehensive training programs focusing on these areas are essential for improving teaching effectiveness and ensuring that educators are adequately prepared to meet educational and industry standards.

Professional Development Strategies for Building Technology Educators (BTEs)
Several professional development strategies were identified to address the competency gaps among Building Technology Educators (BTEs). The study highlighted the importance of Continuous Professional Development (CPD) programs as a means of equipping Educators with up-to-date skills and knowledge. This aligns with the findings of Osu and Ofoha (2022), who emphasized the need for structured and ongoing professional training initiatives.

Providing incentives for professional development and aligning curricula with global best practices were also identified as key strategies. Umeh and Ezugwu (2023) asserted that curriculum alignment ensures that Educators are prepared to deliver instruction that meets international and local industry demands. Mentorship programs and collaborative learning communities were also deemed effective in fostering professional growth, echoing Olorunfemi and Ajiboye's (2021) observation that peer-based learning enhances the exchange of expertise and promotes capacity building.

In addition, the findings emphasized the need for training programs focused on emerging technologies such as BIM, VR, and IoT applications, as well as the establishment of digital resource hubs. Adeola and Kolawole (2023) stressed the transformative impact of technology

integration on teaching effectiveness, supporting this recommendation. International exchange programs and partnerships with the construction industry were also seen as crucial for exposing Educators to global best practices, as noted by Olowoyo and Akindele (2022), who highlighted the benefits of industry-academic collaborations in preparing Educators for workforce-oriented instruction.

The study further emphasized the need for infrastructure upgrades in technical colleges, including the establishment of smart classrooms and VR labs. Igwe and Nwafor (2023) argued that adequate technological infrastructure is essential for effective teaching in technical education. The findings also supported gamification and simulation-based teaching methods, reflecting the work of Akpan and Obot (2023), who demonstrated their effectiveness in enhancing student engagement and improving learning outcomes.

Conclusion

The findings of the study show low modern competency skills among Building Technology Educators (BTEs) in technical colleges in Southwestern States, Nigeria. Hence, a need for targeted professional development initiatives to address competency gaps among Building Technology Educators (BTEs) in Nigerian technical colleges. The integration of technology-focused training, curriculum alignment with global standards, and the establishment of strong partnerships with the construction industry are critical strategies for equipping Educators to meet industry demands. By addressing these gaps, technical colleges can enhance the quality of instruction, better prepare students for the workforce, and contribute significantly to national development efforts.

Recommendations

Comprehensive Capacity Building Programs: Government agencies and educational institutions should organize continuous professional development programs focusing on BIM, VR, AR, and IoT. These workshops and training sessions should be made mandatory for all Building Technology Educators (BTEs).

Collaboration with Industry: Establish partnerships between technical colleges and leading construction firms to facilitate internship programs and industry visits. This collaboration will ensure Educators gain practical exposure to modern construction technologies.

Provision of Advanced Technology Labs: The government should invest in equipping technical colleges with state-of-the-art technology labs featuring tools such as 3D printers, drones, and smartboards to enhance experiential learning.

Incorporation of Digital Platforms: Develop and deploy digital learning platforms tailored to BTE curricula, allowing Educators to access online resources, tutorials, and virtual simulations.

Policy Development: Introduce policies that mandate certification in digital construction tools as part of the career progression framework for **Bui**lding Technology Educators (BTEs).

Research and Innovation Grants: Establish grants dedicated to research and development in digital construction tools and methods to foster innovation within the technical education sector.

By implementing these recommendations, Nigeria can enhance the competencies of Building Technology Educators (BTEs), ultimately contributing to the modernization of technical education and the development of a workforce equipped to meet the demands of the 21st-century construction industry.

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