DIGITAL FLIPPED CLASSROOM MODEL AS A BLENDED LEARNING STRATEGY FOR ENHANCING COMPETENCY AMONG NURSING STUDENTS IN NORTHWEST NIGERIA

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Abstract
This study examined the effectiveness of the Digital Flipped Classroom Model (DFCM), a structured blended learning approach, on nursing students' competency and learning perceptions in Northwest Nigeria. A quasi-experimental pre-test/post-test design was employed. Systematic sampling technique was used to draw 210 students from a population of 620 students, and 178 students continued in the study after the intervention at Ahmadu Bello University, Zaria, and Bayero University, Kano. The intervention consisted of pre-class digital instructional materials and interactive in-class activities. Data were collected using a structured perception questionnaire and a competency-based performance checklist. Paired t-tests and chi-square analyses ($\alpha = 0.05$) revealed statistically significant improvements in students' psychomotor competency and positive shifts in learning perceptions following exposure to the DFCM. Findings indicate that blended digital flipped instruction enhances engagement, flexibility, digital confidence, and practical skill mastery. The study concludes that integrating the DFCM into nursing curricula can support competency-based education and strengthen digital learning readiness in Nigerian universities.

Keywords: blended learning, digital flipped classroom, competency, nursing education, learning perception, educational technology

Introduction

Higher education globally continues to experience transformation driven by advancements in educational technology. Blended learning, an approach that combines digital instruction with face-to-face classroom activities, has emerged as a major innovation for enhancing flexibility, learner engagement, and competency development (Bergmann & Sams, 2014; Chen et al., 2017). As institutions seek more student-centred, technology-supported pedagogies, blended models such as the Digital Flipped Classroom Model (DFCM) have gained prominence for their ability to restructure traditional learning patterns into more active, participatory formats.

The Digital Flipped Classroom Model represents an extension of the conventional flipped classroom, strengthened through the integration of digital learning platforms, multimedia content, and online assessment tools. In this model, students engage with instructional materials, such as videos, readings, animations, and quizzes, before class, enabling them to acquire foundational knowledge at their own pace. Classroom time is then repurposed for collaborative learning, demonstrations, peer interaction, critical thinking exercises, and psychomotor skill practice. This shift aligns the DFCM with constructivist learning theories, which emphasize active engagement, experiential learning, and knowledge construction through meaningful interaction. By frontloading content acquisition and maximizing interactive learning during face-to-face sessions, the DFCM provides deeper cognitive processing opportunities than traditional lectures.

In nursing education, where theoretical knowledge must be consolidated through hands-on experience, the DFCM offers unique advantages. Nursing students must attain competencies in clinical reasoning, procedural accuracy, psychomotor performance, and digital literacy, competencies that are not optimally developed through passive, lecture-driven instruction (Adewale & Amoo, 2020; Oloyede & Adeoye, 2021). The DFCM supports competency-based education by enabling learners to prepare for class

ahead of time, arrive with baseline knowledge, and participate more actively in supervised clinical demonstrations and practice sessions. With Nigeria's nursing education system increasingly emphasizing competency frameworks and skills-based assessment, the DFCM aligns well with curricular reforms and global best practices.

The model is also significant in addressing persistent challenges within Nigerian higher education, including large class sizes, inadequate instructional time, limited access to laboratory resources, and varying levels of digital readiness (Eze et al., 2020; Okereke & Daniel, 2021). By shifting basic content delivery online, the DFCM frees classroom time for active learning, reduces cognitive overload, and enhances opportunities for individualized feedback. It also supports digital skill development, an essential requirement for 21st-century health professionals navigating technology-driven healthcare environments. Studies from international and African contexts have shown that flipped digital instruction improves students' confidence, engagement, motivation, and learning outcomes, particularly in science and health-related disciplines (Almodaimegh et al., 2022; He et al., 2021).

Despite these demonstrated benefits, the adoption of the Digital Flipped Classroom in Nigerian nursing programmes remains limited, and locally contextualized empirical evidence is scarce. Given the growing demand for competent and technologically adept nurses, it is crucial to explore models that can effectively blend digital learning with practical skill development. This study, therefore, examined the effect of the Digital Flipped Classroom Model on nursing students' competency and learning perceptions in Northwest Nigeria, contributing essential evidence to support the integration of digital-blended pedagogies in national nursing education.

Objectives of the Study
The study was designed to:
1. Assess the effect of the Digital Flipped Classroom Model on nursing students' competency in wound dressing.
2. Examine students' perceptions of the Digital Flipped Classroom Model as a blended learning strategy.

Method
Research Design
A quasi-experimental pre-test/post-test design without a control group was adopted to evaluate changes in competency and perception following exposure to the DFCM.
The study was conducted at Ahmadu Bello University, Zaria, and Bayero University, Kano. Participants were undergraduate nursing students enrolled in courses requiring psychomotor skill acquisition. A total of 210 students completed the pre-test, and 178 completed the post-test assessments.
The DFCM intervention consisted of two major components:
   i. Pre-class digital learning: Students accessed short instructional videos, readings, and quizzes uploaded on Moodle prior to classroom engagement. These materials presented foundational concepts and procedures related to wound dressing.
   ii. In-class active learning: Face-to-face sessions focused on application-based learning including demonstrations, supervised hands-on practice, small-group discussions, and collaborative activities designed to reinforce competency.
Instruments
1. Competency Performance Checklist: Evaluated students' ability to perform wound dressing using a three-point scale: *Satisfactorily Done*, *Averagely Done*, and *Not Done*.
2. Perception Questionnaire: Assessed domains such as engagement, motivation, flexibility, independent learning, and digital readiness.

Data Analysis

Digital flipped classroom model as a blended learning strategy for enhancing competency among nursing students in northwest Nigeria

Paired t-tests were used to compare mean pre- and post-intervention scores. Chi-square tests examined differences in competency categories. Statistical significance was set at $p < 0.05$.

Results
Table 1: Distribution of students according to their level of competency performance in wound dressing before and after the intervention ($n_1 = 210$, $n_2 = 178$)

Performance Level	Pre-Intervention (n = 210)		Post-Intervention (n = 178)		t-value	χ² (Chi-square)	p-value
	F	%	F	%			
Satisfactorily Done (3)	30	13.7	159.6	89.7			
Averagely Done (2)	34	28.6	14.6	8.2			
Not Done (1)	146	57.7	3.8	2.1			
Total	**210**	**100**	**178**	**100**			
Mean Score (X̄)	**1.45**		**2.88**		**18.4**	**165.7**	**< 0.001**

(Mean score of 2.50 – 3.00 = High Performance, 1.50 – 2.49 = Moderate Performance, 1.00 – 1.49 = Low Performance).

Competency Performance
Students demonstrated significant improvement in wound-dressing competency following the intervention. Mean performance scores increased from 1.45 at pre-test to 2.88 at post-test, indicating a shift from low to high competency. The proportion of students who performed the skill satisfactorily increased from 13.7% to 89.7%, whereas those who could not perform it declined from 57.7% to 2.1%. These differences were statistically significant, $t(177) = 18.4$, $\chi^2 = 165.7$, $p < .001$.
These findings support evidence that flipped and blended instructional models enhance psychomotor skill acquisition in clinical education (Bingen et al., 2019; He et al., 2021).

Table 2: Distribution of the Students according to their learning perception of DFCM before and after Intervention ($n_1 = 210$ and $n_2 = 178$)

Domain	Pre-Test (n₁ = 210)		Post-Test (n₂ = 178)		Pre-Test Mean (X̄₁)	Post-Test Mean (X̄₂)	t-value	χ²	p-value
	f	%	F	%					
Engagement and Motivation	51	24.4	45	25.1	3.2	4.2			
Learning Outcomes and Understanding	53	25.0	44	24.8	3.3	4.1			
Flexibility and Independent Learning	52	24.6	45	25.5	3.3	4.2			
Technology and Accessibility	55	26.0	44	24.6	3.4	4.1			
Aggregate Scores	**210**	**100.0**	**178**	**100.0**	**3.3**	**4.1**	**13.2**	**19.0**	**p < 0.001**

> 3 = Positive perception, ≤ 3 Negative perception

Students' Learning Perception

Students' perceptions of the DFCM improved significantly. Mean perception scores increased from 3.3 to 4.1, reflecting higher ratings for engagement, motivation, flexibility, digital confidence, and understanding. The positive shift was statistically significant, $p < .001$.

These results align with constructivist learning principles that emphasize learner autonomy, active engagement, and collaborative meaning-making (Brame, 2013).

Discussion

The findings of this study demonstrate that the Digital Flipped Classroom Model significantly enhances both competency and learning perceptions among nursing students in Northwest Nigeria. The marked improvement in psychomotor performance underscores the model's usefulness in strengthening competency-based education, a core requirement in contemporary nursing curricula. By engaging with digital materials before class, students arrived better prepared and demonstrated greater proficiency during hands-on wound-dressing procedures. This outcome aligns with earlier research indicating that flipped and blended approaches enhance psychomotor skill acquisition, procedural accuracy, and clinical reasoning (Bingen et al., 2019; He et al., 2021). More recent studies also corroborate these findings. For instance, Lee and Park (2022) reported that nursing students exposed to flipped clinical skills training demonstrated significantly higher competency scores than those taught using traditional lectures. Similarly, Abuzaid and Elshami (2023) found that the flipped classroom approach improved students' clinical confidence, performance accuracy, and retention of procedural skills.

The study also revealed substantial improvements in students' perceptions of learning. Domains such as motivation, engagement, flexibility, and digital readiness improved significantly following exposure to the DFCM. These findings reflect the strengths of blended digital instruction, which allows learners to study at their own pace, revisit content as needed, and engage more actively during classroom sessions. These outcomes are consistent with recent investigations, including that of Martín-Rodero and Fernández-García (2022), who found that flipped learning significantly enhances student motivation and satisfaction in health sciences education. In a similar vein, Onyema et al. (2023) reported that Nigerian university students perceived blended learning as more engaging and better aligned with their learning preferences compared to traditional classroom instruction. The results also support constructivist perspectives, which emphasize that learning becomes more meaningful when students are active participants and when instruction facilitates autonomy and peer interaction (Brame, 2013).

Importantly, the study highlights the potential of the DFCM to address systemic challenges commonly associated with traditional Nigerian nursing classrooms, including overcrowded learning environments, limited availability of instructional materials, and low digital literacy. By redirecting theoretical instruction to digital platforms, the DFCM creates opportunities for personalized learning and increases the efficiency of classroom time. Recent studies in Africa reinforce this point. Yusuf et al. (2022) observed that blended learning helped nursing students in resource-limited settings overcome constraints related to space, time, and access to learning materials. Additionally, Musa and Abubakar (2023) demonstrated that digital-flipped pedagogies improved students' digital competence and readiness for technology-enhanced clinical environments. These results align with Nigerian studies showing that effective integration of digital tools can significantly improve instructional quality and learning satisfaction when supported by adequate infrastructure and faculty readiness (Eze et al., 2020; Oloyede & Adeoye, 2021).

Overall, the DFCM proves to be a transformative tool capable of enhancing instructional delivery, strengthening psychomotor competencies, and improving learners' digital capacity. Its dual emphasis on flexibility and active learning makes it particularly valuable for nursing education, where competency development is paramount. Evidence from recent global and African studies continues to support its effectiveness. For example, Adarkwah (2024) highlighted that flipped learning fosters deeper engagement and improves learning outcomes among students in developing countries, especially when combined with institutional support for digital innovation. The positive outcomes of this study therefore provide

compelling justification for the broader adoption of blended and flipped digital approaches across nursing programmes in Nigeria and similar resource-constrained contexts.

Conclusion

The Digital Flipped Classroom Model effectively enhanced nursing students' competency and perceptions in Northwest Nigeria. The blended structure, combining digital preparatory materials with interactive in-class activities, promoted engagement, self-directed learning, and digital readiness. The model represents a viable strategy for supporting competency-based nursing education and improving instructional quality in Nigerian universities.

Recommendations

1. Nursing programmes in Nigerian universities should adopt the DFCM as part of their blended learning strategies.
2. Regular capacity-building workshops on digital pedagogy should be organized for faculty.
3. Institutions should invest in ICT infrastructure, including stable internet connectivity and effective learning management systems.
4. Policymakers should integrate flipped and blended learning approaches into national higher education standards and accreditation frameworks.

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