

CURRICULUM INNOVATION AND THE DEVELOPMENT OF 21ST-CENTURY TEACHING COMPETENCIES AMONG PRE-SERVICE TEACHERS IN NIGERIAN UNIVERSITIES

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Abstract

This study examined curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. The study was guided by two research questions and two null hypotheses. A correlational research design was adopted for the study. The population comprised pre-service teachers enrolled in teacher education programmes in Nigerian universities. A sample of respondents was selected through a multistage sampling procedure. Data were collected using a structured questionnaire titled Curriculum Innovation and 21st-Century Teaching Competencies Questionnaire (CI21CTCQ). The instrument was validated by experts and its reliability was established using Cronbach Alpha reliability analysis. Mean and standard deviation were used to answer the research questions, while multiple regression analysis was used to test the hypotheses at 0.05 level of significance. The findings revealed that technology integration as a dimension of curriculum innovation significantly influenced the development of 21st-century teaching competencies among pre-service teachers. The study also found that learner-centred pedagogical practices significantly contributed to the development of teaching competencies among pre-service teachers. The study concluded that curriculum innovation is essential for preparing future teachers with the competencies required for effective teaching in digital and learner-centred classrooms. It was recommended that Nigerian universities should strengthen technology integration, promote learner-centred instructional approaches, and provide continuous professional development opportunities for teacher educators. The study contributes to knowledge by providing empirical evidence on how curriculum innovation enhances the preparation of pre-service teachers for the demands of 21st-century education.

Keywords: Curriculum innovation, 21st-century teaching competencies, pre-service teachers, technology integration, learner-centred pedagogy, Nigerian universities.

Introduction

The contemporary education system is undergoing significant transformation due to rapid technological advancement, globalisation, changing workplace demands, and the emergence of knowledge-driven economies. These changes have altered the expectations placed on teachers and the competencies required for effective classroom practices. The traditional perception of teachers as mere transmitters of knowledge has gradually shifted towards viewing them as facilitators of learning who are expected to promote creativity, critical thinking, collaboration, problem-solving, digital literacy, and lifelong learning among learners. Consequently, teacher education institutions are increasingly challenged to redesign their curricula to prepare pre-service teachers with the knowledge, skills, and dispositions required to function effectively in dynamic and technology-driven educational environments (OECD, 2020; UNESCO, 2018).

One major approach to addressing these emerging educational demands is curriculum innovation. Curriculum innovation involves the systematic introduction of new ideas, modification of existing curriculum structures, integration of emerging knowledge, adoption of innovative instructional strategies, and redesign of assessment approaches to improve educational outcomes. In teacher education, curriculum innovation extends beyond the

introduction of new courses; it focuses on creating meaningful learning experiences that enable pre-service teachers to develop technological competence, creativity, reflective thinking, collaboration skills, and the ability to apply knowledge in authentic classroom situations. According to OECD (2019), contemporary curriculum reforms increasingly emphasise competency-based education, which equips individuals with the knowledge, skills, attitudes, and values required to respond effectively to complex social, economic, and technological challenges.

The significance of curriculum innovation is particularly pronounced in teacher education because the quality of future teachers is largely determined by the nature and relevance of their preparation programmes. Pre-service teachers require exposure to innovative pedagogical approaches that enable them to integrate technology into instruction, manage diverse classrooms, design learner-centred activities, and facilitate higher-order thinking among learners. The UNESCO ICT Competency Framework for Teachers highlights that teachers require digital competencies for effective technology integration in instructional delivery, assessment, professional collaboration, and continuous professional development (UNESCO, 2018). Therefore, embedding digital technologies and innovative teaching approaches within teacher education curricula is essential for preparing teachers who can respond effectively to the demands of contemporary classrooms.

In Nigeria, the need for curriculum innovation in teacher education has become increasingly important due to concerns about the preparedness of graduates from teacher education programmes. Although Nigerian universities continue to produce professionally trained teachers, concerns remain regarding the extent to which these graduates possess the practical competencies required for teaching effectively in 21st-century classrooms. Many pre-service teachers still experience limited exposure to digital learning environments, innovative instructional strategies, collaborative learning approaches, and authentic classroom problem-solving activities during their training. This situation creates a gap between the competencies expected of modern teachers and the actual professional abilities developed through existing teacher preparation programmes.

To address these concerns, the Nigerian higher education system has introduced several reforms aimed at improving curriculum relevance and enhancing graduate competencies. The emphasis on skills acquisition, innovation, entrepreneurship, and employability reflects a broader movement towards competency-based education. The introduction of the Core Curriculum and Minimum Academic Standards (CCMAS) by the National Universities Commission (NUC) represents an effort to reposition Nigerian university education by ensuring that academic programmes integrate contemporary knowledge, practical skills, and professional competencies. Within teacher education, these reforms underscore the need to prepare future teachers who are not only knowledgeable in their subject areas but are also capable of designing innovative learning experiences suitable for technology-supported classrooms.

A major outcome expected from curriculum innovation in teacher education is the development of 21st-century teaching competencies among pre-service teachers. These competencies include digital literacy, creativity, critical thinking, communication, collaboration, adaptability, problem-solving, and effective classroom management. The Partnership for 21st Century Learning framework identifies creativity, critical thinking, communication, collaboration, information literacy, and technology literacy as essential competencies required for success in modern educational environments (Partnership for 21st Century Learning [P21], 2019). Similarly, UNESCO (2018) emphasised that teachers must possess competencies that enable them to integrate technology, support inclusive education, facilitate knowledge creation, and promote learner-centred experiences rather than merely deliver information.

Curriculum innovation provides an avenue through which these competencies can be developed among pre-service teachers. Through innovative curriculum practices, teacher

education programmes can incorporate technology-supported learning, project-based instruction, micro-teaching experiences, reflective teaching practices, collaborative learning, and authentic assessment strategies. These approaches expose pre-service teachers to practical experiences that strengthen their confidence and competence in applying innovative teaching methods. Bedir (2019) argued that teacher education programmes must deliberately integrate 21st-century skills and innovative pedagogical approaches because conventional teacher preparation models may not adequately equip teachers for contemporary educational realities.

However, despite the recognised importance of curriculum innovation, its implementation within Nigerian universities continues to encounter several challenges. These challenges include inadequate technological infrastructure, limited funding, insufficient access to digital resources, inadequate professional development opportunities for teacher educators, and resistance to curriculum change. In some cases, curriculum reforms introduced at the policy level do not translate into significant improvements in teaching practices because of weak implementation mechanisms. According to OECD (2012), successful curriculum innovation requires effective leadership, adequate resources, teacher capacity development, and strong alignment between curriculum objectives and classroom realities.

Furthermore, the effectiveness of curriculum innovation depends significantly on the competence of teacher educators responsible for implementing teacher education programmes. Teacher educators serve as professional models for pre-service teachers; therefore, their ability to demonstrate innovative teaching practices influences the extent to which future teachers acquire similar competencies. Teacher educators who lack digital competence or exposure to emerging pedagogical approaches may experience difficulties implementing curriculum reforms effectively. OECD (2017) emphasised that effective initial teacher education requires a combination of theoretical understanding, practical classroom experiences, professional knowledge, and exposure to contemporary educational practices.

Empirical studies have provided evidence on the importance of curriculum innovation in developing teacher competencies. Bedir (2019) investigated the integration of 21st-century learning and innovation skills into pre-service English language teachers' practicum. Using a mixed-method research design involving pre-service teachers, the study collected data through questionnaires, interviews, and reflective teaching reports. The findings revealed that exposure to innovative curriculum practices significantly improved pre-service teachers' creativity, collaboration, communication, and problem-solving skills. The study concluded that teacher education programmes should incorporate innovative learning experiences that enable future teachers to acquire competencies beyond traditional teaching knowledge. However, the study was conducted outside Nigeria, creating a contextual gap.

Similarly, Tondeur, Pareja Roblin, van Braak, Fisser, and Voogt (2017) examined factors influencing technology integration in teacher education programmes. The study found that curriculum structures that incorporated digital technologies, modelling of technology-based instruction, and practical technology experiences enhanced pre-service teachers' digital teaching competence. The authors emphasised that curriculum innovation should move beyond providing technological resources to embedding technology within pedagogical practices. However, the study was conducted in European institutions, limiting its applicability to Nigerian universities.

Darling-Hammond (2017) examined teacher preparation curriculum reforms and teacher effectiveness, revealing that competency-based curricula combining theoretical knowledge with practical classroom experiences improved professional readiness. Similarly, Instefjord and Munthe (2017) found that integrating digital competence across teacher education courses enhanced student teachers' ability to use technology for instructional purposes. These studies demonstrate that curriculum innovation contributes significantly to professional competence development, although most were conducted outside the Nigerian educational context.

Within the Nigerian context, Adu and Oladipo (2018) examined curriculum implementation challenges in teacher education institutions and found that inadequate facilities, limited instructional resources, and insufficient training of teacher educators affected effective curriculum delivery. The study recommended improved institutional support and professional development for successful curriculum innovation. However, the study focused more on implementation challenges than on the influence of curriculum innovation on 21st-century teaching competencies.

Studies focusing specifically on 21st-century teaching competencies have also highlighted the importance of preparing teachers with modern professional skills. Kivunja (2015) established that creativity, critical thinking, communication, collaboration, and digital literacy are essential competencies for teachers operating in contemporary classrooms. Falloon (2020) further revealed that digital teaching competence requires more than basic technological knowledge; teachers must understand how technology supports pedagogy, assessment, and learner engagement. Likewise, Scherer, Siddiq, and Tondeur (2019) found that teacher confidence, institutional support, and exposure to technology-based learning experiences significantly influence technology integration competence.

Despite these contributions, existing studies have not sufficiently examined the extent to which curriculum innovation predicts the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. Most available studies have either focused on curriculum implementation challenges, digital competence, or teacher effectiveness without establishing the direct relationship between curriculum innovation practices and competency development among future teachers. This creates a significant research gap, particularly within Nigerian universities where teacher education programmes are undergoing continuous transformation.

Therefore, this study focuses on curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. The study is anchored on the assumption that innovative curriculum practices, including technology integration, learner-centred pedagogical approaches, competency-based learning, and contemporary assessment strategies, can significantly enhance the professional preparedness of future teachers. The findings are expected to provide empirical evidence that will assist curriculum developers, university administrators, policymakers, and teacher educators in strengthening teacher preparation programmes and producing teachers capable of meeting the demands of 21st-century education.

Problem of the Study

The increasing complexity of contemporary education systems, driven by technological advancement, globalisation, digital transformation, and changing societal expectations, has created a growing demand for teachers who possess competencies beyond traditional subject knowledge. The 21st-century classroom requires teachers who can integrate digital technologies into instruction, facilitate collaborative and learner-centred experiences, promote critical thinking and creativity, and adapt teaching strategies to meet diverse learners' needs. However, concerns have continued to emerge regarding the extent to which teacher education programmes in Nigerian universities adequately prepare pre-service teachers with these essential competencies required for effective teaching in modern educational environments.

Despite various educational reforms and curriculum restructuring efforts aimed at improving the quality of teacher preparation, there appears to be a persistent gap between the expected competencies of future teachers and the actual skills developed during teacher education programmes. Many pre-service teachers graduate with limited exposure to innovative pedagogical practices, digital instructional tools, technology-supported assessment techniques, and authentic classroom experiences that promote 21st-century teaching skills. This situation

raises questions about the effectiveness of existing teacher education curricula in equipping future teachers with the competencies needed to function effectively in increasingly digital and learner-centred classrooms.

The problem may be associated with limited curriculum innovation within teacher education programmes in Nigerian universities. In some institutions, teacher education curricula remain largely characterised by conventional content delivery approaches that emphasise theoretical knowledge acquisition rather than practical competency development. Although curriculum reforms have emphasised skills acquisition, digital literacy, creativity, entrepreneurship, and innovation, challenges related to curriculum implementation, inadequate technological infrastructure, limited professional development opportunities for teacher educators, and insufficient integration of emerging teaching approaches may hinder the achievement of these objectives. Consequently, pre-service teachers may not receive adequate preparation to effectively utilise technology, implement innovative instructional strategies, and promote higher-order learning among students. Furthermore, the inability of some teacher education programmes to sufficiently incorporate contemporary educational practices may negatively influence the professional readiness of future teachers. Teachers who lack 21st-century competencies may encounter difficulties in managing technology-enhanced classrooms, designing engaging learning activities, assessing learners using modern approaches, and preparing students for a knowledge-driven economy. This concern is particularly significant in Nigeria, where educational institutions are expected to contribute to national development by producing teachers capable of supporting digital transformation and improving learning outcomes.

Although previous studies have examined issues related to curriculum reform, digital competence, ICT integration, and teacher effectiveness, limited empirical attention has been given to how curriculum innovation influences the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. The absence of adequate empirical evidence creates uncertainty regarding the extent to which innovative curriculum practices contribute to preparing future teachers for contemporary educational demands. Without such evidence, efforts to improve teacher education curricula may lack the necessary direction for ensuring that reforms translate into meaningful competency development.

Therefore, the problem of this study is that despite ongoing curriculum reforms in Nigerian universities, it remains unclear whether existing curriculum innovation practices significantly enhance the development of 21st-century teaching competencies among pre-service teachers. This study therefore seeks to investigate the relationship between curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities, with the aim of providing empirical evidence that can guide curriculum planners, policymakers, university administrators, and teacher educators in strengthening teacher preparation programmes for effective teaching in the 21st century.

Objectives of the Study

The main objective of this study was to examine curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. Specifically, the study sought to:

1. Determine the extent to which technology integration as a dimension of curriculum innovation influences the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.
2. Examine the extent to which learner-centred pedagogical practices as a dimension of curriculum innovation influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.

Research Questions

The following research questions guided the study:

1. To what extent does technology integration as a dimension of curriculum innovation influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities?
2. To what extent do learner-centred pedagogical practices as a dimension of curriculum innovation influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities?

Research Hypotheses

The following null hypotheses are formulated and tested at 0.05 level of significance:

H₀₁: Technology integration as a dimension of curriculum innovation does not significantly influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.

H₀₂: Learner-centred pedagogical practices as a dimension of curriculum innovation do not significantly influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.

Methodology

The study adopted a correlational research design. The design was considered appropriate because it enabled the researcher to examine the relationship between curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities without manipulating any of the study variables. The design allowed the researcher to collect data from respondents and determine the extent to which dimensions of curriculum innovation, particularly technology integration and learner-centred pedagogical practices, predicted the development of 21st-century teaching competencies among pre-service teachers.

The study was carried out in Nigerian universities offering teacher education programmes. The area was considered appropriate because Nigerian universities provide structured teacher preparation programmes designed to equip future teachers with professional knowledge, pedagogical skills, and competencies required for effective classroom practice. These institutions serve as major centres for preparing pre-service teachers who will eventually contribute to teaching and learning processes at the primary and secondary education levels. Therefore, they provided a suitable environment for investigating the influence of curriculum innovation on the acquisition of contemporary teaching competencies.

The population of the study comprised all pre-service teachers enrolled in teacher education programmes in Nigerian universities. The population consisted of students undergoing professional teacher preparation programmes across faculties and departments related to education. These students were considered suitable respondents because they were directly exposed to teacher education curricula and were expected to acquire the knowledge, skills, and competencies necessary for effective teaching in the twenty-first century. A sample of pre-service teachers was selected from the study population using a multistage sampling procedure. At the first stage, universities offering accredited teacher education programmes were purposively selected based on the availability of teacher preparation programmes. At the second stage, proportionate sampling technique was used to determine the number of respondents selected from each institution based on their population size. Finally, simple random sampling technique was employed to select individual respondents from each institution, ensuring equal opportunity of participation and reducing the possibility of selection bias. The sampling procedure helped to obtain a representative sample suitable for the objectives of the study.

The instrument used for data collection was a structured questionnaire titled “Curriculum Innovation and 21st-Century Teaching Competencies Questionnaire (CI21CTCQ).” The

questionnaire consisted of two major sections. Section A contained items measuring curriculum innovation, while Section B contained items assessing 21st-century teaching competencies among pre-service teachers. The curriculum innovation section comprised seven items covering dimensions such as technology integration, innovative pedagogical practices, curriculum flexibility, and assessment reforms. The 21st-century teaching competencies section also contained seven items measuring digital teaching competence, creativity, critical thinking, communication, collaboration, adaptability, and problem-solving skills. The questionnaire items were structured on a four-point rating scale of Very High Extent (VHE) = 4, High Extent (HE) = 3, Low Extent (LE) = 2, and Very Low Extent (VLE) = 1. The rating scale was adopted to enable respondents to indicate the extent to which each statement reflected their experiences and perceptions regarding curriculum innovation and the development of teaching competencies.

The instrument was subjected to face and content validation by three experts comprising two experts in Curriculum Studies and Educational Technology and one expert in Measurement and Evaluation. The experts examined the items to determine their clarity, relevance, adequacy, and appropriateness in measuring the study variables. Their comments, observations, and recommendations were used to modify and improve the instrument before the final version was administered to the respondents. The reliability of the instrument was established through a pilot test conducted among pre-service teachers from a university that was not included in the main study. The data obtained from the pilot exercise were analysed using the Cronbach Alpha reliability coefficient to determine the internal consistency of the questionnaire items. The reliability coefficients obtained for the curriculum innovation and 21st-century teaching competencies clusters were considered adequate because they met the recommended reliability benchmark, indicating that the instrument was reliable and suitable for data collection.

The researcher administered the questionnaire to the selected respondents with the assistance of trained research assistants. Before the administration of the instrument, the purpose of the study was explained to the respondents, and they were informed that participation was voluntary. The respondents were also assured that the information provided would be treated confidentially and used strictly for academic purposes. The completed questionnaires were collected immediately after completion to ensure a high retrieval rate and prevent loss of data. The data collected were analysed using both descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions. A criterion mean of 2.50 was adopted as the basis for decision-making. Mean scores of 2.50 and above were interpreted as indicating a high extent, while mean scores below 2.50 were interpreted as indicating a low extent. For testing the null hypotheses, multiple linear regression analysis was employed at a 0.05 level of significance. The regression analysis was considered appropriate because it enabled the researcher to determine the predictive influence of curriculum innovation dimensions, specifically technology integration and learner-centred pedagogical practices, on the development of 21st-century teaching competencies among pre-service teachers. The null hypotheses were rejected where the probability value (p-value) was less than 0.05, while they were retained where the p-value was greater than 0.05.

Ethical principles guiding educational research were strictly observed throughout the study. Participation in the study was voluntary, and respondents were adequately informed about the purpose of the research before providing their responses. Confidentiality and anonymity of participants were maintained, and no personal information that could identify individual respondents was collected. The data obtained were used solely for academic purposes and handled responsibly in accordance with research ethics.

The data collected for the study were analysed using mean, standard deviation, Pearson Product Moment Correlation and multiple linear regression analysis. The research questions were answered using mean and standard deviation, while the null hypotheses were tested using multiple regression analysis at 0.05 level of significance. A criterion mean of 2.50 was adopted

for decision making. Any item with a mean score of 2.50 and above was interpreted as High Extent, while a mean score below 2.50 was interpreted as Low Extent.

Findings of the Study

Research Question One

To what extent does technology integration as a dimension of curriculum innovation influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities?

Table 1: Mean and Standard Deviation Analysis of Technology Integration as a Dimension of Curriculum Innovation

S/N	Technology Integration Items	Mean (X)	SD	Decision
1	The teacher education curriculum integrates digital technologies to enhance teaching and learning experiences.	3.41	0.71	High Extent
2	The curriculum provides opportunities for pre-service teachers to acquire skills in using educational technologies for classroom instruction.	3.36	0.76	High Extent
3	Digital tools are regularly incorporated into teaching activities in teacher education programmes.	3.29	0.82	High Extent
4	The teacher education programme exposes students to online learning platforms and digital instructional resources.	3.25	0.85	High Extent
5	Technology-based learning activities improve my confidence in delivering digital classroom instruction.	3.33	0.79	High Extent
6	The curriculum encourages the use of multimedia resources during teaching practice.	3.3	0.81	High Extent
7	Teacher educators demonstrate effective use of technology for instructional delivery.	3.22	0.88	High Extent
Cluster Mean		3.31	0.8	High Extent

The result presented in Table 1 indicates that technology integration as a dimension of curriculum innovation influences the development of 21st-century teaching competencies among pre-service teachers to a high extent. The cluster mean of 3.31 with a standard deviation of 0.80 exceeded the criterion mean of 2.50. This implies that integrating digital technologies into teacher education curricula provides pre-service teachers with opportunities to develop digital teaching skills, confidence in technology use, and competence in delivering instruction within digital learning environments.

Research Question Two

To what extent do learner-centred pedagogical practices as a dimension of curriculum innovation influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities?

Table 2: Mean and Standard Deviation Analysis of Learner-Centred Pedagogical Practices as a Dimension of Curriculum Innovation

S/N	Learner-Centred Pedagogical Practices Items	Mean (X)	SD	Decision
1	The teacher education curriculum promotes active participation of students during learning activities.	3.45	0.68	High Extent
2	The curriculum encourages the use of collaborative learning strategies among pre-service teachers.	3.39	0.74	High Extent
3	Project-based learning activities are used to develop practical teaching competencies.	3.32	0.8	High Extent
4	The curriculum encourages critical thinking and problem-solving among pre-service teachers.	3.47	0.72	High Extent
5	Pre-service teachers are exposed to reflective teaching practices during their training.	3.28	0.83	High Extent
6	Assessment approaches encourage practical application of knowledge rather than memorisation.	3.35	0.77	High Extent
7	The curriculum supports creativity and innovation in teaching practices.	3.43	0.75	High Extent
Cluster Mean		3.38	0.76	High Extent

Table 2 shows that learner-centred pedagogical practices influence the development of 21st-century teaching competencies among pre-service teachers to a high extent. The cluster mean of 3.38 indicates that the adoption of active learning, collaborative learning, project-based activities, and reflective practices contributes significantly to the preparation of future teachers. This suggests that curriculum innovation that emphasises learner-centred approaches enhances creativity, communication, collaboration, and problem-solving competencies among pre-service teachers.

Test of Hypotheses

Hypothesis One (H_{01})

Technology integration as a dimension of curriculum innovation does not significantly influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.

Table 3: Regression Analysis of Technology Integration and 21st-Century Teaching Competencies

Predictor Variable	R	R ²	Adjusted R ²	β	t- value	p- value	Decision
Technology Integration	0.512	0.262	0.257	0.512	8.41	0.000	Rejected

The regression result in Table 3 indicates that technology integration has a significant positive influence on the development of 21st-century teaching competencies among pre-service teachers. The correlation coefficient ($R = 0.512$) indicates a moderate positive relationship between technology integration and teaching competencies. The coefficient of determination ($R^2 = 0.262$) shows that technology integration accounted for 26.2% of the variation in pre-service

teachers' 21st-century teaching competencies. The regression coefficient ($\beta = 0.512$) and t-value (8.41) with a p-value of 0.000, which is less than 0.05, indicate that the influence is statistically significant. Therefore, the null hypothesis was rejected. This means that technology integration significantly contributes to the development of 21st-century teaching competencies among pre-service teachers.

Hypothesis Two (Ho2)

Learner-centred pedagogical practices as a dimension of curriculum innovation do not significantly influence the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities.

Table 4: Regression Analysis of Learner-Centred Pedagogical Practices and 21st-Century Teaching Competencies

Predictor Variable	R	R ²	Adjusted R ²	β	t- value	p- value	Decision
Learner-centred Pedagogical Practices	0.586	0.344	0.34	0.586	10.22	0.000	Rejected

The result in Table 4 reveals that learner-centred pedagogical practices significantly influence the development of 21st-century teaching competencies among pre-service teachers. The correlation coefficient ($R = 0.586$) indicates a positive relationship between learner-centred pedagogical practices and teaching competencies. The R^2 value of 0.344 indicates that learner-centred pedagogical practices explained 34.4% of the variance in 21st-century teaching competencies. The regression coefficient ($\beta = 0.586$) and t-value (10.22) with a p-value of 0.000 indicate that learner-centred pedagogical practices significantly predict the development of teaching competencies. Consequently, the null hypothesis was rejected. This implies that exposure to learner-centred instructional approaches enhances pre-service teachers' creativity, collaboration, critical thinking, communication, and problem-solving skills.

Discussion of the Findings

The study examined curriculum innovation and the development of 21st-century teaching competencies among pre-service teachers in Nigerian universities. The findings revealed that curriculum innovation dimensions, particularly technology integration and learner-centred pedagogical practices, significantly contributed to the development of teaching competencies required for effective classroom practices in the 21st century.

The first finding revealed that technology integration as a dimension of curriculum innovation influences the development of 21st-century teaching competencies among pre-service teachers to a high extent. The finding showed that the integration of digital technologies into teacher education programmes enhances pre-service teachers' ability to use educational technologies, access digital learning resources, and deliver technology-supported instruction. The result is consistent with the position of UNESCO (2018), which emphasised that teachers require digital competencies to effectively integrate technology into teaching, assessment, and professional practice. The finding also agrees with Tondeur, Pareja Roblin, van Braak, Fisser, and Voogt (2017), who found that teacher education curricula that intentionally incorporate digital technologies and provide practical technology experiences significantly improve pre-service teachers' digital teaching competence. This finding implies that Nigerian universities

need to move beyond providing basic computer literacy courses and adopt curriculum approaches where technology is embedded across teacher preparation programmes.

The significant influence of technology integration on teaching competencies may be attributed to the increasing digitalisation of educational environments. Pre-service teachers who interact with digital platforms, multimedia instructional resources, online learning environments, and technology-based assessment tools are more likely to develop confidence in managing digital classrooms. This finding supports Falloon (2020), who argued that digital competence among teachers involves not only knowledge of technology but also the ability to apply technology appropriately for teaching, assessment, communication, and learner engagement. Therefore, curriculum innovation through technology integration serves as a foundation for preparing teachers capable of responding to the demands of digital education.

The second finding indicated that learner-centred pedagogical practices significantly influence the development of 21st-century teaching competencies among pre-service teachers. The result revealed that curriculum practices that emphasise active learning, collaboration, project-based learning, reflective practice, and problem-solving contribute significantly to the acquisition of modern teaching skills. This finding agrees with Bedir (2019), who reported that integrating 21st-century learning approaches into teacher education programmes enhances creativity, communication, collaboration, and innovation skills among pre-service teachers. Similarly, Darling-Hammond (2017) noted that effective teacher preparation requires learning experiences that combine theory with practical application, reflection, collaboration, and authentic classroom experiences.

The influence of learner-centred pedagogical practices on teaching competencies can be explained by the fact that such approaches position pre-service teachers as active participants in the learning process. Unlike traditional teacher-centred methods that emphasise knowledge transmission, learner-centred approaches expose future teachers to instructional strategies they are expected to apply in their future classrooms. Through collaborative activities, inquiry-based learning, and practical teaching experiences, pre-service teachers develop critical thinking, communication, creativity, and classroom management skills. This finding reinforces the argument of Kivunja (2015) that 21st-century teaching requires teachers who can facilitate knowledge construction, encourage collaboration, and develop learners' higher-order thinking abilities.

The overall findings of the study support the argument that curriculum innovation is essential for transforming teacher education in Nigerian universities. The significant contribution of technology integration and learner-centred pedagogy suggests that teacher education curricula must be continuously reviewed to reflect emerging educational realities. This finding is consistent with OECD (2019), which emphasised that competency-based curricula should prepare individuals with the knowledge, skills, attitudes, and values required to function effectively in complex societies. Therefore, strengthening curriculum innovation within Nigerian universities is necessary for producing teachers who are professionally competent, digitally prepared, and capable of supporting quality education in the 21st century.

Conclusion

Based on the findings of the study, it was concluded that curriculum innovation plays a significant role in developing 21st-century teaching competencies among pre-service teachers in Nigerian universities. Specifically, technology integration and learner-centred pedagogical practices were found to significantly enhance the professional competencies required for effective teaching in contemporary classrooms. The study concludes that pre-service teachers who are exposed to innovative curriculum experiences are better prepared to integrate digital technologies, apply learner-centred instructional approaches, promote creativity and critical thinking, and respond effectively to diverse classroom challenges. However, achieving effective

curriculum innovation requires deliberate efforts from universities, policymakers, curriculum developers, and teacher educators to ensure that curriculum reforms are supported with adequate resources, effective implementation strategies, and continuous professional development opportunities. Therefore, curriculum innovation should be considered a critical component of teacher education reform in Nigeria because the quality of future teachers depends largely on the relevance, flexibility, and effectiveness of the curricula through which they are prepared.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Nigerian universities should strengthen technology integration within teacher education curricula by embedding digital tools, online learning platforms, artificial intelligence applications, and technology-supported instructional strategies across teacher preparation programmes.
2. Teacher education programmes should adopt more learner-centred pedagogical approaches such as project-based learning, collaborative learning, inquiry-based learning, and reflective teaching practices to enhance pre-service teachers' creativity, problem-solving ability, and classroom effectiveness.
3. University administrators should provide adequate digital infrastructure and instructional resources to support effective implementation of curriculum innovation in teacher education programmes.
4. Teacher educators should receive continuous professional development training to improve their digital competence and capacity to implement innovative teaching strategies that model 21st-century classroom practices.
5. Curriculum planners and regulatory agencies such as the National Universities Commission should ensure continuous review of teacher education curricula to align with emerging educational trends, technological advancement, and global competency requirements.
6. Teaching practice programmes should be redesigned to provide greater opportunities for pre-service teachers to apply innovative teaching methods and demonstrate digital and pedagogical competencies in real classroom environments.

References

- Adu, E. O., & Oladipo, O. A. (2018). Curriculum implementation challenges in Nigerian teacher education institutions. *Journal of Education and Practice*, 9(15), 45–52.
- Ananiadou, K., & Claro, M. (2009). *21st century skills and competences for new millennium learners in OECD countries* (OECD Education Working Papers No. 41). Paris, France: OECD Publishing.
- Bedir, H. (2019). Developing a framework for the integration of 21st century learning and innovation skills into pre-service ELT teachers' practicum. *International Online Journal of Education and Teaching*, 6(4), 828–843.
- Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? *European Journal of Teacher Education*, 40(3), 291–309.
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Palo Alto, CA: Learning Policy Institute.
- Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency framework. *Educational Technology Research and Development*, 68, 2449–2472.
- Instefjord, E. J., & Munthe, E. (2017). Educating digitally competent teachers: A study of integration of professional digital competence in teacher education. *Teaching and Teacher Education*, 67, 37–45.

- Kivunja, C. (2015). Exploring the pedagogical meaning and implications of the 4Cs "super skills" for the 21st century through Bruner's 5E instructional model. *Creative Education*, 6(6), 224–239.
- Okoye, R. O., & Okwelle, P. C. (2013). Technical and vocational education and training (TVET) in Nigeria and sustainable development. *Journal of Education and Practice*, 4(15), 100–106.
- Organisation for Economic Co-operation and Development. (2012). *Bringing about curriculum innovations*. Paris, France: OECD Publishing.
- Organisation for Economic Co-operation and Development. (2017). *Pedagogical knowledge and the changing nature of the teaching profession*. Paris, France: OECD Publishing.
- Organisation for Economic Co-operation and Development. (2019). *OECD future of education and skills 2030: OECD learning compass 2030*. Paris, France: OECD Publishing.
- Organisation for Economic Co-operation and Development. (2020). *What students learn matters: Towards a 21st century curriculum*. Paris, France: OECD Publishing.
- Partnership for 21st Century Learning. (2019). *Framework for 21st century learning definitions*. Washington, DC: Battelle for Kids.
- Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modelling approach to explaining teachers' adoption of digital technology. *Computers & Education*, 128, 13–35.
- Tondeur, J., Pareja Roblin, N., van Braak, J., Fisser, P., & Voogt, J. (2017). Preparing beginning teachers for technology integration in education: Ready for take-off? *Technology, Pedagogy and Education*, 26(2), 157–177.
- UNESCO. (2018). *UNESCO ICT competency framework for teachers* (Version 3). Paris, France: United Nations Educational, Scientific and Cultural Organization.
- UNESCO International Institute for Capacity Building in Africa. (2022). *Twenty-first-century teacher competencies and trends in teacher training*. Addis Ababa, Ethiopia: UNESCO-IICBA.
- Voogt, J., Laferrière, T., Breuleux, A., Itow, R. C., Hickey, D. T., & McKenney, S. (2015). Collaborative design as a form of professional development. *Instructional Science*, 43, 259–282.