Assessment of the 21st Century Skills Acquisition as Predictors of Internet Usage of Pre-service Teachers in Nigeria

Évaluation de l'acquisition de compétences au 21e siècle en tant que prédicteurs de l'utilisation d'Internet par les enseignants en formation initiale au Nigeria

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Abstract

It is imperative for pre-service teachers not only to possess the 21st century skills, but also to effectively deploy them in the use of the Internet. The purpose of this study was to assess the Nigerian pre-service teachers' 21st century skills acquisition as predictors of Internet use. The correlational research design was deployed in the study. The study was guided by four research questions and four hypotheses. The target population was institutions offering teacher education programme in South-East and South-South geo-political zones, Nigeria. A sample of 515 pre-service teachers was drawn using simple random and convenience sampling techniques from six tertiary. The instrument, a questionnaire consisting of two sections – Pre-service Teachers' 21st Century Skills Acquisition and Internet Use – adapted from Valtonen et al. (2017) and Rajasekhar and Jaishree (2020) and revalidated, was used for data collection. The instrument reliability coefficients using Cronbach Alpha were respectively: Learning and Innovative Skills (0.980), Information, Media and Technology Skills (0.974), Life and Career Skills (0.972) and Internet use (0.987). The instrument was administered using both Google Forms and face-to-face. The research questions were answered with the aid of descriptive statistics. Whereas the

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hypotheses were tested at 0.05 alpha level using the ANOVA Multiple Regression Analyses. The findings revealed that Nigerian pre-service teachers' acquisition of 21st century skills significantly relates to their Internet use. Recommendations such as the necessity for teacher education programmes to integrate courses that would enable their products to acquire 21st century skills and effectively use the Internet were made.

Key words: 21st century skills; Internet use; Pre-service teachers; Teacher education programmes

Resumé

Il est impératif pour les enseignants en formation initiale non seulement de posséder les compétences du 21e siècle, mais aussi de les 214tilizat efficacement dans l'utilisation d'Internet de nos jours. L'objectif de cette étude était d'évaluer l'acquisition de compétences par les enseignants nigérians en formation au 21e siècle en tant que prédicteurs de l'utilisation d'Internet. La conception de la recherche corrélationnelle a été déployée dans l'étude. L'étude a été guidée par quatre questions de recherche et quatre 214tilizatio. La population cible était constituée d'établissements offrant des programmes de formation des enseignants dans les zones géopolitiques du Sud-Est et du Sud-Sud, au Nigéria. Un échantillon de 515 enseignants en formation initiale a été 214til à l'aide de techniques d'échantillonnage simples, aléatoires et pratiques provenant de six établissements d'enseignement supérieur. L'instrument, un questionnaire 214tiliza de deux sections – Acquisition de compétences des enseignants en formation au 21e siècle et Utilisation d'Internet – adapté de Valtonen et al. (2017) et de Rajasekhar et Jaishree (2020) et revalidé, a été 214tiliza pour la collecte de données. Les coefficients de fiabilité de l'instrument à l'aide de l'Alpha de Cronbach étaient respectivement les suivants: compétences d'apprentissage et d'innovation (0,980), compétences en matière d'information, de 214tiliz et de technologie (0,974), compétences de vie et de carrière (0,972) et 214tilization d'Internet (0,987). L'instrument a été 214tilizatio à la fois à l'aide du formulaire Google et en face à face. Les questions de recherche ont été répondues à l'aide de statistiques descriptives. Alors que les 214tilizatio ont été testées à des niveaux alpha de 0,05 à l'aide des analyses de 214tilizatio multiple ANOVA. Les résultats ont révélé que l'acquisition par les enseignants nigérians des compétences du 21e siècle est significativement liée à leur 214tilization d'Internet. Des recommandations telles que la nécessité pour les programmes de formation des enseignants d'intégrer des cours qui permettraient à leurs produits

d'acquérir des compétences du 21e siècle et d'utiliser efficacement Internet ont été formulées.

Mots clés: Compétences du 21e siècle ; Utilisation d'Internet ; Enseignants en formation ; Formation des enseignants Les programmes

Introduction

Teacher preparation programmes in faculties and colleges of education provide pre-service teachers with tools, mentors, and hands-on experiences necessary for them to begin their teaching careers (Jan, 2017). With the advent of technology, the role of 21st century teachers changed to that of facilitators, as advances in technology drive globalisation and digital transformation (American University, 2020). Hence, today's teachers are characterised by flexibility, friendliness, innovation, creativity and possess the researchers' skills (Nazarbayerv University Writers Guild, NUWG, 2017). Moreover, 21st century teachers are expected to consider the needs of learners by preparing them to acquire skills that would make them successful in future careers and be productive world citizens. Besides, the generation of learners that the pre-service teachers will meet in the classroom are digital natives who Driscol (2021) rightly observed are advanced users of technology. These digital natives are increasingly growing with unprecedented amounts of information at their fingertips. Therefore, the pre-service teachers are expected to be very familiar with different pedagogical approaches that are relevant to flexible and technology-based forms of learning, even in traditional education institutions, as much as they are needed in the open and distance learning of nowadays. A view strongly supported by Valtonen et al. (2017). These researchers also rightly affirmed that pre-service teachers should additionally have cogent potential in leveraging the use of the Internet as indispensable support in the effective and meaningful use of Information and Communication Technology (ICT) applications to support the acquisition of 21st century skills. Thus, they are fully aware that 21st century skills play a central role in what a contemporary education system ought to

afford, which also agrees with Kenworthy and Kielstra (2015) submission on 21st century skills. It is, therefore, imperative for teacher educators to lay emphasis on technology-based forms of learning in the traditional form of education delivery institutions as well as in the open and distance learning contexts. Hence, Jan (2019) and Driscol (2021) from their studies opined that teacher educators should provide innovative training programmes to empower pre-service teachers as facilitators and motivators for learning, so that they can, in turn, empower their prospective students. Empowered pre-service teachers, on the other hand, must learn new ways of doing things and make their classrooms accommodating and engaging by acquiring 21st century skills and are to be able to use the Internet efficiently. Hence, the purpose of this study was to assess Nigerian pre-service teachers' 21st century skills acquisition versus their Internet use relevant to effective deployment of technology-based forms of both teaching and learning in traditional and open and distance learning education institutions contexts.

Education in the 21st century entails giving learners the skills they need to succeed and helping them grow the confidence to practice those skills. Also, 21st century skills focus on making sense of the information, sharing and using it in smart ways (Driscol, 2021). Nevertheless, teacher preparation programmes and classrooms in Nigeria may still be fraught with a traditional approach in which the teacher is the presenter of a standardised curriculum and the students are passive audience. But 21st century skills are being emphasised in the Nigerian Core Curriculum and Minimum Standards (CCMAS) recently (National Universities Commission, 2023).

Besides, students already source information and solve problems using technological devices by surfing the Internet because they learn and think differently (Driscol, 2021). Hence, the need for teachers to embrace innovative instructional strategies that are problem-based and technologically enhancedto provide authentic learning opportunities. These, according to Partnership for the 21st Century Learning Skills (2010), could be achieved by moving beyond primary measures of discrete knowledge to measuring learners' ability to think critically, examine problems, collect data, and make informed,

reasoned decisions by using technology. This assertion underscores and underpins the need for this study as a framework to describe pre-service teachers from 21st century and Internet use perspectives, as teacher preparation programmes provide the right opportunity to address the challenges faced by the education system.

The Role of Open and Distance Learning in the Acquisition of 21st Century Skills and Internet Use

The conventional mode of instructional delivery is highly preferred in Nigeria, while Open and Distance Learning (ODL) is erroneously looked down on as merely providing a second chance opportunity to those who cannot be accommodated in the conventional system. Nigeria has not been able to fulfil the promise of providing education to the entire population through the conventional education system. The carrying capacity of the existing conventional universities in Nigeria is such that "it is no longer practicable to increase access to the Conventional University System without a consequential increase in cost and potential decrease in quality" (Peters, 2023: 120). It is "also impossible to increase cost without a consequential decrease in access, as demonstrated by the number of people admitted into the system". Therefore, only an infinitesimal percentage of applicants can gain entrance into such conventional universities in Nigeria. For instance, the National Open University of Nigeria offers admission to about 25% of students admitted in over 150 public and private universities in Nigeria, according to the National Universities Commission's record on University Enrollment in Nigeria (National Universities Commission, NUC, n.d.). But, distance education is no longer just aimed at providing people with a second chance at education; it is rather a viable alternative to the conventional system of education globally. Besides, open and distance education is still evolving by the continuous embrace of features of flexibility and remote teaching and learning, leveraging on emerging eLearning solutions that give the learners an advantage and boost in the acquisition and use of 21st Century skills as well as Internet familiarity and security. Also, open and distance education can be regarded as an appropriate method of delivery of education that could mitigate the illiteracy and enlightenment level of the masses of people

in the African continent in general and Nigeria in particular. Hence, both the conventional system of instructional delivery and the ODL modes are combined to have a holistic perspective on the issues discussed in this study concerning teacher education. It should be noted that the ODL system of education is technology-driven, and the 21st century mode of digital literacy skills is embedded in instructional delivery. Thus, the ODL mode of instructional delivery, apart from providing limitless access to higher education, also provides opportunities for learners to imbibe the 21st century skills by virtue of its processes and mode of instructional delivery while exposing them to the acquisition of these skills. Hence, ODL is gradually becoming the university of convergence (Peters, 2023), having realised that education provides the means to transmit knowledge, values, and skills across generations, enabling societies to set the foundation for thriving in the future. How learning prepares individuals for decent work, for life, and an interconnected world are increasingly important. The adoption of open and distance learning paves the way for the acquisition of 21st century skills and Internet use.

Conceptual Framework

Various scholars have discussed 21st century skills with a consensus that the skills are essential for the alignment of education with current trends that tackle global challenges. Joynes et al. (2019) observed that there is no single internationally accepted approach to the definition of 21st century skills. According to Voogt & Roblin (2010:16), 21st century skills "is an overarching concept for the knowledge, skills and dispositions that citizens need to be able to contribute to the knowledge society. The 21st century skills are also seen as "the knowledge, skills, attitudes necessary to be competitive in the twenty-first century workforce, participate appropriately in an increasingly diverse society, use new technologies and cope with rapidly changing workforces" (Scott, 2015:8). Furthermore, there are different categorisations of 21st century skills. Chakaidaki (2018) categorised 21st century skills into four types, namely: personal skills, social skills, information and knowledge skills, and digital literacy skills. Stauffer (2022) identified twelve abilities grouped into three

categories of learning skills, literacy skills, and life skills. The learning skills comprised critical thinking, creativity, collaboration, and communication. These skills help students in mental processes required to adapt and improve upon the modern work environment. Literacy skills consist of information literacy, media literacy, and technology literacy skills, which provide students with a strong focus on determining trustworthy sources and factual information to separate it from the misinformation that floods the Internet. While life skills consisting of flexibility, leadership, initiative, productivity and social skills, take a look at intangible elements of students' everyday life, with a particular focus on both personal and professional qualities.

Furthermore, the Partnership for 21st Century Skills (2010) framework outlined three skills set of twelve components that learners need to possess to develop the core academic subject knowledge and understanding. These skills are Learning and Innovation Skills (LIS), Information, Media and Technology Skills (IMTS), and Life and Career Skills (LCS). The Learning and Innovative Skills (critical thinking and problem solving, communication, collaboration and creativity and innovation) prepare students for a more complex life and work environment in the 21st century. The Information, Media and Technology Skills comprise information literacy, media literacy and ICT literacy. These skills help students to access abundant information, align with rapid changes in technology tools, collaborate and make individual contributions on an unprecedented scale and most often via the use of the Internet. These were possible when the pre-service teacher was functional in information, media, and technology skills using the Internet. Lastly, Learning and Innovative Skills, which consist of flexibility and adaptability, initiative and self-direction, social and cross-cultural, productivity and accountability, as well as leadership and responsibility skills, require students to be able to navigate the complex life and work environment in the global competitive information age. These categorisations of 21st century skills by different authors highlight one common feature: information, media and technology skills, and these skills are essential in the Internet age among the 21st century learners (Stauffer, 2022).

On the other hand, Dennis and Kahn (2023) described the Internet as a system architecture that has revolutionised communications, allowing various computer networks to interconnect. Voogt & Roblin (2010) surmised that the Internet serves as a means of communication and collaboration. Additionally, the Internet provides the capacity to access information efficiently. The use of the Internet offered the pre-service teacher the ability to critically evaluate information and to use it creatively. The Internet also provided teachers with access to a variety of educational resources that inspired creativity, critical thinking, communication, and collaboration. Thereby, promoting global awareness supports the acquisition and assessment of 21st century skills (Knowing Technology, 2021).

Review of Related Literature

Several scholars have come up with empirical evidence on 21st century education and technology. Among them were Ramaila and Molwele (2022), who investigated the role of technology integration in the development of 21st century skills. The study found that critical thinking, communication, collaboration, problem solving, and computational thinking skills were developed through technology integration. They further found that technological integration promotes the acquisition of 21st century skills. Similarly, Joshi *et al*. (2022) worked on the Internet as an integral part of human life. They observed in their report that the Internet had positively influenced education by connecting students and educators through unbounded possibilities of knowledge sharing, creating innovative teaching and learning, making the whole very flexible. They opined that using Internet-connected devices captivates and stimulates students' imagination at any time and from anywhere. Thus, acquisition of 21st century skills and effective use of the Internet are very desirable in the current age of technology–driven teaching and learning.

In another development, Diquito et al. (2022), in a survey of pre-service teachers' 21st century skills acquisition, found that respondents had a very high level of 21st century skills acquisition in digital literacy, collaboration, social skills, creativity, and a high level of communication, critical thinking skills, and leadership skills.

Admittedly, the acquisition of these skills at various levels requires technology and Internet use. In an earlier study, Daud and Khalid (2014) explored pre-service teachers' perceptions about the usage of weblogs, the benefits of blogging, preferred usage of weblogs for discussions, as well as sharing of ideas in their classrooms. They found that weblogging resulted in collaborative activities and the construction of new knowledge. With weblogs, their learning was enhanced, and they communicated with their friends and lecturers effectively. They were motivated to integrate technologies into their future teaching practices. They also found that communication and collaborative skills, which were components of 21st century skills, were nurtured using weblogging. Hence, they emphasised the need to expose pre-service teachers to the use of the Internet to understand technology as a tool that can help them create enriched and collaborative pedagogical experiences. Furthermore, Lewin and McNicol (2015) in their study found that ICT was at the core of the majority of 21st century skills framework. Lending credence to this, Voogt and Roblin (2012) contented that the development of ICT skills is embedded within the 21st century competences such as critical thinking, problem-solving, communication, and collaboration. In all the studies reviewed, ICT skills are of much essence and these can only be functional or operative with the use of the Internet. Additionally, Dunbar (2015) rightly stressed that the trend in the 21st century had changed the nature of work, access to work, and the skill set required. Hence, it had become imperative for pre-service teachers to acquire 21st century skills and to use the Internet, since technology was the major driver.

Therefore, this paper leverages on Daud and Khalid (2014) emphasis as well as submissions of other earlier researchers, some of which were already reviewed, to assess the Nigerian pre-service teachers' 21st century skills acquisition because of the relevance of the 21st century skills and Internet use in technology–based forms of teaching and learning. Besides, this study aims to contribute to existing literature and to give credence to the teacher preparation institutions' readiness for 21st century classroom. Hence, this study focused on assessment of Nigerian pre-service teachers' 21st century skills acquisition versus their Internet use.

Research Questions
This study is guided by four research questions and four null hypotheses which are stated below:
1.   To what extent does acquisition of Learning and Innovative Skills predict Internet use among Nigerian pre-service teachers?
2.   To what extent does acquisition of Information, Media and Technology Skills predict Internet use among Nigerian pre-service teachers?
3.   To what extent does acquisition of Life and Career Skills predict Internet use among Nigeria pre-service teachers?
4.   To what extent does acquisition of all the components of 21st century skills collectively predict Internet use among Nigerian pre-service teacher?

Null Hypotheses
1.   Acquisition of Learning and Innovative Skills do not significantly predict use of the Internet among Nigerian pre-service teachers.
2.   Acquisition of Information, Media and Technology Skills do not significantly predict use of the Internet among Nigerian pre-service teachers.
3.   Acquisition of Life and Career Skills do not significantly predict use of the Internet among Nigerian pre-service teachers.
4.   Acquisition of all the components of 21st century skills collectively does not significantly predict use of the Internet among Nigerian pre-service teachers.

Methods

This study adopted a quantitative approach employing correlation research design. Basically, correlation designs in this study explored the components of 21st century skills as predictive variables and Internet use as the criterion variable. The population of the study comprised the entire pre-service teachers in all the tertiary institutions located in South-East and South-South geo-political zones of Nigeria

offering teacher education programmes. The choice of these zones was based on the location of the authors. Six institutions were randomly selected. National Teachers' Institute, Aba Study Centre; National Institute for Nigerian Languages, Aba, and Akwa Ibom State College of Education were randomly drawn; whereas Ebonyi State University, National Open University, Umudike Study Centre were drawn using convenient sampling technique. Convenient sampling technique was used for these institutions because instrument for data collection was administered to them using Google form so those that responded to the questionnaire automatically became part of the participants. A total of five hundred and fifteen (515) pre-service teachers finally participated in the study. The details of the participants were presented in Table 1.

Table1: *Demographic Information of Participants Used in the Study*

Category	Levels	Frequency	Percentage
Gender	Male	304	59.1
	Female	211	40.9
Age	20 – 29	224	43.5
	30 – 39	179	34.8
	40 – 49	112	21.7
Programme	NCE	77	15
	Degree	258	50
	PGDE	51	10
	Masters	129	25
Level of Study	200 level	94	18.2
	300 level	70	13.5
	400 level	95	18.5
	500 level	58	12.3
	800 level	198	38.5
Institution	Ebonyi State University, Abakaliki – South-East	89	17.2
	National Institute for Nigerian Languages, Aba – South-East	49	9.5
	National Teachers' Institute, Aba - South East	53	10.3
	National Open University of Nigeria, Umudike – South-East	99	19.2

| | University of Uyo, Uyo – South-South | 162 | 31.5 |
| | Akwa Ibom State College of Education, Afaha Nsit - South-South | 63 | 12.3 |

Table 1 shows the distribution of the participants used in the study and their categorisation in terms of gender, age distribution, programmes, levels of study, and institutions in terms of frequencies and percentages.

The instrument for data collection was the pre-service teachers' 21st century skills and Internet use questionnaire. The questionnaire consists of two sections - Pre-service Teachers' 21st Century Skills Acquisition section and Internet Use section. These sections of the questionnaire were adopted from Valtonen et al. (2017) and Rajasekhar and Jaishree (2020) respectively. The resulting questionnaire consists of 54 items as follows: Section 1 consists of Learning and Innovative Skills (16 items), Information, Media and Technology Skills (7 items), Life and Career Skills (14 items), while Section 2 consists of Internet use (17 items). Both sections of the instrument had Likert-type 5-points response scales pattern of: Excellent - 5, Good – 4, Satisfactory - 3, Fair – 2, and Poor – 1 point respectively. The resulting mean values for the research questions used are those obtained for the total items in each category. These were the sub-divisions of the 21st century skills and the Internet use sections. The instrument was re-validated using expert validation, while the reliability estimates were obtained using the Cronbach Alpha reliability technique for internal consistency. The estimated reliabilities coefficients for the various components of the questionnaire were for Learning and Innovative Skills (0.980), Information, Media and Technology Skills (0.974), Life and Career Skills (0.972), and Internet Use (0.987). The indices were adequate for the use of the instrument for data collection. Hence, the questionnaire was administered by Google forms and also by face-to-face administration to the participants in their respective institutions using the teacher educators as research assistants for the purpose of the administration of the questionnaire within a period of four weeks.

The data collected was analysed using Statistical Package for Social Sciences version 25 (SPSS-25). The research questions were answered using descriptive statistics and by estimating standardised regression coefficients (Beta weights). The decision rule was because Beta weights indicate the strength of prediction. That is, the 21st century skills acquisition versus the Internet use in this case. Beta weight greater than zero is evidence that the independent variable, 21st century skills (predictor variable), could predict the Internet use (criterion variable). The hypotheses were tested at .05 alpha levels. Furthermore, the tenability of a null hypothesis was based on the F-ratio in the ANOVA of multiple regression output. F-ratio with probability level of equal to or less than the alpha level was rejected, otherwise it is retained.

Results

The results were presented and discussed research questions by research questions and hypothesis by hypothesis, as presented below.

Research Question 1: To what extent does acquisition of Learning and Innovative Skills predict Internet use among Nigerian pre-service teachers?

Table 2: *Mean and Standard Deviation of the Extent Acquisition of* Learning and Innovative Skills *as Predictors of Internet Use*

Variables	$\bar{\chi}$	SD	B
Learning and Innovative Skills	60.50	11.18	
			.806
Internet use	64.77	15.39	

Table 2 shows that the acquisition of Learning and Innovative Skills ($\bar{\chi}$ = 60.50; SD = 11.18) and internet use ($\bar{\chi}$ = 64.77; SD = 15.39) and the beta weight which indicates the strength of prediction β (.806). The result implies that Learning and Innovative Skills predict Internet use to a very great extent.

Research Question 2: To what extent does acquisition of Information, Media and Technology Skills predict Internet use among Nigerian pre-service teachers?

Table 3: *Mean and Standard Deviation of the Extent Acquisition of* Information, Media and Technology Skills *as Predictors of Internet Use*

Variables	$\bar{\chi}$	SD	B
Information, Media and Technology Skills	25.90	5.71	
			.805
Internet use	64.77	15.39	

Table 3 reveals that the acquisition of Information, Media and Technology Skills ($\bar{\chi}$ = 25.90; SD = 5.71) and internet use ($\bar{\chi}$ = 64.77; SD = 15.39) and the beta weight which indicates the strength of prediction β(.805). From the result Information, Media and Technology Skills predict Internet use to a very great extent.

Research Question 3: To what extent does acquisition of Life and Career Skills predict Internet use among Nigeria pre-service teachers?

Table 4: *Mean and Standard Deviation of the Extent Acquisition of* Life and Career Skills *Predict Internet Use*

Variables	$\bar{\chi}$	SD	β
Life and Career Skills	49.39	9.38	
			.839
Internet use	64.77	15.39	

Table 4 indicates that the acquisition of Life and Career Skills ($\bar{\chi}$ = 49.39; SD = 9.38) and internet use ($\bar{\chi}$ = 64.77; SD = 15.39) and the beta weight which indicates the strength of prediction β(.839). This means Life and Career Skills predict Internet use to a very great extent.

Research Question 4: To what extent does acquisition of the components of 21st century skills collectively predict Internet use among Nigerian pre-service teacher?

Table 5: *Mean and Standard Deviation of the Extent Acquisition of the Components of 21st Century Skills as Collective Predictor of Internet Use*

Variables	$\overline{\chi}$	SD	β
Learning and Innovative Skills	60.50	11.18	.403
Information, Media and Technology Skills	25.90	5.71	.398
Life and Career Skills	49.39	9.38	.127
Internet use	64.77	15.39	

Table 5 shows that the mean, standard deviation and beta weight of acquisition of components of 21st century skills as follows: Learning and Innovative Skills ($\overline{\chi}$ = 60.50, SD = 11.18, β = 0.403); Information, Media and Technology Skills ($\overline{\chi}$ = 25.90, SD = 5.71, β = 0.398), Life and Career Skills ($\overline{\chi}$ = 49.39, SD = 9.38, β = 0.127) and internet use ($\overline{\chi}$ = 64.77; SD = 15.39). Learning and Innovative Skills predicted Internet use most; followed by Information, Media and Technology Skills. The least is Life and Career Skills. The result implies that the components of the 21st century skills collectively predict Internet use to a very great extent.

Hypothesis 1: Acquisition of Learning and Innovative Skills does not significantly predict use of the Internet among Nigerian pre-service teachers.

Table 6: *Regression Analysis* Learning and Innovative Skills *as Significant Predictors of Internet Use*

Model	R	R Square	Adjusted R Square	SE	Sig.
1	.806[a]	.649	.648	6.63070	.000
ANOVA[a]					
Model	Sum of	Df	Mean	F	Sig.

		Squares		Square		
1	Regression	41718.059	1	41718.059	948.866	.000[b]
	Residual	22554.679	513	43.966		
	Total	64272.738	514			

Table 6 shows that in the model summary R^2 of .649 indicates that 64.9% of the variance in pre-service teachers' Internet use is explained by Learning and Innovative Skills and this was significant ($p < 05$). The ANOVA table revealed that F-ratio $_{(1, 513)}$ = 948.866 is significant ($p < 05$). These imply that learning and innovation skills predict Internet use among Nigerian pre-service teachers.

Hypothesis 2: Acquisition of Information, Media and Technology Skills do not significantly predict use of the Internet among Nigerian pre-service teachers.

Table 7: *Regression Analysis* Information, Media and Technology Skills *as Significant Predictors of Internet Use*

Model	R	R Square	Adjusted R	SE	Sig.
			Square		
1	.805[a]	.649	.648	9.13284	.000

ANOVA[a]						
Model		Sum of	Df	Mean	F	Sig.
		Squares		Square		
1	Regression	78949.683	1	78949.683	946.539	.000[b]
	Residual	42788.737	513	83.409		
	Total	121738.419	514			

Table 7 indicates that in the model summary R^2 of .649 accounts for 64.9% of the variance in pre-service teachers' Internet use, as predicted by Information, Media and Technology Skills and this is significant ($p < 05$). The ANOVA table revealed that F-ratio $_{(1, 513)}$ = 946.539 is significant ($p < 05$). Therefore, it can be deduced that Information, Media and Technology Skills predict Internet use among Nigerian pre-service teachers.

Hypothesis 3: Acquisition of Life and Career Skills does not significantly predict use of the Internet among Nigerian pre-service teachers.

Table 8: *Regression Analysis* Life and Career Skills *as a Significant Predictor of Internet Use*

Model	R	R Square	Adjusted R Square	SE	Sig.
1	.839[a]	.704	.704	5.10821	.000

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31862.424	1	31862.424	1221.072	.000[b]
	Residual	13386.128	513	26.094		
	Total	45248.551	514			

As can be seen in Table 8, for the model summary R^2 of 0.704 shows that 70.4% of the variance in pre-service teachers' Internet use is explained by Life and Career Skills and this is significant ($p < 05$). The ANOVA table indicated that F-ratio $_{(1, 513)}$ = 1221.072 is significant ($p < 05$). These imply that life and career skills significantly predict Internet use among Nigerian pre-service teachers.

Hypothesis 4: Acquisition of components of 21st century skills collectively does not significantly predict the use of the Internet among Nigerian pre-service teachers.

Table 9: *Regression Analysis on the Collective Significant Contribution of Acquisition of the Components of the 21st Century Skills in Predicting Internet Use*

Model	R	R Square	Adjusted R Square	SE	Sig.
1	.867[a]	.753	.751	7.67791	.000

ANOVAᵃ

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	91614.834	3	30538.278	518.035	.000ᵇ
	Residual	30123.585	511	58.950		
	Total	121738.419	514			

From Table 9, it can be inferred that with R^2 (.753) means that all the predictors account for 75.3% of the total variance in pre-service teachers' Internet use, The collective contribution to the acquisition by the components of 21st century skills is statistically significant ($p < .05$). The ANOVA table returned F-ratio $_{(3,511)}$ = 518.035, which is also statistically significant ($p < .05$).

Discussion of Findings

The analyses of all the research questions showed that Learning and Innovative Skills; Information, Media and Technology Skills; Life and Career Skills as well as the components of the 21st Century Skills collectively predict Internet use among the Nigerian pre-service teachers.

Furthermore, Hypothesis One revealed that the Learning and Innovative Skills significantly predicted Internet use among the participants used in the study. This finding agreed with the position of earlier researchers (Ramaila & Molwele, 2022; Daud & Khalid, 2014; Knowing Technology, 2021) who opined that critical thinking, problem-solving communication, collaboration, creativity and innovation skills as components of learning and innovation skills were developed through technology and weblog and were made possible by Internet connections.

The second hypothesis found that Information, Media, and Technology Skills significantly predicted Internet use. Thus, the finding corroborated the study of Diquito et al. (2022) which found that pre-service teachers had a very high level of acquisition in digital literacy, among others. The findings also agreed with that of Lewin

and McNicol (2015); Voogt and Roblin (2012) who contended that ICT was the core of 21st century skills. These skills enable them to connect to the Internet to access information, as rightly observed by Joshi et al. (2022); Voogt & Roblin (2012); and the Partnership for the 21st Century Skills (2010). According to these earlier researchers, the connection to the Internet aligns with rapid changes in technology tools and empowers them through boundless possibilities of knowledge sharing and creation of new ways of instructional delivery.

Hypothesis Three indicated that Life and Career Skills significantly predicted Internet use. These skills, according to the Partnership for the 21st Century Skills (2010), corroborated by Stauffer (2022), were essential for personal and professional development in the global competitive Internet age. Moreover, the findings of this research study were supported by that of Diquito et al. (2022), who reported a high level of acquisition of leadership skills among pre-service teachers.

Accordingly, the result of the fourth hypothesis revealed that the collective contribution of the predictor variables to the criterion variable was statistically significant. That is, the acquisition of 21st century skills were significantly related to Internet use of the participants' pre-service teachers, as shown in this study and supported by earlier studies already discussed.

Conclusion

Based on the empirical evidence of the findings, the study concludes that Learning and Innovative Skills, Information, Media, and Technology Skills, and Life and Career Skills were significant predictors of Internet use among Nigerian pre-service teachers. This finding was supported by empirical evidence that independently reported components of Learning and Innovative Skills and components of Information, Media and Technology Skills as being associated to ICT and Internet use.

Recommendations

Based on the findings, the following recommendations are made:

1. Teacher education programmes should, as much as possible, integrate courses that would enable pre-service teachers to acquire 21st century skills. This is because the acquisition of 21st century skills will enable them to meaningfully leverage the use of the Internet to the benefit of their 21st century learners.

2. Pre-service teachers should leverage the use of the Internet to boost their acquisition of 21st century skills, which will help them meet the demands of the global economy.

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