

Assessment of 21st Century Competencies Science Education Lecturers Possess in Universities in Enugu State, Nigeria

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Abstract: This study investigated 21st-century competencies possessed by science education lecturers at the University of Nigeria Nsukka and Godfrey Okoye University Enugu. One research question and three null hypotheses guided the study, adopting a descriptive survey research design. The sample for the study comprised 67 Faculty of Science Education lecturers at the University of Nigeria Nsukka and Godfrey Okoye University Enugu. A simple random sampling technique was used to select the sample. Data was collected using a 20-item 21st-century competency questionnaire developed by the researchers. The instrument was validated by three validators in educational measurement and evaluation at the Faculty of Education, University of Nigeria Nsukka. A 0.79 coefficient of internal consistency index was for the instrument using Cronbach Alpha. The collected data were analyzed using frequency, percentage, mean, standard deviation, t-test, and ANOVA statistics. Findings revealed that communication and collaboration skills are possessed by Science Education lecturers to a high extent, whereas learning and innovation skills, information literacy skills, digital literacy skills, and life career skills are possessed to a low extent. Also, there was a significant difference in the 21st-century competencies of science education lecturers based on gender, experience, and qualification. The study concluded that 21st-century competencies are vital for lecturers to thrive in modern society and recommends that tertiary institutions organize in-service hands-on workshops to teach lecturers 21st-century competencies; and lecturers should see private avenues to improve their 21st-century skills.

Keywords: 21st Century competencies, science education, lecturers, gender, universities

Introduction

The concept of 21st century competencies is pivotal in modern education, emphasizing the skills and abilities required for success in this contemporary and dynamic world. These competencies include a wide range of skills, such as learning and innovation, communication and collaboration, information literacy, digital literacy, and life and career skills. Assessing these competencies among education lecturers in selected universities in Enugu State, Nigeria, provides insight into their preparedness to impact students with the necessary skills for the future. 21st century competencies focus on skills, knowledge, and attitudes that are essential for individuals to thrive in a complex, fast-paced, and interconnected world. These competencies go beyond traditional academic knowledge, it involves critical thinking, creativity, communication, collaboration, and technological proficiency. The aim is to prepare individuals to navigate and succeed in both their personal and professional lives, fostering lifelong learning and adaptability (Miller et al, 2023; Stauffer, 2021).

The 21st century skills were classified in five by Joynes (2019). These include: learning and innovation, communication and collaboration skills, information literacy skills, digital literacy skills, and life and career skills. Learning and innovation skills are critical for navigating and contributing to a constantly evolving educational landscape. These skills include creativity, critical thinking, problem-solving, and innovation (Fadel, 2018; Dilekçi & Karatay, 2023). Creativity encourages lecturers to develop new teaching methods and engage students in innovative ways; critical thinking enables lecturers to analyze and evaluate complex problems, fostering a deeper understanding of science concepts; problem-solving equips lecturers with the ability to identify and address educational challenges effectively; innovation promotes the adoption of new technologies and methodologies in the classroom. Therefore, communication and collaboration should be effective as an essential element for creating a supportive and dynamic learning environment. These skills involve the ability to clearly convey information, actively listen, and work cooperatively with others (Johler, 2022; Darling-Hammond et al., 2020). Communication includes verbal, non-verbal, and digital communication, ensuring that lecturers can effectively interact with students and colleagues while collaboration involves working together with other educators, students, and stakeholders to achieve common educational goals.

Information literacy which is the ability to locate, evaluate, and use information effectively should be equipped with competency. This competency is crucial in an age where information is abundant and constantly evolving (Arkorful et al., 2024). Locating Information enables science education lecturers to find relevant and credible sources of information for teaching and research; evaluating information involves assessing the accuracy, reliability, and relevance of information; using information ensures that lecturers can apply information appropriately in educational contexts. The ability and effective use of digital tools and technologies is regarded as digital literacy. It encompasses a range of skills, from basic computer literacy to advanced technical proficiency (Green 2020). Basic digital skills include using software applications, email, and online resources while advanced digital skills involve integrating digital tools into teaching, such as using educational software, virtual labs, and online collaboration platforms. Life and career skills are essential for personal and professional development. These skills include flexibility, initiative, social skills, productivity, and leadership (Karaca-Atik et al., 2023). Flexibility allows lecturers to adapt to changing circumstances and requirements; initiative encourages proactive behavior and self-motivation; social skills enhance interpersonal interactions and teamwork; productivity involves managing time and resources efficiently; and leadership empowers lecturers to guide and inspire students and colleagues.

Science education lecturers can acquire 21st-century competencies through continuous professional development programs specifically designed to address these skills. These programs can include workshops, seminars, and courses focusing on the various aspects of 21st century competencies such as digital literacy, information literacy, communication, collaboration, and life and career skills. For instance, digital literacy workshops can train lecturers in using modern educational technologies and digital tools effectively, while information literacy seminars can help them develop skills in locating, evaluating, and using information from diverse sources. Professional development opportunities also provide platforms for lecturers to engage in collaborative learning experiences, where they can share best practices, solve problems collectively, and learn from each other's experiences. Another critical avenue for acquiring these competencies is through practical application and reflective practice. Lecturers can integrate new skills into their daily teaching practices, experimenting with innovative teaching methods and technologies. This hands-on approach allows them to refine their skills in real-

world settings, receive feedback from peers and students, and make innovative adjustments. Additionally, participating in online learning communities and professional networks can leverage lecturers with access to a wealth of resources, support, and knowledge-sharing opportunities. Engaging in research and staying updated with the latest trends in education also ensures that lecturers are well-versed in current best practices and emerging competencies required for effective teaching in the 21st century.

Several studies have assessed 21st-century competencies among university lecturers, explaining the importance of these skills in enhancing effective teaching and student learning outcomes. A study by Liu (2023) examined the digital competence of university lecturers in China and found that while most lecturers had basic digital skills, there was a need for further training to enhance their digital literacy. Similarly, a study by Harju and Niemi (2016) explored the professional development needs of university lecturers in Belgium and identified a lack of training in communication and collaboration skills, indicating a gap in these competencies among lecturers. Another study by Fadel, C. (2018) investigated the information literacy skills of university lecturers in Australia and found that while lecturers were proficient in using information for their own research, they lacked skills in teaching information literacy to students. This suggests a need for targeted training programs to improve information literacy skills among lecturers. Additionally, a study by Lutovac et al. (2024) examined the learning and innovation skills of university lecturers in Finland and found that while lecturers valued these skills, they faced challenges in integrating them into their teaching practices, highlighting the need for support in this area.

Despite these studies, there remains a gap in research regarding the assessment of 21st-century competencies among science education lecturers in Nigerian universities, particularly in the context of Federal and Private universities respectively, University of Nigeria, Nsukka, and Godfrey Okoye University Enugu State. Existing studies have mostly focused on other countries and disciplines, leaving a knowledge gap regarding the specific competencies and training needs of education lecturers in Nigeria. Therefore, conducting a study on the assessment of 21st-century competencies among science education lecturers in Nigerian universities would give rich insights into the skills and training needs of this group, enabling the development of targeted professional development programs to enhance their teaching effectiveness and ultimately improve students' learning outcomes.

Purpose of the Study

The study seeks to determine the 21st century skills possessed by Science Education lecturers in selected Universities in Enugu State. Specifically, the study will determine the:

- ❖ 21st century competencies possessed by Science Education lecturers.
- ❖ Influence of gender on the 21st century competencies possessed by Science Education lecturers.
- ❖ Influence of teaching experience on the 21st century competencies possessed by Science Education lecturers.
- ❖ Influence of qualification on the 21st century competencies possessed by Science Education lecturers.

Research Questions

The following posed questions guided the study:

1. What 21st century skills do Science Education lecturers possess

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

Ho₁: There is no significant difference in the mean 21st Century competencies of male and female Science Education lecturers.

Ho₂: There is no significant difference in the mean 21st Century competencies of Science Education lecturers with different years of teaching experience.

Ho₃: There is no significant difference in the mean 21st Century competencies of Science Education lecturers with different qualifications.

Methodology

Descriptive survey design was adopted. The study population comprised all Science Education lecturers in selected universities in Enugu State Nigeria. The sample of the study comprised of 67 Science of Education lecturers in University of Nigeria Nsukka, and Godfrey Okoye University Enugu. Data was collected using a 21st century competency assessment questionnaire. The questionnaire is structured in two sections: section I sought to elicit respondents' demographic information like gender, educational qualification and years of teaching experience; section II contained 20 items designed to elicit data on five 21st century competencies possessed. These competencies are learning and innovation, communication and collaboration skills, information literacy skills, digital literacy skills, and life and career skills. The instrument had a 5-point rating response option rating from 1 – 5. The instrument was duly validated by two validators in the Faculty of Education, University of Nigeria Nsukka, and the reliability of the instrument was established through trial-testing (using 10 Science Education lecturers at Enugu State University of Science and Technology, Enugu), and a Cronbach Alpha analysis revealed a reliability index of 0.79. The instrument was distributed electronically through Google Forms, with respondents sent the link and appealed to respond. Data from Google Forms were downloaded into an Excel sheet for formatting and transferred to SPSS version 25 for analysis. Mean and standard deviation were used to answer the research question while the hypotheses were tested at t-test and ANOVA. Findings were presented in tables and discussed.

Result

Research Question: What 21st-century skills do Science Education lecturers possess?

Table 1

21st Century skills possessed by Education lecturers

S/N	Competencies	Mean	SD	Decision
1.	Learning and Innovation	4.14	0.79	Possessed
2.	Communication and Collaboration Skills	4.13	0.90	Possessed
3..	Information Literacy Skills	4.04	0.92	Possessed
4.	Digital Literacy Skills	3.90	0.95	Possessed
5.	Life and Career Skills	4.09	0.90	Possessed

Table 1 shows that the 21st-century skills possessed by Science Education lecturers at the University of Nigeria Nsukka and Godfrey Okoye University Enugu include: learning and innovation, communication and collaboration skills, information literacy skills, digital literacy skills, and life and career skills.

Hypothesis 1: There is no significant difference in the mean 21st competencies of male and female Science Education lecturers.

Table 2*T-test on the Influence of gender on the 21st-century skills possessed by Science Education lecturers*

Gender	N	Mean	SD	df	t.	Sig. (2-tailed)
Male	18	79.17	14.95	65	0.794	.430
Female	49	76.35	12.06			

Table 2 presents data used for testing hypothesis one. The data on Table 2 shows that the probability value for the difference between the mean ratings of male and female education lecturers is 0.430. Since the probability value of 0.430 is greater than 0.05, the null hypothesis is not rejected. Thus, there is no significant difference in the mean 21st competencies of male and female Science Education lecturers.

Hypothesis 2: There is no significant difference in the mean 21st competencies of Science Education lecturers with different years of teaching experience.

Table 3*ANOVA Analysis the influence of years of teaching experience on the 21st Century skills possessed by Science Education lecturers*

	Sum of Squares	Df	Mean Square	F	Sig. (2-tailed)
Between Groups	1392.251	4	348.063	2.272	.071
Within Groups	9498.017	62	153.194		
Total	10890.269	66			

Table 3 presents data used for testing hypothesis two. The data on table 3 shows that the probability value for the difference between the mean ratings of male and female science education lecturers is 0.071. Since the probability value of .071 is greater than 0.05, the null hypothesis is not rejected. Thus, there is no significant difference in the mean 21st competencies of Education lecturers with different years of teaching experience.

Hypothesis 3: There is no significant difference in the mean 21st competencies of Science Education lecturers with different qualifications.

Table 4: ANOVA Analysis the influence of educational qualifications on the 21st Century skills possessed by Science Education lecturers.

	Sum of Squares	Df	Mean Square	F	Sig. (2-tailed)
Between Groups	22.524	1	22.524	.134	.716
Within Groups	10603.538	63	168.310		
Total	10626.062	64			

Table 4 presents data used for testing hypothesis three. The data on Table 4 shows that the probability value for the difference between the mean ratings of male and female education lecturers is 0.716. Since the probability value of 0.716 is greater than 0.05, the null hypothesis is not rejected. Thus, there is no significant difference in the mean 21st competencies of Education lecturers with different educational qualifications.

Discussion of the Findings

The study revealed that the 21st century competency skills possessed by Science Education lecturers in the University of Nigeria, Nsukka and Godfrey Okoye University Enugu are learning and innovation, communication and collaboration skills, information literacy skills, digital literacy skills, and life and career skills. The study also

showed that there was no significant difference in the 21st century competency of these lecturers based on gender, years of teaching experience and educational qualification. Each of these competencies is crucial in equipping lecturers to meet the dynamic demands of modern education. Learning and innovation skills reflect the ability to think critically and creatively, fostering an environment that encourages problem-solving and adaptation to new teaching methods. Communication and collaboration skills underscore the importance of effectively sharing information and working synergistically with colleagues and students to enhance the educational experience. Information literacy skills which is the ability to locate, evaluate, and use information effectively, a vital competencies in the contemporary era of abundance of information sources. Digital literacy skills highlight the necessity for lecturers to adeptly use digital tools and technologies, ensuring they can integrate these resources into their teaching practices to facilitate learning. Social skills, flexibility, initiative, productivity, and leadership are life and career skills that is important for personal and professional growth, enabling lecturers to navigate and thrive in their careers while fostering these qualities in their students.

The finding showing that these competency skills are possessed by science education lecturers of the University of Nigeria Nsukka and Godfrey Okoye University, Enugu reveal a multifaceted proficiency among the faculties. The nature of academia itself often fosters the development of these skills. Research and teaching (which are the primary roles of academic staff of the Faculty) frequently require continuous learning, critical thinking, and the ability to communicate complex ideas. So, as lecturers engage in these tasks, they actively develop 21st century skills. Also, the university places an increased emphasis on these competencies. Initiatives like faculty development programs or workshops focused on digital pedagogy could be equipping lecturers with the necessary tools, hence the finding showing that they possess them.

The finding also showed that there was no significant differences in competency based on gender, years of experience, or educational qualification. This finding suggests that these skills are essential for every lecturer, regardless of background, years of experience and gender, to excel on the job. So, as lecturers are recruited, they already possess the rudiments of these skills and develop them on the job. In-service training opportunities is often to all lecturers, irrespective of their demographic attributes. The lack of significant differences based on gender might also suggest a progressive institutional culture that promotes equal opportunities and resources for all lecturers, thereby minimizing gender disparities in skill acquisition. Similarly, the consistency across different years of teaching experience implies that both new and veteran lecturers are maintaining up-to-date competencies, possibly through continuous professional development and a supportive learning environment that encourages ongoing skill enhancement. The absence of variation based on educational qualification might indicate that these skills are not necessarily tied to formal educational attainment but rather to the practical application and ongoing professional development efforts within the university.

Conclusion and Recommendations

The findings from the study at the University of Nigeria, Nsukka, and Godfrey Okoye University, Enugu highlight the comprehensive competency skills possessed by science education lecturers, essential for navigating the 21st-century educational landscape. The uniformity across various demographics underscores the effectiveness of institutional policies and professional development programs in cultivating these skills and promoting an inclusive and progressive academic environment.

The recommendations made based on the outcome of the study are as follows:

1. The 21st-century skills should be part of the minimum requirement for recruitment of academic staff in universities. This will consolidate the existing prevalence of these competencies among staff of universities.
2. The management of universities should periodically organize refresher training/workshops to keep lecturers regularly updated to ensure they remain relevant and effective in the 21st-century world.
3. The University management should also ensure that all lecturers, regardless of gender, teaching experience, or educational qualifications, have equal access to resources and opportunities for skill development. This can help maintain the uniformity observed in the competency levels.
4. Faculties should encourage and support lecturers to incorporate digital tools and technologies into their teaching practices. Providing training on current educational technologies can improve digital literacy skills and improve the overall teaching and learning experience.
5. Lecturers should seek private opportunities to personally develop their 21st-century competencies on their own without waiting for the management of universities.

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