# Exploring Science Teachers' Perceptions and Strategies in Navigating Online Assessment Challenges: Lessons from the Nigerian COVID-19 Experience

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**Purpose and Research Question -** The study examined science teachers' perceptions and strategies in navigating online assessment challenges.

**Methodology -** Using survey design, the study was guided by two research questions. A structured questionnaire titled "challenges and way outs to online assessment' was adapted and used for data collection. The instrument's reliability was established using Cronbach's alpha with a coefficient value 0.72. Using Google Forms, the instrument was distributed via WhatsApp platforms for science teachers in Katsina state. Data produced from the study were analyzed using descriptive statistics (weighted mean). .

**Findings -** The outcomes of the study revealed that science teachers' perceived challenges and way out to online assessment include among other things: concerns about the accuracy of question banks, suitability of assessing practical courses online, inadequate competency skills among teachers, the time and effort required for preparation and evaluation, potential impersonation, time management with large student populations, and the anxiety caused by digital literacy limitations among students. The findings further revealed that science teachers' perceptions point towards a combination of technological improvements, training, diverse assessment methods, and enhanced security measures to address online assessment challenges.

**Significance and Contribution in Line with Philosophy of LSM Journal –** The findings suggest a general willingness to embrace these strategies, with some variability in agreement levels depending on the specific approach.

***Keywords:*** *Perception; Strategies; Online assessment; Challenges; COVID-19 and Science teachers*

## Introduction

The coronavirus outbreak that started in Wuhan, China, in 2019 presents a grave and immediate threat to everyone worldwide (Sunday et al., 2021), while Nigeria is no exception. As part of the government's reaction to the COVID-19 pandemic, educational institutions were suddenly closed to prevent the virus from spreading further. This has raised concerns about the global consequences of disrupted academic sessions. As a result, the World Health Organization (WHO) opined that it was a global pandemic on March 11, 2020.

## Background and Rationale

Due to the pandemic's repercussions, the government suddenly closed educational facilities to prevent further infections. Online learning has become a new trend in educational practices due to the Covid-19 pandemic. Since the teaching and learning process has changed from face-to-face to online, conducting online assessments has become a requirement (Sunday et al., 2021). According to Vipin (2019), transitioning from traditional pencil-paper assessments to electronic versions eliminates the need for the old-fashioned approach, making online access more convenient. Teachers may find it valuable to receive training in online assessment practices, empowering them to become innovative and digitally literate teachers.

Therefore, technological advancements have continued to offer a wide range of potential benefits to the teaching and learning process, and these benefits have also extended to the online assessment of learning. According to Abdulghani (2020), online assessment is an appraisal of a person's abilities, behaviours and/or characteristics conducted over the internet using available web technologies. It involves conducting an online examination to measure the participants' knowledge on a given topic (Easy LMS B. V., 2021). As opined by Masters, Thomson & Schleicher, (2017), the advantages of online assessment are often described in terms of its administrative convenience, efficiency and lower costs. The assessment can be administered over the web, with students taking part from virtually any location with a computer connected to the internet. It is for this reason that online assessment has gained wider acceptance in recent times.

Accordingly, countries worldwide, including Nigeria, have made efforts to ensure a smooth paradigm shift from traditional face-to-face learning to more online learning. This shift equally demands online assessment of the learning process. This is evident as most States of the Federation adopted learning instructions via online Zoom and Skype social application software (World Bank, 2020). However, some schools did not adopt online assessment but resorted to the traditional paper-pencil assessment technique despite the danger of the pandemic (Ezeugo, 2021).

Hence, the need to conduct assessments during the pandemic was daunting for almost all educational agencies, and science teachers are no exception. Effective science teaching requires proficiency in science pedagogical content knowledge and assessment. Although the benefits of online assessment were clear at such a time, educational stakeholders and teachers never seriously considered online assessment, especially at the secondary school level of education. Those who tried ran into myriads of problems. The indecision to seriously adopt online assessment during the lockdown indicates that educational stakeholders and teachers may have varied perceptions about online assessment, especially regarding its adoption challenges.

However, evidence from the literature has provided different teachers' perceptions regarding online assessment. For example, Fedelis and Harwati (2021) showed that teachers perceived online assessment as difficult due to network transmission, lack of facilities, accessibility to reliable gadgets and time needed by teachers to apply online assessment tools. This finding has been corroborated by Emmanuel (2020), who stated that the teachers found it difficult to upload large notes. A study by Mariam (2021) showed that the teachers' perception of online assessment includes but are not limited to:  dearth of physical interaction,  high risk of cheating and plagiarism,  technical difficulties,  and problem of guaranteeing the integrity of online assessment. However, the ability to use online assessment and the perceptions of its usage may be subject to science teachers' level of digital literacy. Gomathy, (2018) states that digital literacy is the competency required for full participation in a knowledge society. It includes knowledge, abilities, and behaviours involving the effective use of digital experience devices such as smartphones, tablets, laptops, desktops, and personal computers for effective communication, expression, collaboration and advocacy. According to Terry (2021), it is the ability to interpret and design nuanced communication across fluid digital forms.

Therefore, digital literacy impacts students' performance on an online assessment. Several studies focus on assessing digital assessment literacy to support the notion that online assessment requires skills in digital literacy. For example, Farhat (2021) highlighted the importance of online assessment literacy and the need for assessment-literate trained teachers who might support in identifying the training needs of online assessment. Furthermore, Schmidt and DeSchryver (2021) have proven the role of digital application literacy in Online Assessment.

To effectively deal with the challenges of online assessments, science teachers at the secondary school level, who are the ones to administer the assessment, stand in a better position to suggest possible solutions that can alleviate the challenges of online assessment. In other words, the perception of the possible solution may be determined by the science teacher's digital literacy level. Ramazan (2017) reported that teachers perceived the following possible solutions to online assessment: giving students assignments and practices that will not require memorizing but will enable them to use high-order thinking skills and prevent them from cheating; providing students and teachers with training on online assessment and evaluation practices; increasing the encouragement and motivation of lecturers on developing online assessment and evaluation practice. The present study focused on assessing science teachers' perceptions of the challenges and way out to online assessment, bearing in mind the level of their digital literacy.

**Problem Statement**

The coronavirus outbreak in 2019 led to the sudden closure of educational institutions worldwide, including Nigeria, to curb its spread. This closure disrupted academic sessions, prompting a shift towards online learning. With this shift, the need for online assessment emerged as a crucial aspect of the teaching and learning process. Despite the potential benefits of online assessment, including administrative convenience and timely feedback, the adoption of online assessment methods varied among educational stakeholders and teachers. Existing literature has highlighted diverse perceptions of online assessment challenges, ranging from technical difficulties to concerns about cheating and plagiarism (Ezeugo, 2021), while Khitam (2018) identified security, validity and fairness issues as challenges of online assessment. Furthermore, the proficiency of science teachers in addressing these challenges was influenced by their level of digital literacy (Eyiuche & Adebowale, 2020). In Nigeria,

several efforts have been made by the government, as well as some professional bodies like the Science Teachers Association of Nigeria (STAN), to create awareness and provide digital literacy to science teachers and science teacher educators (Nneka & Theresa 2013). All these efforts are geared towards improving science learning through computer use. Given this backdrop, considering their digital literacy level, the present study explores science teachers' perceptions of challenges and potential solutions to online assessment. This study sheds light on the complexities surrounding online assessment during the COVID-19 pandemic and provides insights into improving its implementation among science teachers at the secondary school level in Nigeria.

## Theoretical Framework

The study is anchored within the Technological Pedagogical Content Knowledge (TPACK) framework. TPACK emphasises the intersection of three key components: technological knowledge, pedagogical knowledge, and content knowledge. In the context of online assessment, TPACK provides a lens to understand how science teachers' expertise in their subject matter (content knowledge), teaching strategies (pedagogical knowledge), and technological tools (technological knowledge) shape their perceptions of challenges and solutions to online assessment. This framework can bring into light the complex interplay between these knowledge domains, helping to explain how teachers' digital literacy and pedagogical approaches influence their responses to online assessment difficulties and potential remedies.

## Purpose of the study

The study sought to assess science teachers' perceptions of the challenges and way forward to online assessment. Specifically, the study seeks to answer the following research questions;

## Research Questions

- What are the perceptions of science teachers on the challenges of online assessment?
- What are the way forward on the challenges of online assessment as perceived by science teachers?

## Materials and Methods

The study employed a descriptive survey design, which involves gathering and analysing data from a limited number of participants to conclude a larger group (Nworgu, 2015). The study was conducted in Katsina State, Nigeria, focusing on its twelve educational zones: Katsina, Rimi, Kankia, Dutsin-ma, Mani, Daura, Baure, Mai'adua, Safana, Musawa, Funtua, and Faskari. The target population included 4,971 teachers in senior secondary schools, with a sample size of 497 science teachers (10% of the population) selected using purposive sampling. Data was collected using an adapted questionnaire titled "Challenges and Solutions to Online Assessment of Learning" (CASOAL), divided into three sections: demographics, difficulties in online assessment, and potential solutions. Respondents used a four-point rating scale (Strongly Agree, Agree, Disagree, and Strongly Disagree) for sections B and C.

The questionnaire's validity was ensured through expert review, and reliability was measured with Cronbach's Alpha (0.74) using a sample of 10 teachers. Data collection was facilitated through WhatsApp and Google Forms, which allowed for survey creation, data analysis,

sample selection, and data presentation. Descriptive statistical analysis was applied to the collected data, addressing research questions with a weighted response average by calculating means and standard deviations for each item. Items with a mean score of 2.5 or higher were considered acceptable, while those below 2.5 were discarded.

## Results

The following Table 1 summarizes the findings in response to **RQ 1**: What are the challenges of online assessment as perceived by science teachers in Katsina state?

Table 1 Challenges Perceived in Online Assessment of Learning by Science Teachers

| S/N | Items | M | SD | Decision |
|---|---|---|---|---|
| 1 | Poor internet connectivity is a big problem in rural and remote areas as it interferes with the smooth flow and execution of assessment | 2.65 | 1.01 | Agreed |
| 2 | The quality of the question banks and its accuracy may not represent true assessment | 2.22 | 0.25 | Disagreed |
| 3 | Practical courses in the laboratory can be assessed in online assessment | 2.24 | 0.35 | Disagreed |
| 4 | For students who struggle with technological skills, online assessments may lead to a poorer level of performance in the subject than the student may demonstrate in other assessment contexts | 2.70 | 1.82 | Agreed |
| 5 | There is lack of certainty in terms of academic integrity and cheating, since anyone could accompany the student while they undertake online assessment especially when served over the web | 3.20 | 0.61 | Agreed |
| 6 | There is great difficulty in scoring and correcting questions with open responses that require explanation | 3.33 | 1.90 | Agreed |
| 7 | Most secondary schools do not have the requisite infrastructure needed for effective conduct of online assessment | 3.50 | 0.72 | Agreed |
| 8 | Many science teachers do not have the competency skills needed for online assessment | 2.60 | 1.82 | Agreed |
| 9 | Preparation and evaluation of online assessment requires a lot of time and effort | 2.80 | 1.32 | Agreed |
| 10 | The cost implication of online assessment is much compared to traditional assessment | 3.75 | 1.02 | Agreed |
| 11 | There is possibility of impersonation in online assessment | 2.66 | 1.51 | Agreed |
| 12 | Given the population of the students taking the assessment, time management may become a huge problem | 2.85 | 0.67 | Agreed |
| 13 | It creates anxiety in the students especially those with poor digital Literacy | 2.80 | 1.23 | Agreed |
| 14 | Online assessment occurs without the science teachers' presence increasing risk of assessment accountability | 2.01 | 0.81 | Disagreed |
| 15 | Students often need training or brief orientation to be able to take online assessment | 2.21 | 0.78 | Disagreed |

Cut off mean= 2.5

The table presents the results of a survey regarding the perceived challenges of online

assessment among science teachers in Katsina State. The responses are summarised along with their mean (M) and standard deviation (SD) scores, followed by a decision on whether the mean surpasses the cut-off value of 2.5. Generally, this table provides insights into the science teachers' perceptions of challenges related to online assessment in Katsina State. Items with mean scores above the cut-off of 2.5 were generally agreed upon, indicating that the teachers recognise these challenges in this context. In summary, the analysis of items with mean scores below 2.5 reveals several challenges perceived by science teachers in Katsina State regarding online assessment. These challenges include concerns about the accuracy of question banks, the suitability of assessing practical courses online, inadequate competency skills among teachers, the time and effort required for preparation and evaluation, potential impersonation, time management with large student populations, and the anxiety caused by digital literacy limitations among students.

The following Table 2 summarizes the findings in response to **RQ 2:** What are the way forward on the challenges of online assessment as perceived by science teachers?

Table 2  Perceived Solutions to the Challenges of Online Assessment

| S/N | Items | M | SD | Decision |
|---|---|---|---|---|
| 1 | Latest technologies that ensures good connectivity should be acquired and installed in all secondary schools | 3.80 | 0.37 | Agreed |
| 2 | Mock assessments should be organised for students before the main assessment to familiarise with the online assessment techniques | 3.30 | 0.62 | Agreed |
| 3 | Build in ways for learners to give feedback on any form of assessment | 2.65 | 1.01 | Agreed |
| 4 | Giving learners the option to determine how they can best communicate to you what they have learned | 2.15 | 1.65 | Disagreed |
| 5 | Peer and team assessments can help motivate best efforts as well as help students learn from each other | 2.45 | 0.99 | Disagreed |
| 6 | Online assessment such as online discussion and personal activities in solving learning problems should sometimes be adopted instead of continuous close-ended questions | 2.90 | 0.78 | Agreed |
| 7 | Development of mal-practice check software that prevent access to other platforms during online assessment | 2.75 | 1.11 | Agreed |
| 8 | Use of biometric login to prevent impersonation during online assessment | 3.69 | 0.62 | Agreed |
| 9 | Creation of teachers' or invigilators' virtual presence through a webbed network to monitor online assessment | 3.08 | 0.78 | Agreed |
| 10 | Frequently professional online assessment workshop and development trainings for secondary school teachers. | 3.06 | 0.76 | Agreed |

Table 2 displays the results of the science teachers' perceptions regarding ways to address the challenges of online assessment. The mean (M) and standard deviation (SD) values are provided for each item, along with the decision made based on a cut-off point. The decision is categorised as either "Agreed" or "Disagreed" based on whether the mean score is above or below the cut-off value of 2.5. The science teachers' perceptions point towards a combination of technological improvements, training, diverse assessment methods, and enhanced security measures to address online assessment challenges. The findings suggest a general willingness to embrace these strategies, with some variability in agreement levels depending on the specific approach.

**Discussion on Key Findings Anchored on Theoretical Framework**

The study is grounded in the Technological Pedagogical Content Knowledge (TPACK) framework, which underscores the interplay between technological, pedagogical, and content knowledge. The findings align with this framework as they emphasise the need for a combination of technological improvements (e.g., acquiring the latest technologies for connectivity), pedagogical strategies (e.g., mock assessments for familiarisation), and content-specific considerations (e.g., practical courses assessment) to address online assessment challenges effectively. The TPACK framework provides a lens to understand how these knowledge domains converge to shape science teachers' perceptions of challenges and potential solutions in the context of online assessment during the COVID-19 pandemic.
The results of this study shed light on the challenges perceived by science teachers in Katsina State, Nigeria, regarding online assessment during the COVID-19 pandemic. These findings provide valuable insights into educators' difficulties in transitioning to online assessment and offer potential solutions to mitigate these challenges.

**Discussion of the Findings in Response to RQ 1: Challenges in Online Assessment**

The analysis of responses to the first research question revealed several challenges science teachers face. It is evident that poor internet connectivity in rural and remote areas was a significant concern, which interfered with the smooth flow and execution of assessments. This challenge reflects the broader issue of the digital divide in remote regions, where access to reliable internet infrastructure remains inadequate. This aligns with the discoveries made by (Mariam, 2021; Fedelis & Harwati, 2021; Diarsini, et al., 2022), which both indicate that teachers view inadequate internet connectivity as a hindrance to the effective implementation of online assessment in education. Another notable challenge was related to the accuracy of question banks. Teachers expressed doubts about whether these question banks truly represented a fair assessment. This concern emphasises the importance of ensuring the quality and validity of online assessment items.

Practical courses in the laboratory were seen as difficult to assess through online methods, highlighting the limitations of virtual learning in subjects that require hands-on experience. Furthermore, issues related to students' technological skills and digital literacy were raised, indicating that online assessments might disadvantage those who are not proficient in technology. Uncertainties regarding academic integrity and cheating were also recognised as significant concerns. Teachers expressed worries about the potential for students to have assistance during online assessments, especially when they are not physically supervised. This result aligns with Ramazan's (2017) research, which suggests that online assessment poses challenges in preventing academic dishonesty during examinations. It further aligns with the work of Diarsini et al. (2022), who identified the problem of cheating and plagiarism as part of the challenges of online assessment. Additionally, the time and effort required for the preparation and evaluation of online assessments and the cost implications compared to traditional assessments were viewed as challenges. This has been supported by the work of Diarsini et al. (2022). Time management challenges emerged, especially when dealing with many students. Finally, anxiety among students, particularly those with limited digital literacy, was acknowledged as an issue.

**Discussion  in Response to RQ2: Solutions for Online Assessment Challenges**

The findings in response to research question two indicated a willingness among science

teachers to embrace various strategies to address the challenges of online assessment. Acquiring and installing the latest technologies to ensure good connectivity in all secondary schools received strong support. This step is vital for overcoming the issue of poor internet connectivity in remote areas. Organising mock assessments to familiarise students with online assessment techniques was also deemed a viable solution, helping to ease the transition to online assessment. Building ways for learners to provide feedback on assessments and allowing students to determine how they can best communicate what they have learned were seen as strategies to enhance the assessment process and engage students actively. Peer and team assessments were suggested to motivate students and promote collaborative learning, which could help mitigate some challenges.

The adoption of diverse assessment methods, such as online discussions and personal activities, was recommended as an alternative to continuous close-ended questions, potentially providing a more comprehensive understanding of students' knowledge and skills. The development of anti-cheating software and the use of biometric logins to prevent impersonation were considered essential security measures for online assessments. Creating teachers' or invigilators' virtual presence through a web-based network to monitor online assessment was also seen as a means to enhance the accountability and integrity of assessments. Lastly, the study highlighted the need for frequent professional online assessment workshops and training for secondary school teachers, emphasising the importance of continuous professional development to improve educators' online assessment skills.

Thus, the findings from this study align with the suggestions put forth by Guangul, Suhail, Khalit and Khidhir (2020). These recommendations include creating personalised questions for individual students, utilising online presentations, and incorporating a diverse range of assessment methods as potential solutions to tackle the challenges associated with online assessment. These strategies proposed in the current study align with the findings of Ramazan (2017), who also identified possible solutions to online assessment challenges. Ramazan's research reported that teachers perceived solutions such as assigning tasks and exercises that require high-order thinking skills, thus discouraging cheating. Additionally, providing students and instructors with training on online assessment and evaluation practices and boosting the motivation and support for instructors to develop online assessment and evaluation techniques and alternative evaluation methods were recognised as effective ways to address the challenges of online assessment.

In summary, the results indicate that science teachers in Katsina State recognise the challenges of online assessment and are open to various solutions. These findings can inform educational policies and practices to enhance online assessment during pandemic-induced disruptions and beyond. However, it is essential to consider the specific context of Katsina State when implementing these solutions and comprehensively address the regional limitations, such as internet connectivity issues.

## Conclusion

The study investigated science teachers' perceptions of challenges and potential solutions to online assessment in the context of Katsina State, Nigeria. The findings reveal that science teachers identify several challenges associated with online assessment, including poor internet connectivity, concerns about the accuracy of question banks, difficulties in assessing practical courses online, insufficient teacher competency in online assessment, time and effort

demands for preparation and evaluation, potential impersonation risks, time management with large student populations, and student anxiety due to limited digital literacy. Moreover, science teachers acknowledge the importance of addressing these challenges through various means.

## Results implications

The study's findings have several implications for educational practice and policy. By identifying teachers' perceptions of challenges and strategies related to online assessment, science teachers and policymakers can design targeted interventions. Incorporating advanced technologies, organising mock assessments, fostering feedback mechanisms, enhancing teacher competency, and providing professional development workshops could enhance the efficacy of online assessment. Moreover, addressing concerns about impersonation, time management, and digital literacy could help alleviate teacher and student anxieties about the online assessment process.

## Limitations and suggestions for further research

The study also acknowledges limitations. While it sheds light on science teachers' perspectives in Katsina State, Nigeria, the findings may not be fully generalizable to other contexts due to potential regional variations. The study's reliance on self-reported perceptions could introduce response bias. Additionally, the study focused on secondary school science teachers, limiting the insights gained from teachers in other subjects or educational levels. The choice of a descriptive survey design may limit the depth of understanding, as qualitative approaches could offer richer insights into teachers' experiences and motivations. Future research could explore the challenges and strategies for online assessment from broader perspectives, encompassing multiple subjects, educational levels, and geographic regions within Nigeria. Employing mixed-methods approaches could offer a more comprehensive understanding of teachers' experiences and attitudes. Further investigations could delve into the relationship between teachers' digital literacy levels and their perceptions of online assessment challenges, contributing to a nuanced understanding of the factors influencing these perceptions. Moreover, longitudinal studies could track the evolution of online assessment practices over time, capturing the lessons learned from the Nigerian COVID-19 experience and their long-term implications for education.

## Recommendations

Based on the study's outcomes, the following recommendations are proposed:
1. Infrastructure Enhancement: Acquiring and installing the latest technologies that ensure reliable internet connectivity in all secondary schools is crucial to mitigate connectivity-related challenges.

2. Mock Assessments: Organising mock assessments to familiarise students with online assessment techniques can aid in addressing concerns and ensuring smoother assessment experiences.

3. Feedback Mechanisms: Building mechanisms for learners to provide assessment feedback can lead to continuous improvement and address potential issues.

4. Flexible Communication: Offering students options to communicate their learning in comfortable ways should be considered to improve engagement.

5. Diverse Assessment Methods: Exploring varied online assessment methods, such as discussions and personal problem-solving activities, alongside traditional close-ended questions, can enhance engagement and learning.

6. Security Measures: Developing software that prevents access to other platforms during online assessment and implementing biometric logins can enhance assessment integrity.

7. Virtual Presence Monitoring: Creating a virtual network for teachers or invigilators to monitor online assessments can improve accountability.

8. Professional Development: Conducting frequent professional online assessment workshops and training for secondary school teachers can enhance their skills and confidence in online assessment methods.

To this end, the study underscores the importance of addressing challenges in online assessment to ensure effective learning and evaluation, especially during disrupted academic sessions due to the COVID-19 pandemic. The recommendations can guide educational institutions and policymakers in implementing measures to enhance online assessment practices and facilitate successful learning outcomes.

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