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Revamping Agricultural Science Practical Assessments in Nigeria: Lessons from IGCSE

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Abstract

This study explored the assessment of Agricultural Science practical examinations in Nigerian Senior Secondary Schools (SSCE) and compares them with the Cambridge International General Certificate of Secondary Education (IGCSE) approach. Kolb's Experiential Learning Theory was adapted to support the study. This theory supports learning through experience, reflection and active experimentation. The study adopted an exploratory sequential mixed-methods research design involving three phases: qualitative, secondary and quantitative research. Firstly, qualitative data were collected through an interview of eight selected persons in a focus group discussion (FGD) made up of Agricultural Science teachers, school administrators, and examiners. Afterwards, secondary data were retrieved from official educational websites in order to benchmark the structure and components of Agricultural Science practical assessments in Nigerian SSCE against those in IGCSE. At the final phase, the study conveniently sampled 122 respondents to provide quantitative validation for the qualitative findings and evidence from secondary sources. Results of the study indicates that SSCE Agricultural Science practical assessments are mainly theoretical with emphasis on the identification of specimens, structured questions and diagrams rather than authentic and field-based assessments. The comparisons done alongside IGCSE showed that this lack of projects, fieldwork and direct observation in the SSCE assessments stands out. Critical barriers like poor infrastructure, lack of funds, and insufficient teacher training were pinned down as limiting factors for the greater adoption of practical-based approaches. These findings imply that the inclusion of elements in Nigeria SSCE model such as field hands-on activities, investigative projects and digital evidence may work to the improvement of Agricultural Science education in Senior Secondary Schools in Nigeria. The study made recommendations to incorporate field assessments in the SSCE, adopt mixed-methods for assessment, improve on infrastructures and set up capacity-building programs for teachers. Closing these gaps would bring Agricultural Science education in Senior Secondary schools in Nigeria in line with international standards and sharpen the readiness of students for careers in agriculture and related areas.

Keywords: *Agricultural Science practical assessments, Senior Secondary School Certificate Examination (SSCE), Cambridge IGCSE, field-based assessment, Nigeria*

INTRODUCTION

The assessment of Agricultural Science practical in senior secondary education is essential for equipping students for professions in agriculture, teaching and related industries. Agricultural Science is a subject of the Senior Secondary Certificate Examination (SSCE) in Nigeria (West African Examinations Council,

WAEC, 2021). The philosophical model of Agricultural Science as a vocational or trade subject in Senior Secondary Schools in Nigeria (Ikeoji, 2018), aligns with Kolbe's experiential learning theory, where learning through hands-on activities or concrete experiences is emphasized (Baker, Robinson & Kolb, 2012). Studies reveal that the practical assessment component of this subject in Nigeria, which is crucial for skill acquisition and experiential learning, has faced criticism for prioritizing mostly theoretical assessments rather than hands-on activities (Osagiede & Alordiah, 2024; Akamobi, 2010; Afolabi, Ajayi & Adesanya, 2017).). Arguably, this deficiency presents a significant challenge to the vocational aspect of the subject, which aims to furnish students with the practical skills required for employment or advanced education in agriculture (Ogbuoka & Ajibo, 2023). However, there remains a research gap in systematically comparing Nigeria's practical assessment framework with globally recognized models like the IGCSE, to identify areas for reform and adaptation. This study addresses that gap by benchmarking current SSCE methods against a proven international model.

In Nigeria, the current approach to agricultural science practical assessments in SSCE conducted by both WAEC and National Examination Council (NECO) involves students identifying specimens, drawing and answering structured theoretical questions in a controlled environment. This seems to be an alternative to an authentic practical assessment or simply put, a structured examination testing students' practical experiences rather than real-life performance. In other words, this method may assess cognitive comprehension of practical experiences, but it does not accurately measure students' performance-based skills, which are essential talents emphasized in vocational agriculture education (Ekezie & Deebom, 2019). In authentic assessment, Gedera (2023) asserted that students demonstrate the same skills, knowledge and attributes they would have in an actual workplace. The author further argues that such assessments have positively impacted the quality and depth of student learning as well as skills development, employability, and workplace readiness. In the context of Agricultural Science in Nigeria, authentic assessment could involve tasks such as planting and managing a school farm plot, administering animal vaccines, soil testing using field kits, or preparing a marketing plan for farm produce real-life scenarios that mirror agricultural careers. Though some agricultural educators argue that this form of assessment integrates cognitive tasks (e.g., recalling uses or answering questions about the specimens) with psychomotor tasks (e.g., drawing specimens), there is yet a gap in its ability to fully measure students' ability to perform certain practical skills or fieldworks related to crop and animal production in real-life context. The disparity in curriculum objectives and assessment techniques has created a divide between students' theoretical knowledge and practical abilities in agriculture (Osagiede & Alordiah, 2024), so undermining the educational system's effectiveness in tackling real-world agricultural difficulties, starting from the Senior Secondary Schools. Hence, based on the submission of Osagiede and Alordiah (2024) and the observed gap in agricultural science practical assessment in senior secondary schools in Nigeria, there is an urgent need for a holistic framework to optimize student learning, curriculum and assessment integration Agricultural Science Education at any level.

Conversely, the British curriculum approach employs a more holistic and authentic approach to agricultural science practical assessment in the Cambridge General Certificate of Secondary Education (IGCSE). A content analysis of the current Agricultural Science Cambridge IGCSE syllabus (006, 2024-2025) by this study reveals that practical assessments are conducted through direct observation of students performing experiments, fieldwork and investigative research projects. The IGCSE practical assessment components includes at least four practical exercises and one practical investigative project. Moreso, the individual investigatory project includes hypothesis formulation, data collection, analysis, and a written report. The IGCSE assessment approach to Agricultural Science practical focuses on planning, evidence handling, deductions, recognition of limitations, and originality. These assessments are documented with evidence of photographs and videos, ensuring that both the process and outcomes of students' activities are properly assessed internally by teachers and externally moderated by the British Council. Teachers assess using a set of marking criteria (Responsibility, Initiative, Technique, Perseverance and Quality). Skill areas assessed encompass practical skills in technique, problem-solving, experimentation, with emphasis on methodical work, safety and result quality (Cambridge International Education, n.d). Arguably, this authentic approach to assessment does not only align with the vocational goals of the Agricultural Science

curriculum, but also fosters students' creativity, collaboration and analytical thinking. The IGCSE was chosen as a benchmark in this study because of its global credibility, structured assessment system, and emphasis on performance-based skills that reflect real agricultural practices. Its holistic model serves as a gold standard for evaluating and potentially transforming less practical-oriented systems like the Nigerian SSCE.

The disparity between the approaches adopted by WAEC and NECO, and the Cambridge IGCSE raises critical questions about the efficacy of Nigeria's Agricultural Science practical assessment methods. Evidence in literature has shown that adopting experiential learning strategies, such as those used in the British curriculum, can significantly enhance students' retention, understanding, and application of knowledge (Kolb, 2014). Therefore, by emphasizing direct involvement and reflection in secondary school Agricultural Education, experiential learning fosters deeper engagement and skill development, and qualities essential for modern agricultural practices (Arnol et al., 2006).). Furthermore, a comparative study of educational systems has revealed the need for localized adaptations of global best practices to ensure relevance and feasibility (Phillips & Schweisfurth, 2014). Adapting the British curriculum's Agricultural Science practical assessment strategies to the Nigerian context would offer a promising pathway to addressing the identified gaps of this study. However, the process requires careful consideration of Nigeria's unique educational, cultural and infrastructural constraints. Factors such as inadequate funding, lack of trained assessors, and limited resources in schools must be addressed to ensure the successful implementation of a revamped practical assessment system for a vocational subject like Agricultural Science (Onwusa, 2021). This study aims to investigate how the British curriculum's practical assessment strategies can be adapted to enhance the practical components of Agricultural Science in Nigeria. Arguably, by addressing the current challenges and identifying actionable strategies, this research seeks to bridge the gap between theory and practice in Agricultural Science education in Nigeria. The specific objectives of this study are to evaluate the current practical assessment methods used in Agricultural Science in Nigeria's Senior School Certificate Examinations (SSCE); to identify the disparities between Nigeria's Agricultural Science practical assessment methods and those of the British curriculum as applied in the International General Certificate of Secondary Education (IGCSE); to examine the feasibility of adapting the British curriculum's practical assessment strategies to the Nigerian context; and to identify strategies for enhancing the practical assessment of Agricultural Science in Nigeria's senior secondary schools.

THEORETICAL FRAMEWORK

1. Kolb's Experiential Learning Theory (ELT) and Agricultural Science Practical Assessment

David Kolb's Experiential Learning Theory (ELT) provides a useful framework for enhancing Agricultural Science practical assessments in Nigerian Senior School Certificate Examinations, drawing on the British curriculum approach. The ELT developed by David Kolb in 1984 reveals the way people learn by experience. The theory asserts that learning is a process by which knowledge is gained through knowledge transformation of an experience within a cyclical model (Figure 1) consisting of four different stages, namely: Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation (Dimou & Kameas, 2016; Passarelli & Kolb, 2011). Each of these stages plays a critical role in the whole learning process, particularly for at-the-place-of-work training settings such as Agricultural Science, where it becomes extremely difficult to acquire practical skills without doing them. This is where the ELT becomes more relevant in the argument that students should be more involved in the actual engagement of their learning environment towards better understanding and later retention of knowledge (Abdulwahed & Nagy, 2009; Konak et al., 2014).

At the Concrete Experience phase, students engage directly in an activity or task wherein the experience itself serves to immerse them into the subject matter. This stage is thus important as it provides material to reflect upon and to analyze (Hopkinson & Hogg, 2004; Botelho et al., 2015). For Agricultural Science assessments, this could involve students experiencing actual field work, carrying out activities such

as planting, harvesting or experimenting with crops and animal management practices. With regards to Reflective Observation, students are steered toward critical thinking about their experiences with regard to what worked, what did not work and why in the Agricultural Science practical tasks. This reflective activity is critical to developing critical thinking and a culture of lifelong learning (Tomkins & Ulus, 2015; Konak et al., 2014). For example, after completing a composting activity, students might reflect on the efficiency of decomposition in various organic matter types, drawing lessons from observed outcomes. The next stage, which is Abstract Conceptualization, refers to the stage where synthesizing beyond reflecting insights into broader concepts or theories. Here, students connect their practical experiences with theoretical paradigms that further their understanding (Richardson et al., 2019; Passarelli & Kolb, 2011) of principles underlying Agricultural Science. In Agricultural Science, this could involve linking observations from irrigation practices to principles of water conservation or soil science, thereby deepening conceptual understanding. Active Experimentation, which is the fourth stage if the theory entails taking students through the stages and giving them a chance to put everything into real-world contexts, testing their hypotheses, and practicing everything learned anew. This iterative process not only reinforces learning but also develops adaptability and problem-solving skills, which are crucial in addressing the unpredictable challenges of modern agriculture (Botelho et al., 2015). In the context of Agricultural Science practical assessments, this could include tasks such as planting maize, identifying soil types, conducting animal health checks, or operating basic farm tools. These direct, hands-on encounters provide students with real-world exposure to agricultural processes.

Kolb's ELT has been shown to enhance student engagement and learning outcomes, particularly when students participate in experiential learning activities (Abdulwahed & Nagy, 2011). Studies indicate that students who engage in practical, field-based learning outperform those who learn primarily through lectures, especially in complex fields like Agricultural Science (Abdulwahed & Nagy, 2009; Konak et al., 2014). Additionally, Kolb's model promotes the development of soft skills such as critical thinking, creativity, and collaboration, which are vital in agriculture's dynamic and problem-solving environments (Niranjan, 2024; Petkus, 2000).

Incorporating Kolb's ELT into Agricultural Science practical assessments in Nigeria's Senior School Certificate Examinations could help students integrate theoretical knowledge with practical skills. This approach, which mirrors the British curriculum's emphasis on experiential learning, will prepare students in Nigeria to address the evolving challenges of modern agriculture. However, the application of ELT in Nigeria is not without challenges. Contextual issues such as overcrowded classrooms, inadequate infrastructure, inconsistent curriculum implementation, and limited teacher training may hinder the full execution of all four stages of Kolb's model. Furthermore, time constraints within the school calendar can limit opportunities for repeated experimentation and reflection. Adapting the British curriculum's strategies to Nigeria requires addressing contextual barriers such as inadequate infrastructure, limited funding, and a shortage of trained assessors. ELT's flexible nature makes it particularly suitable for this adaptation, as it can be tailored to different learning environments while maintaining its core principles. For example, low-cost, locally available materials (e.g., recycled containers for nursery planting or indigenous crop varieties for experimentation) can be used for hands-on tasks. Additionally, digital tools such as smartphones can be employed to record and submit practical activities for teacher feedback or examination moderation purposes, thereby enhancing scalability.

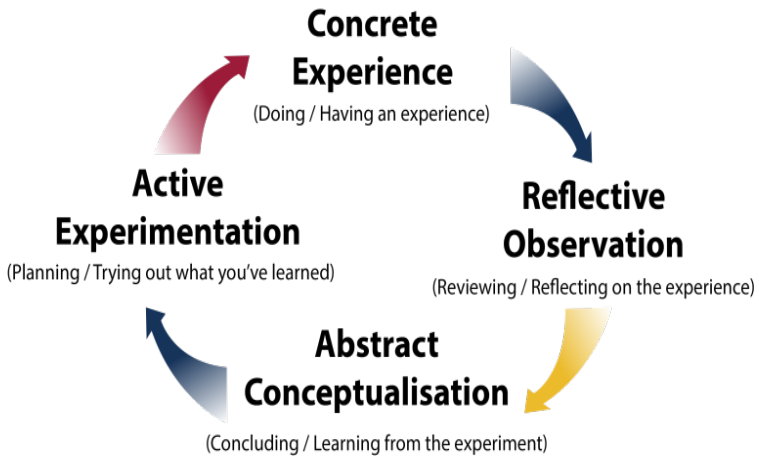

Figure 1 Kolb's experiential learning theory

METHODS

The researchers employed an exploratory sequential mixed-methods design, which consists of three distinct phases (qualitative, quantitative and secondary research). The first phase involved collecting qualitative data from a smaller, purposefully selected sample to explore the research problem in-depth. The second stage involved the retrieval of secondary data from the official websites of the Nigerian Educational and Research Development Council (NERDC), WAEC and International Cambridge Education (ICE). The third phase consisted of gathering quantitative data from a larger, randomly selected sample to validate the findings from the qualitative phase. The population of the study consisted teachers of Agricultural Science in Nigeria, school administrators and examiners. The sample of the study was 122 individuals comprising of teachers of Agricultural Science in Senior Secondary Schools, school administrators and examiners. For the quantitative phase, simple random sampling was employed to select 114 respondents, while at the first phase (qualitative), a purposive sampling technique was used by the researchers to select eight (8) respondents for a one-hour Focus Group Discussion (FGD). The respondents for FGD included two teachers of Agricultural Science involved in teaching the Nigerian Agricultural Science curriculum, two teachers of Agricultural science who teach both Nigerian and IGCSE syllabi in Nigeria, two school administrators and two WAEC/NECO Agricultural Science examiners. This approach ensured that the selected teachers had relevant expertise and experience with the two curriculum types being studied. The data collection for this phase involved a recorded FGD moderated by the researchers via Zoom using a semi-structured discussion guide with open-ended questions. The interview protocol included key themes such as: the relevance of current Agricultural Science practical assessment, perceived strengths and weaknesses of the SSCE and IGCSE practical exams, assessment structure and environment, teacher preparedness, student engagement, and strategies for enhancing the effectiveness of Agricultural Science practicals in Nigeria. This allowed for a flexible and in-depth exploration of the teachers' perceptions and experiences regarding the current Agricultural science practical assessment, challenges, differences between the Agricultural practical examinations in Nigerian SSCE and IGCSE and strategies for improvement. Participants were informed about the voluntary nature of their participation in the FGD, and their privacy and confidentiality were respected throughout the process. At the second phase, secondary data for this content analysis was retrieved from the official website of Cambridge International Education, NERDC and WAEC online repository for Agricultural Science Practical questions. Ten (10) criteria were adopted to evaluate and compare Agricultural science practical assessments in Nigerian SSCE and Cambridge IGSCE. These criteria included structure of assessment, skill areas assessed, nature of assessment, assessment documentation, investigation component, assessment moderation, assessment

environment, assessment focus, authenticity of assessment and teacher role in assessment. These criteria were chosen by the study based on their relevance to core educational assessment standards and their applicability in measuring practical competency and curriculum alignment. They also reflect key factors identified in existing literature on science practical assessment.

At the third phase of this study, a structured survey titled "Assessment of Agricultural Science Practical (AAP)" was developed by the researchers based on data retrieved from the FGD and literature, to gather quantitative data from larger sample of teachers of Agricultural Science. Part A of the questionnaire elicited data on demography of respondents, while Part B retrieved data on feasibility for SWOT analysis. This part was structured on a 5-point Likert scale. The key factors were categorized into Strengths, Weaknesses, Opportunities and Threats (SWOT). Each factor is rated on a scale of 1 to 5 (1 = least feasible, 5 = highly feasible), with an average score categorized into five decision standards. An average score between 4.00 and 5.00 was considered highly feasible, scores from 3.50 to 3.99 suggested feasibility, a range of 3.00 to 3.49 reflected moderate feasibility, scores between 2.50 and 2.99 indicated the least feasibility and any score below 2.50 is deemed not feasible. Part C, elicited data on strategies for enhancing Agricultural Science practical assessments in SSCE. The items were dichotomously scaled (YES-1, No-0). The questionnaire items were developed following a thorough curriculum and literature review and also insights from the FGD**.** To ensure the validity and reliability of the instrument for data collection, the semi-structured discussion guide and structured questionnaire were face-validated by a panel of five experts in Agricultural Science education and curriculum. Based on the input of the experts, content validity was further ensured by aligning the questions with the study objectives and curriculum benchmarks. Afterwards a pilot study was conducted to assess the reliability of the questionnaire, which resulted in a high Cronbach's alpha reliability coefficient of 0.87 on average, indicating good internal consistency based on based on standard reliability benchmarks recommended by Hussey et al. (2023). According to the authors a threshold of alpha values between 0.8 and 0.89 are deemed good, while 0.7 is acceptable. Qualitative data for this study was retrieved via recorded zoom during the FGD, while quantitative data was collected through an online questionnaire (via Google Forms) to ensure ease of access and completion by the respondents. Ethical considerations were upheld throughout, with participants providing informed consent before completing the survey. The qualitative data from the FGD were transcribed and analyzed thematically to identify key themes and patterns. A thematic and comparative analysis was performed on the data retrieved from the official websites of educational bodies to examine key differences between the Agricultural practical examinations in Nigerian SSCE and IGCSE. The quantitative data from the structured questionnaire were analyzed using descriptive statistics, such as simple percentage and frequency distributions, and average score of responses. Additionally, a SWOT analysis was conducted to examine the feasibility of adopting the IGSCE approach in the Nigerian context.

RESULTS AND DISCUSSION

1. Current Practical Assessment Methods Used in Agricultural Science in Nigeria's SSCE

Results in Table 1 reveals that the current agricultural science practical assessment methods in the SSCE heavily rely on specimen identification, drawing and structured theoretical questions, with all respondents confirming their use (100%). This confirms that the SSCE practical assessment heavily relies on theoretical approaches rather than hands-on application. Additionally, all respondents indicate that fieldwork and farm activities, investigative research projects, direct observation of practical tasks, internal moderation, and evidence-based evaluation (e.g., photographs/videos) are completely absent (100%), indicating a lack of real-world performance-based evaluations. Although laboratory practical is included in some cases, with 77.19% of respondents confirming their use, a notable 22.81% report their absence, indicating inconsistency in practical exposure across SSCEs. Furthermore, only 13.16% of respondents indicate that reporting is incorporated into the SSCE assessment process, implying that the majority of students do not engage in structured documentation of their practical work. This weakens the ability to track learning progress and

verify practical competence. All respondents also indicate that external moderation of the national exam is conducted (100%), while internal moderation is completely absent (100%). This suggests that assessment oversight is solely dependent on external examiners, which may limit opportunities for schools to ensure fairness and consistency in grading. The complete absence of evidence-based evaluation means there is no verifiable proof of students' practical work, further reducing the credibility of the assessment process.

Table 1 Current agricultural science practical assessment methods in SSCE

S/N	Assessment Method	YES	NO
		f (%)	*f* (%)
1	Specimen Identification	114 (100)	-
2	Drawing of Specimens	114 (100)	-
3	Structured Theoretical Questions	114 (100)	-
4	Fieldwork/Farm Activities	-	114 (100)
5	Laboratory Practical	88 (77.19)	26 (22.81)
6	Investigative Research Projects	-	114 (100)
7	Reporting	15 (13.16)	99 (86.84)
8	Direct Observation of Practical Tasks	-	114 (100)
9	Internal Moderation of National Practical Examinations	-	114 (100)
10	External Moderation of National Practical Examinations	114 (100)	-
11	Evidence-based Evaluation (Photographs/Videos)	-	114 (100)

Number of respondents (n) = 114

2. Theme 1: Inadequacy of Current Practical Assessments in Nigeria

A significant concern raised by the FGD participants was the inadequacy of the current practical assessment techniques in Nigerian SSCE. According to some teachers and school administrators, agricultural science practical assessments in national examinations have mostly been confined to theoretical tasks, specimen identification mainly, without preparing students for more hands-on application-oriented agricultural work. This view expresses the more general disconnection between what is covered in the curriculum and the actual practice of farming during practical examinations. Several teachers expressed frustration with the assessment's theoretical bias. One teacher noted, *"Agricultural Science practical examinations should not just be about identifying specimens. We need real-life field experiences that would be observed*." This opinion was also echoed by an examination official, who observed that, *"Students graduate without basic farm management skills because assessments are too theoretical, even in the national school exams."* Some administrators also complained about the structural hindrances in schools, which lack necessary facilities such as agricultural labs and demonstration farms. Similarly, a teacher explained that, *"The curriculum assumes students have access to agricultural labs and farms, but many schools do not even have demonstration farms,"* further underlining how this lack of resources limits students' exposure to hands-on learning experiences.

A more significant issue was expressed by another teacher, who revealed that, "*Many students complete secondary school without ever handling a hoe or experiencing soil testing procedures, even in national examinations. This is not how it is supposed to be. In Agricultural practical exams, students should do hands-on the farming exams and should be observed and scored.*" This critique suggests that the current system of Agricultural science practical assessment in SCCE is failing to equip students with basic skills needed for agricultural work, leaving them ill-prepared for further education or employment in the agricultural sector. Moreso, in addition to these issues are the national examinations, such as WAEC and NECO exams. As one teacher pointed out, "*WAEC and NECO examinations are not real-world performance-based or hands-on farm work experiences.*" These exams typically focus on theoretical knowledge and specimen identification, which do not reflect the practical skills required in the agricultural field. This gap highlights the urgent need for a shift toward practical, competency-based assessments.

3. Theme 2: Challenges to Implementing Agricultural Science Practical Assessments in SSCE

During the FGD, some barriers that could hinder an effective and hands-on practical assessment in Agricultural science during SSCE were identified. Some of the themes that emerged during the discussion include financial constraints, inadequate infrastructure and a shortage of trained assessors. One of the most pressing barriers is the lack of funding for agricultural labs and farm facilities. In particular, one school administrator observed that, *"Funding is a major problem… Schools cannot afford good agricultural labs and certain required farm facilities mentioned in the curriculum,"* thereby hindering the school's capacity to undertake the required practical, hands-on assessments expected in Agricultural Science education during SSCE. This problem is especially dire in rural schools, where the basic agricultural tools, irrigation systems and even the demonstration farms are most of the time missing. Similarly, a schoolteacher expressed that, *"Some rural schools do not have access to demonstration farms, irrigation systems, or even basic agricultural tools."* Furthermore, there is a lack of trained assessors who can conduct effective practical exams in secondary schools. An examination official commented, *"We lack trained assessors who can conduct practical exams effectively."* There are indications that there should be specialized training for both teachers and examiners in this area.

4. Comparative Analysis of Agricultural Science Practical Assessment in Nigerian SSCE and IGCSE

The secondary data for this content analysis was retrieved from the official website of Cambridge International Education, NERDC and WAEC online repository for Agricultural Science Practical questions. Data presented in Table 2 thematically compares the assessment criteria or methods used in the Nigerian Senior School Certificate Examination (SSCE) and the Cambridge International General Certificate of Secondary Education (IGCSE) Agricultural Science. It thematically indicates the key differences in 10 assessment criteria. The critical observations provide insights into the implications of each assessment approach. Data the Table shows the differences between SSCE and IGCSE Agricultural Science practical assessments, which indicates significant variations in structure, methodology and educational impact. SSCE employs a single-event practical assessment, where students answer four compulsory questions within a controlled 1½-hour session. In contrast, IGCSE adopts a continuous assessment approach, incorporating multiple practical exercises and an investigative project evaluated through direct observation and both internal and external moderation. This key difference suggests that SSCE's approach limits experiential learning, while IGCSE actively integrates hands-on practice throughout the course. The nature of tasks in both assessments further emphasizes this divide. Most of the assessments in SSCE regarding Agricultural Science are practical theoretical in nature as students have to identify different specimens, draw diagrams and answer questions, practically simulating what really goes on in agricultural practices rather than carrying out. On the other side, students engage directly in field activities on IGCSE, like soil analysis, irrigation installation and animal and crop care, where they are been observed by assessors. Comparatively, Nigerian SSCE concentrates on the theory of practical concepts, while IGCSE brings students into field-based or hands-on modes during examinations.

Similarly, the skill areas assessed reflect different educational priorities. The SSCE mainly aims at assessing the cognitive and psychomotor areas of functioning-the remembering of information, the labeling of structures, and the drawing of diagrams, while laying little weight on performance-based agricultural competencies. The IGCSE, however, evaluates problem-solving, experimentation, and technique evaluation. This means that presumably, WAEC lays more emphasis on keeping knowledge and IGCSE develops both theoretical understanding and practical skills. Assessment documentation also differs significantly. In Senior Secondary Schools in Nigeria, students are meant to maintain practical notebooks to record laboratory observations and field trips, focusing mainly on descriptions. In contrast, IGCSE students document their work using photographs, videos, written reports, and data analyses, thus developing an all-encompassing record of learning processes and outcomes. Such an approach ensures that IGCSE students have tangible evidence to back up their practical skills, whereas SSCE's documentation is inherently descriptive and not demonstrative.

One of the most striking differences is the investigative component. SSCE does not include formal investigative research, relying heavily on rote memorization and procedural recall. The model of SSCE (WAEC) does not have this dimension of scientific investigation and critical thinking developed. IGCSE has an appended element called *"Practical Investigation Project*," which demands that students generate hypothesis statements, collect and analyse data, and write reports about their investigations. This dimension helps students in the development of skills in scientific research and critical thinking. Assessment moderation also varies, with SSCE relying solely on external examiners using standardized grading criteria, limiting teacher involvement. In contrast, IGCSE incorporates internal teacher assessments alongside Cambridge-appointed moderators who review and validate scores. This blended approach in IGCSE ensures greater accuracy and fairness in grading while encouraging teacher participation in the assessment process. The practical environment in both systems further distinguishes the level of experiential learning. The SSCE practical assessments occur mostly in controlled situations, generally adopting static specimens, preserved samples, or illustrations, rather than emphasizing real-time activities. Nevertheless, in IGCSE, this procedure takes place in dynamic farm and laboratory situations in which students actively engage in hands-on agricultural work, such as planting, harvesting and equipment handling. This experiential approach allows IGCSE students to gain direct exposure to agricultural processes, whereas student in SSCE mostly engage with theoretical representations of such tasks.

Additionally, SSCE and IGCSE Agricultural science practical assessments diverge in focus. For example, SSCE emphasizes students' ability to conceptually explain practical activities (e.g., naming farm tools or identifying parts of a plant, farming or processing process) while IGCSE emphasizes application, requiring students to do and interpret scientific processes. In other words, SSCE students focus on understanding 'what' and 'why', while IGCSE students on 'how' and 'what if', providing sufficient impetus for further development of problem-solving and analytical skills. A particular concern with the SSCE assessment is authenticity because practical knowledge in this form is assessed by written responses and not by performing tasks directly. Students may be required to name agricultural pests but not demonstrate pest control measures. In contrast, IGCSE ensures students actively perform tasks, with their processes and outcomes observed and assessed against real-life agricultural contexts. This makes IGCSE's practical assessment more authentic and applicable to real-world scenarios. Finally, the role of teachers in assessment is significantly different. In fact, teachers really serve as facilitators in SSCE. They prepare students for their external examinations without ever designing practical assessments. IGCSE otherwise empowers teachers in a co-assessing role to observe, record and evaluate students' work throughout the course and this engagement makes the assessment more reliable and also encourages better integration of practical learning within the curriculum.

Table 2 Comparative Analysis of the Nigerian SSCE and IGCSE Practical Assessment in Agriculture

	Criteria	**SSCE**	**IGCSE**	**Critical Observations/Implications**
1	Assessment Structure	Paper 3: Practical assessment consists of four compulsory questions answered in a controlled environment within 1½ hours.	Continuous coursework: Involves four practical exercises and one investigative project, assessed through direct observation and internal and external moderation.	WAEC uses single-event testing; IGCSE adopts ongoing, process-based evaluations. WAEC's application of experiential learning is limited; IGCSE actively implements it through hands-on tasks.
2	Nature of Assessment	Tasks often involve identifying specimens, drawing diagrams, and answering structured questions. Real-life tasks like planting or animal care are often simulated.	Tasks include direct, hands-on agricultural tasks such as crop planting, soil analysis, animal care, and irrigation system setup.	WAEC tasks are theoretically practical; IGCSE emphasizes real-world agricultural tasks.

continued

3	Skill Areas Assessed	Focuses on cognitive and psychomotor skills like recalling information, specimen labeling, and drawing. Less emphasis on performance-based agricultural skills.	Assesses practical performance-based skills including technique, problem-solving, experimentation, and result quality.	WAEC prioritizes cognitive tasks; IGCSE assesses both cognitive and psychomotor domains.
4	Assessment Documentation	Students maintain practical notebooks documenting laboratory observations, field trips, and specimen descriptions.	Students document practical work with photographs, videos, written reports, and data analyses, ensuring detailed evidence of work processes and outcomes.	WAEC records focus on descriptions; IGCSE documentation captures the full learning process.
5	Investigation Component	No formal investigative component: assessments mainly test rote memorization of procedures and identification tasks.	Involves a Practical Investigation Project requiring hypothesis formulation, data collection, analysis, and a 1000-word report.	WAEC lacks scientific research practice; IGCSE actively cultivates investigative skills.
6	Assessment Moderation	Assessed by WAEC-appointed examiners based on uniform grading criteria. Limited teacher involvement in assessment design.	Teachers conduct internal assessments, while Cambridge moderators review and validate scores with clear performance descriptors.	WAEC uses external-only assessment; IGCSE blends internal and external evaluation for better accuracy.
7	Practical Environment	Conducted in controlled classrooms or school farms, often involving static setups like soil samples, preserved specimens, and illustrations.	Conducted on-site in farms and laboratories, with students performing real-time tasks like planting, harvesting, and equipment use.	WAEC relies on indirect experience; IGCSE promotes direct experiential learning.
8	Assessment Focus	Prioritizes theoretical understanding of practical activities (e.g., identifying specimen parts or naming farm tools).	Prioritizes application of practical knowledge with an emphasis on scientific processes and result interpretation.	WAEC focuses on the 'what' and 'why'; IGCSE focuses on the 'how' and 'what if'.
9	Authenticity of Assessment	Assesses practical knowledge through written tasks rather than actual task performance (e.g., naming pests rather than managing them).	Students perform tasks directly with processes observed, recorded, and evaluated against real-life agricultural contexts.	WAEC tasks lack authentic application; IGCSE ensures authentic task performance.
10	Teacher Role in Assessment	Teachers act mainly as classroom facilitators; their assessment role is limited to preparing students for external exams.	Teachers play an active role in assessment by observing, documenting, and evaluating practical tasks throughout the course.	WAEC underutilizes teachers; IGCSE empowers teachers as co-assessors.

5. Theme 3: Benefits of the IGCSE Practical Approach

In contrast to the Nigerian SSCE, evidence from FGD indicated that Nigerian teachers with experiences in Agricultural Science IGCSE spoke highly of its emphasis on real-world and authentic assessment techniques. The IGCSE model prioritizes applied learning and examinations, where students engage in farm work, experiments, and document their findings with reports, pictures, and videos. Teachers noted that this practical approach fosters a deeper understanding of agricultural science and develops critical skills needed in the field. One teacher described the benefits of the IGCSE's practical focus by expressing that: *"The investigative research project component of IGCSE encourages students to think critically and solve problems."* This focus on critical thinking is enhanced by a hands-on approach, where students are assessed on their ability to conduct experiments, analyze data, and provide tangible evidence of their work. One teacher stated that, *"Practical observation and documentation through photos and videos give a clearer picture of students' abilities,"* pointing out that visual and documentary evidence of practical work offers a more comprehensive assessment of student skills. Teachers who had experience with both the IGCSE and Nigerian curricula noted the stark contrast in practical assessments. One teacher noted that: *"...Unlike what happens in Nigerian SSCE, students in IGCSE are assessed on their ability to design and conduct field or farm experiments or works"*, thus revealing the IGCSE's hands-on approach during practical examinations.

Additionally, another teacher explained, *"The use of experimental farm plots and digital reporting tools ensures students engage in hands-on activities,"* which makes the learning process more interactive and prepares students for real-world agricultural practices. Teachers who taught both curricula agreed that integrating elements of the IGCSE model could significantly enhance Agricultural Science assessments in Nigeria. The IGCSE model's emphasis on farm work, experiments, and detailed reports was seen as a potential pathway for improving the practical aspect of Nigerian agricultural education.

6. Feasibility of Adopting British Curriculum Approach in Nigerian SSCE

Table 3 evaluates the feasibility of adapting the British curriculum's practical assessment strategies to the Nigerian context. It is structured around key factors categorized into strengths, weaknesses, opportunities, and threats (SWOT analysis). Each factor is rated on a scale of 1 to 5 (1 = least feasible, 5 = highly feasible), with an average score categorized into five decision standards as stated at the methods section. The implications are provided for each factor.

The SWOT analysis presented in Table 3 gives credence to the complexity of applying the British curriculum practical assessment strategies in Nigeria. Strengths such as curriculum integration, teacher acceptance and student readiness demonstrate a strong foundation for adoption, with high average scores indicating a willingness among teachers and students to embrace practical methods and a potential for seamless integration into the existing curriculum. Conversely, the identified weaknesses, which are those of the environment being poorly ready in the infrastructure sense, an absence of trained assessors, funding constrictions, and rigidity on the curriculum end, present tremendous challenges standing pretty strongly, as highlighted by their average low scores. These constraints point toward areas requiring significant investment for infrastructure, human resources, and essentially systemic flexibility.

On the positive side, moderately high opportunities of curriculum modification, teacher professional development, and policy support initiatives are seen as pathways to successful implementation. These, therefore, seem actionable possibilities in closing gaps. However, the threats arising from resistance to change, unstable funding, maintenance of infrastructure, and inconsistencies in policy carry a risk that will undermine the adoption process, as indicated by their lower scores. In summary, these highlight that some challenges must be pushed through but would not be considered insurmountable for implementing the British practical assessment strategies in Nigeria. Arguably, while there is clear potential for integrating innovative assessment strategies (like the IGCSE approach) into the Nigerian Senior School Certificate Examination (SSCE) system, addressing the identified weaknesses and threats will be critical to ensuring successful and sustainable implementation.

Table 3 Frequency distribution on the feasibility of adopting british curriculum approach in Nigerian SSCE

S/N	Key Factors	1	2	3	4	5	Average Score	Decision	Implications
	STRENGTHS (S)								
1	Curriculum Integration	5	10	30	40	29	3.68	Feasible	Can integrate IGCSE into SSCE with some adjustments
2	Teacher Acceptance	3	2	5	20	84	4.58	Highly Feasible	High willingness to adopt new assessments
3	Student Readiness	2	5	15	50	42	4.05	Highly Feasible	Students adaptable to practical methods and assessments
	WEAKNESSES (W)								
4	Infrastructure Readiness	20	25	30	25	14	2.90	Least Feasible	Major facility shortages need addressing
5	Availability of Trained Assessors	10	20	30	35	19	3.29	Moderately Feasible	More training programs required
6	Funding	5	30	40	25	14	3.11	Moderately Feasible	Financial support is insufficient but improvable
7	Curriculum Rigidity	25	30	25	20	14	2.72	Least Feasible	Resistance to change remains a challenge
	OPPORTUNITIES (O)								
8	Curriculum Modification	0	5	10	40	59	3.64	Feasible	New assessment approach can be introduced successfully
9	Teacher Professional Development	14	5	13	30	52	3.89	Feasible	Training programs can be effective
10	Policy Support Initiatives	2	10	25	45	32	3.83	Feasible	Policymaker support can be leveraged
11	Technological Integration	12	15	20	40	27	3.13	Moderately Feasible	Potential exists but infrastructure needed
	THREATS (T)								
12	Resistance to Change	5	20	40	30	19	3.16	Moderately Feasible	Can be addressed with gradual transition
13	Funding Instability	10	29	39	25	11	2.76	Least Feasible	Inconsistencies pose a risk
14	Infrastructure Maintenance	20	40	30	20	4	2.54	Least Feasible	Major deficiencies in maintenance of facilities
15	Policy Inconsistencies	25	41	20	12	16	2.59	Least Feasible	Fluctuating policies create uncertainty

7. Strategies for Enhancing Agricultural Science Practical Assessment in Nigeria's SSCE

Results in Table 4 represent the respondents' views on strategies for enhancing Agricultural Science practical assessments in SSCE. The result reveals strong support for performance-based reforms in SSCE. The highest approval rates were for improving existing laboratories (80.7%), regular training for teachers and assessors (78.9%), and securing government and private sector funding (78.1%), highlighting the need for better infrastructure, professional development, and financial backing. While most respondents were in favor of hands-on learning approaches in SSCE, such as mandatory fieldwork (74.6%), investigative research projects (72.8%) and and mandatory mobile farms in urban schools (71.1%), there was some hesitations regarding fully replacing traditional assessments, as seen in the lower approval rates for abolishing paper tests (40.4%). This result suggests that successful implementation of a new approach to Agricultural Science Practical Assessments in Nigerian SSCE will require policy support, investment in

training and infrastructure and a gradual transition toward performance-based assessments to address feasibility concerns and stakeholder resistance.

Table 4 Frequency Distribution on Strategies for Enhancing Agricultural Science Practical Assessments in SSCE

S/N	Item Statement	YES	NO
		***f*(%)**	***f*(%)**
1	Introduction of mandatory fieldwork during SSCE	85 (74.6%)	29 (25.4%)
2	Regular training programs for teachers & assessors	90 (78.9%)	24 (21.1%)
3	Establishment of school-based agricultural laboratories	88 (77.2%)	26 (22.8%)
4	Improving existing school-based laboratories	92 (80.7%)	22 (19.3%)
5	Regular maintenance of farm infrastructures	86 (75.4%)	28 (24.6%)
6	Adoption of Investigative Research Projects	83 (72.8%)	31 (27.2%)
7	Government & Private Sector Funding Support	89 (78.1%)	25 (21.9%)
8	Adopting performance-based examinations	87 (76.3%)	27 (23.7%)
9	Mandatory use of mobile farms in urban schools	81 (71.1%)	33 (28.9%)
10	Abolishing paper tests during Agricultural Science Practical Assessment in SSCE (structured questions)	46 (40.4%)	54 (47.6%)
11	Assessing Agricultural Science Practical during SSCE through observations and moderated reports	84 (73.7%)	30 (26.3%)

8. Theme 4: Strategies for enhancing Agricultural Science Practical Assessments in SSCE

To address these challenges, the FGD participants proposed several policy interventions and strategies aimed at improving Agricultural Science Practical Assessments (ASPA) in SSCE. These suggestions focused on structural changes, financial investment, and teacher training to bridge the gap between theory and practice. One of the most significant policy recommendations was to make practical assessments mandatory in national exams. A teacher stated that, *"Government should make practical assessments compulsory and provide financial support,"* stressing the need for policy reforms that would ensure practical components are integrated into the national examination system. Increased collaboration with farms and agribusinesses was another key suggestion. *"Schools should partner with local farms to give students real-world exposure,"* said a teacher familiar with both curricula, advocating for partnerships that would provide students with direct agricultural experience and hands-on learning opportunities. This could help bridge the gap between classroom learning and practical farm work, which is essential for skill development. Furthermore, the importance of teacher training was emphasized. One teacher from the Nigerian curriculum highlighted, *"Teachers need workshops on handling practical sessions effectively,"* calling for professional development programs to ensure that educators are equipped to teach practical Agricultural Science skills. Moreover, providing agricultural labs and experimental plots within schools was seen as essential. *"We need funding for school farms and access to digital tools for documentation,"* said a teacher from the IGCSE curriculum, recognizing that modern infrastructure is critical to improving practical assessments.

9. Discussion

The study found that the current SSCE Agricultural Science practical assessments in Nigeria are predominantly theoretical, with students being assessed on specimen identification, drawing, and structured questions rather than hands-on agricultural tasks. This approach limits students' ability to develop essential agricultural skills, creating a gap between theoretical knowledge and practical application. According to Osagiede and Alordiah (2024), the lack of authentic practical assessments undermines the vocational objectives of Agricultural Science, which aim to prepare students for careers in farming, agribusiness, and related fields. A major finding of this study is that laboratory-based practical are inconsistent, with 22.81%

of respondents reporting that their schools do not conduct any form of practical sessions. In contrast, 77.19% indicated the presence of some form of practical activity, although these were often insufficient. Literature suggests that hands-on learning is essential for vocational education, as emphasized by Kolb's experiential learning theory (Baker et al., 2012). Practical activities such as soil testing, farm tool usage, and livestock management are necessary to develop the skills required in agricultural professions (Ogbuoka & Ajibo, 2023). However, the current SSCE assessment model does not mandate these activities, making it difficult to measure students' actual competencies (Ekezie & Deebom, 2019).

This study also found that key practical assessment methods such as fieldwork, investigative projects, direct observation, and evidence-based evaluation through photographs and videos are absent in SSCE examinations. Authentic assessment literature argues that students should demonstrate the same skills, knowledge, and attributes they would use in an actual workplace (Gedera, 2023). The absence of performance-based assessments in SSCE raises concerns about students' readiness for employment or further studies in agricultural science. Some identified barriers to achieving practical assessments included poor and insufficient infrastructure; inability to meet financial obligations; and a significant shortage of trained assessors. Most schools also lack a demonstration farm, irrigation systems, farming tools, and other necessary facilities for agriculture-learning. Budget limitations serve to prevent schools from investing in such resources. Additionally, some teachers lack the necessary training to conduct practical assessments effectively, resulting in an overemphasis on theoretical instruction as noted by Onwusa (2021).

A comparative analysis with the Cambridge IGCSE assessment model revealed significant differences in practical assessment approaches. The IGCSE model includes direct observation of students performing experiments, fieldwork, and investigative research projects which is published in the official website of the Cambridge International Education. Unlike the Nigerian SSCE, which relies solely on written exams lasting 1½ hours, the IGCSE model incorporates continuous assessment, requiring students to conduct soil tests, manage farm plots, and document findings with photographs and videos. These methods provide tangible evidence of students' skills, ensuring a more accurate evaluation of their competencies. The IGCSE also employs internal moderation, ensuring fairness and continuous monitoring of students' progress. The findings suggest that adopting a more practical-based assessment model, similar to the IGCSE, would enhance Agricultural Science education in Nigeria. Literature on experiential learning emphasizes that direct involvement in agricultural activities fosters problem-solving skills and deeper understanding (Kolb, 2014). Teachers' familiar with the IGCSE assessment model have praised its hands-on approach, noting that it aligns with the vocational goals of Agricultural Science while promoting creativity, collaboration, and analytical thinking (Arnold et al., 2006). The implications of these findings are significant for curriculum developers, teacher training institutions, and policymakers. Curriculum developers must revise the SSCE Agricultural Science curriculum to include mandatory hands-on activities and performance-based assessments. Teacher training institutions should update their training programs to equip educators with the skills necessary for conducting and evaluating practical tasks. Policymakers must allocate resources to improve infrastructure, provide learning materials and support the implementation of these revised assessments.

To address the gaps identified in this study, a holistic framework is required to optimize the integration of curriculum, assessment, and practical learning experiences. The disparity between SSCE and IGCSE assessment methods highlights the need for reform in Nigeria's Agricultural Science curriculum. Research suggests that localized adaptations of global best practices can enhance educational outcomes when aligned with local constraints (Phillips & Schweisfurth, 2014). While the British curriculum provides a promising model, the Nigerian adaptation curriculum has to take into account financial limitations and inadequate infrastructure with a lot of teacher training. Thus it will be feasible to consider a modified version of the IGCSE assessment approach which incorporates investigation projects, performance-based assessments, and digital documentation as means to adapt Nigeria-specific conditions. Addressing those infrastructural and financial constraints while bettering teacher training programs would, indeed, position Agricultural Science education in Nigeria to international standards and prepare students for careers in this field.

Regardless of the findings revealed by this study some limitations are obvious. For instance, the study focused on the perceptions of other educational stakeholders like teachers and few administrators neglecting that of students, so there was not any fact-finding from classroom implementation practices. Furthermore, with the selection of one or two schools from each state, there may not be an adequate representation of variability across the states. Future research should explore the effectiveness of pilot implementations of practical assessment reforms, assess student outcomes over time, and investigate region-specific challenges to implementation. Arguably, by addressing infrastructural and financial constraints and improving teacher training programs, Nigeria can gradually move toward a more robust and practical-oriented Agricultural Science education curriculum. Such reforms will align educational practices with the rest of the world and ensure that students are better equipped to participate productively in agricultural careers.

CONCLUSION

This investigation revealed that the practical assessment in SSCE Agricultural Science in Nigeria is poor in quality in that the method is too focused on theory and demonstration of field-based practical skills are neglected. Arguably, a lack of authentic, performance-based examinations denies students the ability to develop essential agricultural competencies, which runs counter to the vocational nature of the subject. Comparison with the British approach (IGCSE) sheds light on the merits of experiential learning and authentic assessment for deeper engagement and skill acquisition. The findings imply that the inclusion of elements in Nigeria SSCE model such as field hands-on activities, investigative projects and digital evidence may work to the improvement of Agricultural Science education in Senior Secondary Schools in Nigeria. Thus, a reform is needed to establish a practical mode of assessment while improving the infrastructure and training teachers so that Agricultural Science education in Nigerian secondary school fulfills local and international standards.

RECOMMENDATIONS

Based on the findings of this study, the following recommendations are made to enhance the quality and effectiveness of Agricultural Science Practical Assessment in Senior Secondary Schools in Nigeria. Foremost, the study recommends that examination bodies in Nigeria, such as the West African Examinations Council (WAEC) and the National Examinations Council (NECO), integrate field-based or hands-on tasks into the Agricultural Science Practical component of the Senior School Certificate Examination (SSCE). These tasks should reflect real-world agricultural practices and may include the use of farm tools, livestock management, crop production activities, and investigative projects. Given the spatial limitations often encountered in urban schools, this study further recommends the incorporation of alternative methods such as bucket, sack, and container farming to facilitate practical assessments. In addition, the study advocates for the adoption of a mixed assessment approach by Nigerian examination bodies. This approach should combine direct observation, continuous assessment through supervised fieldwork, and digital documentation, such as photographs and video recordings to ensure a more holistic and comprehensive evaluation of students' practical skills and competencies. Furthermore, the study recommends that both the federal and state governments provide essential facilities, tools, and infrastructure to support and promote the implementation of authentic, field-based practical assessments in Agricultural Science during the SSCE. Such investment is crucial to bridging the gap between theoretical knowledge and practical application. Lastly, it is imperative that the government, in collaboration with university administrators in Southeast Nigeria, organize regular in-service training programs for Agricultural Science teachers. These professional development initiatives will equip teachers with the necessary skills and

methodologies to effectively conduct internal, field-based practical examinations within their respective schools.

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DECLARATION OF GENERATIVE AI

During the preparation of this work, the author(s) used Research Rabbit in order to discover relevant papers, show connections between them and streamline the review process. After using this tool, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

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