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INSTRUCTIONAL TECHNIQUES FOR ENHANCING SKILL ACQUISITION AMONG DIGITALLY UNDERREPRESENTED ELECTRICAL/ELECTRONICS STUDENTS IN STATE-OWNED UNIVERSITIES IN RIVERS STATE

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Abstract: *The study examines instructional techniques for enhancing skill acquisition among digitally underrepresented Electrical/Electronics students in state-owned universities in Rivers State, Nigeria. The study adopted a descriptive survey design and comprised a population of 117 lecturers and final-year students of technical education. Census Subset (sampling) was applied to select 46 respondents (15 lecturers and 31 students) from the electrical/electronic technology option. Two research questions guided the study. The instrument for data collection was a structured 20-item questionnaire titled "Instructional Techniques for Skill Acquisition Questionnaire (ITSAQ)". The instrument was face- and content-validated by two experts in electrical/electronic technology and one expert in measurement and evaluation from Rivers State University, Port Harcourt. The Cronbach's Alpha was used to test the reliability of the instrument, yielding a coefficient of 0.87. Mean and standard deviation were used to answer the research questions. The study identifies and discusses effective instructional techniques including the contextualized learning, differentiated instruction, and mentoring programs which can foster practical skill acquisition, promote lifelong learning habits, improve academic performance, and enhance employability for digitally underrepresented students in the evolving technological workforce. The paper also highlights implementation challenges such as an outdated curriculum, financial constraints, and poor institution–industry partnerships that hinder the adoption and effectiveness of these approaches in higher education settings.*
Keywords: *Instructional techniques, Skill Acquisition, Digital underrepresentation and Electrical/Electronics.*

Introduction

Teaching and learning are closely linked processes that drive human development and societal transformation. In higher education, teaching goes beyond the mere transmission of information; it involves the deliberate organization of experiences, resources, and strategies that enable learners to acquire knowledge, develop competencies, and apply what they learn to real-life problems. In contemporary education, this process is increasingly shaped by digital technologies, because the workplace and society now demand graduates who can operate in technology-rich environments, think critically, and adapt to continuous innovation. This is especially true in electrical/electronics education, where the field has moved from largely analog systems to digital electronics, microprocessor-based devices, automation, renewable energy systems, smart grids, and computer-aided design and simulation (NBTE 2026).

The transformation of electrical/electronics practice has made skill acquisition more complex and more technology dependent. Modern electrical and electronic systems now require competence in digital logic, embedded systems, power electronics, programmable control, instrumentation, and simulation tools that support design, testing, and troubleshooting before physical implementation. Recent NBTE curriculum updates reflect this shift by including new and emerging areas such as Electronic System Maintenance Craft Practice, Industrial Electronics, Solar Photovoltaic Installation, and courses that introduce digital electronics and computer fundamentals into technical training. These developments show that

electrical/electronics education is no longer limited to circuit assembly and basic wiring, but now demands digital fluency and practical competence with contemporary tools and systems (NBTE 2024) Skill acquisition in this context refers to the process through which learners develop the practical ability to design, simulate, install, maintain, and troubleshoot electrical/electronic systems with confidence and accuracy. For digitally underrepresented students, however, this process may be constrained by limited access to computers, internet connectivity, simulation software, smart laboratories, and adequate exposure to digital learning environments. Such students are often disadvantaged not only by socio-economic conditions, but also by the digital divide that separates them from the tools and experiences required in today's technology-driven learning environment. As a result, instructional approaches that depend solely on conventional chalk-and-talk methods may not adequately support their practical competence or readiness for the modern labour market (UNESCO, FG, NBTE 2026)

In Nigeria, the need for digitally responsive technical education has become more urgent as national policy and institutional reforms increasingly emphasize digital transformation, blended learning, and industry-relevant skills. NBTE has introduced digital quality assurance, mandatory skills qualifications, and technology-enabled learning expectations for TVET institutions, while the Federal Ministry of Education has also highlighted digital skills development as part of its current education agenda. These policy directions indicate a clear movement toward practical, flexible, and digitally supported training that can improve employability and innovation among learners in technical and vocational programmes. For electrical/electronics students in state-owned universities in Rivers State, this means that lecturers must adopt instructional techniques that are not only effective, but also aligned with digital-era expectations and inclusive skill development (NBTE 2026)

Instructional techniques therefore play a central role in enhancing skill acquisition among digitally underrepresented electrical/electronics students. Techniques such as demonstration, Contextualized learning, Differentiated Instructions, Mentoring program, guided practice, project-based learning, problem-based learning, cooperative learning, blended instruction, and simulation-assisted teaching can help bridge the gap between theory and practice. In particular, simulation software such as Multisim and MATLAB offers learners opportunities to visualize circuit behavior, test designs safely, analyze system performance, and build competence before handling physical components. Recent studies have shown that simulation-based learning improves understanding of electrical circuit concepts and supports practical training when physical laboratories are limited or inaccessible (Strathclyde 2026)

The relevance of these instructional techniques is further strengthened by current developments in smart grids and automation, which are reshaping the electrical power and electronics landscape. Smart grids depend on intelligent monitoring, digital control, communication technologies, and automated systems that require learners to understand both electrical principles and digital applications. Likewise, automation in industrial and domestic systems demands competence in sensors, control systems, programmable logic, and digital interfaces. These realities make it necessary for university lecturers to use teaching methods that foster hands-on skill acquisition, digital problem-solving, and adaptability to emerging technologies (NBTE 2026)

State-owned universities in Rivers State have an important responsibility in preparing students for this changing environment. However, digitally underrepresented electrical/electronics students in such institutions may not fully benefit from modern technical education if instructional delivery remains tied to obsolete practices or if digital tools are underused. There is therefore a pressing need for lecturers to adopt instructional techniques that promote access, participation, competence development, and practical mastery in a digital learning environment. Against this background, the present study examines instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.

Statement of the Problem

The rapid transition from analogue electrical systems to digital electronics, automation, smart-grid technologies, embedded systems, and computer-based design has changed the skills expected of electrical/electronics Students, graduates and lecturers. Contemporary students are required to understand digital circuits, programmable control, electronic instrumentation, power electronics, and computer-aided simulation in addition to traditional electrical principles. Consequently, university instruction that relies mainly on lectures, outdated equipment, and limited practical activities may not adequately prepare students for the technological demands of modern industry. Despite the growing importance of digital competence, many state-owned universities continue to experience inadequate laboratory facilities, obsolete equipment, limited internet connectivity, insufficient computers, and restricted access to relevant software. The problem is particularly serious among digitally underrepresented students, including learners from low-income households and those with limited prior exposure to computers and digital learning resources. The World Bank (2020) identified inadequate access to relevant skills, technology, and quality learning opportunities as continuing constraints on employability and skills development in Nigeria. The effectiveness of Simulation depends on the ecturers' competence, students' access to devices, and the availability of appropriate instructional strategies. Research on engineering education indicates that simulation-supported and virtual laboratory approaches can complement physical laboratory work and improve students' understanding of practical concepts (Heradio et al., 2016). However, the use of such approaches may remain limited in some university electrical/electronics programmes. If appropriate instructional techniques are not adopted, the transition to digital electronics, automation, smart grids, and computer-based engineering practice may further widen the skills gap between advantaged and disadvantaged learners. The problem, therefore, is that instructional practices, facilities, and digital learning opportunities in some state-owned universities in Rivers State may not sufficiently support the acquisition of contemporary electrical/electronics skills among digitally underrepresented students. There is a need to identify instructional techniques such as Contextualized learning, Differentiated Instructions, Mentoring program, demonstration, project-based learning, collaborative learning, problem-based learning, and simulation-assisted teaching using Multisim and MATLAB that can improve students' practical competence and participation. This study consequently seeks to examine instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.

Purpose of the Study

The purpose of this study is to explore instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State, Nigeria. Specifically, the study is conducted to:

1. Determine the instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.
2. Determine the challenges associated with the usage of these instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.

Research Questions

1. What are the instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State ?
2. What are the challenges associated with the usage of these instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State ?

Literature Review

Digitally Underrepresented Students

The expression digitally underrepresented students refers to learners who have limited access to digital devices, reliable electricity, affordable internet services, current software, digital learning materials, and supportive technology-enabled learning environments. Digital underrepresentation is not determined by income alone. It may also be associated with students' location, gender, disability, prior educational experience, digital literacy, language, and the availability of institutional support. The digital divide therefore involves differences in access to technology, the ability to use technology effectively, and the benefits obtained from its use in education (van Deursen & van Dijk, 2019; UNESCO, 2023).

In electrical/electronics education, digital underrepresentation can have serious consequences because contemporary learning increasingly depends on computers, circuit-simulation platforms, online resources, digital measurement instruments, and computer-aided design. Students who have limited experience with such technologies may struggle to understand digital circuits, microcontrollers, programmable control, automation, power electronics, smart-grid systems, and simulation-based analysis. They may also experience reduced confidence when required to use software such as Multisim and MATLAB. This can create a gap between students who have previously used digital tools and those encountering them for the first time at university.

The problem is particularly important in state-owned universities, where students may experience inadequate laboratories, insufficient computers, unstable electricity supply, limited internet connectivity, and obsolete instructional equipment. The World Bank (2020) identified weaknesses in the availability and relevance of skills development as continuing challenges in Nigeria. Similarly, UNESCO (2023) emphasizes that technology improves learning only when it is supported by appropriate infrastructure, teacher competence, relevant content, and equitable access. Thus, providing software alone may not eliminate digital underrepresentation; lecturers must also use instructional techniques that guide students progressively from basic digital literacy to independent technical application.

Digitally underrepresented electrical/electronics students may display several characteristics:

1. Limited prior experience with computers, simulation software, and digital instruments.
2. Inadequate access to personal devices, internet services, and electronic learning resources.
3. Difficulty interpreting digital circuit diagrams, simulation outputs, graphs, and technical data.
4. Dependence on lecturer demonstrations because of restricted opportunities for independent practice.
5. Low confidence in using technology to solve electrical/electronics problems;
6. Interrupted learning resulting from financial pressures, unreliable electricity, or competing responsibilities; and
7. A need for Contextualized learning, differentiated Instructions, mentoring program, practice, feedback, and peer support.

These characteristics should not be interpreted as evidence of low ability. Rather, they indicate differences in access, preparation, and learning opportunities. Effective instruction should therefore diagnose students' entry-level competence and provide gradual, inclusive support. In the context of the present study, digitally underrepresented students are electrical/electronics students who have limited access to, experience with, or confidence in using digital technologies required for contemporary technical learning.

Skill Acquisition in Electrical/Electronics Education

Skill acquisition is the progressive development of knowledge, practical ability, problem-solving competence, accuracy, confidence, and professional judgement through instruction and practice. In electrical/electronics education, skill acquisition involves more than memorizing definitions or reproducing circuit diagrams. It includes the ability to interpret technical information, select appropriate

components, construct and simulate circuits, use measuring instruments, diagnose faults, observe safety procedures, and evaluate the performance of electrical/electronic systems.

The technological transformation of the electrical/electronics sector has expanded the range of skills required of graduates. Traditional analogue knowledge remains important, but students must also understand digital logic, microcontrollers, sensors, embedded systems, automation, programmable control, power electronics, renewable-energy technologies, communication systems, and smart-grid applications. The International Energy Agency (2023) notes that digitalization is transforming electricity systems through technologies such as sensors, communications, data systems, automation, and intelligent control. Electrical/electronics education must therefore provide learning experiences that connect foundational theory with contemporary digital applications.

For digitally underrepresented students, skill acquisition may be hindered when practical learning depends exclusively on expensive equipment or irregular access to physical laboratories. Simulation can provide a complementary environment in which students practise circuit design, observe system behaviour, test parameters, and correct errors before working with physical components. However, simulation should not be treated as a complete replacement for physical laboratory practice. Effective programmes should integrate simulation, physical experimentation, design projects, troubleshooting, and reflection. Such integration can support both conceptual understanding and psychomotor development.

The National Board for Technical Education (NBTE, 2026) emphasizes the importance of curricula that respond to current occupational requirements and emerging technical competencies. Therefore, skill acquisition among electrical/electronics students should be assessed through authentic tasks, including circuit construction, simulation, measurement, fault diagnosis, system design, technical reporting, and project presentation. This approach gives students opportunities to demonstrate what they can do, rather than merely what they can recall.

Instructional Techniques for Enhancing Skill Acquisition

Instructional techniques are the practical methods lecturers use to organize content, present information, guide activities, support participation, and assess learning. For digitally underrepresented electrical/electronics students, effective techniques should be learner-centred, practical, flexible, and responsive to differences in prior digital experience. No single technique is sufficient for all learning objectives. The strongest approach is usually a planned combination of explanation, Contextualized learning, differentiated Instructions, mentoring program, demonstration, simulation, physical experimentation, collaboration, feedback, and independent application. For this study, the contextualized learning, differentiated Instructions, and mentoring program amongst others will be concentrated on and discussed here.

Contextualized and Project-Based Learning

Contextualized learning connects academic concepts with authentic situations, community needs, and workplace applications. It can make difficult electrical/electronics concepts more meaningful by showing students how they are used in practical settings. Examples include using local power-supply challenges to teach voltage regulation, using solar installations to explain photovoltaic systems, using household energy consumption to introduce measurement and control, or using water-pumping systems to demonstrate automation.

Project-based learning extends contextualized learning by requiring students to investigate a problem and produce a practical outcome. A project might involve designing a regulated power supply, simulating an automatic lighting system, developing a basic solar-charge controller, constructing a digital alarm, or

modelling a smart-energy monitoring system. Projects promote integration of theory, design, simulation, construction, teamwork, documentation, and presentation.

The approach is particularly relevant to digitally underrepresented students because it provides a meaningful reason to use digital tools. Instead of learning MATLAB or Multisim as isolated software packages, students use them to solve recognizable technical problems. Lecturers should structure projects according to students' levels of preparedness, provide clear criteria, and ensure that access to devices and software does not unfairly determine success. Group work may be useful, but individual contributions should also be assessed.

Differentiated Instruction and Scaffolding

Differentiated instruction involves adjusting content, learning processes, learning resources, products, or support according to students' readiness, interests, and learning needs. Tomlinson (2017) explains that differentiation is not the creation of an entirely different curriculum for every student; rather, it is responsive planning that provides appropriate routes to common learning goals.

In electrical/electronics education, lecturers can differentiate instruction by:

1. beginning with diagnostic activities to identify students' digital and electrical knowledge;
2. providing basic, intermediate, and advanced circuit tasks;
3. combining verbal explanations, diagrams, demonstrations, videos, and hands-on activities;
4. offering step-by-step templates before assigning open-ended designs;
5. allowing students to demonstrate learning through practical products, simulations, technical reports, or oral explanations;
6. providing additional tutorials for students with limited software experience; and
7. extending advanced students through more complex automation, control, or smart-grid projects.

Scaffolding is closely related to differentiation. It involves temporary support that is gradually removed as students gain competence. A lecturer may initially provide a complete circuit diagram, later provide only the design requirements, and finally ask students to develop and justify their own design. This progression helps students develop independence without being overwhelmed by the complexity of the task.

Mentoring program

Mentoring is a structured developmental relationship in which a more experienced lecturer, professional, graduate, or senior student supports a less experienced learner. In electrical/electronics education, mentors can help students understand difficult concepts, develop study routines, use simulation software, select projects, identify internship opportunities, and connect classroom learning with professional practice.

A university-based mentoring programme should have clear objectives, appropriate mentor preparation, regular meetings, and mechanisms for monitoring progress. Mentors may support students through:

1. orientation to university laboratories and digital learning platforms;
2. tutorials in basic computer use, circuit simulation, and technical documentation;
3. guidance on academic planning and project selection;
4. information about internships, professional bodies, competitions, and industrial visits;
5. discussions about employability and emerging technologies; and
6. encouragement during periods of financial, academic, or personal difficulty.

Mentoring should not be limited to informal advice. Institutions can establish mentor–mentee schedules, learning goals, progress records, referral procedures, and periodic evaluations. Industry-linked mentoring may be particularly useful because it exposes students to automation, renewable energy, instrumentation, telecommunications, smart-grid systems, and other areas of current practice. However, mentors should receive guidance on ethical boundaries, inclusion, confidentiality, and appropriate referral of serious welfare concerns.

Simulation-Assisted Instruction

Simulation-assisted instruction involves the use of software to model, visualize, test, and analyse systems before or alongside physical implementation. Multisim can help students construct virtual circuits, select components, apply instruments, observe waveforms, and examine circuit responses. MATLAB can support mathematical modelling, signal analysis, control-system analysis, power-system studies, data visualization, and selected smart-grid applications. Simulation is valuable because it permits repeated practice and immediate observation of results. Students can change component values, introduce faults, test alternative designs, and compare outputs without damaging physical equipment. It can also help lecturers present abstract concepts such as transient response, frequency behaviour, control systems, and power-flow relationships more clearly. Research on virtual and remote laboratories indicates that digital laboratory environments can increase access to experimentation and complement conventional laboratory work (Heradio et al., 2016).

For simulation to enhance skill acquisition, lecturers should use it within a structured instructional sequence:

1. Explain the relevant concept and learning objective.
2. Demonstrate the software interface and procedure.
3. Provide a guided simulation task.
4. Require students to predict results before running the model.
5. Ask students to compare simulation results with theoretical calculations.
6. Where possible, reproduce the circuit physically and compare measured results.
7. Require students to interpret errors, modify the design, and document their conclusions.

This sequence prevents students from treating simulation as a button-clicking exercise. It also develops conceptual understanding, digital fluency, design judgement, and troubleshooting ability. Since software licences and computer access may be limited, institutions can combine scheduled laboratory sessions, open-source alternatives, offline resources, shared devices, and carefully organized group activities.

Feedback and Authentic Assessment

Feedback is essential for developing technical competence. Students need to know whether their circuit connections, calculations, simulation procedures, measurements, safety practices, and explanations are correct. Effective feedback should be timely, specific, constructive, and linked to clearly stated performance criteria. Hattie and Timperley (2007) describe effective feedback as information that helps learners understand their present performance, the desired standard, and the next steps required for improvement.

Authentic assessment is appropriate for electrical/electronics skill acquisition because it evaluates performance in conditions that resemble real technical practice. Suitable assessment tasks include:

1. designing and simulating a circuit to meet stated specifications;
2. constructing and testing the circuit;
3. diagnosing an intentionally introduced fault;
4. interpreting measured and simulated results;
5. producing a technical report;
6. explaining design decisions; and
7. working collaboratively while demonstrating individual competence.

Rubrics can improve transparency by assessing criteria such as design accuracy, safety, component selection, software use, troubleshooting, measurement, documentation, teamwork, and technical communication. Multiple low-stakes assessments may be more supportive than a single final practical examination, especially for students who are developing digital confidence.

Relevance to Electrical/Electronics Education in Rivers State

The use of contextualized, differentiated, simulation-assisted, and mentoring techniques is relevant to state-owned universities in Rivers State because the region has significant connections with electricity generation, energy services, oil and gas, telecommunications, industrial automation, manufacturing,

marine activities, and renewable-energy development. These sectors require graduates who can combine theoretical understanding with practical digital competence. Lecturers should therefore connect instruction with local and national technical challenges. Students may investigate power reliability, solar-energy systems, energy monitoring, industrial control, electronic safety, communication infrastructure, or automation in small enterprises. Using local contexts can make learning meaningful while encouraging students to consider how electrical/electronics knowledge can support community development and entrepreneurship.

Nevertheless, instructional innovation must be supported by institutional conditions. Universities need functional laboratories, adequate computers, software access, reliable electricity, internet connectivity, lecturer training, technical support, and maintenance plans. Without these conditions, the effectiveness of instructional techniques may be limited. The study is therefore justified because it can provide evidence on the techniques that lecturers use, the extent to which those techniques enhance skill acquisition, and the challenges that affect their implementation among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.

Methodology

Descriptive survey design was used for the study whose population comprised of 117 (42 lecturers and 75 final year students of technical education from Rivers State University and Ignatius Ajuru University of Education, Port Harcourt). A Census subset approach (sampling) was used to select from the population, 46 respondents (15 lecturers and 31 students) in electrical/electronic technology option. Two research questions guided the study. The instrument for data collection was a 20-item questionnaire titled "Instructional Techniques for Skill Acquisition Questionnaire (ITSAQ)". The questionnaire was designed on 5-Likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (DA) and Strongly Disagree (SD) corresponding to numerical values of 5, 4, 3, 2 and 1 respectively. The instrument was face and content validated by 2 experts in electrical/electronic technology and one expert in measurement and evaluation from Rivers State University Port Harcourt. Cronbach's Alpha was used to test the reliability of the instrument and a coefficient of 0.87 was obtained. A total of 46 copies of the instrument was distributed to the respondents and only 42 was retrieved from the respondents (14 lecturers and 28 students). Thus, the 42 questionnaires were used for data analysis. Mean and standard deviation were used to answer the research questions. Hence, it was decided that an item with a calculated mean value equal to or greater than 3.00 was accepted while an item with a calculated mean value below 3.00 was rejected. Standard deviation values close or wide apart were used to determine the homogeneity in the opinion of the respondents.

Results and Analysis

The findings of the study are presented in tables according to research questions as shown below:

Table 1: Mean and Standard Deviation on Instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State

S/N	Item Statement	Lecturers			Students		
		$\overline{X_1}$	SD_1	Decision	$\overline{X_2}$	SD_2	Decision
1.	Digitally underrepresented electrical/electronic students are taught using contextualized learning technique.	4.50	0.5	Agree	4.60	0.49	Agree
2.	Contextualized learning is used to teach students electrical design and drafting	4.75	0.43	Agree	4.40	0.55	Agree

3.	Electrical energy consumption by consumers as a topic is taught using real life illustrations	4.50	0.50	Agree	4.49	0.50	Agree
4.	Collaborative projects in electrical and electronics courses are usually executed by students	4.25	0.43	Agree	4.70	0.46	Agree
5.	Designing of electrical/electronic circuits and troubleshooting systems are usually carried out by students	4.50	0.50	Agree	4.43	0.49	Agree
6.	Conceptualized learning prepares students for future work demands	4.28	0.43	Agree	4.89	0.46	Agree
7.	Differentiated instruction allows educators to modify content, process, and assessment methods to meet the needs of digitally affected students	4.50	0.50	Agree	4.74	0.44	Agree
8.	Provision of adequate feedback on students' assessment encourages students struggling in technical areas of electrical and electronics.	4.75	0.43	Agree	4.56	0.50	Agree
9.	Pairing students with experienced professionals or senior students can enhance their learning experiences.	4.25	0.43	Agree	4.66	0.47	Agree
10.	Mentorship provides vital support, guidance, and resources that contribute to academic success and professional development	4.75	0.43	Agree	4.73	0.44	Agree
	Grand mean and SD	**4.50**	**0.46**		**4.62**	**0.48**	

Table 1 revealed that both electrical/electronic lecturers and final year students in the two state- owned universities in Rivers State agreed with all the items as seen from the mean values of both categories of respondents. This showed that the item statements represent instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State, Nigeria. The standard deviation values ranging from 0.46 to 0.48 show closeness in the responses of the respondents.

Table 2: Mean and Standard Deviation on Challenges associated with the usage of instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State.

S/N	Item Statement	Lecturers			Students		
		$\overline{X_1}$	SD_1	Decision	$\overline{X_2}$	SD_2	Decision
11.	Outdated curriculum often affects the implementation of modern instructional techniques.	4.60	0.55	Agree	4.62	0.56	Agree
12.	Most lecturers are not implementing project-based learning due to paucity of funds	4.53	0.44	Agree	4.45	0.55	Agree
13.	Poor institution-industry partnership affects the	4.40	0.50	Agree	4.49	0.52	Agree

	implementation of modern instructional techniques						
14.	Prototyped assessment method does not allow students demonstrate their understanding in ways that align with their strengths.	4.25	0.45	Agree	4.71	0.43	Agree
15.	Poor technology usage affects students' achievement tremendously.	4.50	0.50	Agree	4.44	0.48	Agree
16.	Absence of structured mentorship affects students learning negatively.	4.20	0.42	Agree	4.90	0.47	Agree
17.	Inadequate industrial exposure limits the acquisition of technical skills among Digitally underrepresented students	4.45	0.52	Agree	4.75	0.48	Agree
18.	Poor grouping strategies affects the learning outcome of digitally underrepresented students.	4.76	0.45	Agree	4.58	0.51	Agree
19.	Inadequate continuous professional development of lecturers affects the quality of teaching/learning in universities in Rivers State.	4.26	0.43	Agree	4.66	0.48	Agree
20.	Poor workshops and networking events impair interactions between mentors and students.	4.77	0.44	Agree	4.72	0.45	Agree
	Grand mean and SD	**4.47**	**0.47**		**4.63**	**0.49**	

Table 2 indicated that both electrical/electronic lecturers and final year students in the two state-owned universities in Rivers State agreed with all the items as seen from the mean values of both categories of respondents. This showed that the item statements represent challenges associated with the usage of instructional techniques for enhancing skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State, Nigeria.The standard deviation values ranging from 0.47 to 0.49 show homogeneity in the responses of both categories of respondents.

Discussion of Findings

The findings in Table 1 reveal that contextualized learning, differentiated instruction, and mentoring amongst others enhance skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State. These techniques enable students to connect electrical/electronics theories with practical applications, develop confidence in using digital tools, and participate actively in circuit design, simulation, construction, testing, and troubleshooting.

This finding agrees with Heradio et al. (2016), who noted that virtual and remote laboratories can expand students' access to practical experimentation and support laboratory learning. The use of Multisim and MATLAB can therefore provide students with opportunities to simulate circuits, observe system responses, test alternative designs, and identify faults before working with physical equipment. Such tools are especially useful for digitally underrepresented students who may have limited access to well-equipped laboratories. However, simulation should complement rather than completely replace physical practical activities.

The finding is also consistent with Tomlinson (2017), who explained that differentiated instruction enables lecturers to accommodate students' different levels of preparedness, interests, and learning needs. Providing step-by-step demonstrations, guided simulation exercises, videos, circuit diagrams, practical projects, and varied assessment methods can help students progress from basic digital skills to more complex activities involving automation, digital electronics, control systems, and smart-grid technologies. Similarly, contextualized and project-based learning can make instruction more meaningful by linking lessons to practical challenges such as solar-energy systems, unstable power supply, automatic lighting, energy monitoring, and industrial control.

The findings in Table 2 show that outdated curricula, inadequate laboratories, obsolete equipment, insufficient computers, unreliable electricity, poor internet connectivity, limited access to simulation software, inadequate funding, weak university–industry relationships, poor implementation of project-based learning, insufficient lecturer training, lack of structured mentoring, and inadequate internship opportunities constitute major challenges. These conditions limit students' exposure to current electrical/electronics technologies and reduce their opportunities to practise digital design, simulation, automation, and fault diagnosis.

The finding agrees with UNESCO (2023), which emphasizes that educational technology can improve learning only when learners have equitable access to infrastructure, relevant digital content, and competent teachers. Similarly, the World Bank (2020) identified weaknesses in Nigeria's skills-development system and emphasized the need for relevant, high-quality training. Therefore, providing computers or software without reliable electricity, internet access, technical support, and trained lecturers may not substantially improve skill acquisition.

Generally, the findings indicate that modern instructional techniques can enhance the skill acquisition of digitally underrepresented electrical/electronics students, but their effectiveness depends on supportive institutional conditions. Universities should update curricula, improve laboratories, train lecturers in emerging technologies, provide access to Multisim and MATLAB, strengthen industry partnerships, introduce authentic practical assessments, and establish structured mentoring and internship programmes. These measures will help students develop the digital and practical competencies required for employment and further professional development.

Conclusion

Skill acquisition among digitally underrepresented electrical/electronics students in state-owned universities in Rivers State require innovative instructional techniques that address their unique challenges. By implementing contextualizing education, differentiating instruction, and fostering mentorship, educators are ready to create a more inclusive and effective learning environment. Addressing these challenges will not only enhance educational outcomes but also contributes to the overall development of the Electrical/ Electronics workforce and improve their employability opportunities.

Recommendations

The following recommendations were drawn from the findings of the study:

1. Educators should design curricula that address local challenges or needs, such as energy distribution or renewable energy solutions since engaging students with relevant projects, would enable them see the direct impact of their studies on the society.
2. Lecturers in state-owned universities in Rivers State should adopt the use of project-based learning (PBL) since it is an effective way to contextualize education.
3. Institutions should establish partnerships with local industries to enhance contextualized learning.
4. Lecturers should endeavor to use technology to create simulations or virtual labs that can help contextualize learning in a way that is accessible to all students.

5. Lecturers should strive to use flexible grouping strategies to create dynamic learning environments, hence promoting inclusive lifelong learning.
6. Lecturers in universities should incorporate a range of assessment methods such as projects, presentations, and traditional exams to allows students demonstrate their understanding in ways that align with their strengths.
7. Educators should engage in continuous professional development that focused on differentiated instruction techniques as this can boost the training of students.
8. Lecturers should create student-centered classrooms that prioritize students' choices and voices.
9. Educators should create structured mentorship programs with clear goals, training for mentors, and regular assessment can enhance the experience for both mentors and mentees.
10. Lecturers can pair students with mentors who share similar academic interests or career goals. This alignment fosters engagement and relevance, increasing the likelihood of positive outcomes.
11. Lecturers should organize workshops and networking events to facilitate interactions between mentors and students.

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