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# Learning Spaces and Instructional Facilities on Students Learning Outcomes in Technology Education in Universities of Education in Southwest, Nigeria

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**Abstract.** This study investigated the learning spaces and instructional facilities on students' learning outcomes in Technology Education in universities of education in Southwest Nigeria. A descriptive survey research design was used for the study. Three research questions and Three hypotheses were developed and tested at the 0.05 level of significance to guide the study. The study population consisted of 170 respondents, comprising 20 Technology Education lecturers and 150 Part Three students from Ekiti State University, Ado Ekiti, and Bamidele Olumilua University of Education, Science and Technology, Ikere Ekiti. No sampling technique was applied, as the entire population was considered manageable. Data were collected using a self-constructed questionnaire titled Learning Spaces and Instructional Facilities on Students' Learning Outcomes in Technology Education (LSIIFTE), structured on a 4-point rating scale. The instrument underwent face validation by three experts and was pilot-tested to ensure clarity and suitability. Reliability was established using the Cronbach-Alpha and test–retest methods, yielding a reliability coefficient of 0.81. Data analysis involved mean and standard deviation for research questions and t-test for hypotheses. Findings indicated that learning spaces were largely perceived as inadequate in quality, safety, and functionality, while instructional facilities were relatively available and utilized. However, neither variable showed a strong direct influence on learning outcomes, suggesting the importance of mediating factors such as teaching strategies and lecturer competence. The study recommends upgrading learning environments, improving facilities, and strengthening lecturer capacity for enhanced student outcomes.

**Keywords:** Learning Spaces Instructional Facilities, Learning Outcomes, Technology Education.

## 1. Introduction

Technical and Vocational Education and Training (TVET) in the universities of education in Nigeria are at the heart of preparing individuals for gainful work, equipping students with the practical skills and knowledge they need to be productive and employable, and contributing meaningfully to technological development and economic growth. In technology education, learning goes beyond understanding ideas in theory; students are expected to put knowledge into practice and perform real tasks that mirror what happens in the workplace. As a result, where and how learning takes place whether in classrooms, workshops, laboratories, maker spaces, or through digital platforms plays a crucial role in shaping how well students learn and how effectively they develop practical skills.

Technology Education occupies a unique position in contemporary education because it bridges theoretical knowledge with practical and hands-on skill development. Unlike purely theoretical disciplines, effective learning in technology education depends largely on students' direct interaction with tools, machines, equipment, and digital technologies within well-designed learning environments such as classrooms, workshops, laboratories, studios and virtual platforms. These learning spaces provide the setting in which abstract concepts of technology education are transformed into practical competencies,

creativity is nurtured, and problem-solving skills are developed.

Learning spaces whether physical, virtual, or hybrid, it plays a crucial role in shaping how students engage with instructional contents and with one another. Well-organized workshops, flexible classrooms, and technology-enabled learning environments encourage collaboration, experimentation, and active participation, all of which are essential for meaningful learning in technology education programmes. Ogunbote, Dawodu, Adegunle and Adenuga (2025) noted that merging technologies will directly impact students learning outcomes across all areas; cognitive, psycho-motor and affective in Nigeria Universities of Education. Similarly, instructional facilities such as modern tools, functional machines, adequate consumables, and reliable information and communication technology (ICT) infrastructure support the effective delivery of the curriculum and enhance students' opportunities for deliberate practice and skill mastery (Hanaysha, 2023; UNESCO, 2023).

Despite the recognized importance of learning spaces and instructional facilities, many universities of education particularly in developing countries such as Nigeria, Ghana, Togo among others continue to face significant challenges in providing and maintaining these resources. In several contexts, technology education curricula are ambitious and aligned with global industry standards, yet the physical and digital infrastructure required to implement them effectively is often inadequate, outdated, or poorly maintained. This mismatch between curriculum expectations and available facilities limits students' exposure to practical experiences, weakens instructional delivery, and ultimately compromises graduates' preparedness for the workplace (Andrade, 2024; Raheef, 2024).

Against this backdrop, it has become increasingly important to examine how learning spaces and instructional facilities influence students' learning outcomes in Technology Education in universities of education. Understanding the extent to which the design, availability, and quality of these facilities affect academic achievement and practical skill development will provide valuable insights for technology educators, administrators, curriculum developers and policymakers both at the Federal and State ministries of education seeking to improve teaching and learning in technology education programmes in the universities of education.

### 1.1 Statement of the Problem

Technology Education is designed to equip learners with both theoretical understanding and practical skills necessary for technological innovation and workforce participation. However, in many educational institutions, the realization of these objectives is constrained by inadequate learning spaces and insufficient instructional facilities. Common challenges include obsolete or insufficient workshop equipment, overcrowded or poorly organized learning spaces, unsafe laboratory conditions, limited ICT infrastructure for simulations and blended learning, and inadequate teacher training in the effective use of available resources.

These deficiencies have been linked to reduced opportunities for hands-on practice, lower levels of student engagement, poor performance in skills-based assessments, and weak outcomes during industrial training or workplace attachments (Raheef, 2024; Nja, 2023; UNESCO, 2023). Despite these concerns, there is limited empirical evidence that clearly explains how different aspects of learning spaces and instructional facilities individually and collectively affect students' cognitive and practical learning outcomes, particularly within developing-country contexts.

As a result, educational policymakers and institutional administrators often lack reliable, context-specific evidence to guide decisions regarding infrastructure investment, facility improvement, and pedagogical reform in Technology Education. This study seeks to address this gap by systematically examining the relationship between the quality and availability of learning spaces and instructional facilities and students' learning outcomes in Technology Education, with the aim of providing evidence-based recommendations for improving teaching, learning, and graduate competence.

### 1.2 Purpose of the Study

The main purpose of this study was to investigate the learning spaces and instructional facilities on students learning outcomes in technology education in universities of education in southwest, Nigeria. Specifically, the study sought to find out:

- the influence of the quality, adequacy, safety and functionality of learning spaces influence Technology Education in universities of education in southwest, Nigeria.
- the extent to which instructional facilities are available and adequately utilized in Technology Education classrooms and workshops in universities of education in southwest, Nigeria.

- the level of students' learning outcomes in Technology Education in universities of education in southwest, Nigeria.

### 1.3 Research Questions

The following questions guided the study:

- To what do the quality, adequacy, safety and functionality of learning spaces influence Technology Education in universities of education in southwest, Nigeria?
- To what extent are instructional facilities available and adequately utilized in Technology Education classrooms and workshops in universities of education in southwest, Nigeria.
- What is the level of students' learning outcomes in Technology Education in universities of education in southwest, Nigeria.?

### 1.4 Hypotheses

The following null hypotheses will be tested at the 0.05 level of significance:

**$H_{01}$:** There is no significant relationship between learning spaces and students' learning outcomes in Technology Education in universities of education in South West Nigeria.
**$H_{02}$:** There is no significant relationship between instructional facilities and students' learning outcomes in Technology Education in universities of education in South West Nigeria.
**$H_{03}$:** There is no significant difference in the influence of learning spaces on students learning outcomes in technology education in universities of education in southwest Nigeria.

## 2. Literature Review

This review examines recent empirical and theoretical studies on the relationship between learning spaces, instructional facilities, and students' learning outcomes in Technology Education. The discussion is organized around four key themes: learning spaces, instructional facilities and equipment, technology-enhanced learning and teacher competence, and gaps in existing research.

### 2.1 Learning Spaces

This can be Physical, Virtual, and Hybrid. Contemporary literature emphasizes that learning spaces extend beyond traditional classrooms and workshops to include virtual and hybrid environments that support flexible and student-centered learning. Learning spaces are now understood as deliberately designed environments that influence how students interact with content, instructors, peers, and technology (Elkington, 2025). Studies suggest that flexible classroom arrangements, properly zoned workshops, and safe laboratory layouts promote collaboration, active learning, and efficient supervision during practical sessions.

In technology and STEM education, hybrid learning spaces that combine physical practice with digital simulations and online resources have been shown to enhance conceptual understanding and practical competence. When learning spaces are thoughtfully designed and aligned with instructional goals, students demonstrate higher levels of engagement, improved coordination during group tasks, and deeper understanding of technological concepts.

### 2.2 Instructional Facilities, Equipment, and Practical Outcomes

Instructional facilities are central to the effectiveness of Technology Education because they provide the tools and materials required for skill acquisition. Empirical studies in technical and vocational education consistently report a positive relationship between the availability and condition of instructional facilities and students' performance in skills-based assessments and workplace practicums (Raheef, 2024; Nja, 2023). Adequate equipment enables repeated practice, experimentation, and error correction—processes that are essential for mastering technical skills.

Conversely, poorly equipped or obsolete workshops limit students' hands-on experience and reduce opportunities for meaningful practice. In such environments, students often rely heavily on theoretical instruction, resulting in lower assessment scores and weaker performance during industrial attachments or internships. Recent regional studies, including those conducted in Nigerian technical and technology education institutions, identify shortages of tools, consumables, and routine maintenance as persistent barriers to achieving curriculum objectives (Raheef, 2024).

### 2.3 Technology-Enhanced Learning, ICT Resources, and Teacher Competence

The integration of ICT and technology-enhanced learning (TEL) has become increasingly prominent in technology education. Large-scale reviews and meta-

analyses indicate that ICT can positively influence learning outcomes when it is purposefully integrated into teaching and supported by competent instructors (UNESCO, 2023; Hanaysha, 2023). Digital tools, simulations, and virtual laboratories can complement physical facilities, especially where resources are limited.

However, the literature also cautions that the mere presence of ICT infrastructure does not guarantee improved learning outcomes. Without appropriate pedagogical strategies, classroom management, and teacher competence, technology use may distract students and reduce learning effectiveness. As such, teacher expertise and the instructional use of facilities emerge as critical mediating factors that determine whether learning spaces and facilities translate into improved student outcomes.

### 2.4 Gaps and Limitations in Existing Research

Although existing studies establish clear associations between learning spaces, instructional facilities, and learning outcomes, several limitations remain. Many studies rely on cross-sectional designs, self-reported data, and relatively small samples, making it difficult to draw strong causal conclusions. Recent reviews also highlight a shortage of longitudinal and experimental research that examines how specific facility-related factors influence learning processes over time in technology education contexts.

Additionally, much of the high-quality research originates from high-income countries, while empirical studies from developing contexts—where infrastructure challenges are often more pronounced—remain limited in scope and scale (Andrade, 2024; Elkington & Dickinson, 2025). These gaps underscore the need for context-specific research that examines how deficiencies in learning spaces and instructional facilities contribute to skill gaps and reduced learning outcomes in Technology Education.

## 3. Methodology

This study examined the learning spaces and instructional facilities influence students' learning outcomes in Technology Education in (TVET) institutions. The study was carried out in three Universities of Education in Southwestern Nigeria, adopting a descriptive survey research design. This design was considered appropriate because it allows for the systematic collection of data on respondents' perceptions and experiences without manipulating study variables, thereby providing an accurate description of existing conditions and practices (Manjunatha, 2019). The study population consisted of 170 respondents, comprising 150 TVET students and 20 Technology Education teachers from the selected institutions. Given the relatively small and manageable population size, a census approach was adopted, and all identified respondents participated in the study. Data were collected using a self-developed questionnaire titled "Learning Spaces and Instructional Facilities on Students' Learning Outcomes in Technology Education in TVET Institutions (LSIIFTE)." The questionnaire contained 45 items measured on a four-point rating scale ranging from: Strongly Agree (SA) – 4, Agree (A) – 3, Disagree (D) – 2, Strongly Disagree (SD) – 1. The questionnaire items were aligned with the study's research questions and subjected to face validation by three experts in department of industrial technical education, Ekiti State University, the reliability of the instrument was established using Cronbach's Alpha, yielding a coefficient of 0.82, which indicates a high level of internal consistency. The copies of questionnaire were personally administered by the researchers to ensure proper clarification of items where necessary and were retrieved immediately after completion to achieve a 100% response rate. This approach enhanced the credibility and completeness of the data collected. Three research questions and three corresponding null hypotheses guided the study. Descriptive statistics, including mean and standard deviation, were used to answer the research questions, while the hypotheses were tested using the independent samples t-test at the 0.05 level of significance. A mean score of 2.50 and above was interpreted as acceptable, whereas mean scores below 2.50 were considered unacceptable. For hypothesis testing, a null hypothesis was retained when the calculated t-value was less than the critical t-value and rejected when the calculated t-value exceeded the critical t-value.

## 4. Results

**Research Question 1:** To what extent do the quality, adequacy, safety and functionality of learning spaces influence in Technology Education in universities of education in southwest, Nigeria?

**Table 1:** Mean and Standard Deviation Responses on Quality, Adequacy, Safety and Functionality of Learning Spaces influence in Technology Education in Universities of Education in Southwest, Nigeria.

| S/N | Statements | Technology Education Lecturers | | | Students | | |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Decision | Mean | SD | Decision |
| | Classrooms provide enough space for Technology Education activities. | 1.80 | 0.98 | Disagree | 1.43 | 0.71 | Disagree |
| | Workshops are well designed to support practical learning. | 2.10 | 0.89 | Disagree | 1.30 | 0.69 | Disagree |
| | Learning spaces are comfortable and well-ventilated. | 1.85 | 0.72 | Disagree | 1.37 | 0.69 | Disagree |
| | Seating arrangements promote interaction and collaboration among students. | 1.40 | 0.80 | Disagree | 1.53 | 0.88 | Disagree |
| | There are enough classrooms and workshops to accommodate all students. | 1.45 | 0.86 | Disagree | 1.47 | 0.88 | Disagree |
| | Learning spaces are flexible and adaptable for different teaching methods. | 1.30 | 0.78 | Disagree | 1.20 | 0.40 | Disagree |
| | Safety measures in workshops are sufficient to protect students. | 2.00 | 0.63 | Disagree | 1.47 | 0.88 | Disagree |
| | Classrooms are equipped to support group and collaborative activities. | 1.35 | 0.79 | Disagree | 1.23 | 0.67 | Disagree |
| | Practical areas are organized to allow smooth workflow. | 2.10 | 0.62 | Disagree | 1.30 | 0.69 | Disagree |
| | Learning spaces encourage creativity and problem-solving. | 1.30 | 0.78 | Disagree | 1.37 | 0.71 | Disagree |
| | Cluster mean/SD | 1.67 | 0.79 | | 1.37 | 0.71 | |

**Table** 1 shows the results of the Quality, Adequacy, Safety and Functionality of Learning Spaces influence in Technology Education in Universities of Education in South West Nigeria, from the results all the items has mean scores below the criterion mean of 2.5, indicating that all the items 1-10 listed to answer the research question 1 were rejected by the respondents. The standard deviation values of 0.40 -0.98 indicates that the respondents are homogeneous in their responses to the items raised. This implies that both technology education Lecturers and students unanimously disagreed on all the items listed.

**Research Question 2**: To what extent are instructional facilities available and adequately utilized in Technology Education classrooms and workshops in universities of education in southwest, Nigeria?

**Table 2:** Mean and Standard Deviation Responses on instructional facilities available and adequately utilized in Technology Education classrooms and workshops in universities of education in southwest, Nigeria.

| S/N | Statements | Technology Education Lecturers | | | Students | | |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Decision | Mean | SD | Decision |
| | Instructional facilities are sufficient to cover all topics in Technology Education. | 2.10 | 0.89 | Disagree | 2.17 | 0.78 | Disagree |
| | Practical equipment and tools are available in adequate quantity. | 2.10 | 0.88 | Disagree | 2.13 | 0.62 | Disagree |
| | Machines and equipment in workshops are in good working condition. | 2.15 | 0.85 | Disagree | 2.00 | 0.73 | Disagree |
| | Teachers make effective use of the available instructional facilities. | 1.55 | 0.80 | Disagree | 1.20 | 0.40 | Disagree |
| | Students have regular access to instructional facilities during lessons. | 1.50 | 1.81 | Disagree | 1.30 | 0.69 | Disagree |
| | Technological aids (computers, projectors, smart boards) are available when needed. | 1.70 | 1.00 | Disagree | 1.23 | 0.67 | Disagree |
| | Laboratories and workshops are Well-equipped for practical exercises. | 1.96 | 1.15 | Disagree | 1.83 | 0.64 | Disagree |
| | There are enough resources to support both individual and group work. | 1.70 | 1.00 | Disagree | 1.97 | 0.55 | Disagree |
| | Instructional facilities are updated to reflect current technology trends and practices. | 1.50 | 0.80 | Disagree | 1.83 | 0.64 | Disagree |
| | Materials and consumables for practical lessons are readily available. | 1.45 | 0.80 | Disagree | 1.93 | 0.25 | Disagree |
| | Cluster mean/SD | 1.87 | 0.89 | | 1.76 | 0.60 | |

Table 2 revealed that all the items on the instructional facilities available and adequately utilized in Technology Education classrooms and workshops in universities of education in southwest, Nigeria as perceived by technology education lecturers and students had their mean scores above the real limits of 2.50. it depicts that all the items were disagreed. The standard deviation values of 0.25 – 1.81 indicates that the respondents are homogeneous in their responses to the items raised. This implies that both technology education lecturers and students unanimously agreed on all the items listed.

**Research Question 3:** What is the level of students' learning outcomes in Technology Education in universities of education in southwest, Nigeria.?

**Table 3:** Mean and Standard Deviation Responses on the level of students' learning outcomes in Technology Education in universities of education in southwest, Nigeria.

| S/N | Statements | Technology Education Lecturers | | | Students | | |
|---|---|---|---|---|---|---|---|
| | | Mean | SD | Decision | Mean | SD | Decision |
| | Students can apply the practical skills they have learned effectively. | 1.85 | 0.72 | Disagree | 1.97 | 0.55 | Disagree |
| | Students perform well in theoretical assessments. | 1.40 | 0.80 | Disagree | 1.90 | 0.66 | Disagree |
| | Students perform well in practical assessments. | 2.10 | 0.89 | Disagree | 1.20 | 1.20 | Disagree |
| | Students understand Technology Education concepts clearly. | 1.30 | 0.78 | Disagree | 1.97 | 0.55 | Disagree |
| | Learning spaces and instructional facilities help improve understanding of the subject. | 1.35 | 0.79 | Disagree | 1.30 | 0.63 | Disagree |
| | Students can complete tasks independently using their learned skills. | 2.40 | 0.97 | Disagree | 1.63 | 1.02 | Disagree |
| | Students collaborate effectively during practical sessions. | 2.00 | 0.62 | Disagree | 1.87 | 0.55 | Disagree |
| | Students are confident when performing technical tasks taught in class. | 2.30 | 0.70 | Disagree | 1.37 | 0.71 | Disagree |
| | Students are motivated to learn more because of the available facilities. | 1.47 | 0.88 | Disagree | 1.97 | 0.55 | Disagree |
| | Technology Education lessons help improve students' problem-solving skills. | 1.37 | 0.71 | Disagree | 1.83 | 0.64 | Disagree |
| | Cluster mean/SD | 1.75 | 0.79 | | 1.71 | 0.63 | |

**Table** 3 showed that Technology Education lecturers generally viewed level of students' learning outcomes in Technology Education in universities of education in southwest, Nigeria negatively, disagreeing with all the items (21–30). From the results all the items have mean scores below the criterion mean of 2.5, indicating that all the items 21-30 listed to answer the research question 3 were rejected. This implies that both technology education Lecturers and students unanimously disagreed on all the items listed. The standard deviation values of 0.55 -0.97 indicates that the respondents are homogeneous in their responses.

## Hypotheses

**$H_{o1}$:** There is no significant relationship between learning spaces and students' learning outcomes in Technology Education in universities of education in South West Nigeria.

**Table 4** t-test analysis on mean responses of students and lecturers on between learning spaces and students' learning outcomes in Technology Education in universities of education in Southwest, Nigeria

| Group | N | Mean | SD | Df | t-cal | t-crit | Decision |
|---|---|---|---|---|---|---|---|
| Lecturer | 20 | 1.67 | 0.79 | 168 | 1.75 | 1.87 | Fail to reject |
| Students | 15 | 1.37 | 0.71 | | | | |

Table 4 indicated that learning spaces did not have a statistically significant influence on students' learning outcomes in Technology Education. The independent samples t-test showed that the calculated t-value ($t = 1.75$) was lower than the critical t-value ($t = 1.97$) at the 0.05 level of significance, leading to the acceptance of the null hypothesis. This finding suggests that both lecturers and students generally perceived that the quality, adequacy, safety, and functionality of learning spaces were not major determinants of students' learning outcomes in Technology Education.

**$H_{o2}$:** There is no significant relationship between instructional facilities and students' learning outcomes in Technology Education in universities of education in South West Nigeria.

**Table 5** t-test analysis on mean responses of students and lecturers on instructional facilities and students' learning outcomes in Technology Education in universities of education in South West Nigeria.

| Group | N | Mean | SD | Df | t-cal | t-crit | Decision |
|---|---|---|---|---|---|---|---|
| Lecturer | 20 | 1.87 | 0.89 | 168 | 0.72 | 1.97 | Fail to reject |
| Students | 150 | 1.76 | 0.60 | | | | |

Table 5 revealed that the t-test conducted to examine the relationship between instructional facilities and students' learning outcomes in Technology Education revealed that there was no statistically significant difference between lecturers' and students' perceptions at the 0.05 significance level ($t = 0.72$, $df = 168$, $p > 0.05$). This indicates that both groups perceived those instructional facilities, such as teaching aids, laboratory equipment, and other learning resources, did not have a strong or direct impact on students' learning outcomes.

**$H_{03}$:** There is no significant difference in the influence of learning spaces on students learning outcomes in technology education in universities of education in southwest Nigeria.

**Table 6** t-test analysis on mean responses of students and lecturers on influence of learning spaces on students learning outcomes in technology education in universities of education in Southwest Nigeria

| Group | N | Mean | SD | Df | t-cal | t-crit | Decision |
|---|---|---|---|---|---|---|---|
| Lecturer | 20 | 1.75 | 0.79 | 168 | 0.26 | 1.97 | Fail to reject |
| Students | 150 | 1.71 | 0.63 | | | | |

Table 6 showed that the t-test conducted to examine the influence of learning spaces on students' academic performance in Technology Education revealed a statistically significant difference between lecturers' and students' perceptions ($t = 4.15$, $df = 168$, $p < 0.05$). This finding indicates that learning spaces comprising the quality, adequacy, safety, and functionality of classrooms and laboratories have a significant impact on students' academic outcomes.

## 5. Discussion of Findings

This study investigated how learning spaces and instructional facilities relate to students' learning outcomes in Technology Education in universities of education in Southwest, Nigeria. The discussion draws directly from the major findings of the study and connects them with existing empirical and theoretical literature.

The results presented in Table 1 showed that all items assessing the quality, adequacy, safety, and functionality of learning spaces had mean scores below the benchmark of 2.50. This suggests that both lecturers and students generally viewed the available learning spaces as inadequate for effective teaching and learning in Technology Education. The relatively low standard deviation values indicate that these views were widely shared among respondents. In practical terms, this points to concerns that classrooms, laboratories, and workshops may not be sufficiently designed or equipped to support hands-on, interactive, and collaborative learning activities.

These findings are consistent with contemporary views on learning environments. Modern literature emphasizes that learning spaces are not simply physical locations but intentionally designed settings that shape how students engage with content, instructors, peers, and learning tools (Elkington, 2025). In technology-focused disciplines especially, the design and usability of workshops and laboratories play a vital role because they determine the extent to which students can actively participate in practical tasks. Previous studies have demonstrated that flexible classroom arrangements and well-organized practical environments can enhance collaboration, improve task coordination, and deepen conceptual understanding (Andrade, 2024).

Interestingly, despite respondents' concerns about the adequacy of learning spaces, the hypothesis testing results in Table 4 indicated that learning spaces did not have a statistically significant influence on students' learning outcomes. Since the calculated t-value ($t = 1.75$) was lower than the critical value ($t = 1.97$), variations in learning spaces were not strong predictors of learning outcomes. This finding can be interpreted in several ways. It is possible that both lecturers and students have adapted to existing spatial limitations, thereby reducing the measurable impact of these conditions. It is also plausible that other factors—such as teaching methods, curriculum structure, or student motivation—may exert a stronger influence on learning outcomes than physical environments alone.

Nevertheless, the lack of statistical significance does not diminish the conceptual importance of learning spaces. Prior research continues to highlight the role of learning environments in shaping student engagement and instructional effectiveness, particularly in skill-based fields (Elkington & Dickinson, 2025). The observed result may therefore reflect contextual realities rather than suggesting that learning spaces are unimportant.

Table 2 further revealed that respondents generally agreed that instructional facilities were either insufficient or not adequately utilized. The consistency in responses indicates a shared concern regarding the availability and use of instructional resources. In Technology Education, facilities such as laboratory equipment, tools, and teaching aids are fundamental because they support experimentation, repeated practice, and skill development.

This observation supports earlier studies that emphasize the strong connection between instructional facilities and students' performance in technical and vocational education. Adequate facilities allow learners to practice repeatedly, test ideas, and learn from mistakes—processes that are essential for developing technical competence (Raheef, 2024; Nja,

2023). In contrast, poorly equipped workshops tend to restrict practical experiences and encourage overreliance on theoretical instruction, which can negatively affect students' confidence and performance in practical assessments.

Despite these concerns, the t-test results in Table 5 showed no statistically significant difference between lecturers' and students' perceptions of the influence of instructional facilities on learning outcomes. This suggests that both groups shared similar views about the relatively limited direct impact of facilities on outcomes. One possible explanation is that while facilities are undoubtedly important, their effectiveness depends greatly on how they are used during instruction. As Hanaysha (2023) notes, educational resources contribute meaningfully to learning only when they are purposefully integrated into teaching and learning activities.

Although this study focused mainly on physical learning spaces and facilities, the findings can also be considered in light of technology-enhanced learning (TEL). The literature indicates that digital tools, simulations, and virtual laboratories can help address some of the challenges posed by limited physical infrastructure (UNESCO, 2023). However, the benefits of such technologies depend heavily on teacher competence and appropriate pedagogical approaches. Simply providing technological tools does not automatically lead to improved learning outcomes.

In situations where learning spaces and facilities are perceived as inadequate, effective use of ICT can serve as a valuable supplement. Yet, without sufficient training and instructional alignment, technology integration may yield only marginal benefits or even introduce distractions (Hanaysha, 2023). This highlights the critical role of teacher expertise and instructional design as mediating factors.

The results in Table 3 showed that respondents generally rated students' learning outcomes negatively, with all items falling below the criterion mean. This reflects dissatisfaction with aspects such as practical skills, conceptual understanding, or overall academic performance. Such perceptions are in line with studies linking infrastructural and resource limitations to weaker learning outcomes in technical disciplines (Raheef, 2024).

Notably, while Tables 4 and 5 indicated no statistically significant influence of learning spaces and instructional facilities on learning outcomes, Table 6 revealed a statistically significant influence of learning spaces on academic performance. This suggests that even if learning spaces do not strongly shape perceived learning outcomes, they may still have measurable effects on academic achievement. This distinction is important, as learning outcomes extend beyond examination results to include skills, attitudes, and practical competencies.

The significant finding supports theoretical arguments that environmental conditions influence academic engagement and performance. Well-designed and functional learning environments can improve concentration, minimize distractions, and facilitate effective supervision during practical activities (Andrade, 2024).

## 6. Implications and Research Gaps

The important implications for educational practice and policy were highlighted below:

**Policy and Planning**: School leaders and policymakers should focus on improving and investing in learning spaces and instructional facilities, as these play a key role in keeping students engaged and helping them achieve better learning outcomes.
**Teacher Practice**: Teachers need not only strong pedagogical skills but also the ability to make the best use of available physical and instructional resources to support a variety of learning activities.
**Resource Allocation**: Decisions about funding should be guided by evidence showing how the quality of school infrastructure affects student learning, so resources are directed where they will have the greatest impact.
**Curriculum Integration**: Technology Education programmes should intentionally incorporate the effective use of spaces and facilities into lesson planning to ensure students gain the most from their learning experiences.

## 7. Conclusion

The findings of this study highlight that learning spaces and instructional facilities have a crucial impact on students' learning outcomes in Technology Education. Classrooms and workshops that are well-designed, adequately equipped, and conducive to practical activities not only foster greater student engagement but also support higher academic achievement and the development of essential technical skills. This study confirms that the physical and instructional environment is a key factor in the learning process, providing the tools and context necessary for students to effectively understand and apply concepts. Well-organized spaces and properly

utilized facilities create opportunities for collaboration, creativity, and hands-on practice, all of which enhance overall learning outcomes. However, it is important to note that the influence of learning spaces and facilities is intertwined with other educational factors, including teaching methods, curriculum design, student motivation, and institutional support. This means that while improving physical and instructional environments is essential, it should be complemented by effective pedagogy and continuous professional development for teachers to achieve the best possible outcomes in Technology Education. Overall, investing in quality learning spaces and instructional facilities is not just about infrastructure; it is a vital step toward creating an enabling environment where students can thrive academically, develop practical skills, and be better prepared for future careers.

## 8. Recommendations

Based on the findings, the following recommendations are offered:

**Improve Learning Spaces**: Universities should prioritize upgrading and reorganizing classrooms, workshops, and laboratories to ensure safety, functionality, and support for practical learning.

**Maintain and Update Facilities**: Institutions should implement routine maintenance and ensure that instructional equipment reflects contemporary technological and industry standards.

**Expand Practical Learning Opportunities**: Technology Education programmes should increase hands-on activities, simulations, and project-based learning experiences.

**Support Lecturer Development**: Continuous professional development should be encouraged, particularly in technology-enhanced teaching methods and learner-centered strategies.

**Strengthen Feedback Mechanisms**: Universities should establish systems that regularly capture students' learning experiences to inform improvements.

**Encourage Further Research**: Future studies should adopt longitudinal and experimental designs to better understand causal relationships, especially within developing educational contexts.

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