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Bridging Smart Industries' Skills Gap Through Work-based Training of Mechanical Engineering Technology Students in Lagos State, Nigeria

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ABSTRACT

The study determined to bridge smart industries' skills gap through work-based training of mechanical engineering technology students in Lagos State, Nigeria. The study examines smart industries skills required to bridge the skill gap of mechanical engineering technology (MET) students and to find out strategies for bridging the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State, Nigeria. The study comprised of 490 respondents, out of which 119 were purposively selected and participated in the study. The data collection instrument was developed based on a rating scale with options including Strongly Agree, Agree, Disagree, and Strongly Disagree, and comprised twenty-two (22) items. The validity of the instrument was assessed by three (3) experts, and it was distributed to the selected participants by the researcher with assistance from three (3) research aides. The completed instruments were collected after a period of two (2) weeks from the time of administration. Additionally, the reliability was assessed using the Cronbach alpha method, resulting in a coefficient of .78. The gathered data was analyzed using Analysis of Variance (ANOVA). The finding showed that that automation and control systems skills received the highest mean rating followed by knowledge of IoT integration, machine learning and AI, additive manufacturing, and interdisciplinary collaboration, emphasizing their importance in smart industries. The National University Commission (NUC) and National Board for Technical Education (NBTE) should prioritize courses and training in these skill areas as identified in the Table 2 above.

Keywords: Skill, Skill Gap, Work-Based Training, Mechanical Engineering Technology, and Smart Industries

1.0 INTRODUCTION

The modern labor market is characterized by an increasing gap between the skills developed by STEM graduates and the needs of the industrial sector, which is especially acute in the manufacturing industry. The high rate of intelligent manufacturing, automation and modernization of industries, especially in high-end and advanced manufacturing industries, has contributed to this disjunction. With the rapid transformation and modernization of the industry, a large number of graduates are left without the hands-on experience and core competencies needed to meet the needs of the industry, which puts them at a disadvantage in the employment market. As [1] explains, skill refers to a practical ability and not an abstract ability or cognitive system. Skills acquisition entails the acquisition of new skills, habits, or ways of doing things, usually by training or experience. [2], defined learning of skills as the process of acquiring useful and practical knowledge that hones the aptitude and ability in a given field, like engineering technology.

The direction of necessary changes is predisposed by a plethora of factors, and different stakeholders have opposing views on the issues, especially concerning technological advancement and skills mismatch. The lack of skills does not only reduce the chances of employment among graduates, but also hinders the future development of the manufacturing industry, which endangers the competitiveness of the country in the global manufacturing industry. The salient challenge in the global labour market identified by [3] was skill mismatch. Empirical research in places like Saudi Arabia and the United States indicates that graduates often have weak soft skills- such as teamwork, communication, and problem-solving skills. In addition, [3] criticized American tertiary institutions on the basis of poor preparation of students in career-readiness skills. Based on these results, the partnership between universities and industry takes a central position. The mechanical engineering technology program should be re-tuned to address the demands of the workplace, and more experiential learning opportunities should be established to make students more employable in the smart industrial environment.

Employability summarizes the presence of the underlying functional and enabling knowledge, skills, and attitudes that are needed in the contemporary workplaces to advance careers at all levels of education. As stated in [4], employability is mainly constituted of technical skills and general capabilities that make graduates to be considered employable. The term employability as defined refers to the ability to participate in the work and includes the myriad of factors that are required to obtain a job [5]. It is the capability of a person to secure first employment, maintain it, and acquire new ones whenever necessary [6]. Employability is therefore the ability to acquire and sustain meaningful jobs.

The shift toward smart industries marks the radical change in the business processes, which is marked by the introduction of the new technologies, automation, and data analytics into the production and service delivery. This development has triggered a desperate need to have a workforce with the relevant skills to respond to the modern market needs. As a result, the gap between the skills demanded by employers and those developed by graduates of mechanical engineering technologies at the traditional tertiary institutions has become even wider. Employers are always complaining about the lack of technical skills, competencies and practical training in graduates in relation to their future jobs in industries. Also, [7], [8] and [9] reported that in many countries, especially the developing ones, there is still a strong disconnect between the content of engineering curriculum and the job market skills. Aligned with this observation, the study "bridging smart industries' skills gap through work-based training of mechanical engineering technology students in Lagos State, Nigeria" was studied.

Objectives of the Study

The study sought to:

1. Identify smart industries' skills needed to address the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State, Nigeria

2. Determine strategies for addressing the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State, Nigeria

The study was guided by the following two research questions:

1. Which smart industry skills are needed to address the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State?

2. Which strategies are needed for addressing the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State?

Two (2) null hypotheses were formulated at .05 significance level.

Ho1: No significant difference exists between the mean responses of Lecturers, Students, and Employers regarding smart industries skills needed to address the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State.

Ho2: No significant difference exists between the mean responses of Lecturers, Students, and Employers regarding strategies needed for addressing the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State.

2.0 LITERATURE REVIEW

2.1 Engineering

The Engineering Technology Education involves the education of technologically oriented human resources that act as the facilitators and enforcers of technological development in any given country thus fostering the economic and social welfare of its people. On the same note, [10] [11] highlighted that engineering education guarantees that the future professional engineers have the required skills, which is critical. Besides, [12] described Engineering Technology as the hub of growth and development in a digitalized, knowledge-based economy in the world. Engineering on the other hand is a science-oriented field and it focuses on mathematics, engineering design and development fields. Engineering is the practice of science. [13] considered it as a profession that applied knowledge gained in the management sciences, natural sciences, physical sciences, social sciences, biological sciences, humanities, and arts through good judgment to devise ways of using natural resources in a manner that benefited humanity in the best way possible. Engineering technology, as defined by [14], is a problem solving profession. They further added that it goes beyond the economic and physical factors and requires a high level of sophistication in its design, construction, operation, and maintenance. Engineering Technology is practice-based, with a focus on engineering science and design, and with a focus on experiential learning in engineering laboratories. Engineering technology is used as a general term to refer to a number of sub-disciplines, such as Mechanical Engineering Technology (MET).

2.2 Mechanical Engineering Technology (MET)

Mechanical engineering is a field that combines engineering, physics, chemistry, mathematics and material science in the study, design, analysis, production, assembly, testing, operation and maintenance of mechanical systems and equipment [15]. This discipline requires a sound understanding of a number of ground fields, including mechanics, kinematics, thermodynamics, materials science, structural analysis, and electricity. Design and development roles in mechanical engineering have also been influenced by this changing environment. The field deals with the generation, transfer and use of heat and mechanical energy, which accompany the manufacture and use of tools and machinery as stipulated by the Council of the Regulation of Engineering in Nigeria [16]. Practically, mechanical engineering is usually complicated, unclear, and full of various challenges [17]. This field of engineering overlaps with numerous other fields such as aerospace, automotive, naval architecture, agricultural, civil, electrical and chemical engineering. According to [18], work-based training sessions are essential in equipping engineering technology students with the skills needed in the industry. To be able to face the complicated issues that graduate students in mechanical engineering will face in the real-life employment, it is vital to participate in work-based training (WBT).

2.3 Work-Based Training (WBT)

Work Based Training (WBT) is an essential part of Technical and Vocational Education and Training (TVET); it is directly related to the mission of TVET to provide learners with the knowledge, skills, and competencies that they need in order to live a professional life. The strategy anticipates the student-employee as a learner first and foremost, and it provides the skill acquisition with the help of alternative pedagogical and training techniques, at the same time, rewarding the on-the-job learning. Based on academic descriptions, WBT integrates practical experiences with industry-based skill demands to create a skilled and innovative workforce, hence promoting creativity and flexibility. Practically, WBT is an extracurricular educational procedure that combines the classroom curriculum with the workplace exposure, thus, improving the learning process and developing strong academic and work-related knowledge through the use of work experience as the main source of learning. This integration entails learning and acquisition of competencies and knowledge on the job, such as learning as part of workforce development.

Work Based Training programmes are usually provided in the TVET institutions to help the learners to be ready to move out of the classroom to the workplace, which includes field trips, school-based production units, job shadowing, internship or practicum, clinical experience in health-related subjects, cooperative education and youth apprenticeships. The literature defines WBT as a learning process that is represented in the triad of learning at work, learning through work and learning for work. WBT pedagogic intent is to empower students to make wise career choices, build professional networks with prospective employers, and acquire job-relevant skills that can be applied to future jobs. Engagement in professional activities in the workplace enables students to develop personally and professionally.

Therefore, the empirical data confirms the conclusion that WBT is a key process through which TVET can help close the gap between theoretical and practical knowledge and make sure that learners acquire the necessary competencies to become productive members of the labour market.

2.4 Smart Industries

Smart industries can be described as industrial sectors with a high level of production flexibility, including product specifications, quality, design, volume, delivery time, resource efficiency, and cost parameters, and at the same time capable of refining output to satisfy particular customer requirements and integrate the whole supply chain to optimize value creation, as described in reference [21]. This view places smart industry as a new paradigm that can be used to produce customized products using agile and flexible production systems, which is made possible by improved connectivity and ubiquitous data collection throughout the value chain. Furthermore, reference [22] highlights that smart industry is an integrative model that utilizes the current economic and technological trends to develop a unified plan, thus preparing the Dutch manufacturing industry to overcome the changes that will occur in the future. The concept of smart industries is a result of an intersection of economic and technological changes, with reference [23] defining the key components of smart industry, i.e., automation, constant access to data through IoT, and sophisticated data processing supported by AI methods. Moreover, reference [22] restates that the effective implementation of smart industry depends on a network-based model that exploits information value, which is facilitated by ICT and the latest proven manufacturing techniques, whereas reference [24] emphasizes the uniqueness of smart industries by the use of sensors, real-time data, and advanced actuators to optimize the manufacturing of products.

3.0 RESEARCH METHODOLOGY

The research employed a descriptive survey methodology. The study was conducted in Lagos State, Nigeria. The participants (respondents) included lecturers and students of mechanical engineering technology from tertiary institutions in Lagos State, along with industry-based supervisors from selected industries with smart manufacturing units in Lagos State, Nigeria. The population and sample distribution for the study are presented in Table 1 below.

Table 1: Population and Sample for the Study

S/N	Category of Respondents	Populations	Samples
1.	MET Lecturers	54	27
2.	MET Students	402 (300 Level)	58
3.	Industry-Based Supervisors	34	34
Total		**490**	**119**

Source: Fieldwork (2026); Key: MET = Mechanical Engineering Technology

A 4-point rating scale questionnaire containing twenty-two (22) items was created for data collection. The scale included the following response options: Highly Required (HR), Required ®, Moderately Required (MR), and Not Required (NR), with corresponding numerical values of 4, 3, 2, and 1, respectively. Three (3) subject matter experts evaluated the instrument to ensure its validity. The questionnaire was administered to the sampled respondents by the researcher with the help of three research assistants. The questionnaires were sent out and two weeks later, the filled questionnaires were retrieved. Cronbachs alpha was used to assess the reliability of the instrument and the coefficient was found to be.78. The data were then analyzed statistically using Analysis of Variance (ANOVA) which was selected due to its ability to compare the mean values of three or more groups and also to establish whether there are statistically significant differences between them.

4.0 RESULTS AND DISCUSSION

Research Question 1: Which smart industry skills are needed to address the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State?

Table 2: Mean responses of respondents on smart industry skills needed to address the skill gap of mechanical engineering technology (MET) students

S/N	ITEMS (N = 119)	HR	R	MR	NR	Mean	Std.	Remark
1	Competency in simulation and modeling	10	63	27	19	2.54	.86	Require
2	Ability to create virtual models of physical system using digital twin technology	8	100	3	8	2.91	.88	Require
3	Knowledge of Internet of Thing (IoT) Integration in mechanical system	74	26	0	19	3.30	1.21	Require
4	Automation and Control Systems	87	12	10	10	3.48	096	Require
5	Proficiency in Additive Manufacturing (3D and 4D)	21	45	33	20	2.56	.97	Require
6	Sustainable Engineering Practices	59	9	22	29	2.82	1.27	Require
7	Machine Learning and AI skill	23	59	9	28	2.65	1.04	Require
8	Project Management and Agile Methodologies	52	3	53	11	2.81	1.10	Require
9	Interdisciplinary Collaboration	44	1	50	24	2.55	.76	Require
10	Automation and robotic skill	20	62	6	31	2.60	.98	Require
11	Big Data and analytic skill	5	88	1	25	2.61	.96	Require
12	Optimize system using Lean and Sigma methodologies	52	14	18	35	2.70	1.03	Require
Average Mean & SD						**2.79**	**1.00**	Require

Source: Fieldwork (2026)

The information in Table 2 summarises the mean scores and standard deviations of the answers provided by lecturers, students, and industry-based supervisors, in terms of the competencies considered as required in smart industries to fill the skills gap in the mechanical engineering technology (MET) students in Lagos State. The results show that automation and control systems proficiencies obtained the highest rating with a mean score of 3.48; the next one is knowledge of Internet of Things (IoT) integration with a mean of 3.30. Machine learning and artificial intelligence competencies had a mean of 2.95, whereas additive manufacturing and interdisciplinary collaboration competencies had means of 2.56 and 2.55 respectively, highlighting their central position in smart industry settings. In addition, Table 2 shows that all items exceeded the 2.50 mean score and the grand mean of all items is 2.79, thus demonstrating a general agreement among the respondents that these competencies are the necessary ones in closing the skill gap in smart industries in Lagos State, Nigeria.

Research Question 2: Which strategies are needed for addressing the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State?

Table 3: Responses of respondents on strategies needed for addressing the skill gap of mechanical engineering technology (MET) students

S/N	ITEMS (N = 119)	HR	R	MR	NR	Mean	Std.	Remark
1	Industry Collaboration	36	29	16	38	3.19	.98	Require
2	Curriculum Alignment with workplace demand	35	38	16	30	2.66	.87	Require
3	Hands-On Experience	46	20	33	20	2.77	.93	Require
4	Creating industry advisory board	45	33	11	30	3.40	.9	Require
5	Mentorship Programs	41	30	37	11	2.85	.95	Require
6	Feedback Mechanisms	38	26	34	21	2.68	.92	Require
7	Certification and Accreditation	26	37	37	19	2.59	.93	Require
8	Upskilling and Lifelong Learning Opportunities	39	24	17	39	2.53	.89	Require
9	Government and policy support	59	34	12	14	3.16	.69	Require
10	STEM and workforce development grants	58	16	18	27	2.88	.91	Require
Average Mean & SD						**2.87**	**.90**	Require

Source: Fieldwork (2026)

Table 3 data give the mean and standard deviation of the feedbacks of lecturers, students, and employers on the strategies needed to close the skills gap among mechanical engineering technology (MET) students who are about to graduate to Smart Industries in Lagos State. Based on the findings, the government and policy support associated skills had the highest mean score of 3.89 with STEM and workforce development grants coming second with a mean score of 3.85. The other strategies were the establishment of industry advisory boards (3.40), industry partnerships (3.19), alignment of curricula with workplace needs (3.16), mentorship programs (2.85), feedback (2.77), practical hands-on training (2.77), certification and accreditation (2.59), and ongoing up-skilling and lifelong learning (2.89) which emphasized their relevance in Smart Industry settings. Moreover, Table 3 indicates that all items had a mean score of above 2.50, with a mean of 2.87 and a standard deviation of 0.90, which proves that all the identified strategies are necessary to bridge the skills gap among MET students in Lagos State, the Smart Industries of Nigeria.

Test of Hypotheses

Ho1: No significant difference exists between the mean responses of Lecturers, Students, and Employers regarding smart industries skills needed to address the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State.

Table 4: One-way ANOVA on difference in mean responses of respondents on smart industries skills needed to address the skill gap of mechanical engineering technology (MET) students in smart industries

Categories	Sum of Squares	Df	Mean Square	F-ratio	Sig.
Between Groups	.615	2	.307	.294	.746
Within Groups	121.234	116	1.045		
Total	121.849	118			

Source: Fieldwork (2026)

The one-way analysis of variance (ANOVA) was used to establish whether there were statistically significant differences in the perceptions of engineering lecturers, students, and employers in relation to the smart industry skills requirement to reduce the skill gap among MET students in Lagos State. The outcomes showed that there were no statistically significant differences between the three groups, f(2, 116) =.294 and p=.746. Since the p -value (.746) was greater than the traditional alpha (.05), the null hypothesis was accepted. This observation means that the three respondent groups had similar perceptions on the smart industry skills needed to close the skill gap among MET students in Lagos State.

Ho2: No significant difference exists between the mean responses of Lecturers, Students, and Employers regarding strategies needed for addressing the skill gap of mechanical engineering technology (MET) students in smart industries in Lagos State

Table 5: One-way ANOVA on difference in mean responses of respondents on strategies needed for addressing the skill gap of mechanical engineering technology (MET) students in smart industries

Categories	Sum of Squares	df	Mean Square	F-ratio	Sig.
Between Groups	.530	2	.265	.182	.838
Within Groups	172.294	116	1.485		
Total	172.824	118			

Source: Fieldwork (2025)

One-way analysis of variance (ANOVA) was used to determine the presence of statistically significant differences in the mean response of the engineering lecturers, students and employers on the strategies required to address the skill gap among MET students in Lagos State. There was no statistically significant difference between the groups as shown in the analysis, f (2, 116) =.182 and Sig =.838. Since the significance value (.838) was more than the.05 level, the null hypothesis was accepted. This finding indicates that the three groups of respondents had similar views regarding the measures that should be taken to close the skills gap of mechanical engineering technology (MET) students in intelligent industries in Lagos State.

Findings

1. The skills that the leaders of the smart manufacturing industry will need include, but are not limited to, the ability to master simulation and modeling, a subtle understanding of how the Internet of Things can be incorporated into the mechanical systems, skills in both automation and control systems, expertise in additive manufacturing methods, such as 3D and 4D printing, and sophisticated skills in big data analytics. These are the capabilities that cannot be ignored to fill the professional development gap that mechanical engineering technology scholars in the smart industry environment of Lagos State, Nigeria, are going through.

2. Approaches such as partnerships with industry, aligning curricula with workplace requirements, providing practical hands-on training, offering upskilling and continuous learning opportunities, and implementing STEM and workforce

development grants, among others, are necessary for addressing the skill gap of mechanical engineering technology (MET) students in smart industries within Lagos State.

3. Table 2 shows that the mean score of all items is above 2.50, and the overall mean score is 2.79, which means that there is a strong agreement among the respondents on the identified competencies that are required to bridge the skills gap in the smart industries of Lagos State. Further, Table 4 analysis showed that there was no statistically significant difference between the groups because of the value of f(2,116) =.294 and p=.746. Since the significance value exceeded the traditional alpha=0.05, the null hypothesis was not rejected. This is in line with the results of [25], who contended that despite the central role played by educational institutions in equipping students to fit into the labour market, their pedagogical methods still fall short of the current technological developments. In line with this view, [26] observes that smart manufacturing systems combine sensors, actuators, and equipment that are connected to digital networks and the larger digital ecosystem to control and coordinate production processes.

4. As indicated in Table 3, all items have mean scores of more than 2.50, with the total mean of 2.87 and a standard deviation of 0.90, thus demonstrating the strategic relevance of the identified initiatives in resolving the skills gap in the smart industries among mechanical engineering technology students in Lagos State, Nigeria. Table 5 shows that there was no statistically significant difference between the groups, and the value of f (2,116) =.182 and p=.838; the significance value is greater than 0.05 again) resulted in the null hypothesis being retained. This observation resonates with the arguments of [27] who argued that employability pedagogy should be embedded throughout the curriculum, so that every study programme is designed in such a way that it develops learning, teaching and assessment experiences that enable the production of creative, confident and articulate graduates.

5.0 CONCLUSION

On the whole, the researcher emphasizes the essential role of the workplace competencies that were discovered in this investigation, i.e. mastery of automation and control systems, integration of IoT, machine learning methods, artificial intelligence applications, additive manufacturing procedures, and development of cross-disciplinary collaboration. These are the competencies that cannot be ignored in the employability of the graduates of Mechanical Engineering Technology (MET) in the changing environment of smart industries.

We also emphasize the need of external support systems, including government and policy programs, STEM-oriented programmes, workforce development grants, industry advisory committees, and strategic industry partnerships, and internal institutional responses, such as curriculum alignment with market needs, mentorship programs, feedback mechanisms, experiential training, and strict certification and accreditation. Ongoing upskilling and lifelong learning is important to keep the MET graduates abreast of the dynamic skills requirements of smart industry employers. Based on the study's findings, the researcher proposed the following recommendations:

1. The National University Commission (NUC) and National Board for Technical Education (NBTE) should give priority to courses and training programs in the skill areas identified in Table 2.

2. Policy developers should enhance collaboration between industry and government while increasing investment in science, technology, engineering, and mathematics programs within the state and nationwide.

3. Higher education institutions should concentrate on establishing advisory boards that will synchronize curricula with industry skill requirements to facilitate effective graduate transition into industries.

4. CONFLICT OF INTERESTS

No conflict of interest was disclosed

AUTHOR CONTRIBUTIONS

- **Baritule P. Saue:** Conceptualization, Methodology and Validation.
- **Ogbondah N. Chukuigwe:** Data Curation and Instrument Administration and Retrieval
- **Chidi Ebere:** Original Draft Preparation, Writing and Editing;

- **Ekwueme Orikoha:** Supervision, Editing and Final Review

REFERENCES

1) J. Kelly, D., Gielstra, T. J. Oberding, J. Bruno, and S. Hadley, "Uniting academia and industry to bridge the skills gap: Incorporating industry advisory councils in curriculum-to-careers programmatic mapping in undergraduate environmental science programs. Industry and Higher Education, vol. 38, no. 2, 2024.
2) C.I. Ihebereme, "Teachers and Students Perception of the Problems of Effective Skill Acquisition in Senior Secondary Schools". Journal of Qualification Education, vol. 6, no. 2, 2020.
3) D.M., McGunagle, and L. Zizka, "Employability skills for 21st-century STEM students: the employers' perspective". Higher Education, Skills and Work-based Learning, vol. 10, 2022.
4) K. E., Zegwaard, M. Campbell, and T. J. Pretti, "Professional identities and ethics: The role of work-integrated learning in developing agentic professionals". In T. Bowen, & M. T. B. Drysdale, (Eds.), International perspectives on education and society (pp. 145–160). 2023. Emerald Publishing
5) M. Yorke, "Employability: Aligning the Message, the Medium and Academic Values". Journal of Teaching and Learning for Graduate Employability, vol. 1, no. 1, 2021.
6) R. Hogan, T. Chamorro-Premuzic, and R. B Kaiser, Employability and career success: Bridging the gap between theory and reality. Industrial and Organizational Psychology, vol. 6, no. 1, 2013.
7) W. M. Adegbite, and C. Hoole, "The Nexus of Work Integrated Learning and Skills among Engineering Students in Nigerian Universities: A Structural Equation Model Approach". Journal of Teaching and Learning for Graduate Employability, vol. 15, no. 1, 2024.
8) A., Brennan, M. Dempsey, J. McAvoy, M. O'Dea, S. O'Leary, and M. Prendergast, "How COVID-19 impacted soft skills development: The views of software engineering students. Cogent Education, vol. 10, no. 1, 2023. 2171621. https://doi.org/10.1080/2 331186X.2023.2171621
9) N. O. James, "Re-engineering Technology Education in Nigeria for Sustainable Knowledge Economy in a Digitalized World. Journal of Teacher Perspective, vol. 18, no. 1, 2023.
10) M. Abdulwahed, W. Balid, M. O. Hasna, and S. Pokharel, "Skills of engineers in knowledge-based economies: A comprehensive literature review, and model development. International Conference on Teaching, Assessment and Learning for Engineering (TALE), 2013.
11) Y. Teknikföretagen, Framtidsspaning. Så påverkar teknikskiftena behoven av ingenjörskompetens.chrome-extension. 2020. http://efaidnbcajpcglclefindmkajteknikskiftena-behoven.pdf.
12) N. O. James, B. E. Isaac, and E. B. Joseph, "Technology education and development in Nigeria beyond 2020". Multidisciplinary Journal Knowledge Review, vol 33, 3, 2025.
13) H. I. Ifeanyichukwu, "The impact of engineering technology education on the society". Nigeria Society of Engineers Journal 2020.
14) T. Onyije, and B. P. Saue, "Work-based skills need for employability of mechanical engineering students of polytechnics in Rivers State". International Journal of Engineering and Modern Technology (IJEMT), vol 8, no 2, 2022
15) Mechanical Engineering, "Mechanical engineering" Accessed 28 March, 2017
16) Council of Registered Engineers of Nigeria, "Mechanical engineering" COREN Benchmark, 2017.
17) L. R. Barroso, S. B. Nite, J. R. Morgan, A. Bice, R. M. Capraro, and M. M. Capraro, "Using the engineering design process as the structure for project-based learning: An informal STEM activity on bridge-building". In 2016 IEEE Integrated STEM Education Conference (ISEC), 2023.
    I. Gratchev, and D. S. Jeng, "Introducing a project-based assignment in a traditionally taught engineering course". European Journal of Engineering Education, vol 43, no 5, 2021
18) R. Haruna, and Y. Kamin, "Application of work-based learning model in technical and vocational education: A systematic review". Education, Sustainability and Society, vol 2, no 4, 2021
19) W. A. W., Mohamed, and B. Omar, "Developing problem solving skills for lifelong learning through Work-based Learning among community college student". Journal of Technical Education and Training, vol 2, no 1, 2020

20) B. R. Haverkort, and A. Zimmermann. “Smart industry: How ICT will change the game” IEEE Internet Computing, vol 21, no 2, 2021
21) Smart Industry. Smart industry: Dutch industry fit for the future. Smart Industry, 2025.
22) K. O. Li, and M. Dong, “Deep learning for smart industry: Efficient manufacture inspection system with fog computing,” IEEE Transactions on Industrial Informatics, vol 14, no 10, 2018
23) J. Byabazaire, G. O’Hare, and D. Delaney “Data quality and trust: Review of challenges and opportunities for data sharing in IoT. Electronics, vol 9, no 12, 2020
24) R. Luckin, W. Holmes, M. Griffiths, and L. B. Forcier, “Intelligence unleashed: An argument for AI in education. Pearson publisher, 2022
25) P. Zheng, H. Wang, Z. Sang, R.Y. Zhong, Y. Liu, C. Liu, K. Mubarok, S. Yu, and X. Xu, “Smart manufacturing systems for Industry 4.0: Conceptual framework, scenarios, and future perspectives”. Frontier Mechanical Engineering, vol 13, 2024

A. Pegg, J. Waldock, S. Hendy-Isaac and R. Lawton, “Pedagogy for employability”. Higher Education Academy, 2018.