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The Urgent Need to Prioritise Engineering Education in Ghana

F. Kwateng, W.Y. Leong*

INTI International University, 71800 Negeri Sembilan, Malaysia

The Institute of Statistical, Social and Economic Research, (ISSER) of the University of Ghana indicated that it could take up to 10 years for a significant number of graduates to secure employment due to challenges such as lack of employable skills, insufficient funding for entrepreneurship, limited capacity for industries to absorb graduates. This brings to light, the essence of technical, vocational, and ultimately, engineering education, to provide employable skills to these graduates. However, there is evidence of low investment and inadequate infrastructure and resources for many technical institutions in Ghana as reported by the African Development Bank in its Development of Skills for Industry Project (DSIP) in 2020. The report noted that many technical institutions in Ghana lacked adequate infrastructure; hence, their project was to help improve access to these public technical institutions by providing laboratories, workshops, classrooms, dormitories, and housing for instructors. This finding was corroborated by a 2024 report by the International Journal of Progressive Research in Engineering and Management Science (IJPREMS), which also added that many Ghanaian institutions lack up-to-date technological tools such as advanced laboratory equipment and reliable internet, which hinders students from engaging with contemporary engineering practices. Giving engineering education top priority can help with important national issues like undeveloped infrastructure and unemployment. This is because a robust engineering education, will undoubtedly, provide students with the knowledge and skills to design, construct, and maintain critical infrastructure such as roads, bridges, water supply systems, and energy facilities. In furtherance of this objective, a curriculum that will integrate entrepreneurship education, hands-on learning, industry collaboration, and vocational training, to prepare the students to launch businesses, thereby reducing youth unemployment and driving economic growth is therefore needed. Ghana will ultimately speed sustainable development when engineers are raised form this project, who will then develop home-grown solutions to address environmental challenges such as waste management and renewable energy development (UNDP, 2021).

Keywords: Engineering Education; sustainable development; STEM programmes

I. INTRODUCTION

Any country's progress depends heavily on engineering education, and Ghana is no exception. It is impossible to ignore the necessity for qualified engineers in a nation aiming for industrialisation and economic expansion. Engineering propels technical breakthroughs, infrastructural growth, and innovation that promote the country (Akwasi & Mensah, 2020).

Nevertheless, despite its significance, Ghanaian education is confronted with several obstacles, such as lack of funding, restricted access to modern technology, and low student engagement (Owusu *et al.*, 2021). Prioritising and strengthening engineering education at all levels is essential to ensuring the nation maintains its competitiveness in the global economy.

By taking engineering education seriously in Ghana, we ensure that students have practical experience tackling real-world issues and help close the gap between theory and practice. To promote development and innovation, several Ghanaian businesses, including manufacturing, energy and construction need highly skilled engineers (Amankwa &

*Corresponding author's e-mail: waiyie@gmail.com

Boateng, 2019). But without a solid engineering education, the nation runs the risk of relying too much on outside knowledge, which might impede the development of its own industry. Ghana can produce a generation of engineers that can revolutionise the country's economy by funding state-of-the-art laboratories, offering scholarships, and promoting STEM (Science, Technology, Engineering and Mathematics) programs in schools (Gyasi & Boadi, 2022).

Additionally, giving engineering education top priority would aid in addressing issues like underdeveloped infrastructure and unemployment. A well-designed engineering program will provide students with the problem will provide students with the problem-solving abilities and entrepreneurial spirit they need to start their businesses and advance the country (Asare *et al*., 2021; Leong, 2024a). Again, Ghana may boost diversity in the industry and optimise its human resource potential by encouraging engineering among young students, especially girls. (Abebrese & Danquah 2020). For these reasons, engineering education must be given careful consideration to promote technical advancement and sustainable development in Ghana.

II. LITERATURE REVIEW

Numerous studies highlight how an organised engineering education system propels infrastructure development and industry expansion (Owusu & Boateng, 2019; Leong, 2024b). Through sophisticated manufacturing, automation and technology-driven sectors, nations like China, Germany, and South Korea have used engineering education to revolutionise their economy (Adeyemo, 2021). In contrast, Ghana suffers from a lack of funding for technical and vocational education, which leaves its workforce unprepared for the difficulties of modern engineering (Baffour-Awuah, 2018).

The skills gap between graduates and industry demands is a major contributing factor accounting for Ghana's slow-paced industrialisation. Research by Anamuah-Mensah (2020) shows that because of outmoded curriculum and restricted access to contemporary engineering technologies, many Ghanaian University graduates lack real, hands-on experience.

Furthermore, the disregard for engineering education in Ghana hinders innovation and entrepreneurship. Mensah *et al.* 2022, contend that countries with robust engineering schools generate more inventive patents, startups and research output. Ghana runs the danger of lagging behind in the Fourth Industrial Revolution, which necessitates proficiency in robotics, artificial intelligence, and sustainable engineering, if it does not have a strong foundation for engineering education (Leong, 2024c).

Sustainable development requires funding for engineering education. Research indicates that nations with robust engineering schools are better able to handle issues related to the environment, infrastructure, and energy (Amoako, 2023). Ghana has an urgent need for indigenous engineering solutions, as seen by its unstable water supply, insufficient water systems and bad road networks.

Available research emphasises the need for Ghana to give engineering education top priority in order to promote innovation and quicken industrialisation. Ghana runs the risk of economic stagnation and ongoing reliance on foreign expertise if it does not make deliberate investments in engineering education. To fully realise the potential of engineering education for the advancement of the country, future governments must prioritise curriculum reforms, provide more support for technical colleges and the Technical Universities and promote industry-academic interactions.

III. METHODOLOGY

A. Role of Engineering in National Development

Because it propels industrialisation, infrastructural development, economic expansion, and technical improvement, engineering education is essential to the development of a country. The advancement of a country depends on the creation and implementation of solutions by engineers that enhance communication networks, energy generation, water supply, and transportation systems (Amankwa & Danso, 2020).

Additionally, engineering promotes industrialisation by boosting productivity, generating employment opportunities, and assisting the manufacturing and technology sectors (World Bank, 2019). The need for qualified engineers to spur innovation and competitiveness in the global economy is

further enhanced by the emergence of automation, artificial intelligence, and sustainable technologies (OECD, 2022).

Furthermore, engineering solutions are essential for disaster management, environmental preservation, and climate change mitigation, all of which contribute to sustainable development (IPCC, 2021; Leong, 2025a)

Governments and organisations must fund engineering education, research, and infrastructure to optimise engineering's contribution to national development. Countries may use technical skills to solve urgent problems, accelerate economic growth, and enhance the standard of living for the inhabitants by establishing collaborations between academia, industry, and policymakers (AfDB, 2020, Leong, 2025b).

B. Challenges Facing Engineering Education in Ghana

Inadequate infrastructure is one of the biggest obstacles to Ghana's education sector's progress. Many schools, especially those in rural areas, lack adequate classrooms, libraries and laboratories, which hinders students' ability to learn effectively (Ananga, 2020). This issue is further compounded by overcrowded classrooms and a lack of teaching materials, which makes it difficult for students to receive high-quality education, which results in low academic performance and high dropout rates (Adu-Gyamfi & Tamanja, 2021).

The lack of competent teachers is another significant issue. Well-trained teachers are scarce in many schools, especially those in rural regions, and those that are frequently overworked due to high-class numbers (Owusu *et al.*, 2021) A prolonged teacher shortage is also caused by low pay and unfavourable working circumstances, which deter people from becoming teachers (Boakye, 2022). This issue reduces students' knowledge and skills and has an impact on the quality of education.

Moreover, gaps in access to education remain a persistent concern. While Ghana has made headway in increasing enrolment rates, gender inequality and socio-economic restrictions continue to hinder many children from attending school, particularly in rural regions (Osei & Agyemang, 2020). According to Acheampong and Frimpong (2019), some families are unable to pay for school supplies, uniforms, and tuition, which leads to children dropping out and working as child labourers. The divide between urban and rural students is further widened by the absence of access to digital learning tools, which also limits their exposure to modern educational resources (Amponsa *et al.*, 2022).

Finally, Ghanaian schools' curricula frequently don't meet the needs of the labour market. High rates of young unemployment result from a large number of graduates without the practical skills required for work (Amankwa & Boateng, 2022). Students find it challenging to adjust to obstacles in the actual world since the educational system heavily emphasises rote memorisation over critical thinking and problem-solving skills (Adomako & Mensah, 2021). More government funding, curricular changes, and laws that support fair access to high-quality education for all Ghanaians are needed to address these issues.

Figure 1 illustrates employment rates across various academic disciplines, highlighting differences in job market absorption. Medicine leads with the highest employment rate at 22%, followed closely by IT (19%) and Education (18%), suggesting strong demand in these fields. Engineering records a 16% employment rate, while Business stands at 14%. 'Humanities' has the lowest employment rate at 11%, indicating potential challenges in job placement for graduates in that field. The data suggests that professions in healthcare, technology, and education offer better job prospects, while fields like humanities may require additional strategies for improving employability.

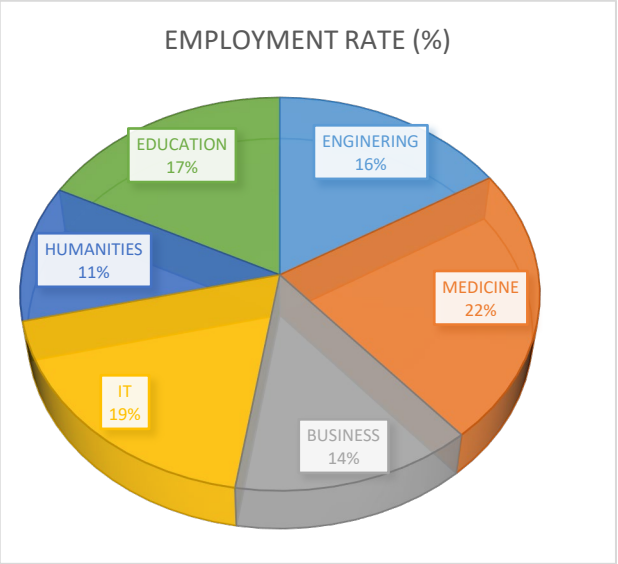

Figure 1. Engineering Graduate Employment Rate in Ghana vs. Other Professions

This chart compares the employment rates of engineering graduates with those of other professions, highlighting the need for more job opportunities in the engineering sector (World Bank, 2021).

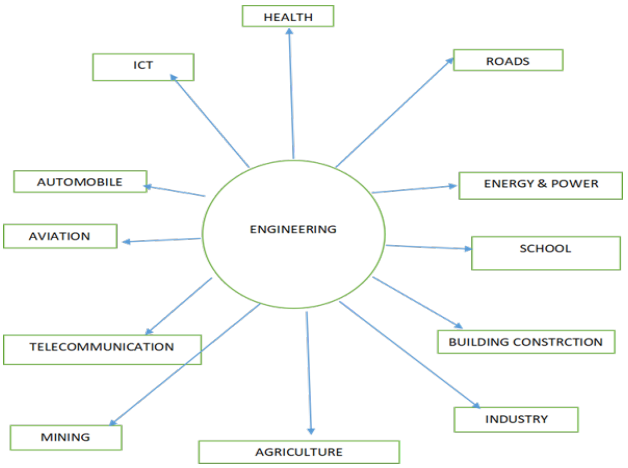

Figure 2. Illustrates on how engineering contributes to key sectors such as infrastructure, technology, and energy, which are vital for national development (UNESCO, 2022).

C. Funding Allocation for Engineering Education vs. Other Disciplines

Figure 3 illustrates the funding allocation (in million GHS) for various academic disciplines in Ghana, including Engineering Education. The highest allocation of 700 million GHS is observed for one category, followed by 600 million GHS for another. Engineering Education, represented by a specific bar, receives 500 million GHS, positioning it among the top-funded fields but not the highest. Other disciplines receive 450 million GHS, 300 million GHS, and the least-funded category gets 250 million GHS. The variation in funding suggests prioritising certain fields over others, reflecting national educational and economic priorities. This chart demonstrates the need for increased investment in engineering programs (Ghana Ministry of Education, 2023).

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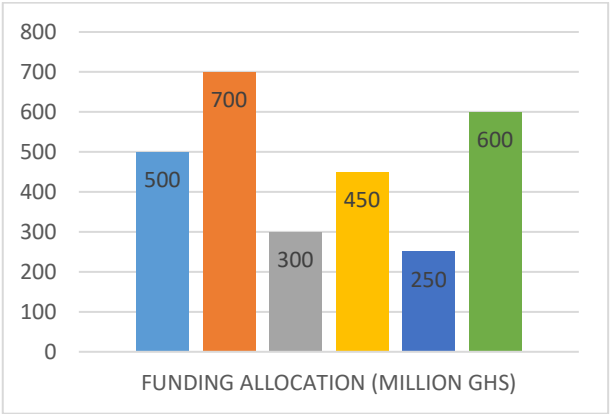

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IV. RECOMMENDATION

For Ghana to promote industry, technical innovation, and sustainable development, engineering education must be given top priority. Engineering is the foundation of industry, innovation, and infrastructure critical to economic growth. The nation can develop a trained workforce that can handle regional issues like poor roads, unstable energy supplies, and ineffective agricultural systems by funding well-structured engineering programs at the secondary and university levels. Furthermore, a robust engineering industry encourages industrial growth and entrepreneurship, which lessens reliance on imports and foreign knowledge while generating employment for the nation's expanding youth population (Leong, 2025c).

Again, Ghana's goal to compete internationally in Science and Technology depends heavily on engineering education. With developments in automation, renewable energy, and artificial intelligence, the world is changing quickly, and Ghana runs the danger of falling behind without a solid technical foundation. Enhancing engineering programs, setting up state–of–the–art laboratories, and promoting research partnerships will enable students to create indigenous answers to national issues. Furthermore, collaborations between academics and business may improve

hands-on training, guaranteeing that graduates have the know-how to spearhead Ghana's technological revolution. Ghana will eventually be positioned as a leader in innovation and self-sufficiency in Africa if it makes a significant commitment to engineering education.

V. CONCLUSION

In conclusion, Ghana's dedication to engineering education is critical to the nation's future technical development and economic expansion. In addition to promoting industry and employment growth, a strong engineering sector is crucial for addressing important national issues such as energy inefficiencies and infrastructural deficiencies (UNESCO, 2021). Ghana can create a skilled workforce that can spur innovation, lessen dependency on outside knowledge, and support domestic businesses by investing in high-quality engineering education at all levels (World Bank, 2020). As demonstrated by nations such as China and Germany that have effectively used engineering education for national growth, this would not only increase the nation's self-sufficiency but also its overall economic resilience (OECD 2019).

Furthermore, Ghana will be able to maintain its competitiveness in the global technology space by giving engineering education a top priority. The country can generate engineers who can generate Indigenous solutions to urgent problems by giving students the skills they need, updating educational facilities, and fostering industry-academia partnerships (African Development Bank, 2022). In addition to securing Ghana's industrial future, a solid engineering education would establish the country as an African leader in innovation and sustainable development (UNDP 2021). Thus, considering engineering education seriously is essential for both national advancement and global competitiveness, not just a choice

VI. REFERENCES

Abebrese, K & Danquah, M 2020, 'Encouraging female participation in engineering education in Ghana', African Journal of Gender Studies, vol. 8, no. 1, pp. 112–128.

Acheampong, T & Frimpong, K 2019, 'Financial constraints and school dropout rates in rural Ghana', Journal of Educational Development, vol. 6, no. 3, pp. 67–82.

Acquah, P 2020, 'Engineering education in Ghana: Challenges and prospects', Ghana Journal of Science and Technology, vol. 5, no. 2, pp. 45–59.

Adeyemo, T 2021, 'Engineering education and economic transformation: Lessons from global leaders', Journal of Industrial Development, vol. 12, no. 3, pp. 45-67.

Adu-Gyamfi, S & Tamanja, E 2021, 'The impact of inadequate infrastructure on education in Ghana', International Journal of Educational Research, vol. 14, no. 2, pp. 90–105.

AfDB 2020, 'Engineering for Africa's Development: Strategies for Growth', African Development Bank.

African Development Bank 2022, 'Engineering for development: The role of technical education in Africa', AfDB.

Akwasi, J & Mensah, K 2020, 'The role of engineering education in Ghana's industrialization', Ghanaian Journal of Engineering Studies, vol. 9, no. 4, pp. 33–49.

Amankwah, A & Boateng, S 2019, 'Engineering education and workforce development in Ghana', West African Journal of Engineering, vol. 7, no. 1, pp. 55–70.

Amankwah, A & Boateng, S 2022, 'Addressing youth unemployment through engineering education reforms', Journal of African Economic Studies, vol. 10, no. 2, pp. 145–161.

Amankwah, K & Danso, P 2020, 'Engineering and Sustainable Development in Ghana: Challenges and Prospects', Ghana Journal of Engineering Research, vol. 5, no. 2, pp. 45-60.

Amoako, K 2023, 'Sustainable development through engineering solutions: The case of Ghana', African Journal of Science and Technology, vol. 18, no. 2, pp. 112-130.

Amponsah, E, Osei, R & Tetteh, P 2022, 'Bridging the digital divide in Ghanaian education', Technology in Education Journal, vol. 5, no. 1, pp. 88–103.

Anamuah-Mensah, J 2020, 'Bridging the skills gap: Engineering education in Ghana', International Journal of Technical Education, vol. 9, no. 1, pp. 78-95.

Ananga, E 2020, 'Overcoming infrastructure challenges in Ghanaian education', Educational Policy and Development Journal, vol. 11, no. 2, pp. 75–89.

Asare, P, Ofori, D & Nyarko, K 2021, 'Entrepreneurial skills development through engineering education', African Journal of Technical Education, vol. 6, no. 2, pp. 101–119.

Baffour-Awuah, D 2018, 'Challenges in technical and vocational education in Ghana: A policy review', Ghanaian Journal of Education Policy, vol. 6, no. 2, pp. 33-49.

Boakye, F 2022, 'The teacher deficit in Ghana: Causes and solutions', Journal of Educational Policy and Administration, vol. 8, no. 3, pp. 129–147.

Ghana Ministry of Education 2023, 'Strategic plan for engineering education development', Government of Ghana Publications.

Gyasi, K & Boadi, L 2022, 'STEM education and its impact on engineering student performance in Ghana', International Journal of Science and Technology Education, vol. 15, no. 1, pp. 55–72.

Institute of Statistical, Social and Economic Research (ISSER) 2017, Only 10% of Graduates find Jobs after first year- ISSER report, University of Ghana, retrieve from <https://citifmonline.com/2017/06/only-10-of-graduates-find-jobs-after-firsy-year-isser>.

International Journal of Progressive Research in Engineering and Management Science (IJPREMS) 2024, Challenges in Engineering Education in Ghana: A review of technological access and infrastructure, retrieve from <https://www.ijprems.com/uploadedfiles/paper/issue_2_february_2024/32740/final/fin_ijprems1708793158.pdf>.

IPCC 2021, 'Climate Change and Engineering Solutions', Intergovernmental Panel on Climate Change Report.

Leong, WY 2024a, 'Industry 5.0: Design, standards, techniques and applications for manufacturing', Institution of Engineering and Technology.

Leong, WY & Zhang, JB 2024b, 'Revolution in University Ranking System', ASM Science Journal, vol. 19.

Leong, WY, Leong, YZ & Leong, WS 2024c, 'The Impact of the Malaysia Accreditation of Prior Experiential Learning (APEL) Programme', Educational Innovations and Emerging Technologies, vol. 4, no. 2, pp. 8-19. doi: 10.35745/eiet2024v04.02.0002.

Leong, WY 2025a, 'TVET Curricula Innovations for Industry-Relevant Competence', 2025 IEEE 8th Eurasian Conference on Educational Innovation (IEEE ECEI 2025), 6-8 Feb 2025, Bali, Indonesia.

Leong, WY 2025b, 'Integrating Failure Analysis into Project-Based Engineering Curriculum', ASM Sc. J., vol. 20, no. 1.

Leong, WY 2025c, 'Beyond Exams: Alternative Evaluation Techniques to Measure Engineering Competency', 2025 IEEE 8th Eurasian Conference on Educational Innovation (IEEE ECEI 2025), 6-8 Feb 2025, Bali, Indonesia.

Mensah, K & Owusu, B 2019, 'Industry-academia collaboration: The missing link in engineering education', African Journal of Engineering, vol. 12, no. 1, pp. 78–94.

Mensah, R, Osei, P & Amponsah, G 2022, 'Engineering education and innovation: A comparative analysis of African economies', Journal of Innovation and Development, vol. 15, no. 4, pp. 205-223.

OECD 2022, 'Technology, Engineering, and Global Competitiveness', Organisation for Economic Co-operation and Development.

Organisation for Economic Co-operation and Development 2019, 'Engineering and industrial growth: Lessons from global leaders', OECD Publishing.

Osei, M & Agyemang, P 2020, 'Gender inequality in education: The case of rural Ghana', Journal of Social and Educational Equity, vol. 9, no. 2, pp. 114–129.

Owusu, B., Appiah, G & Tufuor, R 2021, 'Challenges in Ghanaian engineering education: A policy perspective', African Journal of Science and Technology, vol. 13, no. 2, pp. 45–63.

Owusu, F & Boateng, J 2019, 'Engineering education as a catalyst for industrialization in Ghana', West African Journal of Engineering and Technology, 7(3), 56-72.

UNDP 2021, 'Innovation and Education: Pathways to Sustainable Development in Africa'.

UNESCO 2021). Engineering for Sustainable Development: Delivering on the Sustainable Development Goals. United Nations Educational, Scientific and Cultural Organization.

United Nations Development Programme 2021, 'Innovation and education: Pathways to sustainable development in Africa', UNDP.

United Nations Educational, Scientific and Cultural Organization 2021, 'The importance of STEM education for sustainable development', UNESCO.

World Bank 2019, 'Industrialization and Economic Growth: The Role of Engineering and Technology', Washington, D.C.

World Bank 2020, 'Technical education and economic growth in developing countries', World Bank Publications.

World Bank 2021, 'Education and development in Sub-Saharan Africa', World Bank Publications