



**2024 ENGINEERING INSTITUTION OF ZAMBIA
SYMPOSIUM**

**ADAPTIVE ENGINEERING: MEETING THE EVOLVING
NEEDS OF TOMORROW**

Avani Victoria Falls Resort, Livingstone, Zambia

Presenter: Eng.Dr.Patrick Mwamba Mubanga

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PRESENTATION OUTLINE



1. Introduction
2. Statement of the problem
3. Engineering curricula reforms : a global perspective
4. Case study: review of engineering education curriculum: a university of Zambia perspective
5. Challenges in engineering curriculum
6. Recommendations
7. Conclusion



1. INTRODUCTION

- a. Engineering is a global industry undergoing a period of unprecedented change. The future of engineering is being framed by global forces which **transcend national boundaries** (Parashara & Parashar, 2013).
 - b. Through the application of science and engineering, humanity possesses the **capability to tackle current and future demands**, paving the way for exponential growth in innovation (United Nations , 2021).
 - c. Consequently, the engineering curriculum **needs to be adaptive and constantly striving to keep pace with these changes**, particularly the contribution of engineering to these global opportunities and challenges.
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2. STATEMENT OF THE PROBLEM

- a. The **inability of engineering curricula** to adequately address current and future demands and challenges has remained unexplored (Kolmos, et al 2015).
- b. Engineering curricula should **prepare students to respond to the ongoing emergence of technologies and challenges**, enabling them to address the evolving needs of the future.
- c. The **failure by engineering curriculum** to be innovative and responsive to both existing challenges and future demands can be likened to the famous quote that was made by Albert Einstein i.e.

2. STATEMENT OF THE PROBLEM cont'd

“Our situation is not comparable to anything in the past. It is impossible, therefore, to apply methods and measures which at an earlier age might have been sufficient. We must revolutionize our thinking, revolutionize our actions, and must have the courage to revolutionize relations among nations of the world. Cliches of yesterday will no longer do today, and will, no doubt, be hopelessly out of date tomorrow” (Einstein 1948, p. 52).

- a. Therefore, **normal or old methods and measures** that might have been effective before are not sufficient in addressing the current situation. Einstein argues that there is need to change our way of thinking and our actions.
- b. It is important to note that as the world becomes increasingly complex, the curricula must **therefore adapt to equip students with the necessary skills and knowledge to respond to the continuously emerging technologies and global challenges.**
- c. After reviewing various documents, the presentation examines the challenges and recommendations in order **to make engineering curriculum be innovate and effective in addressing current / future technological demands and problems.**

3.ENGINEERING CURRICULA REFORMS : A GLOBAL PERSPECTIVE



- a. In response to global challenges, engineering educators and researchers worldwide have been **striving to reform engineering curricula over the past decades.**
- b. Significant restructuring reforms have been implemented in prominent engineering institutions to meet these demands and challenges such as the **American Accreditation Board of Engineering Education (ABET) and American National Academy of Engineering (NAE)**

4.CASE STUDY: REVIEW OF ENGINEERING EDUCATION CURRICULUM: A UNIVERSITY OF ZAMBIA PERSPECTIVE

- a. A study conducted by Zulu et al. (2019) whose objective was to enhance graduate employability by examining various aspects of engineering education and their relevance in producing fit-for-purpose graduates.
- b. The key finding indicated that the UNZA engineering curriculum should be **updated to align with local industry needs and should include entrepreneurship skills and provide practical training.**

Some of the key recommendations are provided as follows:

- There was need to **revise the engineering curriculum** and ensure that content was focused more on **entrepreneurship** rather than on employability.
- There was need to strike a **balance between theory and practice** to help expose the students with real life experiences.
- There was need for a **strong synergy with government and the industry.**
- There was need to enforce **a five-year curriculum review cycle.**



5. CHALLENGES IN ENGINEERING CURRICULUM

- a. **Rapid technological advancements:** The field of engineering is constantly evolving while the traditional engineering curricula often struggles to keep up with these advancements, **resulting in a gap between industry requirements and graduate skills.**
- b. **Lack of interdisciplinary approach:** Modern engineering problems often require interdisciplinary solutions. However, many engineering programs still **follow a siloed approach, focusing on specialized knowledge** without adequately integrating other disciplines limiting students' ability to address complex real-world challenges.
- c. **Limited soft skills development:** Engineering graduates need more than technical expertise to succeed in today's globalized workforce. Employers increasingly value soft skills such as **communication, teamwork, and problem-solving abilities.** Yet, traditional engineering curricula often neglect the development of these essential skills.

5. CHALLENGES IN ENGINEERING CURRICULUM CONT'D

- d. **Limited emphasis on innovation and entrepreneurship:** Traditional curricula **may not prioritize teaching skills related to entrepreneurship, innovation and business management.**
- e. **Insufficient hands-on and practical experience:** While engineering involves practical applications, traditional curricula may **rely heavily on theoretical knowledge and classroom instruction.** Limited opportunities for hands-on experiences, practical exercises, or real-world projects can make it difficult for students to apply their knowledge effectively.
- f. **Limited resources to invest in new lab. technology and equipment**



6.RECOMMENDATIONS

- a. **Integration of emerging technologies:** An innovative engineering curriculum should incorporate emerging technologies such as **artificial intelligence, robotics, renewable energy, cyber security and data analytics**. This could expose and help students develop the skills necessary to adapt to future industry demands.
- b. **Interdisciplinary collaboration:** To address complex challenges, engineering programs should foster collaboration with other disciplines such as **business (economics), design, and social sciences**. This interdisciplinary approach encourages holistic problem-solving .
- c. **Project-based learning:** An innovative engineering curriculum should emphasize **project-based learning (group)** allowing students to apply theoretical knowledge to practical situations, enhancing their **communication skills, critical thinking and problem-solving abilities**.

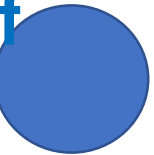
6.RECOMMENDATIONS CONT'D

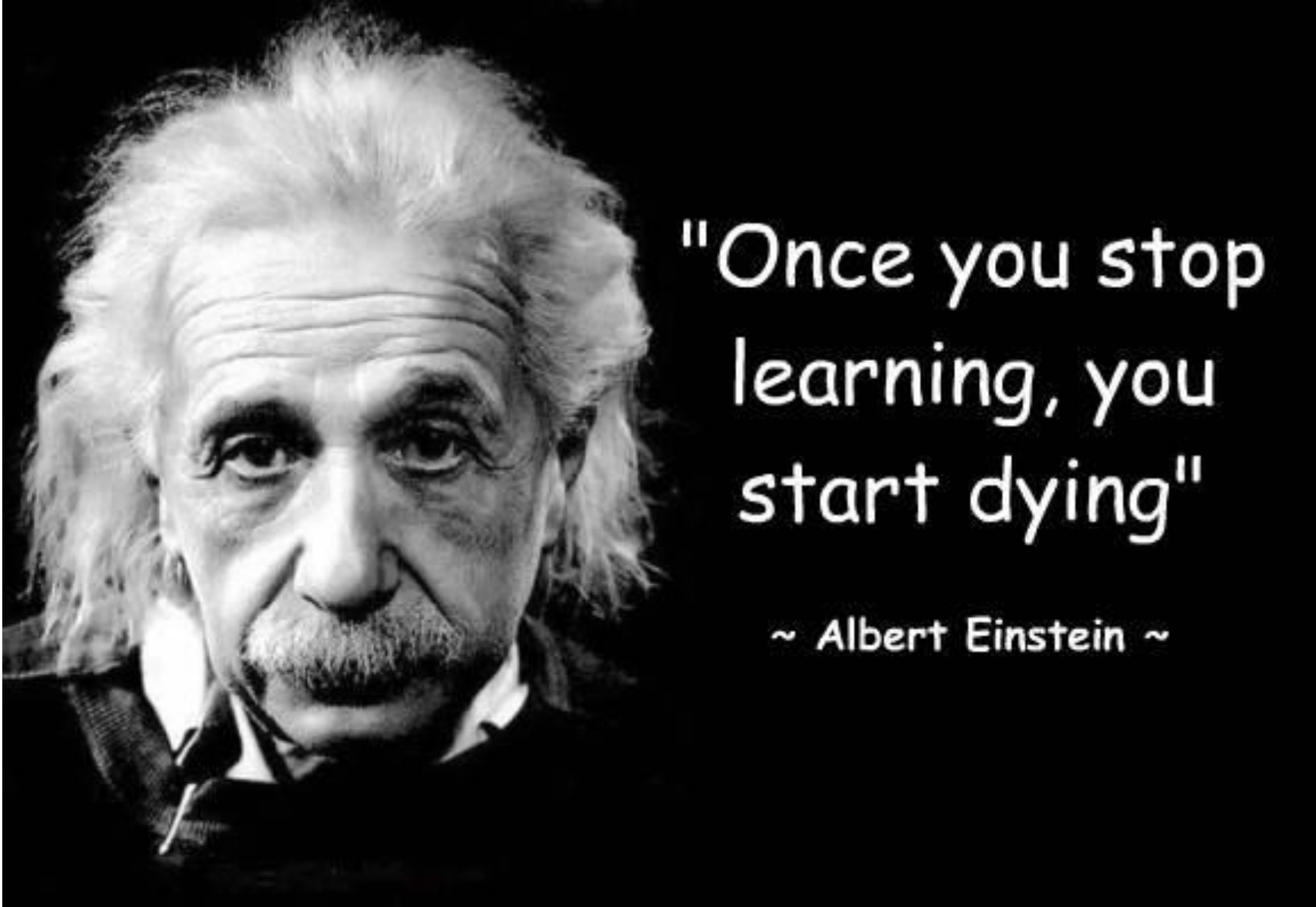
- **Soft skills development:** To meet industry demands, engineering curricula should incorporate opportunities for students to develop essential soft skills. This can be achieved through **team projects, communication workshops and leadership development programs.**
 - **Research and Innovation Centres:** Establish research centres within the institution to encourage faculty and students to engage in **innovative research, focusing on cutting-edge technologies and problem-solving.**
 - **Assessment and Feedback:** **Regularly evaluate the effectiveness** of the curriculum through feedback **from students, faculty, and industry partners.** Adapt the curriculum based on constructive criticism and changing needs.
 - **Advisory Boards:** Universities offering engineering courses should encourage the creation of **advisory boards comprising industry professionals, alumni, and academia** to provide guidance and ensure the **curriculum remains relevant and innovative.**
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7.CONCLUSION



- a. An innovative engineering curriculum is essential **to address existing and future demands and challenges**. By integrating emerging technologies, fostering interdisciplinary collaboration, emphasizing project-based learning, and developing soft skills, engineering programs can **better prepare students for the evolving needs of the industry**.
- b. By blending traditional engineering principles with a forward-looking, adaptable, and collaborative approach, this innovative curriculum can equip students **to tackle current challenges while preparing them for future engineering demands**.
- c. Regular updates and feedback mechanisms are crucial to ensure the curriculum remains aligned with the **dynamic nature of technology and industry requirements**.





"Once you stop
learning, you
start dying"

~ Albert Einstein ~

**THANK FOR
YOUR
ATTENTION**

Q & A