



Engineering the Future: Mentorship for Young Students and Graduates in Career, Personal, and Professional Progression in Africa: Case Study Kenya

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Abstract

Engineering is fundamental to sustainable development, innovation, and economic growth in Africa. However, the continent continues to face significant challenges in cultivating the next generation of engineers, particularly among youth. In Kenya, many students lack exposure to engineering practice, guidance in career planning, and mentorship from industry professionals. These gaps contribute to low enrolment in STEM (Science, Technology, Engineering, and Mathematics) disciplines and a mismatch between academic knowledge and industry needs. The Institution of Engineers of Kenya (IEK), through its Future Leaders Committee (FLC), has pioneered a comprehensive mentorship program that seeks to inspire, educate, and empower students and young graduates across secondary schools and universities. This paper aims to examine how mentorship programs, particularly those led by professional bodies such as the Institution of Engineers of Kenya (IEK), contribute to the academic, personal, and professional growth of students and graduates in Kenya. It explores the impact of the FLC's mentorship initiatives using a descriptive case study methodology. The study draws data from over 15 learning institutions across Kenya through surveys, interviews, and document analysis. Findings reveal that mentorship significantly increases interest in STEM careers, enhances students' self-confidence, builds critical soft skills, and encourages peer mentorship. Notably, awareness of engineering as a career and understanding of professional pathways improved markedly among both high school and university participants. The study highlights key areas for strengthening the program, including integration with national education policy, digitization of mentorship delivery, and expansion to underserved regions. It also documents the replicability of this model, which has already influenced mentorship structures in universities and grassroots communities. The paper concludes that mentorship is a vital strategy in developing Africa's future engineering Leaders by recommending the institutionalization of mentorship as a national strategy for professional and personal development in Kenya and Africa.

Keywords: Mentorship, engineering education, STEM, youth empowerment, professional development, career guidance, Kenya.

Introduction

Africa is a continent brimming with potential, characterized by a youthful population and an urgent need for sustainable development solutions. At the heart of this transformation lies the critical role of science, technology, engineering, and mathematics (STEM) in driving innovation, infrastructure

development, and economic growth. However, despite the demand for skilled professionals in engineering and technical fields, many young Africans face significant challenges in transitioning from education to successful careers in these sectors. In Kenya, while academic institutions provide foundational knowledge, students and graduates often struggle with limited exposure to real-world engineering practice, lack of career guidance, and minimal mentorship. These gaps hinder both individual progression and national development goals such as industrialization and technological advancement. Structural barriers, including socioeconomic inequality, gender disparities, and rural–urban divides, further exacerbate the problem, resulting in underrepresentation in engineering courses, low retention, and inadequate job readiness. Without targeted interventions, the country risks undermining its Vision 2030 aspirations and the Sustainable Development Goals.

Recognizing the urgency to bridge these gaps, the Institution of Engineers of Kenya (IEK) established the Future Leaders Committee (FLC), tasked with nurturing the next generation of engineers through mentorship, advocacy, and capacity-building programs at both secondary and university levels. The FLC initiatives extend beyond technical training by focusing on personal development, leadership, and career planning. Through school visits, interactive forums, and one-on-one mentorship, students are exposed to engineering role models, professional pathways, and ethical practices that shape their career outlook.

To date, the program has engaged with a wide range of institutions. At the secondary level, mentorship activities have reached schools such as Thika High, Kapenguria Boys, Tartar Girls, Machakos Girls, Chebisas Boys, Enaiposha Girls, Riara School, Materi Girls, Nyandarua High, and Plateau Girls, particularly targeting Form Three and Form Four students pursuing physics, mathematics, and other science subjects. At the university level, outreach has included the University of Eldoret, Moi University, Machakos University, Multimedia University, Dedan Kimathi University of Technology, University of Nairobi, Kenyatta University, Murang’a University, and Masinde Muliro University of Science and Technology. Reported outcomes include enhanced self-confidence, stronger communication and presentation skills, improved career clarity, and the growth of peer-to-peer mentorship, with some beneficiaries returning as mentors themselves, creating a sustainable cycle of empowerment.

Research underscores the importance of mentorship as a catalyst for academic and professional development. Crisp and Cruz (2009) highlight its role in fostering achievement, self-efficacy, and career persistence, while Packard (2016) and Drury et al. (2011) link mentorship to higher STEM enrollment, reduced attrition, and improved gender balance, especially where female mentors are involved. At the policy level, UNESCO (2017) and the African Union (2019) emphasize the urgent need to expand Africa’s engineering talent pool through structured mentorship. Evidence from global case studies further supports this approach: the National Society of Black Engineers (NSBE) in the United States has boosted minority participation in engineering through mentorship (NSBE, 2015), while South Africa’s Engineering Council (ECSA) Graduate Development Program integrates mentorship to improve graduate readiness and professional registration (ECSA, 2018).

The FLC’s mentorship model embodies experiential learning principles (Kolb, 1984) by combining local contextualization with best practices. Its grassroots, peer-led approach enables scalable and cost-effective outreach, making it an adaptable model for diverse communities. Moreover, some Kenyan universities are already integrating mentorship into academic programs and student clubs, while beneficiaries of mentorship often return to serve as mentors, creating a sustainable cycle of empowerment. By cultivating a culture of mentorship within the engineering ecosystem, IEK’s Future Leaders Committee is not only contributing to individual success stories but also supporting Kenya’s vision of achieving industrialization and innovation-led development.

This paper, therefore, examines how structured mentorship programs contribute to academic, personal, and professional growth, documents the FLC’s model and outcomes, identifies challenges, and proposes strategies for scaling mentorship in Kenya and Africa. Ultimately, mentorship emerges as a strategic

tool for preparing Africa's future engineers, closing gaps between education and practice, and fostering inclusive, sustainable development.

Methodology

This study employed a descriptive case study methodology designed to explore the influence and outcomes of structured mentorship programs spearheaded by the Institution of Engineers of Kenya (IEK) through its Future Leaders Committee (FLC). The methodology focuses on uncovering both qualitative and quantitative impacts of mentorship among high school and university students across Kenya. The approach allowed for triangulation of data sources including participant surveys, key informant interviews, and review of FLC documentation.

Sampling and Scope

The research targeted diverse educational institutions, ranging from high schools to universities, and encompassed both urban and rural regions. A purposive sampling method was used to select schools and universities that actively engaged with FLC mentorship activities. The sample consisted of approximately 300 high school students and 150 university students. In addition, 20 mentors and FLC program coordinators were interviewed.

Participating Institutions Included:

- Kapenguria Boys
- Chebisan National School
- Enaiposha Girls High school
- Turkana Girls National School
- Nyandarua High School
- Riara School
- Tartar Girls High School
- Thika High School
- Machakos Girls High School
- Plateau Girls High School
- Mumbuni Girls High School
- University of Nairobi
- Moi University
- Masinde Muliro University of Science & Technology
- Technical University of Mombasa
- South Eastern Kenya University
- Murang'a University of Technology
- Jomo Kenyatta University of Agriculture and Technology

The diversity of institutions allowed the research to consider varying levels of mentorship exposure, socioeconomic background, and regional disparity.

Data Collection Tools

Data was collected through three primary tools:

- a) **Structured Surveys:** Administered to students to gather quantitative data on mentorship impact, STEM interest, and personal development indicators.
- b) **Key Informant Interviews:** Conducted with mentors, school heads, and FLC coordinators to gather qualitative perspectives on implementation challenges and success stories.
- c) **Document Review:** Included analysis of mentorship records, council papers, planning reports, and event evaluations provided by FLC.

Results and Discussion

Data Analysis

Quantitative data were entered into SPSS and analyzed using descriptive statistics such as frequencies, percentages, and cross-tabulations. These data informed patterns on program reach and outcome perceptions. Qualitative data were coded thematically using NVivo, extracting common themes around mentorship effectiveness, soft skills development, leadership enhancement, and institutional collaboration.

Analysis and Findings

This section presents the results of the mentorship program assessment based on data collected from high school and university students, mentors, and FLC documentation. It provides quantitative results supported by a summary table, followed by a qualitative discussion of key findings. The analysis is divided into thematic areas aligned with the goals of the mentorship initiative: student engagement in STEM, soft skill development, career awareness, and peer mentorship.

Qualitative Findings and Interpretation

Table 0-1: Quantitative Findings

Indicator	High School (%)	University (%)	Overall (%)
Interest in STEM careers post-mentorship	72%	68%	70%
Improved self-confidence	75%	81%	78%
Better communication/public speaking skills	70%	77%	74%
Understanding of engineering career paths	65%	72%	69%
Participation in peer mentorship	40%	58%	49%
Awareness of IEK/FLC membership	55%	88%	72%

The mentorship program produced notable positive impacts across both high school and university levels. Overall, 70% of students reported increased interest in STEM careers, showing that structured engagement with role models and industry professionals successfully inspired career aspirations. Self-confidence and communication skills improved significantly, with 78% of participants highlighting gains in public speaking, class presentations, and interview readiness.

Mentorship also enhanced career clarity, particularly among university students, who reported a stronger understanding of engineering pathways and job preparedness. A multiplier effect was evident, with nearly half of the respondents (49%) engaging in peer-to-peer mentorship, indicating that beneficiaries were motivated to guide others. Additionally, awareness of IEK and FLC grew markedly—88% among university students and 55% in high schools—signaling increased institutional visibility and potential for sustained professional engagement.

High School Outreach Summary

As part of its nationwide mentorship initiative, the IEK Future Leaders Committee (FLC) visited 12 high schools across different counties. These schools collectively hosted a total of 7,863 students, with an average of approximately 655 students per school. This high level of engagement reflects the scale and reach of the mentorship effort, particularly at the secondary school level, where early career exposure is most impactful.

The breakdown of student numbers across the visited schools is illustrated in the table below:

Table 0-2: Number of High Schools Visited and Students Mentored

Name of the school	Number of students
Kapenguria boys	850
Tartar Girls High school	350
Chebisas school	800
Enaiposha girls	800
Turkana girls	638
Plateau school	558
Nyandarua school	680
Riara school	650
Machakos school	586
Thika high	800
Materi Centre	553
Mumbuni school	598
Total	7863

(source: individual school visitation and council paper)

This quantitative outreach demonstrates the FLC’s strong logistical capability and commitment to inclusive mentorship by covering both urban and rural institutions. It also confirms the program’s strategic targeting of students in science-oriented streams, primarily those in Forms 3 and 4 studying subjects like mathematics and physics.

The relatively high average number of students mentored per school suggests strong student interest and institutional support for mentorship engagements. Moreover, this engagement level contributes to the observed outcomes in STEM career awareness, improved self-confidence, and peer mentorship uptake among the high school cohort, aligning directly with the study’s objectives and methodological focus on both reach and impact.

Conclusion

This study confirms that mentorship is a powerful tool for preparing Africa’s next generation of engineers by bridging the gap between academic training and professional practice. The IEK Future Leaders Committee (FLC) model has demonstrated measurable impact in raising interest in STEM careers, strengthening self-confidence and communication skills, and improving understanding of engineering career pathways among both high school and university students.

Beyond individual growth, the program has fostered peer-to-peer mentorship and increased awareness of professional bodies, showing that mentorship can create a sustainable cycle of empowerment. Despite challenges such as limited resources and geographical barriers, the FLC approach has proven cost-effective, scalable, and replicable, contributing directly to Kenya’s national development goals.

The way forward lies in institutionalizing mentorship within education systems, leveraging technology to expand reach, and ensuring inclusivity for girls and underserved regions. Sustainable financing, strong partnerships, and robust monitoring will be essential for scaling the model into a nationwide and continental movement that supports Africa’s innovation and socio-economic transformation. Policymakers and professional bodies should therefore adopt mentorship as a national strategy to strengthen human capital development and accelerate Africa’s industrialization agenda.

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