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*Perspective Article*

# Methodologies In Global Engineering

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## INTRODUCTION

Poverty remains in the low- and middle-income nations targeted by these efforts, despite decades of global development programming. To account for structural and systemic hurdles to global poverty reduction, training methods to global development must adapt, as must the role of engineers in these initiatives. Rapid expansion in graduate programmes in Global Engineering in the United States and Canada presents an opportunity to coordinate efforts among academic institutions and ensure that programmes are aligned with industry requirements as reported by practitioners. We gathered practitioners, academics, and graduate students for a two-day workshop to construct an agreed-upon Global Engineering body of knowledge in order to generate agreement on how to equip engineering students with the requisite knowledge, skills, and attitudes. A pre-event poll of individual participants and representatives from participating academic institutions with graduate programmes in Global Engineering or a similar topic provided input for the workshop. We developed the following priority learning objectives for graduate education in global engineering through workshop breakout sessions and post-event work by the authors: Contextual Comprehension and Analysis; Cross-cultural Humility; Global Engineering Ethics; Stakeholder Analysis and Engagement; Complex Systems Analysis; Data Collection and Analysis; Data-driven Decision Making; Applied Engineering Knowledge; Project Design; Project Management; Multidisciplinary Applied Engineering Knowledge. Although technical skills are vital in educating the next generation of Global Engineers, transversal and interdisciplinary abilities are just as important in preparing students to work across sectors and account for global development and equity hurdles. By teaching them to solve engineering problems collaboratively in low-resource settings and equipping them to account for socioeconomic, environmental, and political constraints, the practise of Global Engineering can prepare the next generation of engineers to address structural and systemic barriers.

This generation of Global Engineers will be in charge of developing and validating the tools, policies, and practises that will help the public, commercial, and non-profit sectors improve people's lives throughout the world. Academic institutions' attempts to train Global Engineers provide a chance to develop a shared body of knowledge for Global Engineering and to improve on previous efforts while taking into consideration the evolution that engineering must undergo to aid in global poverty reduction.

## GLOBAL ENGINEERING

The Mortenson Center in Global Engineering and the Environmental Engineering programme at the University of Colorado Boulder (UCB) hosted a workshop in February 2021, in collaboration with the University of Michigan and the American Society of Mechanical Engineers (ASME), to generate consensus on the emerging field of Global Engineering and to establish learning objectives for Global Engineering graduate education and programming in the United States and C. Faculty, students, and employees from 38 North American university programmes, as well as practitioners from 17 global engineering corporations, attended this session. Over the course of two days, participants participated in organised working sessions, discussed current graduate and undergraduate curriculum, and created and improved learning goals to be used across graduate programmes. The workshop, which was supported by the National Science Foundation, was confined to graduate education at North American universities. We purposefully adopted this inclusion criterion because of the structural commonalities between these graduate programmes and the professional prospects available to these individuals. We realise, however, that Global Engineering is not limited to academics, nor is Global Engineering education limited to North America. In the discipline of Global Engineering, we also recognise the relevance of undergraduate teaching and research. While the workshop's emphasis was purposefully limited, the hope is that the information, cooperation, and outcomes presented will contribute to worldwide advancements in

education and research.

Global Engineering is a new discipline that reflects a shift in how engineers approach global development disparities and issues. As a result, Global Engineering relies on engineering education methodologies that have been developed over the previous decade, such as Development Engineering, Humanitarian Engineering, and Peace Engineering. The goal of establishing the subject of Global Engineering is not to replace these or other well-established fields like global health or development economics, but to learn from them and find common ground. As a result, it's critical to involve academic stakeholders from all of these disciplines in developing a Global Engineering consensus body of knowledge.

Global Engineering, as defined by us, is concerned with the unequal and unfair distribution of fundamental services such as water, sanitation, electricity, food, transportation, and housing, with a focus on finding the causes, determinants, and solutions to increase equitable access to dependable services. Global Engineering envisions a society in which everyone has access to safe drinking water, sanitation, electricity, food, shelter, and infrastructure, allowing them to live in health, dignity, and prosperity.

We argue that Global Engineering can serve as a professional and academic complement to Global Health and Development Economics, focusing on broadening the scope of poverty-reduction tools and practises while deliberately including health, economics, policy, and governance as relevant dimensions and requiring our professionals to be knowledgeable in these fields."

Over the last two decades, global engineering programmes have proliferated, including degree programmes, specialisations, and certifications. These programmes are designed to provide engineering students with the information, skills, and awareness they need to alleviate chronic poverty and respond to emergencies in low-resource environments. While these schools all have the same purpose of teaching engineering students to help alleviate global poverty, evaluations of their offerings indicate a broad diversity of pedagogical techniques and curricular material. As a result, there is an opportunity to bring programmes together to define a shared set of learning objectives and strive toward consistency in how these objectives are met, with the goal of boosting the collective effect of these programmes and their graduates.