

It's time for a gear change

We applaud the proposed updates to the international framework on graduate attributes and professional competencies for engineers, and the recognition that engineers need to evolve in order to tackle 21st century challenges. But a key component is missing -- to address this century's complex problems, engineers must also be able to reflect on and think critically about the role of engineering itself.

The Engineers Without Borders movement is founded on the belief in engineering as a critical enabler of positive change -- that the engineering profession can and should work towards changes that allow the planet, including all people and living things, to thrive. Established initially in France in the early 1980s to focus engineering skill on social injustice, a whole family of organizations now exist throughout the world with the collective aim of benefiting people and the planet.

As part of this aim, many in our global movement have identified that the education and development of engineers is crucial to ensuring that all of engineering is focused on creating positive impact for all people, now and in the future. Concerns have been raised that engineering education does not adequately prepare engineers with the skills needed to create this positive impact, especially as social and environmental problems have grown increasingly complex. The unpredictable events of 2020, combined with the climate change and biodiversity crisis looming in the background, have intensified these concerns. There is a strong sense that there is a narrow, ten-year window of opportunity to lay a positive path forward --and that if we are too late, we will not be able to prevent disasters.

The latest proposed revision of the International Engineering Alliance's Benchmark for Graduate Attributes and Professional Competencies makes great strides towards addressing these concerns. In recognizing the need for engineers to situate their work within the UN Sustainable Development Goals, in emphasizing diversity and inclusion, and in acknowledging the disruptive potential of emerging future technologies, the revision goes a long way towards recognizing the role engineers can and need to play in addressing current global challenges.

But the framework falls short in that it fails to acknowledge the need for a fundamental shift in the engineering mindset: the need for engineers to reflect on and think critically about the role of engineering itself.

In the revision, engineering continues to be promoted as a process uninfluenced by societal values that leads to one correct solution, when in fact it is a complex process embedded in society that necessarily involves navigating ethical issues and value tensions, making judgements with uncertain and ambiguous information, and adapting to context. In other

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words, the revision does not adequately guard against -- and at points even perpetuates -- a narrow view of engineering, one that doesn't fully acknowledge that engineering itself has a serious impact on and consequences for people and the planet.

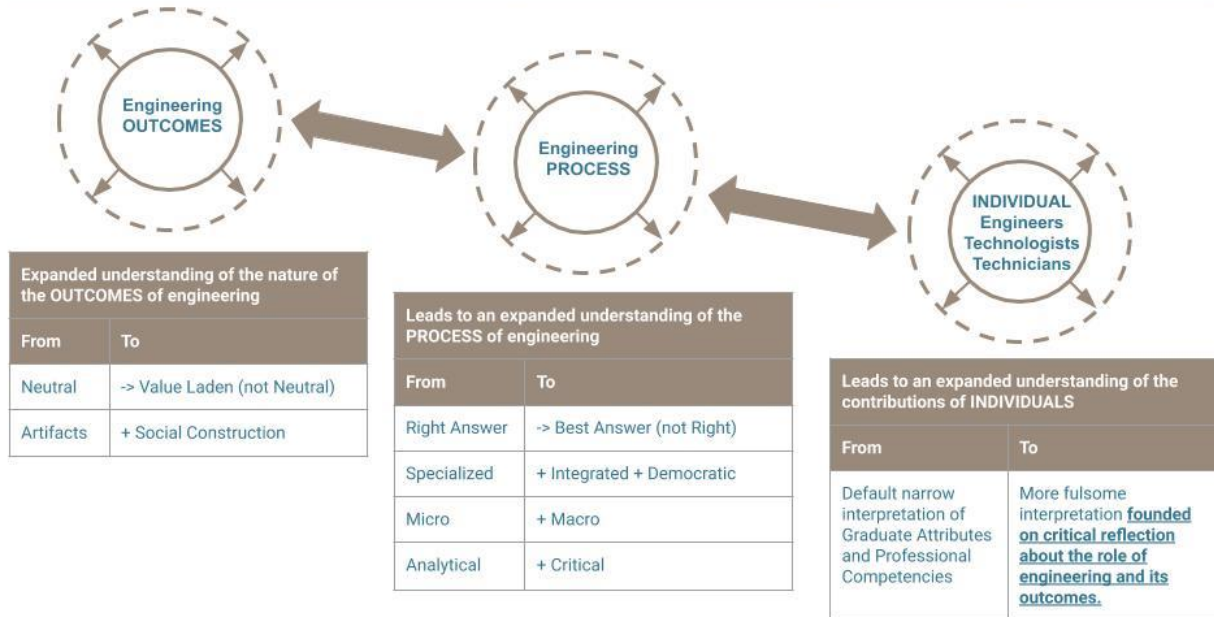
Thinking critically about engineering includes the ability to see it as potentially part of the problem. As the practice that underpins processes around building, energy production and use, food and water provision, transportation, communications, and space exploration, to name but a few, engineering plays a key role in our daily lives and in our future. While it has resulted in incredible advances to our comfort, health, and safety, it has also played a fundamental role in getting us to the unjust and unsustainable practices that dominate the world today.

This kind of critical reflection of its own role and implications is essential for engineering to engage in the kind of in-depth problem solving required to find our way through 21st century issues, because it both acknowledges complexity and builds skills in navigating it. This opens engineering up to a wider range of possibilities; promotes making intentional choices around the purpose of and focus of engineering; and highlights the need to meaningfully engage stakeholders so that solutions are genuinely equitable and sustainable, as opposed to merely adequately meeting technical benchmarks.

To redress the issues with the framework, our group of Engineers Without Borders organizations and supporters urges that the following are vital in transforming engineers educated for the 20th century into engineers capable of positively addressing the complex issues of the 21st century:

- Emphasis on critical thinking as a fundamental cornerstone of engineering competence; on critically analyzing and critiquing the role of engineering, its relationship with humanity, and its impact on our past and potential futures.
- Deeper comprehension of the ethical issues inherent in engineering due to the relationship between engineering, people and the planet, and greater focus on developing the skills necessary to navigate these complex issues.
- Broader appreciation for the knowledge needed to make effective engineering judgements, including explicitly acknowledging the value of the social sciences in helping engineers understand the implications of their work.

Increased Benefit For All: a world that is more equitable, inclusive, just and sustainable



Our group of Engineers Without Borders organizations is actively advancing these vital elements by helping students and professionals develop the skills to reflect on and think critically about engineering, and by building connections with social scientists, Indigenous leaders, and other groups with important insights on the relationship between engineering and society. We would welcome the opportunity to work more closely with the International Engineering Alliance and other groups to support this crucial shift to the engineering mindset.

We have no planet B and time is running out. To ensure engineering is beneficial for all, the engineering mindset must shift to include reflecting on and thinking critically about the role of engineering itself.

This statement has been compiled by Engineers Without Borders International with the specific endorsement of the following Engineers Without Borders organizations (presented alphabetically).

The Engineers Without Borders International movement has representation in 102 countries worldwide with thousands of active supporters across engineering industry and academia.

To find out more, please contact us: admin@ewb-international.org.

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Engineers Without Borders International's vision is a sustainable world where engineering enables long-term positive social and global development for the benefit of people and the environment everywhere.