

428. Care to Change

Introduction

Imagine a world where artificial intelligence surpasses human decision-making, rising sea levels threaten coastal cities, and energy demands push our planet to the brink. The challenges we face — technological revolutions, global interconnectedness, social upheavals, and climate change — demand a new breed of engineer. As Barabási (2011) noted, "an increasing number of the big questions of contemporary science are rooted in the same problem: we hit the limits of reductionism."

A purely technical approach will not lead to sustainable change. To thrive in this volatile, uncertain, complex, and ambiguous (VUCA) world, engineers need more than just technical expertise; they must be proactive, adaptable, resilient, responsible, and conscious of their impact on society and the planet. At TU Delft, we are not just educating engineers; we are shaping the future of engineering. This manifesto outlines a new educational paradigm—one that shifts from producing "professional problem solvers" to fostering "individuals who care for our collective future through engineering."

From 'Concern' to 'Care': A New Perspective

TU Delft has a proud legacy of engineering excellence. Our graduates are known for their problem-solving skills and technical acumen. However, the problems they now face are increasingly complex — not only from an engineering standpoint but also from socio-political perspectives. The origins of these challenges are socially debated, and their solutions are highly politicized. In a VUCA world, engineers must:

- Make critical decisions amid uncertainty and constant change.
- Be receptive to both emerging technologies and diverse ways of thinking.
- Embrace lifelong learning to navigate societal transformations.
- Collaborate effectively with people from all backgrounds.
- Understand the societal and environmental impact of their work.
- Develop solutions that benefit humanity and the planet.

Latour (2004) distinguished between 'matters of fact' and 'matters of concern,' emphasizing that scientific inquiry is deeply embedded in social contexts. While TU Delft has integrated problem-based learning and socially dynamic approaches into education, we propose going one step further: reframing engineering challenges not just as 'matters of concern,' but as 'matters of care.' Puig de la Bellacasa (2017) expands on Latour's concept, introducing an ethical and affective dimension to knowledge. Rather than viewing engineering as merely solving technical problems, we advocate for an approach where students actively engage with the world through care, maintenance, and repair. This shift moves beyond 'caring about' issues to 'caring for' our collective future. To realize this, we must fundamentally transform how we educate future engineers. To equip students for this new reality, we must cultivate 'future-ready' competencies by:

- Breaking down disciplinary silos to foster holistic problem-solving.
- Encouraging lifelong learning and adaptability.
- Cultivating proactive, responsible, and resilient engineers.

Key competencies include proactivity, which fosters curiosity, critical thinking, and initiative; responsibility, which cultivates ethical awareness and social accountability; and resilience, which equips students with the mental and emotional skills needed to navigate complexity. Additionally, self-reflection encourages students to connect their personal experiences with broader societal challenges, while collaboration and communication develop essential skills for success in an interconnected world.

Empowering Students as Agents of Change Through Identity Development

Education should not only impart knowledge but also help students develop a strong sense of self. Moving from concern to care requires students to discover personal motivations for shaping the future, rather than simply understanding what they could do.

Gert Biesta outlines three purposes of education:

1. Qualification: Equipping learners with knowledge, skills, and competencies.
2. Socialization: Integrating students into cultural and societal structures.
3. Subjectification: Emphasizing personal autonomy and critical thinking.

Engineering education has traditionally prioritized qualification, often at the expense of subjectification—the process of developing individual identity and agency. Paulo Freire (2005) warns against an educational model that merely deposits knowledge into students, arguing that critical consciousness emerges through active engagement with the world. We must foster this critical consciousness, helping students align their values and aspirations with their engineering pursuits to cultivate a genuine sense of care.

Anticipating and Integrating Future Engineering Competencies

To nurture care and identity development, educators must co-produce future-oriented engineering competencies. Our curricula should:

- Anticipate future needs by collaborating with industry partners to identify essential competencies like systems thinking, digital literacy, negotiation, and ethical reasoning.
- Be modular and flexible, integrating emerging topics such as ethics in technology, sustainable energy, AI, and entrepreneurship.
- Encourage transdisciplinarity, merging insights from engineering, social sciences, and humanities to address complex real-world challenges.

- Stimulate critical consciousness by fostering open dialogue, allowing students to challenge assumptions, and documenting their learning journeys through reflective portfolios.

By embracing these principles, TU Delft aims to develop engineers who are technically proficient, ethically responsible, and capable of navigating a VUCA world with a systems-thinking mindset. These engineers will make informed decisions and contribute positively to society and the environment from their own moral frameworks.

From Problem-Solvers to Individuals Who Care

We envision a world where students actively shape their own educational journeys. Learning should not be a passive process of absorbing knowledge but an active cultivation of a "knowing will"—the ability to apply knowledge meaningfully to create positive change. This requires a shift from a teacher-centric model to a student-driven approach where:

- Students have greater autonomy in designing their learning paths, fostering diversity and inclusion.
- Learning environments encourage exploration, experimentation, and risk-taking.
- Education moves beyond solving pre-defined problems to engaging with open-ended, real-world challenges.

By transitioning from closed-ended problem-solving to open-ended challenge-based learning, students will engage more deeply with the ethical and societal dimensions of engineering. This approach helps them see problems not as societal 'speed bumps' but as opportunities to cultivate meaningful, lasting change. By embracing this abstract's principles, we can empower our students to become the future-proof engineers our world needs. We invite faculty, students, and staff to join us in reimagining education — one where engineers are not just technical experts but individuals who genuinely care for our collective future.

References

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