

Hvor er verdens teknologiutdanninger på vei?

Geir E. D. Øien
Professor og senterleder SEED
IVs utdanningsdag, 7/5-2024

www.ntnu.no/seed/center-for-science-and-engineering-education-development

**FREMTIDENS
TEKNOLOGISTUDIER**



NTNU

Stikkord: Bærekraft, ansvarlighet og KI!



SEFI ANNUAL CONFERENCE 11-14 September 2023 TUJ Dublin

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SEFI Conference 2023
11-14 September
Engineering Education for Sustainability

The banner features a blue and teal color scheme with a central image of four people looking at a globe. The background shows a cityscape with a river.



SEFI ANNUAL CONFERENCE 2-5 SEPTEMBER 2024 LAUSANNE

Home Call & Submission Venue Conference Sponsors Register

SEFI 2024
Educating Responsible Engineers
2 - 5 September 2024 - Lausanne

The banner features a blue header and a background image of a cityscape with a large church spire. The text is overlaid on the image.

CDIO Regional meeting at KTH 9th January 2024

How can CDIO promote - and prevent - transformations towards sustainable futures?



Anders Rosén (aro@kth.se), KTH Royal Institute of Technology

Ola Leifler (ola.leifler@liu.se), Linköping University



cdio TUNISIA 2024

esprit Responsible Learning HONORIS UNITED UNIVERSITIES

unesco Chair

The 20th International **CDIO Conference**
IN TUNIS, TUNISIA

Engineering education in **THE ERA OF AI**

10 -13 JUNE, 2024
AT ESPRIT

Registration is now open

The banner features a light blue background with a large image of the Colosseum in Rome. The text is overlaid on the image.

Viktigste utviklingstrekk som påvirker fremtidens kompetansebehov, oppsummert



Bærekraftig utvikling og grønt skifte



Økende kompleksitet, usikkerhet, uforutsigbarhet



Digital transformasjon endrer samfunnet og alle fagfelt

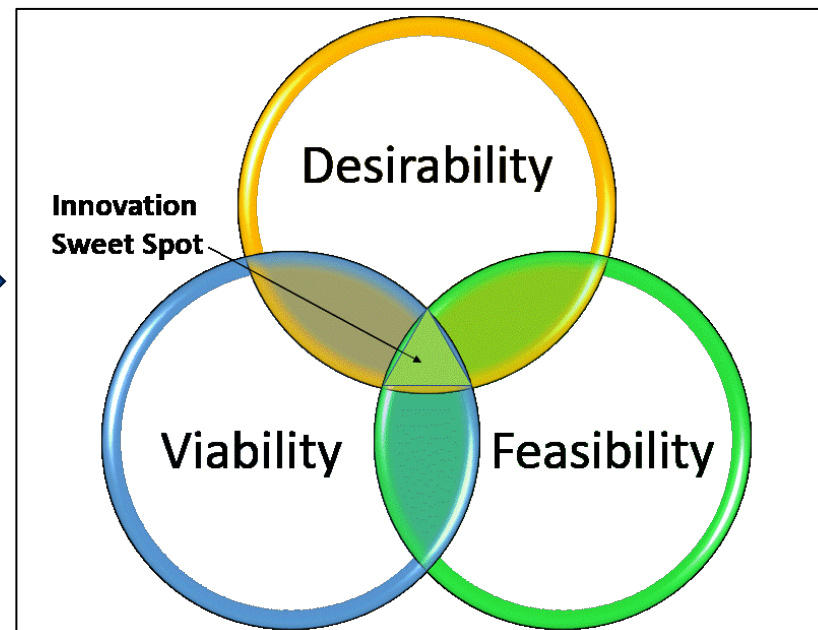


Omstillingsbehov gir behov for mer entreprenørielt tankesett – teknologer som endringsagenter

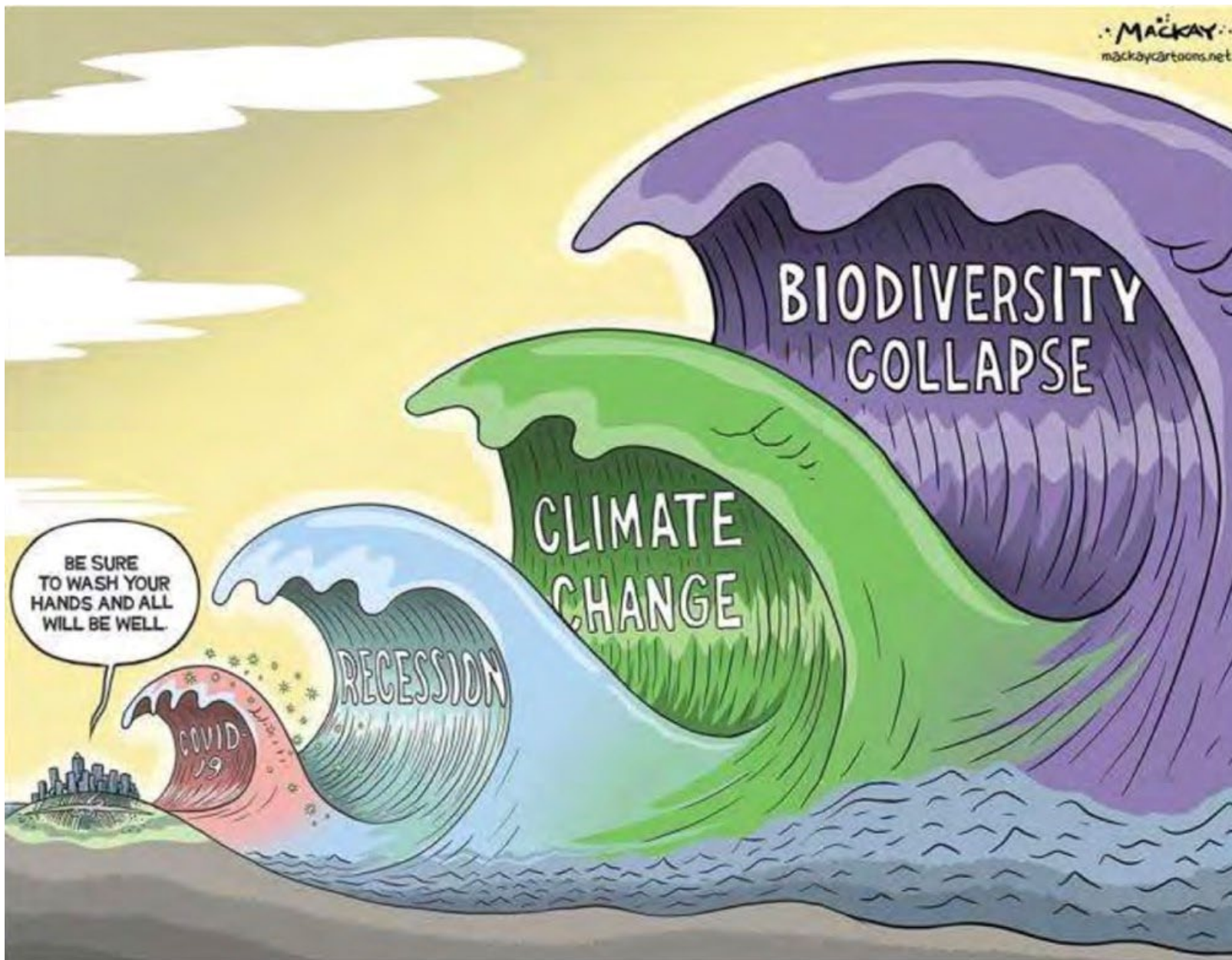


Økende endringstakt - evne til livslang læring blir en sentral kompetanse for alle

'... the mindset to become change agents for the better'?
(SFU Engage)



'Kunnskap for en bedre verden'?



'Industry 5.0': Menneskesentrert, bærekraftig, og motstandsdyktig – for en grønn og digital fremtid



The screenshot shows the European Commission website page for Industry 5.0. The page header includes the European Commission logo and the text 'European Commission'. Below the header, there is a navigation bar with 'Research and innovation' and a breadcrumb trail: 'Home > Research by area > Industrial research and innovation > Industry 5.0'. The main heading is 'Industry 5.0' with a sub-heading 'What this approach is focused on, how it will be achieved and how it is already being implemented.' A table of contents is visible on the left, listing sections like 'What is Industry 5.0?', 'Why Industry 5.0?', 'How to make it happen?', 'Industry 5.0 Award', 'Industry 5.0 Community of Practice (CoP 5.0)', 'Publications', 'Documents', and 'Latest'. The 'Documents' section is highlighted with a red box, containing two paragraphs of text.

European Commission

EN

Research and innovation

Home > Research by area > Industrial research and innovation > Industry 5.0

Industry 5.0

What this approach is focused on, how it will be achieved and how it is already being implemented.

PAGE CONTENTS

- What is Industry 5.0?
- Why Industry 5.0?
- How to make it happen?
- Industry 5.0 Award
- Industry 5.0 Community of Practice (CoP 5.0)
- Publications
- Documents
- Latest

What is Industry 5.0?

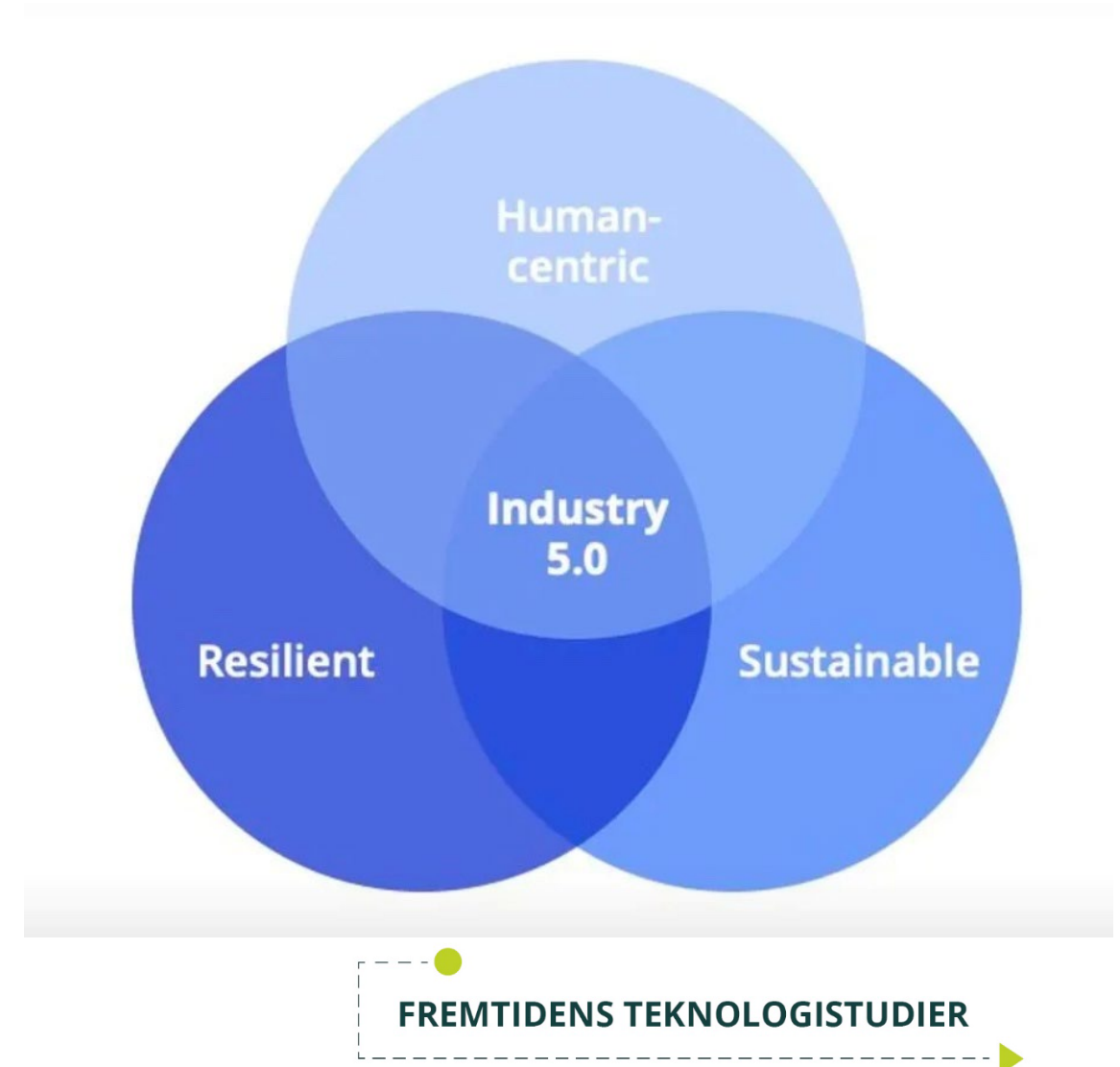
European industry is a key driver in the economic and societal transitions that we are currently undergoing.

In order to remain the engine of prosperity, industry must lead the digital and green transitions.

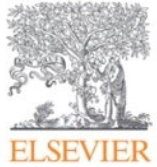
This approach provides a vision of industry that aims beyond efficiency and productivity as the sole goals, and reinforces the role and the contribution of industry to society.

It places the wellbeing of the worker at the centre of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet.

It complements the existing "Industry 4.0" approach by specifically putting research and innovation at the service of the transition to a **sustainable, human-centric and resilient European industry**.

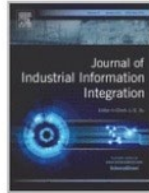


Konsekvenser for våre utdanninger?



Journal of Industrial
Information Integration

Volume 25, January 2022, 100311



Rethinking engineering education at the age of industry 5.0

Didem Gürdür Broo^a , Okyay Kaynak^b, Sadiq M. Sait^c

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<https://doi.org/10.1016/j.jii.2021.100311> 

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5. Strategies for the future

After considering the fifth industrial revolution, important trends/influencing factors that will affect engineering education fundamentally and analyzing the need for skills from the next generation, we have identified four strategies that may help the higher education institutions to redesign their programs. These strategies are;

- lifelong learning and transdisciplinary education
- sustainability, resilience, and human-centric design modules
- hands-on data fluency and management courses
- human-agent/machine/robot/computer interaction

 FREMTIDENS TEKNOLOGISTUDIER 

TU Ledige stillinger Nyhetsbrev Nyhetsstudio Video **Abonner** Innlogget Meny

Slike ingeniører trenger Norge nå

Digital kompetanse, tverrfaglig forståelse og motivasjon til å stadig lære er det de store selskapene ønsker seg når de ansetter ingeniører i et arbeidsmarked i stadig endring.



Anders Hatlelid (t.v.) har en master i data science, Martin Heir i kybernetikk og robotikk og Sunniva Steiro i miljøfysikk. De er alle nyansatt i DNV Maritim og jobber med maskinlæring. Foto: Mona Strande

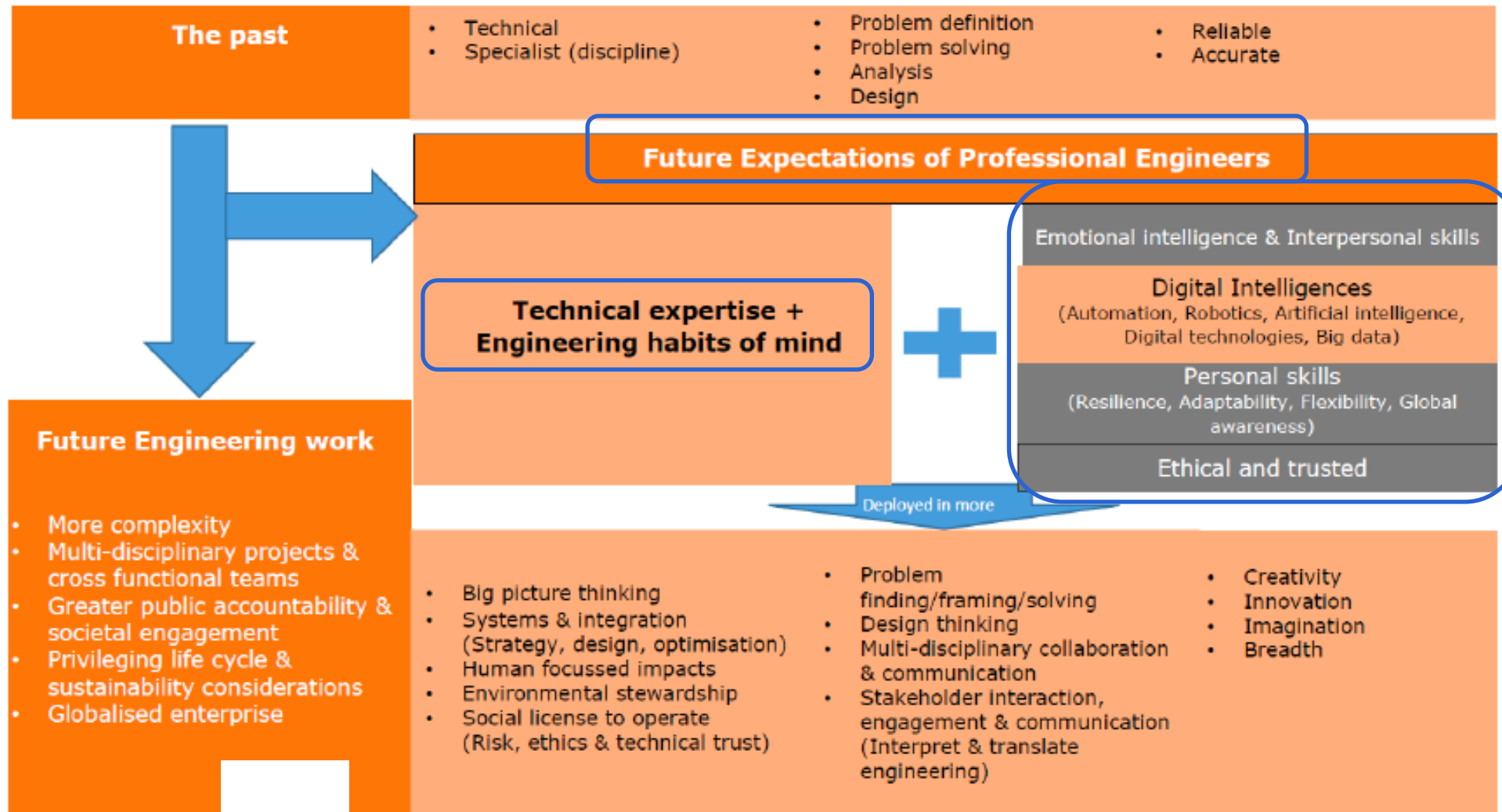
Faglig utadvendt

Den digitale transformasjonen er her og treffer etter hvert alle fagfelt. Derfor trenger alle kompetanse på å bruke teknologi, men også kompetanse til å forstå hvilke premiss teknologien gir i samhandling med andre og for fagdisiplinene som kommer inn i prosjektet etter deg. Det mener Martin Halvorsen, som er leder for talent og rekruttering i Multiconsult.

– Fremover trenger vi mange flere nysgjerrige og faglig utadvendte ingeniører. Altså ingeniører som søker mer i bredden enn veldig i dybden, og som har evne til å søke ut for å forstå helheten i problemstillingene vi jobber med, sier han.

Rekrutteringssjefen sier Multiconsult ikke vil slutte å lene seg mot de klassiske linjene bygg, energi og miljø, fordi det behovet ikke vil forsvinne. Men de vil gradvis også trenge vesentlig flere som er utdannet innen IKT og tech-orienterte studieretninger.

'There are no simple problems left to solve ...'



Eksempel 1: MIT

NEET Ways of Thinking

Learning how to learn

Making

Discovering

Interpersonal skills

Personal skills and attitudes

Creative thinking

Systems thinking

Critical and metacognitive thinking

Analytical thinking

Computational thinking

Experimental

Humanistic

**First
Years!**

**Engineer
Differently.**

MIT New Engineering
Education Transformation

NEET

Autonomous
Machines



Climate &
Sustainability
Systems



Living
Machines



Digital
Cities



NEET's cross-departmental 'threads' allow students to join a community and engage in interdisciplinary projects while pursuing a degree in their chosen major.

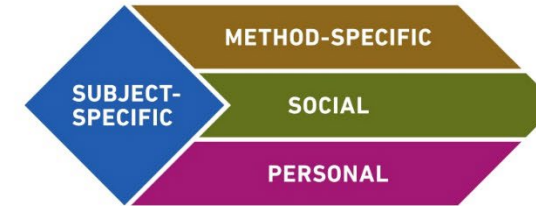
Registration closes May 15!

REGISTER

Eksempel 2: **ETH** zürich

Disconnect

COMPETENCE FRAMEWORK



SUBJECT-SPECIFIC COMPETENCIES (to be specified by individual degree programmes)
Knowledge of theories, concepts, and techniques and its application to specific fields

METHOD-SPECIFIC COMPETENCIES

Knowledge Disconnect application of methods to make sense of, and operate in, any context

SOCIAL COMPETENCIES

Competencies applied in the interaction with others

PERSONAL COMPETENCIES

Competencies concerning self-management in the context of own work

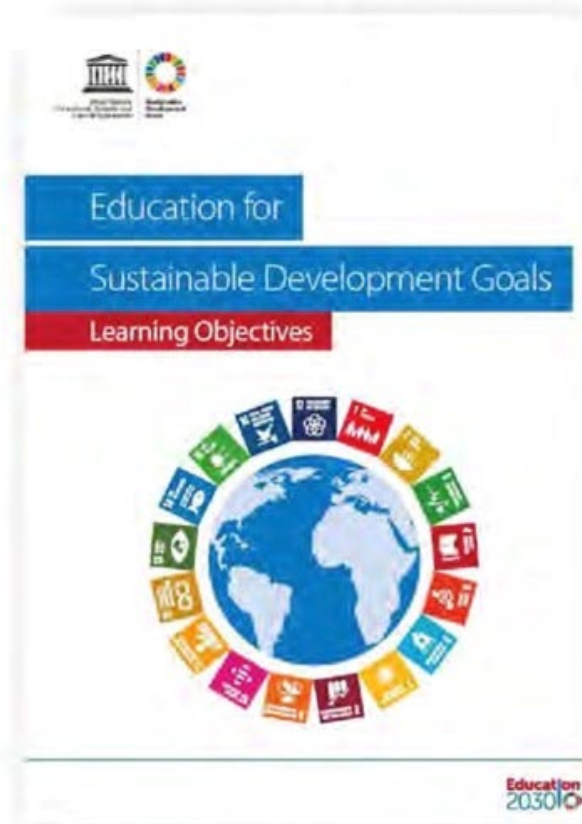
Education for Sustainable Development

as framed by UNESCO

Crucial features:
(UNESCO 2017)

Integrating
sustainability
content

Developing
key sustainability
competencies



<http://unesdoc.unesco.org/images/0024/002474/247444e.pdf>

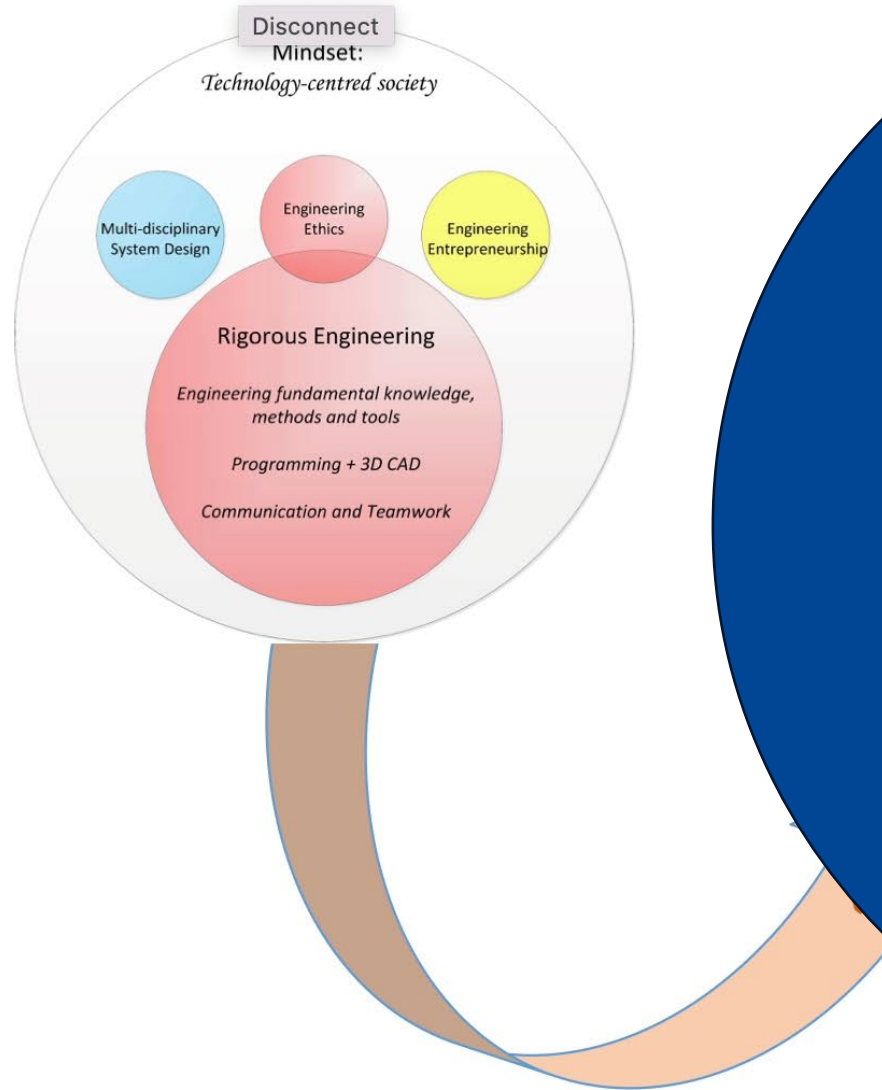
Pedagogical approaches:
(UNESCO 2017)

Learner-centered

Action-oriented

Transformative

S&T Education 4.0



Vi skal utdanne hele kandidater



Fremtidens teknologer må ha:

- 1 høy bærekraftskompetanse
- 2 høy digital kompetanse
- 3 evne til livslang læring
- 4 en sterk profesjonskjerne
- 5 en bred verktøykasse
- 6 et solid kunnskapsfundament
- 7 evne til tverrfaglig samhandling

... i en bred samfunnsmessig kontekst

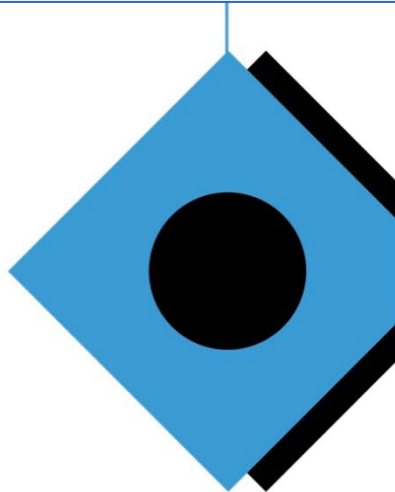
(flere detaljer om FTS-kompetanseprofilene finnes [her](#))

ENHANCE+ - WP4 Future Skills: Eksempel på europeisk samarbeid om fremtidens kompetanser for teknologer



Disconnect **FUTURE. SKILLS.**

Friday, 23 February 2024
15:00-16:15
H1012, Horst-Wagon Saal, Technische Universität Berlin
Straße des 17. Juni 135, 10623 Berlin
In-person + Live Stream on YouTube



On 23 February 2024, the ENHANCE Alliance will host the next edition of the ENHANCE Conversations addressing the key question:
Which skills and values should learners be equipped with to positively contribute to societal challenges and to meet the needs of the future labour market?

The following questions will provide interesting points of departure to allow for an engaged and informative exchange between our panelists:

- What are the top skills European STEM graduates will need in the next 10 years?
- Can (gender) inequalities be addressed through skills training?
- Can European values, such as democracy, freedom of expression, etc. be translated to skills education?
- How much emphasis should we place on AI, with regards to future skills education?
- How do you become competitive as Europe, as a European, and still globally inclusive?
- Which skills do we teach well in Europe?
- Which skills do we struggle to teach in Europe?

SEED deltar i arbeidspakken på vegne av NTNU!

Chalmers Tekniska Högskola AB
Eidgenössische Technische Hochschule Zürich
Politechnika Gdańska
Norges Teknisk-Naturvitenskapelige Universitet
Politecnico di Milano
Rheinisch-Westfälische Technische Hochschule Aachen
Technische Universität Berlin
Technische Universiteit Delft
Universitat Politècnica de València
Politechnika Warszawska

FREMTIDENS TEKNOLOGISTUDIER

Takk for oppmerksomheten!

Besøk SEEDs hjemmeside på www.ntnu.no/seed/center-for-science-and-engineering-education-development.



Photo: © Kai Dragland