SPS Future Skills Development
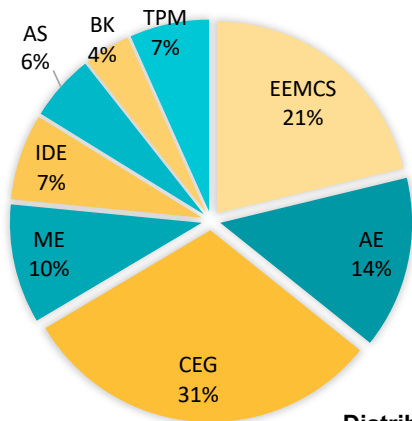
Survey Results • 07.*10.2024 – 21.10.2024*

Topic of research

The research asked students questions related to:

- how well they feel prepared for the job market,
- the skills they get to develop and those they miss in their programmes
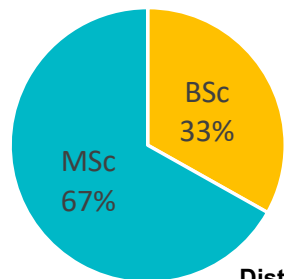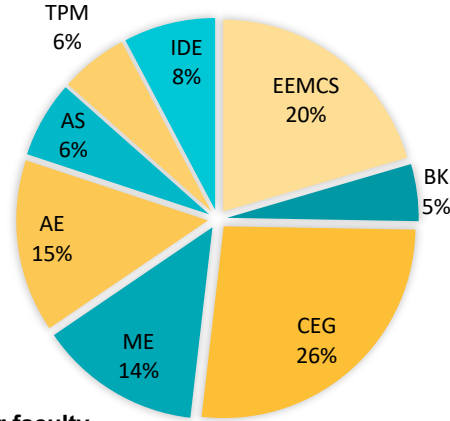- the relevance for their programmes to stay current with the industry needs.

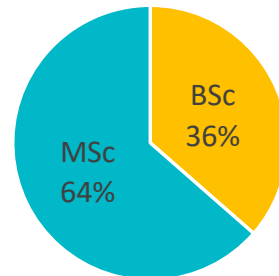**Survey Respondents**

180 Survey Respondents

TPM 7% · BK 4% · AS 6% · EEMCS 21% · IDE 7% · ME 10% · AE 14% · CEG 31%

Survey Sent to 542 Panel members

TPM 6% · IDE 8% · AS 6% · EEMCS 20% · BK 5% · AE 15% · CEG 26% · ME 14%

Distribution per faculty

BSc 33% · MSc 67%

BSc 36% · MSc 64%

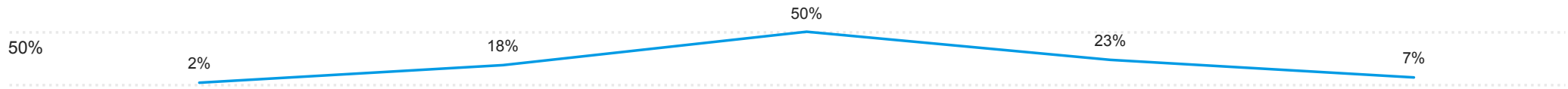**Distribution per programme**

Survey Insights:

- Most students feel **moderately prepared for the job market** in their field of study (50% of 180 respondents) similarly across faculties.
- A majority of students (44% of 180) feel **a lot of confidence towards their ability to apply new technologies** effectively in their field.
- Students feel **moderately (43% of 180) to a lot (32% of 180) equipped with real-world engineering skills**, varying between faculties, most towards moderate.

- In terms of **non-technical skills students receive** in their programmes, most students pointed out skills for **working with others (n=80) and specifically communication (n=64).** Other cognitive skills such as creative thinking, logical reasoning; and personal skills such as discipline, time management were also pointed out. Few students mentioned project management (n=7), research related (n=3) and skills with societal relevance (n=3) such as ethics, or sustainability.
- Amongst **the skills students miss in their programmes**, practical knowledge/ workshops, **job preparedness and hands-on experience and application** were pointed out most (n=45), followed by **technical skills** (n=28). Some mentioned personal (n=14) and communication (n=12) skills such as networking or negotiation.

    The overall response to the question of skills students miss was much lower (127 from 180 total respondents). And 19 students mentioned they don't miss any skills in their programmes, or they began their studies recently.

- Most students (50% of 159) associate a great deal of **importance for their programmes to stay current with the industry needs**. For "*ensuring a smooth transition*", or a" *higher chance of being hired*". Some also point out the theoretical nature of mathematics or physics or maintaining "*independence as research and academic facility*."

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Study Climate

Student Panel
Surveys

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Study Climate

2a - I feel adequately prepared for the current job market in my field of study
(TUD Wide)

180 Responses

50%

Not at all	A little	A moderate amount	A lot	A great deal
2%	18%	50%	23%	7%

(Faculty specific)

30

20

10

	Not at all	A little	A moderate amount	A lot	A great deal
CEG		10	28	13	3
EEMCS		6	20	10	0
AE			12	6	
IDE		2	8	3	
ME			4	1	
ABE/TPM/AS	0		1		

● ABE ● TPM ● EEMCS ● CEG ● AS ● IDE ● ME ● AE

(BSc./MSc. Programme specific)

100

50

	Not at all	A little	A moderate amount	A lot	A great deal
MSc	1	14	61	29	4
BSc.			28	11	

● MSc ● BSc.

Student Panel Surveys

TUDelft | Education & Student Affairs / Study Climate
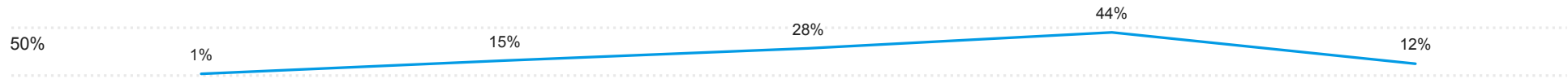
2b - I feel confident about my ability to learn and apply new technologies (for example AI) effectively in my field after graduation

(TUD wide)

180 Responses

50%

44%

28%

15%

1%

12%

(Faculty specific)

20

20

17

15

14

13

10
9

6

6

4
3

2

2

1

6
5

1
0

● ABE   ● TPM   ● EEMCS   ● CEG   ● AS   ● IDE   ● ME   ● AE

(BSc./MSc. Programme specific)

60

51

40

32

26

20

17
17

9

0
0

15
6

Not at all   A little   A moderate amount   A lot   A great deal

● MSc   ● BSc.

2c - I feel like my degree program has equipped me with practical, real-world engineering skills

(TUD wide)

180 Responses

(Faculty specific)

● ABE   ● TPM   ● EEMCS   ● CEG   ● AS   ● IDE   ● ME   ● AE

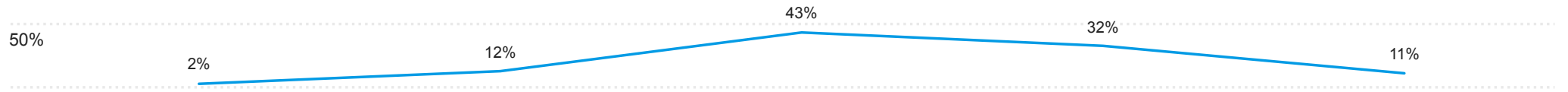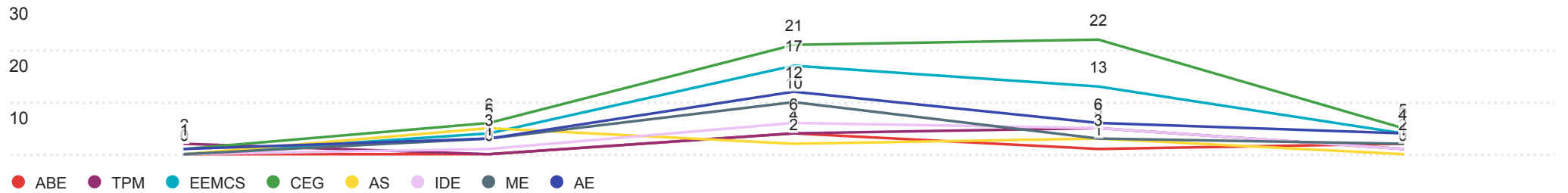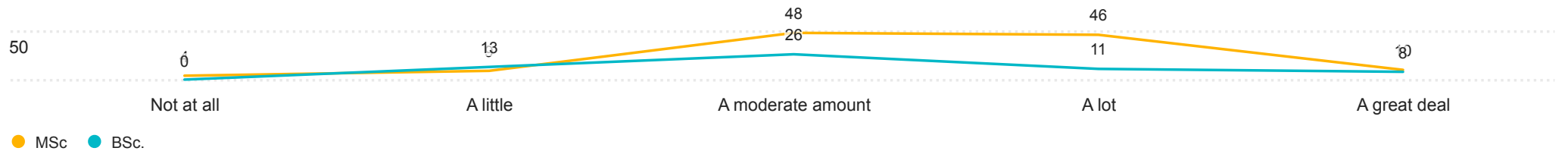*(BSc./ MSc. programme specific)*

Not at all   A little   A moderate amount   A lot   A great deal

● MSc   ● BSc.

3b. Non-Technical skills students get in their programmes:

(Based on open-text responses)

149 respondents

Teamwork/ working with others — n=80

Working in groups, teams, and projectgroups
Leadership
Communication in project groups
how to connect people from different field and lead an interdiciplinary team

(how to work in groups with people with diverse backgrounds and workstyles)

intercultural and diversity skills - *CME, CEG MSc. student*
Team management
Collaborating with peers
Planning in groupwork
Negotiation

Stakeholder management
socio-technical relationships
Group discussion skills
Giving and taking feedback

Communication skills — n=64

Communication
Talk about abstract ideas
Speaking English
Presentation skills
Writing a technical report
presenting posters
Giving and taking feedback
Networking
Group discussion
Public Speaking
Debat
Professional communication with peers and stackholders
Pitching ones ideas
summarizing
scientific writing
interview

Cognitive skills (Ways of thinking) — n=32

Logical reasoning
Systematic problem solving
Critical thinking
Analyze data

Creative thinking

Conceptual and structural problem-solving approaches
filling skill gaps
thinking by sketching
real life situation solving
kwalitatieve onderzoeksmethoden
be able to zoom in and zoom out about a project to be able to have a better overview but also frame properly a problem - *IDE MSc. student*
intuition for estimates
combining different branches and creating a holistic picture
argument-building
ethics and reasoning

Other personal skills — n=26

Discipline
Reflection on personal work
Self-assesment
Ethics in decision-making
Working under time pressure
self-management
Adaptability in changing situations
time-efficient productivity
Time management/ Planning
being flexible if things go wrong
ability to learn
focus and long study
time efficient productivity

Others — n=10

Undersatnding Policy issues
lesgeven, pedagogiek - *SEC, AS, MSc. student*
Marketing, financial planning
applying sustainabilty during product development
Understanding of socio-technical systems and policy issues - *CoSEM, TPM, MSc. student*
Analyzing a situation and creating oversight in the situation and actors involved to help with making appropriate policy.
intuition for estimates etc,
Minor insight into law, economics and goverance
working with various software

Project Management — n=7

Research — n=3

design research
Research
How to find out the underlying problems that a userbase can have.
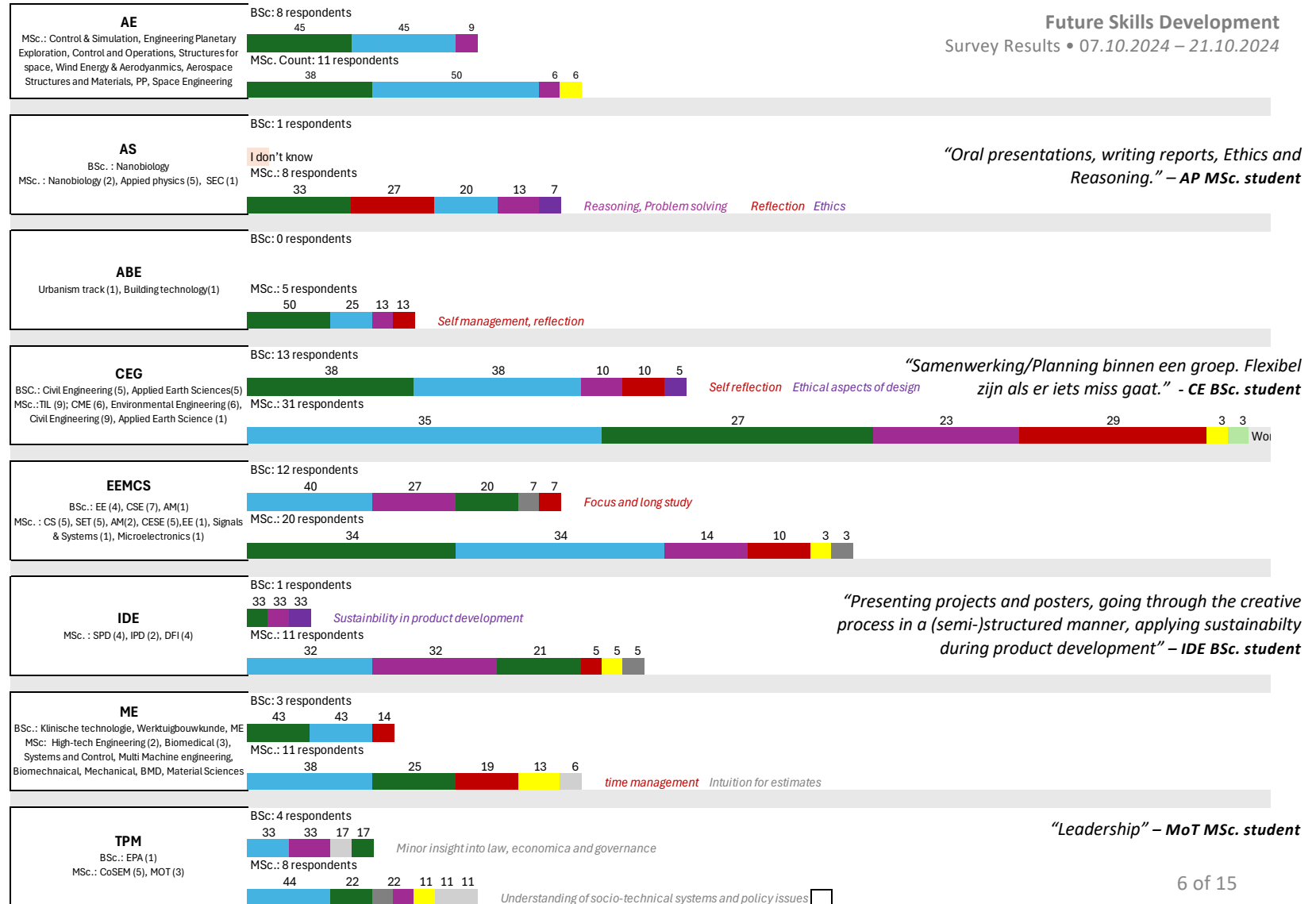
Societal — n=2

Ethics
Sustainability in product development

Practical/Application — n=1

Student Panel Surveys

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3b. Non-Technical skills students get in their programmes:

149 respondents
(programme specific % distribution of mentioned skills)

- Communication (Academic)
- Working with others
- Cognitive skills (Ways of thinking)
- Other personal skills
- Societal relevance
- Research
- Others

AE
MSc.: Control & Simulation, Engineering Planetary Exploration, Control and Operations, Structures for space, Wind Energy & Aerodyanmics, Aerospace Structures and Materials, PP, Space Engineering

BSc: 8 respondents
45 | 45 | 9

MSc. Count: 11 respondents
38 | 50 | 6 | 6

AS
BSc. : Nanobiology
MSc. : Nanobiology (2), Appied physics (5), SEC (1)

BSc: 1 respondents
I don't know

MSc: 8 respondents
33 | 27 | 20 | 13 | 7
Reasoning, Problem solving   Reflection   Ethics

"Oral presentations, writing reports, Ethics and Reasoning." – AP MSc. student

ABE
Urbanism track (1), Building technology(1)

BSc: 0 respondents

MSc.: 5 respondents
50 | 25 | 13 | 13
Self management, reflection

CEG
BSC.: Civil Engineering (5), Applied Earth Sciences(5)
MSc.:TIL (9); CME (6), Environmental Engineering (6), Civil Engineering (9), Applied Earth Science (1)

BSc: 13 respondents
38 | 38 | 10 | 10 | 5
Self reflection   Ethical aspects of design

MSc: 31 respondents
35 | 27 | 23 | 29 | 3 | 3   Wo…

"Samenwerking/Planning binnen een groep. Flexibel zijn als er iets miss gaat." - CE BSc. student

EEMCS
BSc.: EE (4), CSE (7), AM(1)
MSc. : CS (5), SET (5), AM(2), CESE,EE (1), Signals & Systems (1), Microelectronics (1)

BSc: 12 respondents
40 | 27 | 20 | 7 | 7
Focus and long study

MSc: 20 respondents
34 | 34 | 14 | 10 | 3 | 3

IDE
MSc. : SPD (4), IPD (2), DFI (4)

BSc: 1 respondents
33 | 33 | 33
Sustainability in product development

MSc.: 11 respondents
32 | 32 | 21 | 5 | 5 | 5

"Presenting projects and posters, going through the creative process in a (semi-)structured manner, applying sustainabilty during product development" – IDE BSc. student

ME
BSc.: Klinische technologie, Werktuigbouwkunde, ME
MSc: High-tech Engineering (2), Biomedical (3), Systems and Control, Multi Machine engineering, Biomechnaical, Mechanical, BMD, Material Sciences

BSc: 3 respondents
43 | 43 | 14

MSc: 11 respondents
38 | 25 | 19 | 13 | 6
time management   Intuition for estimates

TPM
BSc.: EPA (1)
MSc.: CoSEM (5), MOT (3)

BSc: 4 respondents
33 | 33 | 17 | 17
Minor insight into law, economica and governance

MSc.: 8 respondents
44 | 22 | 22 | 11 | 11 | 11
Understanding of socio-technical systems and policy issues

"Leadership" – MoT MSc. student

3a. Technical skills students get in their programmes:
(Based on open-text responses)

149 respondents

Technical skills students get

Programming & coding
n=71

Python, Java, C++, R, MATLAB, Assembly, Rust, and JavaScript.

Machine Learning, Deep Learning, Optimization Algorithms, OOP (Object-Oriented Programming).

Agent-based modeling, scientific computation, system analysis, simulation, coding for civil engineering, and environmental models.

Specific Engineering Skills
n=63

Circuit design, signal processing, telecommunications, power electronics, PCB design, FPGA, control engineering.

Aircraft and spacecraft systems, structural analysis, mechanics, finite element analysis, experimental testing.

Construction project management, structural design, quantity surveying, understanding forces in structures, safety considerations, technical calculations.

Renewable energy technologies, grid integration, energy storage, economics of energy, energy systems simulation.

Design for medical applications, tissue regeneration, computational modeling in medical devices.

Recycling technologies, environmental engineering principles, sustainable energy policies.

Aircraft and spacecraft system design, signal analysis, robotics, technical writing, socio-technical systems analysis.

Software
n=34

MATLAB, Simulink, CAD, SolidWorks, Abaqus, COMSOL, Revit, VectorWorks.

BIM (Building Information Modeling), energy systems modeling, FEA (Finite Element Analysis), system dynamics modeling, ABM (Agent-Based Modeling).

QGIS, data analysis with Python, statistics software

Technical drawing skills, 3D modeling (SolidWorks, CAD), design and prototyping with tools like 3D printers.

Project & Research skills
n=32

Using BIM, analysis software for project planning and execution.

Research paper writing, operating lab equipment, statistical research, and performing literature reviews.

Wind tunnel testing, simulation software for aerospace and mechanical applications, prototyping (3D printing, model-building).
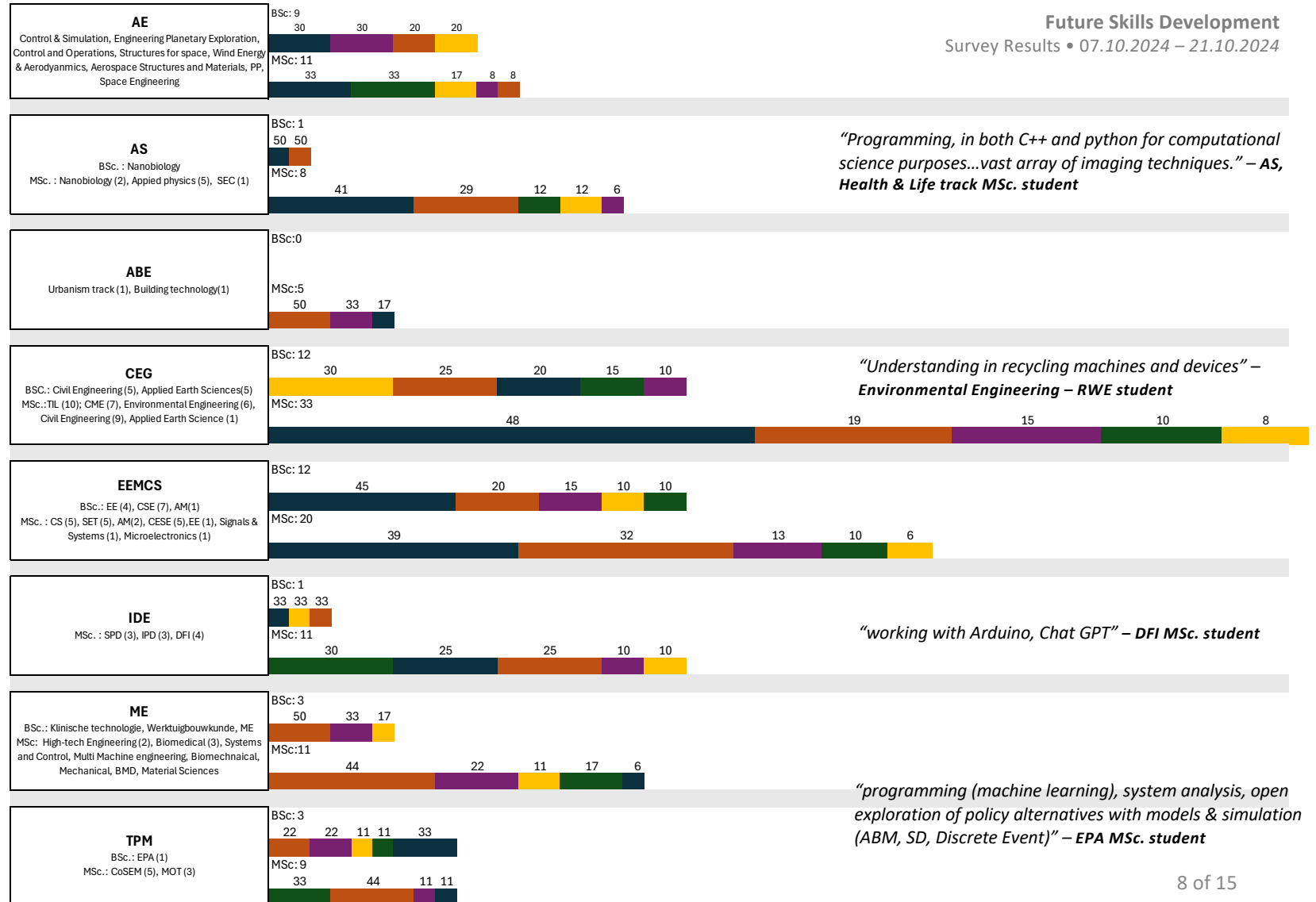
General engineering skills
n=27

Advanced mathematics (calculus, linear algebra, probability, optimization, theoretical probability), physics fundamentals for engineering applications.

Logical reasoning, critical thinking, optimization, and solving complex engineering problems.

Student Panel Surveys

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Study Climate

3a. Technical skills students get in their programmes:

149 respondents
(programme specific % distribution of mentioned skills)

- ■ Programming & Coding
- ■ Specific engineering skills
- ■ Software
- ■ Project & research skills
- ■ General engineering skills

AE
Control & Simulation, Engineering Planetary Exploration, Control and Operations, Structures for space, Wind Energy & Aerodyanmics, Aerospace Structures and Materials, PP, Space Engineering

BSc: 9
30 30 20 20

MSc: 11
33 33 17 8 8

AS
BSc. : Nanobiology
MSc. : Nanobiology (2), Appied physics (5), SEC (1)

BSc: 1
50 50

MSc: 8
41 29 12 12 6

"Programming, in both C++ and python for computational science purposes...vast array of imaging techniques." – AS, Health & Life track MSc. student

ABE
Urbanism track (1), Building technology(1)

BSc:0

MSc:5
50 33 17

CEG
BSC.: Civil Engineering (5), Applied Earth Sciences(5)
MSc.:TIL (10); CME (7), Environmental Engineering (6), Civil Engineering (9), Applied Earth Science (1)

BSc: 12
30 25 20 15 10

MSc: 33
48 19 15 10 8

"Understanding in recycling machines and devices" – Environmental Engineering – RWE student

EEMCS
BSc.: EE (4), CSE (7), AM(1)
MSc.: CS (5), SET (5), AM(2), CESE (5),EE (1), Signals & Systems (1), Microelectronics (1)

BSc: 12
45 20 15 10 10

MSc: 20
39 32 13 10 6

IDE
MSc. : SPD (3), IPD (3), DFI (4)

BSc: 1
33 33 33

MSc: 11
30 25 25 10 10

"working with Arduino, Chat GPT" – DFI MSc. student

ME
BSc.: Klinische technologie, Werktuigbouwkunde, ME
MSc: High-tech Engineering (2), Biomedical (3), Systems and Control, Multi Machine engineering, Biomechnaical, Mechanical, BMD, Material Sciences

BSc: 3
50 33 17

MSc:11
44 22 11 17 6

"programming (machine learning), system analysis, open exploration of policy alternatives with models & simulation (ABM, SD, Discrete Event)" – EPA MSc. student

TPM
BSc.: EPA (1)
MSc.: CoSEM (5), MOT (3)

BSc: 3
22 22 11 11 33

MSc: 9
33 44 11 11

3c. Skills students miss in their programmes:

(Based on open-text responses)

127 respondents

Practical/Application
n=45

More practical knowledge, workshops, skills. Anything practical
hands on experience
More real-life testing with something that was designed by us, only happened once with the beam.
Anything practical *- AE MSc. student*
More hand-on experimental testing, Flight Testing
some of the practical skills that would be related to the real world job market *- CEG, AES MSc. stduent*
Interaction with industry, industry partnerships
Real-world experience
Job market - how it works, preperation, undersatnding current skills
using knowledge to real-world engineering problems

A stronger link with how this will help in our field

More practical real-world business knowledge
Soms wel de link met realiteit/praktisch.
 business structure knowledge
Wellicht meer ervaring in de werk-wereld waar we terecht zouden kunnen komen.
 exposure to the private/public sector.
Wat meer voorbereiding op de arbeidsmarkt *-EE, BSc. student*
I would like to see more partnerships with the industry, especially for course projects. *- CESE MSc student*

Technical Skills
n=28

More in-depth mathematics and physics, especially for complexity science, systems design, and technical calculations in engineering.
 practical technical skills (e.g., use of machines, manufacturing, testing, SolidWorks), CFD, manipulation of computational tools.
Python, collaborative programming, GitHub/GitLab, AI, coding for specific applications (e.g., PCB design, ASIC design, real-time systems, FEM analysis).
 practical technical skills (e.g., use of machines, manufacturing, testing, SolidWorks), CFD, manipulation of computational tools.
Embedded systems, signal processing, architecture knowledge, technology adoption, flight testing, environmental topics.

None
n=19

Other Personal skills
n=14

Inclusion and awareness of the world
Time management

Stress management
Planning
Emotional intelligence
Ethical and philosophical knowledge
Adaptability

Awareness of societal issues
Empathetic design, Empathy
Humanitarian work *- DFI, IDE, MSc. student*
 finances and personal money managing

Communication skills
n=12

Presentation skils
debating
public speaking
CV writing

Portfolio development

Networking

negotiation

social skills

Professional emailing

Teamwork/ working with others
n=6

social skills
Experience with different company environments

Teamwork
Group dynamics
leadership skills

peer review

Cognitive skills (Ways of thinking)
n=4

structured thinking
Creative problem-solving
Solving real-life problems, real-world testing of designed items, practical knowledge application, practical workshops, real-world examples in labs.
Analytical thinking *- Biomedical, ME MSc. student*
Hands-on lab experience, real-world engineering problems,

Societal
n=3

Ethics

Environmental topics
Humanitarian work

Research & Procedure
n=2

Experiment design

Setting up research proposals

Technical procedures

project management
n=1

Student Panel Surveys

TUDelft | Education & Student Affairs — Study Climate

3c. Skills students miss in their programmes:

127 respondents
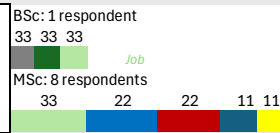*(programme specific % distribution of mentioned skills)*

Legend:
- Practical/ Real-world/ Industry related
- Personal skills
- Technical Skills
- Communication (Academic)
- Working with others
- None/ Just started
- Cognitive skills
- Societal relevance
- Research

AE
Control & Simulation, Engineering Planetary Exploration, Control and Operations, Structures for space, Wind Energy & Aerodyanmics, Aerospace Structures and Materials, PP, Space Engineering

BSc: 7 respondents — 43, 29, 29
MSc: 12 respondents — 44, 31, 13 — *Job AI AI*
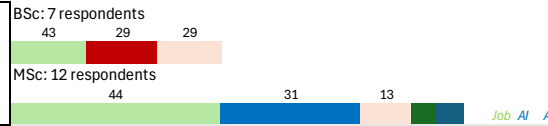
"Programming (especially collaborative programming)" – AE MSc. student

AS
BSc. : Nanobiology
MSc. : Nanobiology (2), Appied physics (5), SEC (1)

BSc: 1 respondent — 33 33 33 — *Job*
MSc: 8 respondents — 33, 22, 22, 11 11

ABE
Urbanism track (1), Building technology(1)

BSc: 0 respondents
MSc: 4 respondents — 75, 25
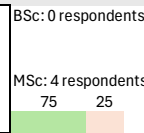
"Knowledge about architecture firms" – ABE MSc. student

CEG
BSC.: Civil Engineering (5), Applied Earth Sciences(5)
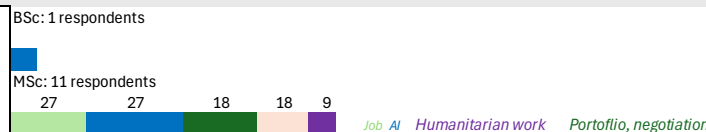MSc.:TIL (5); CME (5), Environmental Engineering (6), Civil Engineering (6), Applied Earth Science (1)

BSc: 10 respondents — 31, 23, 15, 8, 8, 8, 8 — *Job AI Enviornmental topics, ethics*
MSc: 23 respondents — 33, 25, 13, 8, 8, 8, 4 — *Job AI Technology Adoption*
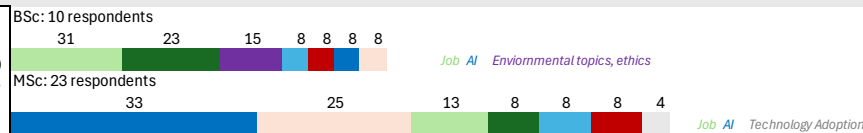
EEMCS
BSc.: EE (4), CSE (4)
MSc. : CS (5), SET (4), AM(2), CESE (5), Microelectronics (1)

BSc: 8 respondents — 38, 25, 25 — *Job*
MSc: 17 respondents — 44, 25, 19, 12, 6
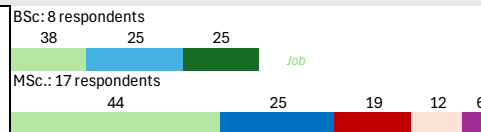
"Real life problems in labs" – EE BSc. student

IDE
MSc. : SPD (4), IPD (2), DFI (4)

BSc: 1 respondents
MSc: 11 respondents — 27, 27, 18, 18, 9 — *Job AI Humanitarian work Portoflio, negotiation*
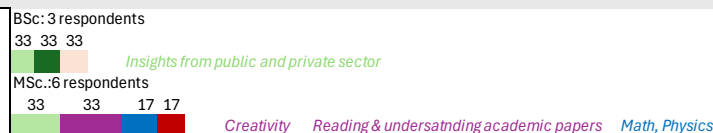
ME
BSc.: Klinische technologie, Werktuigbouwkunde, ME
MSc: High-tech Engineering (2), Biomedical (3), Systems and Control, Multi Machine engineering, Biomechnaical, Mechanical, BMD, Material Sciences

BSc: 3 respondents — 33 33 33 — Empathetic design, Awareness of the world
MSc.: 11 respondents — 33, 27, 13, 7, 7, 7, 7 — *Business structured skills Personal finances Experiment design*
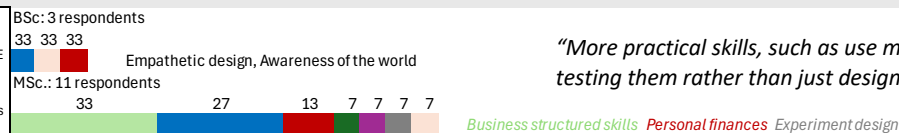
"More practical skills, such as use machines or make our own devices and testing them rather than just designing them" – Biomedical MSc. student
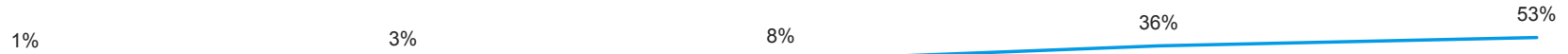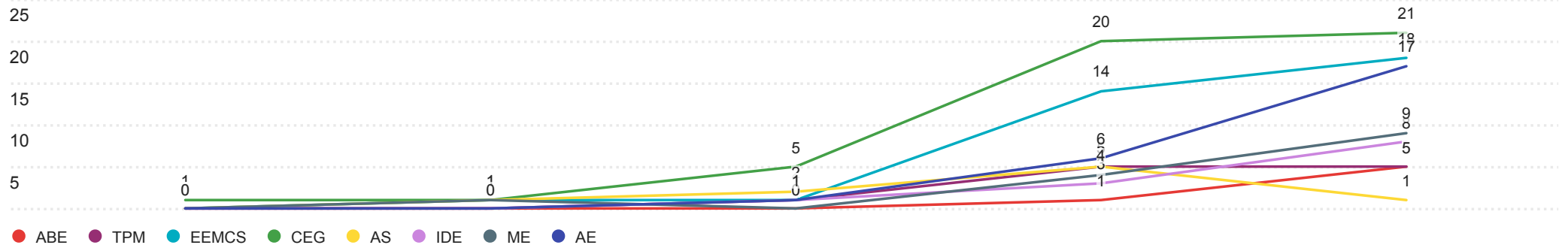
TPM
BSc.: EPA (1)
MSc.: CoSEM (5), MOT (3)

BSc: 3 respondents — 33 33 33 — *Insights from public and private sector*
MSc.:6 respondents — 33, 33, 17, 17 — *Creativity Reading & undersatnding academic papers Math, Physics*

Q4 - I find it important that my program's curriculum stays current with industry needs

(TUD Wide)

159 Responses

1%   3%   8%   36%   53%

(Faculty Specific)

Legend: ● ABE ● TPM ● EEMCS ● CEG ● AS ● IDE ● ME ● AE

(Faculty Specific)

Legend: ● MSc ● BSc.

Categories: Not at all · A little · A moderate amount · A lot · A great deal
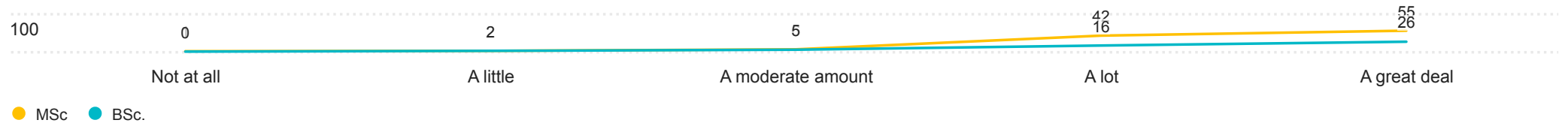
4. I find it important that my program's curriculum stays current with industry needs
(Open-text comments)

Aboslutely

Yes, but the theory is more important. Physics and maths does not change rapidly. They need to focus on the more technical and theory parts of systens engineering and complexity science.

I would like to stay as much as possible up to date with the current needs of the industry, ensuring smooth transition and giving me more opportunities on the job market

Mathematics is based in theory, not application that much

De industrie is een erg breed begrip en de behoeften van verschillende industriën zullen ver uiteen lopen. Uiteindelijk zal een aanzienlijke hoeveelheid klassieke basiskennis door de decennia heen relevant blijven.

Because that provides me with a higher chance of being hired by companies who are motivated by the current industry needs

Control is a hidden field. If it is not relevant to the industry needs, there might be a lot of advancement being withheld.

Denk dat het goed is om in te spelen op behoeften van de industrie. Daardoor zorg je er in de opleiding voor dat ook nuttig blijft voelen en je je toch nog op de een of andere manier 'betrokken' voelt met de arbeidsmarkt. De techniek verandert veel en de opleiding moet daarbij blijven aansluiten.

on the one hand its nice to have a practical link to build up experience, but on the other hand we do need to maintain our indipendence as a research and academic facility

yes i do

It is important especially for people looking to enter the labor market. It may be less relevant to Phd candidates, but they can still benefit since it gives perspective on what the industry is doing.

Eens. We moeten geen achterstand hebben tijdens de opleiding. Want als er toch eentje veroorzaakt gaat het later dan een probleem zijn voor de kans op de arbeidsmarkt.

It is very important for my kind of degree to be useful in working environments, but todays needs aren't forever so a solid general knowledge is also helpful to navigate unforseen futures

As an engineer, it as a must to keep update with the industry society

5 - Any other comments or suggestions about how your program could better prepare you for the job market?

70 Responses

More collaboration between staff and students on what will be expected from students once they start looking for work

More soft skills, project planning, teamwork, communication

More integrated projects, and showing that mathematics is not always the solution

Nee

More engineering courses rather than scientific

projects where we actually make physical things - like small scale assemblies

"AI" is slechts een reclamestunt en dient in het onderwijs vermeden te worden.

I have completed the same survey twice as it was sent twice. However the second time I had better explanations.

Bringing more industrial software to use.

maybe some more info on the kinds of jobs available with our bachelor especially for those whose parents come from a different background, the term engineer is so vague/broad it might help specify it especially when it comes to choosing master tracks etc

More hard skills, because those will help you understand the theory better instead of knowing only how to implement systems thinking during a project!!!!

No

-

educate students more about options outside of academia, and show us the biggest fields etc.

real-life clients (at least once in the curicculum)

5 - Any other comments or suggestions about how your program could better prepare you for the job market?

70 Responses

My course is a very vast and diverse field in itself. There is a need for Control Engineers in a variety of sectors. In my opinion, giving students a more hands on and practical curriculum would definitely help appreciate the field.

-

Nee, momenteel nog niet omdat ik ook pas net ben begonnen.

I would like to see more examples of working in my field that are not based on working for companies that have a profit motive. my field is perfect for things like governmental work and NGO´s/non profits. Sometimes it feels like the tudelft ignores the existence of those kind of institutions.

more practical work (i know that there is no time in the curriculum of a university)

It is a good balance between preparing for the labor market and learning skills and languages that arent as used in industry. I would leave it as it is for the most part

Workshops geven over hoe je je goed op de arbeidsmarkt kan voorbereiden, mogelijk met behulp van oud studenten van de studie en hun ervaringen

They already do talk about it a lot, but maybe encourage to do internships and help more in that process

Een keer met college op een bouwplaats komen om te zien hoe het eraan toe gaat buiten de tekeningen en berekeningen

Hoe je als een profesioneel werknemer aan de slag moet.

Maybe more details about the actual work content previous graduates took up after their graduation

More hands on practical courses offered

More intermediate assessment to evaluate student's learning progress and scores contribute to final grade to reduce reliance on single final exam to determine students' learning.

Longer internship and more assistance in finding a suitable one

Maybe educate me more on what the job market is so I can understand the application of the curriculum

5 - Any other comments or suggestions about how your program could better prepare you for the job market?

70 Responses

Online presentation

Change the criteria for internships. Theyre so valuable but it's weird that you can only get 15ects / 1 quarter of internship when it's a given that almost all companies prefer a 6 month commitment. This makes it either very hard to find one, unless you are willing to delay your studies

Maybe more assembly classes

Using real-world tools, case studies, more projects and less exams

Meer faciliteren om bij bedrijven binnen te kijken, bijvoorbeeld door het faciliteren van stages van een kwartaal of langer om je keuzeruimte mee te vullen.

Aside from the theory there should be more practical examples

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Have courses to prepare for that, how to write a CV. Maybe try to have an internship program aided by the school for ambitious students during the summer.

Not really, as this is still better than other universities, and I barely started.

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More guest lectures part of the program where non-professors give lectures. Currently the break lectures are more hiring campaigns for companies, and thus they do not give critical insight from their field, rather show how great it is to work there

I didn't even know what skills were needed for a job in my field. I think we should be made more aware of this so that we know what skills are important and what skills we should develop next to our TU education. I want to know what it is I don't know.

The programme duration is small better to have tri-mister rather than quarter to get better understanding and application based approach in adequate amount allocation for each course.

As mentioned before on the previous page.

aes is an outdated program that is too focused on unsustainable practices