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Department of Chemical Engineering

Improving students' skills on sustainability through workshops

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Sustainability in the chemical engineering education

- Students at the Department of Chemical Engineering:
 - Chemical engineering and biotechnology (MTKJ)
 - Sustainable Chemical and Biochemical Engineering (MSCHEMBI)
 - Some other
- Sustainability a core skill
- Industry (and the future) needs chemical engineers that can think and work sustainably

Sustainability in the chemical engineering education

— We wanted to know:

- How much do the students know about sustainable chemical engineering?
- Can they apply their knowledge?
- Is something missing in their education?

Assessment options

Many tools/metrics

- Sustainability is inherently extremely complex
- Choice of tool / metric impacts result ^{1,2}
- Method must reflect goal

Goal

- What do the students know?
- Can they perform sustainable chemical engineering?
- What are we/they missing?

Focal points

- Holistic thinking
- Embracing complexity

Extracurricular workshops at IKP



Voluntary

Students from different:

- Study years
- Study programmes

Three-hour workshops

- Presentations
- Group work
- (Pizza) dinner included



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Two topics that cover our focal points

Sustainability of chemical processes

- Assessment of process sustainability
- Presentations by IKP
 - Life-cycle assessment
 - Emission permits
- Evaluation of CO₂ footprint of various processes

Green chemistry & engineering

- External presentations
 - Sustainability work in Aker Carbon Capture
 - Green ammonia production
- Introduction to green chemistry
- Group discussion on green chemistry in chemical engineering education



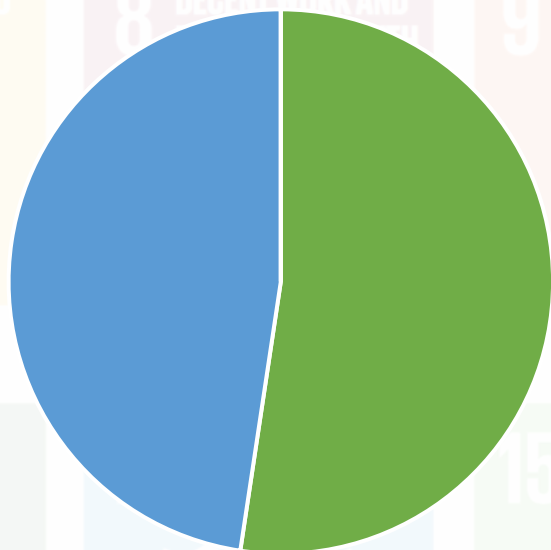
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Survey results:

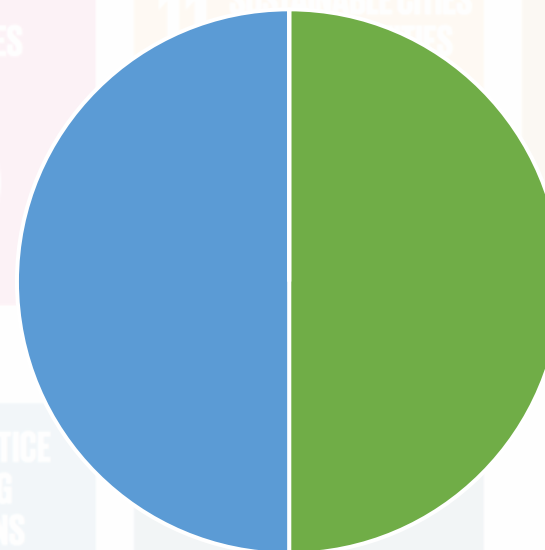
What did the students think of the content?

Sustainability of chemical processes



- Very interesting
- Interesting
- Sort of interesting
- Not that interesting

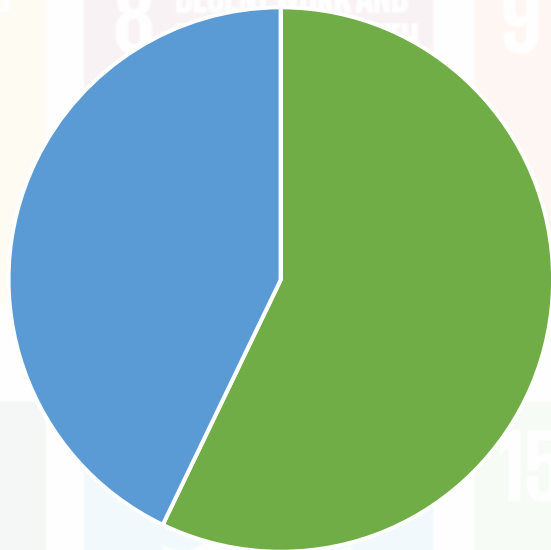
Green chemistry & engineering



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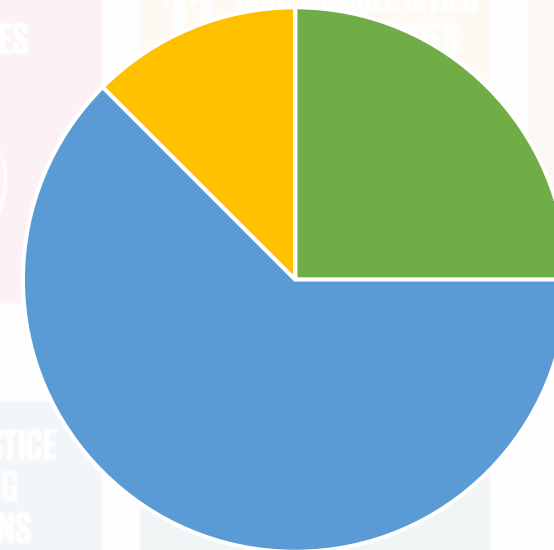
Survey results: Did the students learn anything?

Sustainability of chemical processes



- I learned a lot
- I knew most of it
- I learned some
- I knew everything already

Green chemistry & engineering



- I learned a lot
- I knew most of it
- I learned some
- I knew everything already

Green chemistry & engineering workshop

Principles to work by:

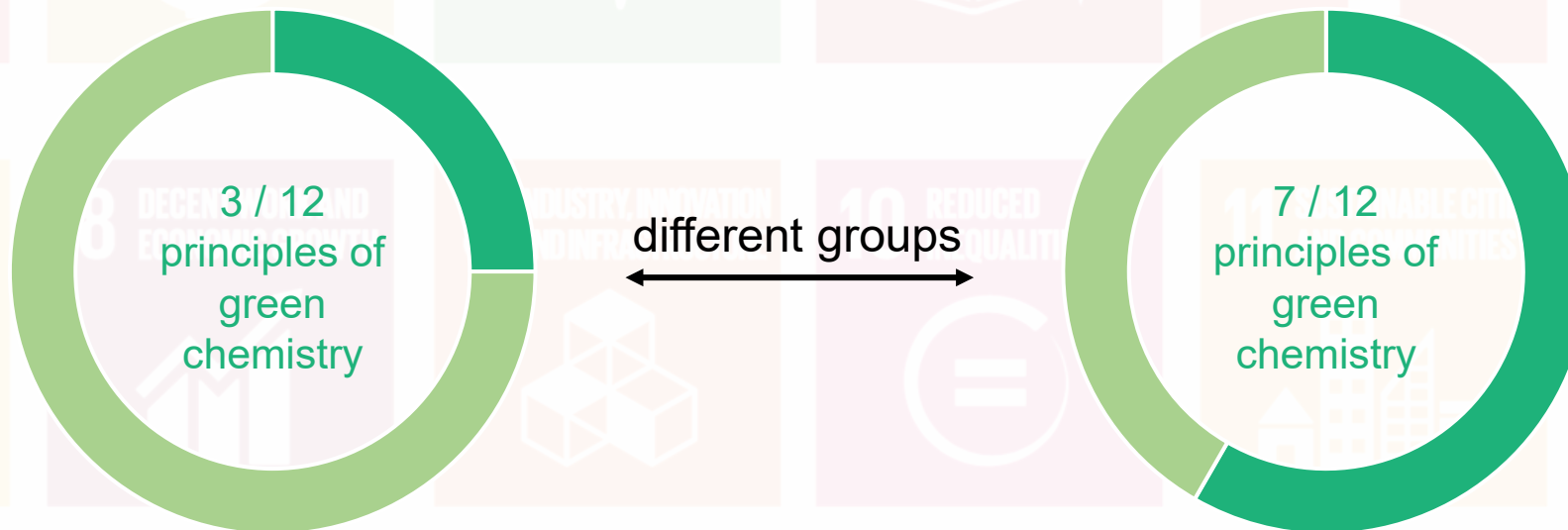
- Maximising resource efficiency
- Eliminating and minimising hazards and pollution
- Holistic design and life cycle thinking

Discussion topic:

- Have these topics been covered in your education?
- How?
- When/where?
- Do you have tips for us, on how we can include this better?



Highlights from the discussion: Green chemistry principles included in curriculum



■ Included ■ Not included

■ Included ■ Not included

Different students have different backgrounds.

Different students reflect differently on their education so far.

Learnings and things we want to keep working on

Some students suggest horizontal, others say they prefer vertical integration of sustainability in the curriculum – what should we do?

Some answers suggest sufficient integration of sustainability, others suggest there might be need for more – how can we know it's enough?

Overall, the holistic way of seeing things may be a missing piece – where should that come in?

Other learnings, and things we think about after this:

- Are voluntary workshops like these a good addition to the student life?