

# Designing an evidence-based interdisciplinary curriculum in science: the case of the new master in materiomics

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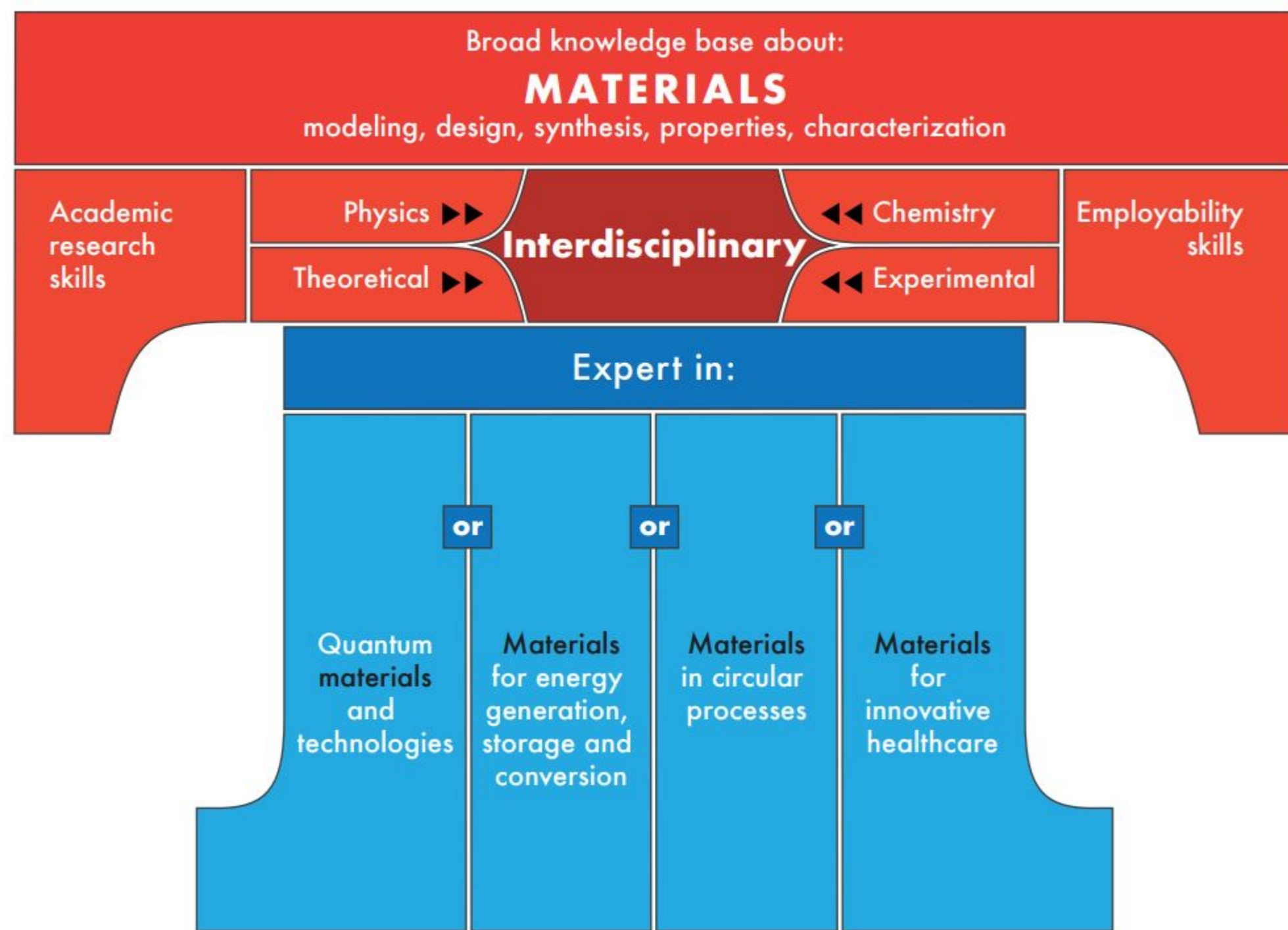
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## Profile of the Master of Materiomics

In 2022-2023, the Master of Materiomics starts at the Faculty of Sciences (Hasselt University) aimed at students who want to **develop sustainable and innovative materials** at the intersection of physics and chemistry and using both theoretical/computational and experimental approaches, the **interdisciplinary T-shaped professional**:



Direct access for Flemish students with the following bachelor degree:

- Academic bachelor in physics
- Academic bachelor in physics and astronomy
- Academic bachelor in chemistry
- Academic bachelor in biochemistry and biotechnology
- Academic bachelor in bioscience engineering
- Academic bachelor in engineering sciences

## Need for an interdisciplinary approach

### Global context

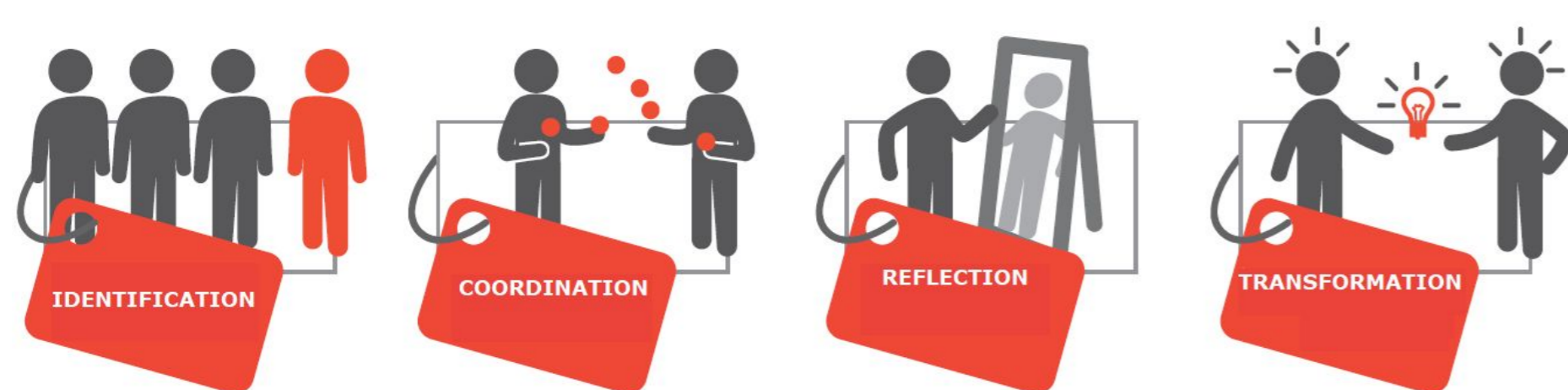
- **Increasingly complex grand societal challenges**, which are in part material-related: climate change, pandemics, innovative and safe communication technologies, the energy transition, changing industrial processes, innovative space research and finite resources that are becoming depleted
- High demand for true **scientists** focusing on materials, who are ready for an **internationally-oriented and interdisciplinary research environment and labour market**

### Goal of the master's program

- To train **experts in their field who are able to build bridges/cross boundaries** between the different perspectives involved in materials research and development:
  - between chemistry and physics
  - between experimental and theoretical/computational methods
- Students are taught to **approach materials from different perspectives and learn to communicate across disciplinary boundaries**
  - with due attention to academic research skills and soft skills which prepare them for their professional careers
  - broad knowledge base + in-depth knowledge and skills in one of the 4 areas of specialization (Quantum, Energy, Circularity, Health)
  - closely linked to the research expertise of the UHasselt Institute for Materials Research (imo-imomec)
  - ready for the interdisciplinary teams of the future

## Training interdisciplinary competences

To obtain these goals, interdisciplinary competences are required. Interdisciplinarity is introduced gradually throughout the curriculum, building on the **four learning mechanisms** from boundary crossing theory (Kluijtmans, 2019, based on Akkerman & Bakker, 2011):



- Students are introduced to the different perspectives and approaches, to making connections between different perspectives, synthesizing them (e.g. through assignments, group work...), and applying all this to new, complex material problems (e.g. through a hands-on project, the internship and master's thesis)
- To maximize the implementation of the interdisciplinary learning line and the development of interdisciplinary competences in students, we work with a learning portfolio (discussed three times a year with a professor of the master)

## Evidence-based and systematic support for faculty and students

- In the **development phase of the curriculum**, this involved the development of a clear vision of interdisciplinarity and the description of the learning line throughout the curriculum + several professionalization sessions on interdisciplinary teaching and evaluation have already taken place for the professors involved
- The next step, the **implementation phase**, includes:
  - Supporting implementation through **practice-based research** (including a literature review) and **feedback** from students and teachers
  - **Teacher professionalization** and exchange of good practices on the subject (within and outside the program)
  - **Facilitating interdisciplinary teacher teams, development of interdisciplinary courses and methodologies** (e.g., applying design thinking (Melles, 2020) and the STEMOOV model, see <https://stemoov.weebly.com/>; workshops that support the four boundary crossing learning mechanisms; Oonk, Gulikers, den Brok, & Mulder, 2022), **tools related to the evaluation of interdisciplinary competences** (Gulikers & Oonk, 2019), ...

Once the new master has started, the effect of the above actions will be monitored.

## References

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Het STEMOOV-Model. Geraadpleegd van <https://stemoov.weebly.com/>

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