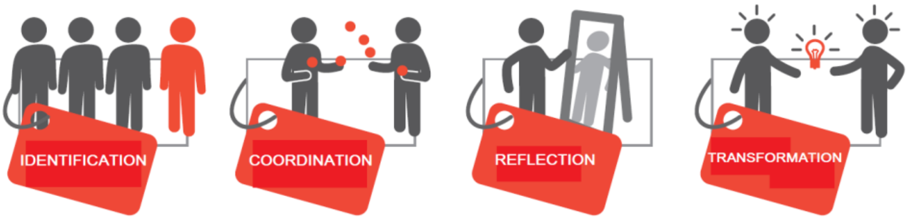
Curriculum design for a sustainable future: the case of the new master in materiomics

In 2022-2023, a new master's program 'Master of Materiomics' starts at Hasselt University (Belgium), aimed at students who want to develop sustainable and innovative materials at the interface of chemistry and physics and on the basis of both theoretical/computational and experimental approaches (4 possible areas of specialization: circular processes; energy generation, storage and efficiency; materials for quantum technologies; or materials for innovative healthcare). From the very beginning the rapidly growing awareness regarding sustainability issues both globally and in this specific field has been guiding our curriculum design. Accordant with the UHasselt educational policy plan 2022-2029, societal sustainability challenges and sustainability competences are given an explicit place in the curriculum of the master in materiomics (cf. Greencomp: e.g., embracing complexity in sustainability, envisioning sustainable futures; Bianchi et al., 2022), both in specific courses (e.g., Sustainable materials and energy; Sustainable development goals: materials and their management) and in the 4 specialization pillars (mainly circular processes and energy generation, storage and efficiency). Moreover, an interdisciplinary educational approach was taken in response to increasingly complex societal issues, 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. Students are trained in conceptualizing and developing alternative, sustainable materials that may contribute to solutions for these grand challenges and which may help the world to remain within planetary boundaries and not to overshoot.
To obtain these goals, interdisciplinary competences are required: while taking the larger societal context into account, students need to cross boundaries between chemistry and physics, as well as between experimental and theoretical/computational methods. Interdisciplinarity is gradually introduced throughout the curriculum, building on the four learning mechanisms from boundary crossing theory (Kluijtmans, 2019, based on Akkerman & Bakker, 2011), i.e. identification, coordination, reflection and transformation:



More specifically, students are introduced to the different perspectives and approaches, 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 the master's thesis). In order to maximize the development of interdisciplinary competences among students, a learning portfolio is used which is discussed three times a year with a mentor (professor of the master). In addition, however, we want to provide evidence-informed and systematic support for professors and students w.r.t. interdisciplinary collaboration and competence development associated with it. To this end, staff members have e.g. followed professional development trajectories regarding both interdisciplinary and sustainable education. During our action atelier, we will further elaborate on how we hope our curriculum design will lead to transformative learning by our students and we will also go deeper into some specific courses and their teaching and assessment approaches. Participants are invited to a) reflect on advantages and obstacles of interdisciplinary competence development for sustainability education and for their own education (e.g., by means of a speed boat activity; Pavelin, Pundir, & Cham, 2014) and b) to design interdisciplinary learning activities for their own courses/educational program according to the four learning mechanisms described above.

References

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