



Advanced Fuels

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Learning Objectives

- Students should be able to agree with the following statements at the end of the course:
 - "I know methods for evaluating sustainability criteria."
 - "I am able to apply complex evaluation criteria and to critically question them."
 - "I am able to define motivating goals for myself and to reflect and control the process while learning."
- Knowledge: Students are able to describe and explain different alternative fuel pathways.
- Skills: Students are able to evaluate alternative fuels even with incomplete information. Students are able to prepare systematic documentation of work results in form of reports, presentations and are able to defend their findings in a group.
- Social Competency: Students can participate in subject-specific and interdisciplinary discussions, develop cooperated solutions and defend their own work results in front of others and promote the scientific development of colleagues.
- Autonomy: Students can independently develop questions and are able to understand challenges regarding the evaluation of sustainability aspects. They are capable to define areas of incomplete information and define further steps on this basis.

Initial Situation

- The course "Advanced Fuels" was offered for the first time in the winter semester 2020/21. The course was divided into two halves, one half of the lecture to teach the theoretical approaches of alternative fuels, the other half as an interactive exercise based on the CBL approach.
- The exercise was developed from scratch and successfully tested with student volunteers. The initial situation was the desire to be able to offer students a new type of course on highly current issues of the transportation transition and to integrate future international participants from the planning stage and to enable learning success through new methodological approaches.

Focus of Innovation

- *Describe the concept of the project.*
- The concept of the course was carried out according to the CBL approach. To engage students, the problem of transportation transition was introduced and the difficulty in evaluating alternative fuels. Students were asked to complete two phases of work in a small group. The first phase of work investigated what sustainability criteria exist and how they can be applied to alternative fuels. In the second phase of work, students actively applied these sustainability criteria to one of the alternative fuels. At the end of the course, the applied sustainability criteria of the small groups were presented in a panel discussion and the experiences in dealing with uncertain sources as well as novel concepts were reflected.
- *What is the general idea?*
- The general idea was to help students understand the importance of balance limits in different studies and to encourage a more reflective approach. Independence and adaptability during the course of the project were also key points.

Structure

- *Timeline*
- The engagement phase took place in the first two weeks of the semester. A general overview of the state of the transport transition and the challenges to be solved was the starting point of the course.
- The investigating phase involved researching sustainability criteria and exploring the methodological approaches behind them. The phase lasted for three weeks in free working time.
- The acting phase occurred during the final eight weeks of the semester, in which the sustainability criteria previously researched were applied to specific alternative fuels per small group.
- Finally, a panel discussion was held during the last week of the semester.

Feedback and Future Improvements

Teaching Staff:

- More coordination among different lecturers to avoid duplication of content
- Set topics of the question hours more strongly in order to promote specific questions
- Discuss scientific basics, e.g. how and where to search for papers
- Partially clearer guidelines of the framework per work phase

Students:

- Make more specific use of the question hours offered
- Distribute workload more evenly throughout the semester
- Accept incomplete data basis and focus more on methodological approach