

ICED 2020 proceedings:

Integrating transferable skills into an existing curriculum: The example of Geospatial Engineering at ETH Zurich

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Abstract

In this contribution we present an approach to integrating improved formation and consolidation of transferable skills into the Bachelor's program Geospatial Engineering at ETH Zurich. We report how the development of competences in argumentation, critical thinking, technical/scientific writing, visualisation, presentation, learning management, teamwork, and project management was supported without changing the structure of the existing curriculum, providing additional courses or assigning other lecturers. The approach focused on feasibility under the temporal, structural and financial limitations of an academic programme. Its pillars are (i) stakeholder participation, (ii) transparency, (iii) communication, and (iv) supporting material for both students and instructors.

1 Introduction

Graduates from a university need a broad range of competences for a successful and rewarding professional career. Apart from general methodological competences and domain specific competences this comprises a broad range of social and personal skills. Taking into account how important transferable skills are for employability and job satisfaction (see e.g. García-Aracil & Van der Velden, 2008; Brall, 2009; Abelha et al., 2020) and for successful studies, academic programs should support their development. Students should also recognize these skills as very powerful assets in their personal and professional lives. They should be aware of their own proficiency and understand that this proficiency (e.g. in writing, argumentation or critical thinking) can and needs to be developed. This requires the explicit addressing of transferable skills within the curriculum (Leckey & McGuigan, 1997).

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In the course of a revision of the BSc programme in Geospatial Engineering⁴ at ETH Zurich the working group decided to explicitly enhance the development of the following eight competence areas:

- Argumentation
- Technical and scientific writing
- Visualisation
- Presentation
- Critical thinking
- Learning management
- Project management
- Teamwork

This selection was triggered not only by considerations of employability but also intrinsically motivated by the requirements for studying successfully. We chose to tightly integrate the fostering of the transferable skills with fundamental and domain specific teaching, and thus explicitly to address transferable skills throughout the curriculum rather than with extra courses. In line with the related literature (e.g. Leckey & McGuigan, 1997; Buff Keller & Jörissen, 2015) we expected that this would be more effective than addressing such skills additively.

In this paper we briefly describe the process (Section 2), the documents generated for lecturers and students (Section 3), and the means for establishing transparency (Section 4).

2 Process

Discussions about the goals and requirements of the curriculum revision started informally in early 2016 among the main professorships involved in the Bachelor's program. The formal revision process was mainly carried out in 2017 and included a workshop with stakeholders from outside the university. The revised curriculum started in fall 2018. Early on, the working group decided to focus on method and domain specific competences within the formal revision process, and to deal with the transferable skills in a degree program initiative separately. This allowed quick implementation of the necessary structural changes to the curriculum while leaving more time for careful planning and implementation of the transferable skills across the curriculum. Figure 1 shows the timeline of the revision and the initiative.

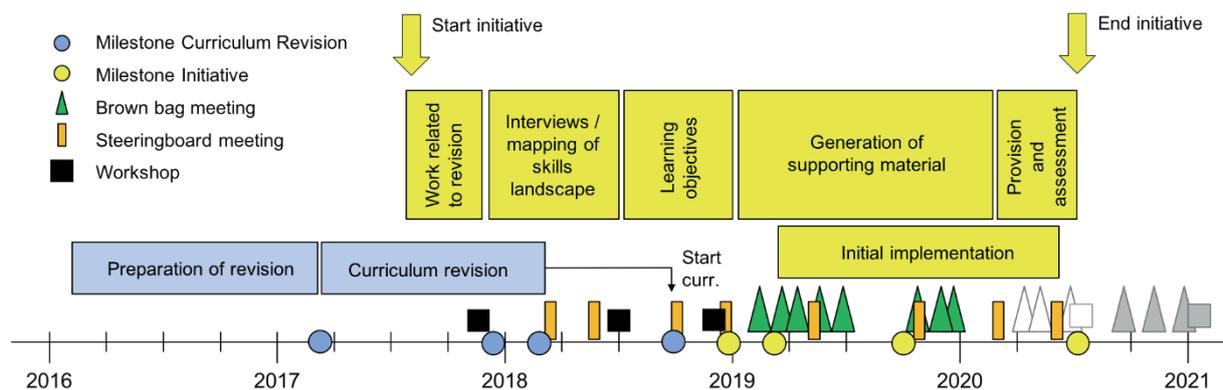


Figure 1: Timeline of the curriculum revision and the degree program initiative

We started by mapping the initial landscape of transferable skills within the curriculum. This was based on bilateral interviews with the lecturers. Using a specially prepared questionnaire we identified (i) which skills were already fostered, assessed or required in any of the courses; (ii) which teaching methods and materials were used; and (iii) which transferable skills, based

⁴ The name was changed from Geomatics and Planning to Geospatial Engineering during the revision.

also on the qualification profile, the students should have acquired by graduation. These interviews supported the initiative beyond the information explicitly provided. The lecturers became better aware of the initiative and had the opportunity to give input at an early stage, and the project team received a first indication of which particular lecturers and courses could help to foster specific transferable skills in line with the structure, goals and requirements within the course; the personal interests, background and engagement of the lecturer; and class size and composition.

Building on the results of the interviews, we developed a catalogue of objectives and explicit learning outcomes for the above skills. The elaboration of the objectives started with a workshop at which various stakeholders (lecturers, potential employers, teaching experts etc.) discussed, prioritized and extended the results of the interviews. Another workshop took place half a year later to broadly discuss a draft of the explicit outcomes before they were fixed (see Figure 1).

From that point, we developed a hierarchical set of short documents for in-class and self-study use (see Section 3); implemented brown bag meetings for low-threshold exchange and networking between the lecturers; and created an interactive web-tool for visualisation of the transferable skills across the curriculum (see Section 4). Finally, we aligned the learning outcomes with the existing courses, involving only the lecturers who were interested and felt capable of fostering the respective skills within their courses. This commitment was established and recorded in further bilateral meetings.

After initial implementation, which started for some competence areas in spring 2019, an evaluation survey among students and lecturers using a questionnaire similar to that described in Chan & Fong (2018) was planned for Spring Semester 2020. As a result of the unanticipated adaptations to teaching and learning due to the Covid-19 pandemic this survey had to be postponed.

3 Supporting material

There is a vast body of literature on each of the above competences, and a list of recommended reading might be enough to support self-study or skills fostering within classes. Nevertheless, we decided to generate a hierarchic set of documents for each of the competence fields in order to better support both the students and the lecturers by (i) making it easier for them to get started, and (ii) assuring that they all have low-threshold access to the same material. Each of the sets comprises an outline, several fact sheets, advanced documents, and working material like checklists or templates (see Figure 2). So far these documents are available in German only; a translation into English has recently started.

The outline and fact sheets make the students aware of the competences and of the available supporting material. They are encouraged to use the templates and checklists proactively and on their own. Nevertheless, the lecturers are encouraged to explicitly integrate these documents into their courses. They may expect the students to be familiar with them according to the implementation plan (see Section 4).

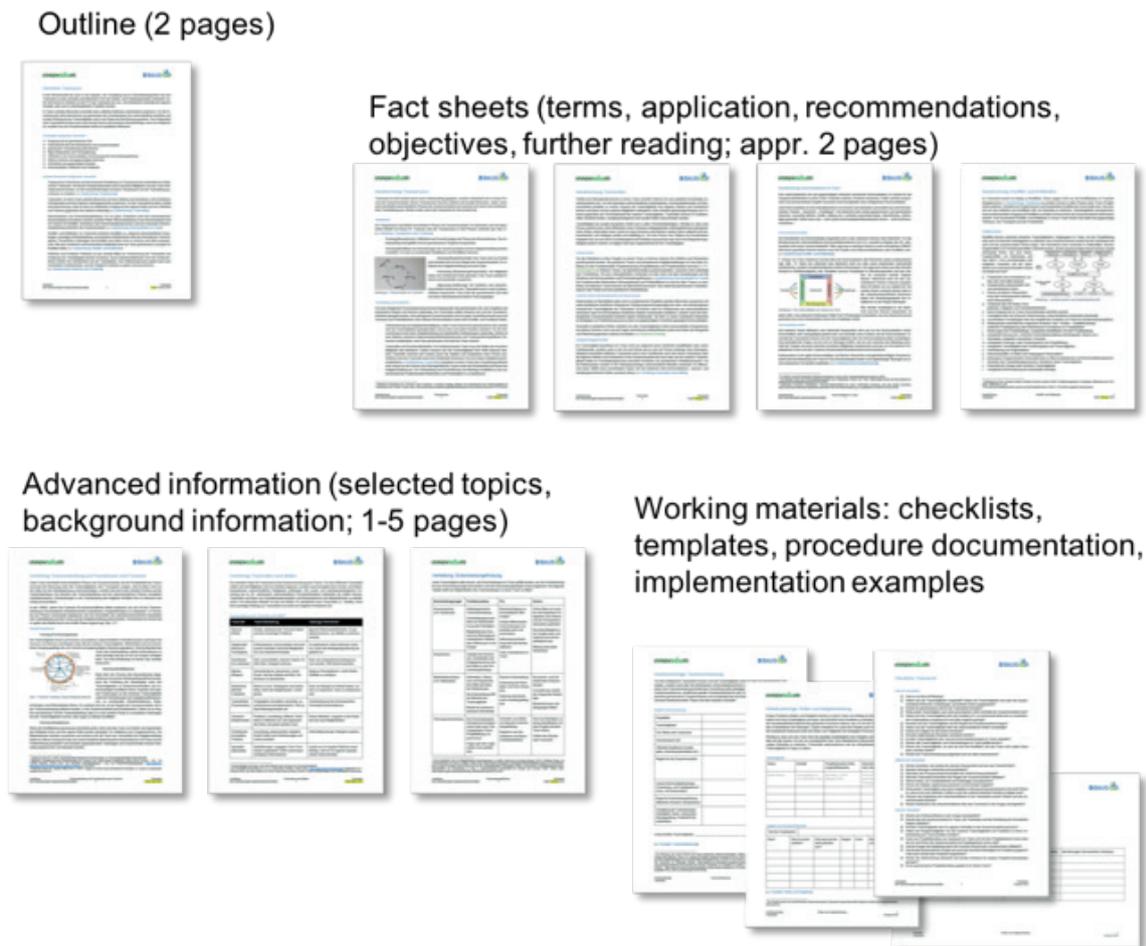


Figure 2: Types of supporting document with typical extent per document

4 Transparency and communication

All the documents are provided freely on the webpage of the study program. Additionally, the learning outcomes and their association with the courses of the BSc program can be visualized using a JavaScript program which colors a display of the course plan to indicate which competences, domains or objectives are integrated into which courses and to which level (introduction, deepening, application, performance assessment); see Figure 3. This visualization is based on the implementation plan, i.e. the agreement which states the specific objectives which lecturers address in their courses. This creates transparency across the curriculum and allows lecturers to understand which transferable skills they can build upon in their courses and which associated supporting material the students are aware of.

To further develop mutual awareness among the lecturers, enable exchange of practical experiences, and facilitate lecturer engagement in the enhancement of transferable skills, we have established brown bag meetings covering teaching related topics. They take place roughly once per month during the semester. They provide a low-threshold opportunity for moderated discussion, and are typically preceded by a short introduction to the topic by an invited expert or the moderator. Feedback and attendance indicate that these meetings are a useful tool not only for exchanging teaching related information but also for better integrating new or external lecturers.

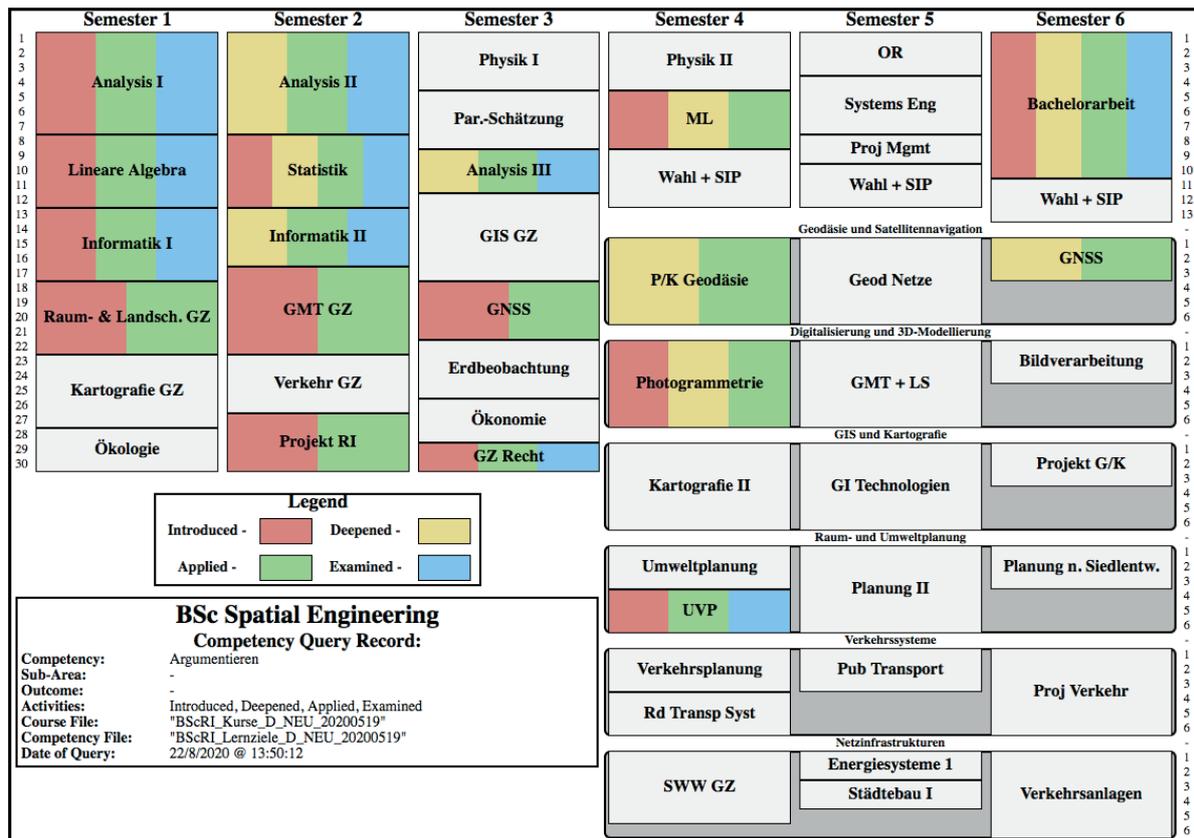


Figure 3: Visualisation of explicit activities related to the development of transferable skills throughout the curriculum (example display for entire competence area "Argumentation")

5 Conclusion

We have defined high-level objectives and detailed learning outcomes for transferable skills to be developed gradually during the entire Geospatial Engineering BSc programme at ETH Zurich. To facilitate development within the existing courses of the curriculum, a key challenge was to win enough lecturers to support the initiative and to transparently show which skills are developed in which courses and to which level.

Key success factors have been stakeholder participation throughout the project (see also Buff Keller et al., 2018), interviews and bilateral meetings with the lecturers, the provision of hierarchically organized documents for students and lecturers, and transparency through brown bag meetings and visualization. A survey is planned for the near future. Personal and anecdotal feedback indicate that the process has been successful and that the supporting documents are found useful by students and lecturers.

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