

## **Title: The impact of an incremental and iterative teaching method on student learning and motivation**

Topic: Student-centered education

### a short abstract (max. 250 characters)

We present a study on an iterative and incremental teaching and assessment method. Our approach focuses on skill development, early feedback and individual growth. We present the effects on the learning process and motivation of students.

### an extended summary (max. 750 words)

In this study, we explore the impact on students of an iterative and incremental teaching and assessment approach used in a course on Human AI Interaction (HAI, 6 ECTS), a master-level course in computer science. There is a wide diversity in prior knowledge of the students who take up this course, and this diversity triggered us to rethink our teaching approach. Our approach is aimed at teaching a subject where the focus is on developing applicable skills. When developing skills that require applying a combination of several disciplines (interface design, software engineering, programming, data science, and human-machine interaction), traditional teaching approaches often fall short. We believe that learning skills can be done more successfully by working incrementally as well as iteratively, providing a clear horizon for assessment and stimulating individual growth through collaborative learning. Assessment is based on the evolution of the student and/or student group through the iterations, rather than on a series of fixed assessment moments that do not allow for further improvement opportunities.

The research question of our study is the following: "What is the impact of an iterative and incremental teaching and assessment approach on the study performance, perception, and motivation of students?". We map which components of this iterative and incremental teaching and assessment approach have an impact on students' perception, learning and motivation, and analyze in what way these components contribute to this.

Our approach was to focus on skill development, and primordially train the students to apply what we taught them and to motivate their choices thoroughly, rather than reproduce knowledge. The course includes a series of lectures, five assignments that have to be done in small groups and one individual project. There are six lectures that introduce the various topics, provide additional context, and explain various frameworks, guidelines, techniques and technologies that are available. The students are informed there is no need to learn the content of the lectures by heart. All assignments are shared early in the course, and students can ask for feedback early and regularly on their progress. Feedback sessions were organized per group, which lowered the threshold for questions significantly. The teaching staff answers the following questions during these feedback sessions:

- Do we get a "pass" on this assignment?
- What do we need to do to get a "pass" on this assignment?
- How do you expect us to do this?

Students can ask other questions too. Each feedback session is also a teaching moment the teaching staff uses to explain further the underlying theories and reasoning that are

unclear for the group. There are between 6 and 15 feedback sessions with various groups and the teaching staff.

The maximum group size was 4 students, to ensure the teaching staff also had sufficient time and opportunity to interact with each individual of the group. All group assignments were scored based on a pass/fail-system, and could be retried as many times as they needed before the end of the semester. When the students got a pass on all group assignments, they received 12 out of 20 points. In addition, students could receive up to 8 out of 20 points for an individual project. This approach is based on principles of mastery learning (Garner, Denny & Luxton-Reilly, 2019), assessment as learning (Ye, 2018) and collaborative learning (López-Fernández, et al., 2019).

We established a within-groups design with all the students involved in the course during the academic year 2022-2023. These students completed a questionnaire at the beginning of the course, during the teaching period and at the end of the course. In the questionnaires, students were surveyed about demographic characteristics, their personality, their motivation and perception of the course. These results are associated with their study results. For the analysis, we control for certain entry characteristics of students such as personality, motivation and past study results. This allowed us to study the effects of this teaching and assessment approach on the study performance, perception, and motivation of students, as well as the evolution of these effects. Based on this, we aim to establish a framework for similar courses.

During the paper presentation we will present the results of this study and discuss possible opportunities and pitfalls for the implementation of this method to other skill-based courses in higher education.

a response to the question: 'How does your contribution on higher education generate an impact in the field? (max. 100 words)'.

Higher education needs to prepare students for a complex and changing society. Students are expected to develop different skills, so that they are able to tackle societal challenges. Therefore, alternative ways of teaching and assessment are required, where students are active agents. This study provides insight into an innovative teaching and assessment method that focuses on the individual growth of a student/student group and provides students the chance of incrementally improving their skills. By sharing the results of this study, we hope to inspire others into rethinking and redesigning their teaching practice.