

# Promoting reflexive learning in cartography in an international classroom

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**Keywords:** cartography higher education, reflexive learning, mapping project

## Abstract:

Reflexive learning as a process of questioning our assumptions, learning from our experiences, and adapting our approaches (Taylor, 2009) has become more important in the age of AI than ever before because it can promote critical thinking, resilient growth and transformative change in individuals and teams. The potential of reflexive learning in cartographic higher education still needs to be explored. As our previous research confirms, academic study programs should take into account the personal backgrounds of students to foster the development of their social skills, including critical thinking habits and a strong sense of responsibility for sustainable development (Cron and Meng, 2023). In increasingly international classrooms, the potential for intercultural, intersectional, and transdisciplinary exchange is even more pronounced (Klein, 2022). This research demonstrates how reflexive learning can be implemented using a case study of the course 'Mapping Project' within the international MSc Cartography ([www.cartographymaster.eu](http://www.cartographymaster.eu)), and thus contributes to an understanding of the benefits of reflexive learning in cartographic higher education.

The 'Mapping Project' is an elective 5 credit course spanning 14 weeks of 150 total hours of which 45 hours are contact-based and 105 hours are self-study. The course is designed for a heterogeneous group of first-semester Master's students with different levels of prior knowledge in cartography and mapping. The main goal of the course is to familiarize students with the concepts and examples for attractive and socially oriented maps that consider certain user requirements, and also to improve mutual understanding and communication among students. The design of the project is left flexible and open to students' creativity. However, an easy-to-understand, modern and possibly interactive web map or app is expected as a result, which offers an alternative to existing and conventional representations. Students work in pairs on different topics and are responsible for conceptualizing the project, cartographical symbolization and presentation of the processed data. They are encouraged to realize their own ideas, working with and building upon each other's diverse disciplinary skills and knowledge. To do this, they must first reflect on their professional strengths and skills they would like to acquire in mapping. They have to categorize their knowledge into one of the three areas of cartography: art, science and technology, and indicate where they are strong and where they can become stronger. For example, a student who has extensive experience working with geospatial data would be placed in the technology group and paired with another student who is strong in art or science and want to deepen the knowledge in technology. Additionally, local partners can be involved to increase the application potential of the project to meet the needs of local community.

Each year, the course brings together a dynamic and diverse group of students with different national and academic backgrounds, personalities and interests. The classroom is a new constellation every year, shaped by the diverse perspectives and experiences of its members. In 2022, the group consisted of 19 students from 16 different countries working on 9 unique projects. The following year, 2023, the group was even more diverse, with 27 students from 17 different countries working on 14 projects. The students come from a range of academic disciplines, including geography, urban planning, computer science, design, architecture, or physics, creating a rich, interdisciplinary environment.

Assessing a course that takes students' reflexive learning into account, and the consequent adaptation and development of their own ideas, proposed solutions and teamwork is challenging. Therefore, the course assessment focuses not only on the final map product, but also on the mapping process itself, encouraging students to engage in thoughtful discussion and critical reflection at each stage. The assessment of the 'Mapping Project' is designed to measure students' competence in developing and realizing a project from the initial idea to the completed deliverable. Overall, this includes understanding the intended project topic and linking this topic to new cartographic research questions and problems, evaluating, combining and processing spatial and non-spatial data using various tools, and evaluating and applying different cartographic techniques, principles and methods to achieve user- and purpose-oriented results. The assessment is per group, which emphasizes the essential teamwork and collaboration. The project result itself (the map) contributes 50% to the final mark; a poster with a comprehensive description of the project as well as the state of the art, applied methods and methodologies contributes 20%; and a final presentation at the exhibition contributes 30%. In addition, three short presentations in a lightning talk format during the semester are part of the project. These 2-minutes presentations

serve to measure the students' ability to summarize the project, present the results to an audience in an appropriate manner, and engage in a subsequent discussion of the presented project in the classroom. In particular, the subsequent discussion provides an opportunity to assess students' ability to discuss and argue about the cartographic techniques, principles, and methods used and to develop the own ideas further.

In a final exhibition, students showcase the diverse range of projects, highlighting the vast potential of cartography. With topics ranging from sound mapping and collaborative web apps to AR-enhanced 3D models, the projects underscore how diverse and innovative the field of mapping can be when students with different backgrounds and experience working together creating a map and discuss it. Notable work includes efforts to raise awareness about period poverty and assess governmental responses, as well as projects with a focus on inclusive mapping, such as an emotion map designed to enhance wellbeing. Other projects include mapping museum accessibility or creating storytelling podcasts for individuals with blindness or visual impairments. Students from the 2023 and 2024 classes have documented their project results in interactive web portfolios, providing accessible and engaging insights into these works. The portfolios can be viewed online at <https://cartographymaster.eu/mapping-project-2023-vernissage/> and <https://cartographymaster.eu/mapping-project-2024-vernissage/>.

Course evaluations over the past two years have revealed that the 'Mapping Project' is one of the most positively implemented course across the curriculum, as it explicates the use of three dialogue-based methods and imbeds project work in the local context. Student feedback gathered via online course evaluation at the end of the semester showed that participants have learned a lot during the course (4.8/5.0); the content was consistent with the program (5.0/5.0); the teaching approach was motivating (4.9/5.0); the assessment was appropriate to test the learning outcomes (5.0/5.0); and students like the incorporation of discussions and consultations (5.0/5.0). Representative students' components included: "creating something 100% our own", "creative map-making, teamwork and group integration", "project-driven structure of the course", "work in a team - a challenge that turned out well", "making the poster, the website and the presentation as interesting experience", "free choice of topic and feedback rounds with the other students", "learning from each other", and "the independence and excitement to stand up on my own feet, study difficult concepts and try to make sense and connect them for a mapping project". Nearly all enrolled students from the cohort attended the course, even though it is an elective one. Students would like to make it a compulsory course with more credits, discussions and lightning talks.

In summary, the 'Mapping Project' as a practical approach to reflexive learning, created the following added value: For students: The course for first-semester Master's students has an immediate networking effect, allowing cross-disciplinary collaboration driven by interests and specific problems. Students exposed to other disciplines and cultures tend to better reflect their own knowledge profile and cultural background with less bias.

For lecturers: The course has a co-learning effect on the lecturers who have observed the students carrying out the projects. Lecturers become more open to unconventional learning paths, more willing to integrate the new knowledge into the curriculum and to identify new topics or modules for their teaching portfolio.

For the cartographic discipline: The course has resulted in a collection of well-designed map prototypes that can demonstrate the progress of cartography as an art, science and technology. More importantly, they can be used in training models for generative AI, contributing to the development of MapGPT for the cartographic discipline.

"What got us here won't get us there". This mantra also applies to the cartographic higher education. With the aforementioned case study, we are on the right track for reflexive learning.

## References

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