

# Competences of a modern academic cartographer

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## Abstract:

Cartography is sometimes mistakenly perceived either as an outdated discipline or as an easy-to-use mapping tool without a need for formal training. It is true that, over the last few decades, academic study programs in cartography have shrunk or merged with related and neighboring disciplines due to insufficient student enrollment. This is because there is no need for large numbers of scientifically educated cartographic specialists. But the need for such academic cartographers is still there as witnessed by the many disqualified or erroneous maps that go viral on the Internet and in social media, indicating a lack of basic cartographic competences. Modern society with its numerous cartographic applications needs qualified professionals for good map design and for the development of effective and efficient mapping tools. Facing the obvious mismatch between supply and demand, the International Cartographic Association (ICA) has reiterated the importance of education and lifelong training for future generations of cartographers to mitigate global and local problems that affect sustainable development.

Cartography is continuously evolving but unique with its independent scientific core aspects. At the same time, it is highly interdisciplinary and connected to a wide range of other dynamically evolving disciplines, especially earth-related disciplines and human-related cognitive sciences. Consequently, the competences of a modern academic cartographer are not always clear and continuously changing as well. In order to understand what makes a qualified modern academic cartographer, we have to analyze the demand from both a market perspective and a societal perspective, and relate it to the competencies university graduates should have.

Competences and skills in response to the needs of the geo-sector in general have been investigated in previous research. According to Cron et al. (2019) and Cron (2022), the most demanded skills include familiarity with GIS software, proficiency with geodata handling and practical experiences in data visualization. Cartographers nowadays are needed not only in the changing cartographic profession, but basically in all research domains that require interdisciplinary competences such as geodata literacy, graphic literacy, critical reflection of ethical values and design thinking play a fundamental role in addressing the grand challenges of a sustainable world.

Gartner et al. (2019) and Gartner (2022) envisioned the future of academic cartographic education and proposed a triangle of competences showing the relationships among the current skills and competences a cartographer needs. They explain how they equip their own students in the MSc Cartography, a joint study program in cartography, with these competences and skills. This follow-up research now aims at getting a deeper insight and a more holistic view on the required academic competences by conducting two focus group interviews.

Both rounds of interviews were attended by world-renowned academic cartographers with different thoughts and experiences and with different research profiles in the field of cartography. All participants play active roles in the international cartographic community and in various academic advisory boards. They have multiple cultural and academic backgrounds and several years of experience in successfully coordinating, supervising and implementing educational programs. Moreover, they are well networked in the academic communities in Europe and worldwide.

The first focus group discussion was conducted during EuroCarto in September 2022 in Vienna with five participants from different parts of the world. The second during the MSc Cartography Welcoming Week in October 2022 in Munich with four directors involved in the joint MSc Cartography ([www.cartographymaster.eu](http://www.cartographymaster.eu)). Both interview rounds were designed to gather information on the question: "What competences are needed and should be addressed in an academic study program in cartography?". Participants of both focus groups were selected to find out if there were different views: (1) between external experts who are not involved in the joint MSc Cartography and those who are, and (2) between internal experts who are involved in the joint MSc but represent different universities.

Participants in the first focus group argued that cartographic science cannot exist without application. They consider cartography as a geospatial science in which graduates should be equipped with the following spatial and non-spatial competences: (1) the ability to think geospatially, (2) skills to collect, manage and understand all kinds of geodata, (3) design skills to visualize and represent all kinds of geodata, incl. interactions (4) technological skills about software, tools

and programming and (5) communication and collaboration skills. Soft skills could be acquired while working on case studies. Additionally, motivation was named as a fundamental competence.

According to the second focus group, it is essential that graduates in cartography have more than the knowledge on how to produce a map and translate data into visual variables. They describe graduates in cartography also as data scientists who should be prepared with (1) fundamental competences of data science, (2) advanced theories, methods and technologies incl. skills on software, interactions and programming, for a holistic understanding of the scientific cartographic discipline and multiple map-based worldviews, (3) awareness of and sensitivity to ethical issues throughout the value chain of geospatial data that includes processes of data acquisition, modelling, analysis, visualization and user experiences, and (4) skills for transparent and trustworthy communication of cartographic knowledge in interdisciplinary and intercultural settings. The second focus group emphasized the importance of soft skills and argued that, besides subject-specific competences, human competence which includes self- and social competences and motivation is important.

Generally, both focus groups share a similar view that students majoring in cartography need to obtain technological skills incl. programming, and gain an in-depth understanding of cartographic communication which requires skills to purposefully select, present and justify their design decisions in the creation of various maps. Moreover, the analytical competences should be accompanied by outstanding soft skills of written and verbal communication, self-motivation and a proactive attitude towards collaboration.

In summary, academic study programs should not only impart broad and up-to-date sectoral knowledge, but also take into account students' personal backgrounds to enable the growth of their social competences, including habits of critical thinking and a strong sense of responsibility for sustainable development. This is essentially a combination of "yes, we can" and "yes, we care".

The insights gained from the focus group interviews can directly serve as useful input for the quality management of cartography-related study programs. We believe that a modern academic study program should impart more comprehensive and longer-term competences than current training courses or apprenticeship programs do. The job market and society at large need not only skilled talent that knows how to efficiently solve clearly defined technical problems at hand, but also forward-looking talent that can demonstrate leadership potential in addressing uncertain, highly complex and ambiguous problems with profound societal implications. The joint MSc Cartography with its international cohort of students from diverse personal and cultural backgrounds can directly benefit from these findings.

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