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A new course concept to overcome linear teaching in Structural Geology and Tectonics

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Structural Geology courses often follow a rather linear path, where key concepts are taught sequentially. It is thus not always clear to students why they are expected to learn sometimes rather complex content. Here, we present a course concept that reverses the theory-first/application-second approach. Our “Structural Analysis of Rocks and Regions” course confronts 3rd-year students with lectures on deformed regions around the globe and invites them to learn key concepts of structural geology through the exploration of multi-scale data sets. The regions are chosen so that a) in sum, they represent all important deformation processes and styles, b) the students will/may visit them, c) excellent (teaching) material is available to allow for a true multi-scale and integrated assessment and d) the lecturers know them well. In that way students will experience key quantities, concepts and descriptors of rock deformation through a large variety of structural and geospatial datasets. The advantage of this approach is that, at all times, students know why they read a particular chapter in a textbook and immediately see the application of their newly-gained knowledge.

This approach requires active student participation. In addition to 4 contact hours/week (two lecture hours/week, a 1-hour practical and a weekly tutorial), students are expected to spend in excess of 10 hours/week with independent studying. To allow students to prepare themselves for lectures, the presentations are available on an online learning platform well in advance and come with recommendations as to which chapters in textbooks and which papers they should read before attending the lectures. Because they revisit structural concepts throughout the semester, coming from different angles each time, their learning is highly networked and non-linear. The tutorials, online discussion forums and individual meetings with lecturing staff give them opportunities to ask questions on theoretical concepts and engage in discussions. In the practicals, they learn how to work with maps and structural data sets to gain the confidence they need to process such data independently. We reinforce this aspect through the course assessment, 50% of which is through an independently produced oral presentation. For this presentation students explore pre-formulated research questions on one of the field areas. Students are expected to independently process and organize tectonic and structural information to address these questions and present their findings in a scientific way at the end of the course.

Course feedback we have received in the past years indicates that students are intellectually challenged by the approach. The lack of linearity seems to leave them unclear about the learning aims. Positive comments highlight the benefits of self study, the advantages of learning to integrate different kinds of data sets, and the applicability of the content. From the lecturers' perspective, we learned that students rarely spend the expected hours on independent studying during the semester. As a knock-on effect, they are not in a position to ask reflected questions until just before the exam. We have responded to this by using the tutorials to go through fundamental structural geological and tectonic concepts.