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Improving fieldwork by using GIS for quantitative exploration, data management and digital mapping

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Fieldwork is an essential part of teaching geosciences. The essence of a fieldwork is to study natural phenomena in its proper context. Fieldworks dominantly utilize a learning-by-experiencing learning style and are often light on abstract thinking skills. We introduce more of the latter skills to a first-year fieldwork of several weeks by using Geographical Information Systems (GIS). We use simple techniques as the involved students had no prior experience with GIS.

In our project, we introduced new tutorials prior to the fieldwork where students explored their research area using aerial photos, satellite images, an elevation model and slope-map using Google Earth and QGIS. The goal of these tutorials was to get acquainted with the area, plan the first steps of the fieldwork, and formulate hypotheses in form of a preliminary map based on quantitative data. During the actual fieldwork, half of the students processed and managed their field data using GIS, used elevation data as additional data source, and made digital geomorphological maps. This was in contrast to the other half of the students that used classic techniques with paper maps.

We evaluated the learning benefits by two questionnaires (one before and one after the fieldwork), and a group interview with students that used GIS in the field. Students liked the use of Google Earth and GIS, and many indicate the added value of using quantitative maps. The hypotheses and fieldwork plans of the students were quickly superseded by insights during the fieldwork itself, but making these plans and hypotheses in advance improved the student's ability to perform empirical research.

Students were very positive towards the use of GIS for their fieldwork, mainly because they experienced it as a modern and relevant technique for research and the labour market. Tech-savvy students were extra motivated and explored additional methods. There were some minor technical difficulties with using GIS during the fieldwork, but these can be solved by focussing the preparatory tutorials on what to expect during the fieldwork. We did not observe a significant difference in the quality of the products created by students between both groups since both digital and classic maps show a large range of aesthetic and scientific quality.

To conclude, we had a positive experience with our first attempt to add GIS components to a classic fieldwork. The main benefit is that students use quantitative data which provides a different view on the fieldwork area and triggers abstract thinking. Future plans include using the student's field data in a web-gis app to allow easy remote supervision and using digital maps in the field.