



## **Enhancing fieldwork learning using blended learning, GIS and remote supervision**

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Fieldwork is an important part of education in geosciences and essential to put theoretical knowledge into an authentic context. Fieldwork as teaching tool can take place in various forms, such as field-tutorial, excursion, or supervised research. Current challenges with fieldwork in education are to incorporate state-of-the art methods for digital data collection, on-site GIS-analysis and providing high-quality feedback to large groups of students in the field.

We present a case on first-year earth-sciences fieldwork with approximately 80 students in the French Alps focused on geological and geomorphological mapping. Here, students work in couples and each couple maps their own fieldwork area to reconstruct the formative history. We present several major improvements for this fieldwork using a blended-learning approach, relying on open source software only.

An important enhancement to the French Alps fieldwork is improving students' preparation. In a GIS environment, students explore their fieldwork areas using existing remote sensing data, a digital elevation model and derivatives to formulate testable hypotheses before the actual fieldwork. The advantage of this is that the students already know their area when arriving in the field, have started to apply the empirical cycle prior to their field visit, and are therefore eager to investigate their own research questions.

During the fieldwork, students store and analyze their field observations in the same GIS environment. This enables them to get a better overview of their own collected data, and to integrate existing data sources also used in the preparation phase. This results in a quicker and enhanced understanding by the students.

To enable remote access to observational data collected by students, the students synchronize their data daily with a webserver running a web map application. Supervisors can review students' progress remotely, examine and evaluate their observations in a GIS, and provide georeferenced feedback. As a result, valuable supervision time in the field has a higher quality as a first-order feedback is already given remotely. Furthermore, students can share each other's results, enabling important academic skills such as discussing interpretations of results and peer-feedback.

In the coming year we will evaluate and further explore means of enhancing the learning experience of fieldwork education as well as the possibilities of different methods to collect data in the field using mobile devices. Also, a software framework for archiving spatial fieldwork data stored on the map server will be developed.