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Geodiversity, Geoheritage and Geomatics: interactions for a new learner-based geoeducational model

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The increasing sensitivity among the academics towards a holistic approach to Geoheritage and Geodiversity implies the involvement of society in geoscience topics. The mixture of social values and features related to Geodiversity predisposes for the design of educational projects based on experimental and cooperative activities with local communities. Moreover, the first step towards an effective geoconservation action plan is by raising public awareness of the value of Geodiversity (Carrada 2006; Gray 2011, 2013; Henriques et al. 2011). By taking awareness of the spatial and temporal scales related to landforms and geomorphical processes, as well as to Man-Nature interactions, we want help people to realize the "dynamic dimension" of Geodiversity and its role as archive of the memory of the Earth. As a consequence, people will be enabled to perceive the geomorphological environment as a system changing over time and as fragile Geoheritage, therefore worthy of protection.
In this context, during four years of a PhD research, a series of actions have been designed and tested to implement innovative educational practices for spreading Geodiversity and Geoheritage awareness, by integrating geoscience knowledge, geoconservation principles, learner-based educational approaches, geomatics tools, ICTs, and geoethics. More than 300 secondary school students and their teachers have been therefore involved in monitored educational activities developed in a variety of areas in the Piemonte Region (NW Italy): the Susa and the Sangone Valleys, the Morainic Amphiteatre of Ivrea, and the Sesia Val Grande Geopark.
Results based on data form analysis confirmed the use of familiar, informal, and friendly ICTs devices (smartphones, tablets and PCs) being effective in encouraging students to approach Geodiversity. For achieving successful results the use of ICTs has to be:
1. learner centered (Mayer 2009). It is fundamental to propose them within a well-designed educational project. In this context, the IBSE approach (European Commission 2007) allows to nurture critical thinking and increase students' interest towards geoscience topics; the BSCS 5E model (Bybee et al. 2006) proposes steps which are very similar to those previewed by the scientific method, thus allowing students to approach geological topics through a process of research, instead of simply studying results.
2. combined with the use of analogical tools. This is useful for showing students the processes which are under geomatics. Moreover, this allow students to discover by themselves which are the pros and the cons of both digital and analogical tools, becoming able at choosing the better tool needed for achieving their goal.
The PhD research allowed to bring a new discipline such as geoconservation in schools, and to teach students the meaning of the terms Geoheritage and Geodiversity. Moreover, teachers confirmed that students increased their critical and systemic thinking concerning Earth system. A final action plan has been therefore developed: it is proposed as a model to be modified and adapted both in the timetable and in the region visited during the field trips, for achieving a variety of geoeducational results.