



Plate tectonics: an example of knowledge construction using different scales

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Plate Tectonics, as a unifying theory of Geology, is an important subject in the curriculum of Portuguese students, from elementary school to high school. It is a highly complex subject that requires special cares, namely in the definition of strategies that allow the learning with content quality, through methodologies that promote active learning.

In laboratory and fieldwork, carried out in Geology, pedagogical dynamics of autonomy and empowerment of the students are privileged. The Geosciences teachers create opportunities and conditions so that the students, holders of geological knowledge, can frame new situations and apply their learning in activities of analysis, discussion, cooperation, critical reflection and communication. Students take an active role from decision making to assessing progress itself, enabling the development of high-level skills. In the example we present, the implementation of active methodologies has underpinned the integration of Information and Communication Technologies (ICT), as well as the fieldwork that allows observation and in situ contact with geological processes and materials, indispensable for the learning of the thematic. These strategies enrich learner practice and promote conscious and meaningful learning, surpassing the merely instrumental vision of new technologies, awakening the interest by nature and promoting the skills related to environmental education. In addition, they prove to be facilitators of students' school success.

The study of Plate Tectonics was carried out in different scales:

- a) At the level of thin slides and hand samples (laboratory work);
- b) At the level of the outcrop (field work);
- c) Globally, through aerial imagery in the Google Earth tool.

The small scale (thin slides and hand sample) study, as well as the study at outcrop level, was based on the NE region of Portugal. These geologic materials have an extremely long and complex history. In this evolution are added different orogenic periods, with diverse consequences, resulting in a "packaging" of geological information difficult to disentangle which are included in a larger unit of the Portuguese geology: the Galician-Trás-os-Montes Zone, one of the units of the Hesperian Massif. It is possible to distinguish some fragments of continental margins, portions of oceanic crust (ophiolitic complex) and portions of the base of continental crust.

Educational research has shown that Information and Communication Technologies (ICT) can improve the quality of science teaching and learning. The application Google Earth makes it easier than ever to travel around the planet, and to find, visualize and understand many geographical features. It helps students to develop critical thinking and data visualization skills, to interpret and to understand relationships by visualizing locations, geophysical features, geotectonic structures and environmental changes.

From the use of satellite imagery, Google Earth allows to grab, spin, pan, tilt and zoom up and down, helping to visualize and to understand many geographical features, which are a consequence of tectonic activity in active divergent, convergent and transform plate boundaries. It also has the possibility of downloading layers of information, like the world distribution of volcanoes and earthquakes and view them in geotectonic context.