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Designing an Educational Scenario Aiming to Teach the Concept of Geological Time to Secondary Education Students with Visual Disabilities

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Introduction

The understanding of the enormous amount of time in which the Earth has been formed and evolved is one of the most difficult concepts not only for students but for people of all ages (Dodick & Orion, 2003). The difficulty in understanding the geological time is due to its vast scale of events that go beyond everyday experience, as human existence on Earth is very small compared to the temporal scale of the geological events on it (Dodick & Orion, 2006; Trend, 1998).

Despite all the difficulties described above the concept of the geological time is taught in the secondary education of Greece as it is necessary for students to understand not only the long-term geological changes but also other processes that occur slowly on the planet, including climate change, oceanography, paleontology, evolutionary biology and cosmology (Dodick, 2007; Dodick & Orion, 2006; Nam, Karahan & Roehrig, 2016; Ravachol & Orange, 2012).

Given that in the context of equal opportunities, visually impaired people should have access to the same information as their sighted peers (Aldrich & Sheppard, 2001), Geology teachers are also called to teach geological time to students with visual impairments. The challenge for them is even bigger as in that case visual representations are not an option.

Options-Aim

For students with visual impairments learning is possible through touch (Millar & Al-Attar, 2004). Appropriately designed educational scenarios involving hands-on activities can be used to further enhance teaching (Simone, 2007) and make it in a funy and enjoyable way (Howe, 2006).

Inspiration

Inspiration resources are successful efforts made by researchers to teach concepts related to geological time to students with visual impairments including:

- The haptic exploration of actual fossils or replicas, which may include placing them in the correct chronological order (Neuhauser, 2011; Perkins School for the Blind, 2016; Richard, 1967; Travis, 1990; Wild, Hilson, & Farrand, 2013).
- The use of materials of different texture that simulate a stratigraphic sequence (Neuhauser, 2011; Ratajeski, 2017).

Other inspiration resources are scenarios made for normal vision students like the linear representation of the geological time on the human hand (Borel, 2014) or the proposals for the representation of stratigraphic strata using simple materials in order to teach the principle of superposition. Those ideas have been adapted adequately for students with visual impairments.

Description

A variety of specific haptic educational objects or activities is proposed to be used to teach and stimulate the interest of students with visual impairments in geological time. These haptic educational objects or activities are easily made with low cost materials and do not require much time for their construction. The construction details and teaching scenarios directions are also provided.

The Examples are designed for personalized instruction and include: Haptic comparison of recent and fossilized sea cells, haptic exploration of a fictional dinosaur footprint made in clay, simulation of a stratigraphy sequence with pieces of fabric, simulation of a drilling core, simulation of geological timeline in the students hand and the placement of animal toy models in the correct chronological order.

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