# How to approach groundwater research to high school students: a project on water resources characterization in urban areas

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High school students must reinforce the idea that Earth is a complex system of interacting rock, water, air, and life, where the hydrosphere is one of the four major systems of Earth including the ice, water vapour, and liquid water in the atmosphere, the ocean, lakes, streams, soils, and groundwater. However the study of groundwater in their curricula is very scarce. A group of six high school students was introduced to carry out a guided research project on "Environmental evaluation of groundwater resources in urban areas: the aquifer of Jabalcuz in Jamilena (Jaén)" aiming to emphasize that: a) water resources are limited in supply; b) groundwater composition can change through geological, hydrological, physical, chemical, and biological processes that are explained by universal laws; c) pollution from sewage runoff of urban areas, agricultural practices, and industrial processes can reduce groundwater quality. We also aimed to attract high school students to be researchers on this field. The guided research project belongs to the initiative Science IES which included the implication of the high school teacher to coordinate the activities in-out schools. Students planned and executed the scientific research, undertook a literature review, characterized groundwaters and aquifer materials ionic using "in situ" measures of physical properties, ionic chromatography and XRD, interpreted and discussed their results, generated conclusions and produced a well organised and written scientific report as well as oral and poster presentations. Students were able to conclude that the Jamilena area has enough groundwater resources for the development of the different activities, but they must take care about this precious resource for avoiding pollution and overexploitation, given that last years, a reduction of spring discharges has been detected in the village. They were also able to made connections between different science disciplines (Mineralogy, Hydrogeology, Geochemistry), learn in a cooperative way, and finally enjoyed a conference displaying their oral and poster communications.