

Opinion

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The Hard but Joyful Work to Convince Students The Everyday Importance of Soil and Sediments!

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I believe that teaching about ground conditions, like soils and sediments, and what this means for nature and us as humans, is one of the most important things we can do. But it is a big challenge, because what I see being convinced and dedicated as an extraordinary interaction between minerals, organics, water and organisms, is what some would call "dirt" and the students don't always see the amazing thing. How can sand and gravel be cool? Is clay beautiful? Isn't humus just dirty?

I have been teaching in university in the discipline earth science for almost 30 years, partly as researcher, as mainly teacher and during the last 3 ½ years in the role as consultant in a company. I am an earth scientist, Quaternary geologist, but started actually once as archaeologist. Also, parallel with teaching I have a lot of field working for geological survey, private companies and in research, and earlier literally speaking cutting slowly through layers of clay to reveal prehistoric remnants. So, one could say, I have dedicated my life practically to soils and sediments. Today I still work with this, but now in environmental geology, still dominated by soils, sediments and water, but more with contaminants, constructions and risk assessments.

It is easy for anyone to see what importance this has on things like cultivation and how it can have severe effects on the stability of roads and houses. But, from that to get the students to deepen their knowledge about soil and sediments might be a difficult step. So, we have to clarify how many questions there are that have effect on or are affected by the soil and sediment conditions like water, climate, organisms, contaminants, resources, stability etc.

I believe that one has to clarify very carefully in the teaching situation, how the situation around soils and sediments connects to challenging questions for us today. I found a citation on Internet, that pinpoint some parts very well: "Despite all our achievements, we owe our existence to a six-inch layer of topsoil and the fact that it rains". According to Wisconsin state farmer Robert Riley, he states in an article that this saying is coming from a farm equipment association of Minnesota and South Dakota. This organization is very far from my home horizon, but the saying is very essential in what it says. But it must be seen in a wide perspective, it doesn't only concern agriculture, but also environmental and geotechnical issues, questions around climate change, garden and forest and, yes, everything more or less.

In the teaching situation we bring up questions about soils and sediments in the classroom and explore the scientific and practical knowledge in lectures and theoretical arguments. But we also have triumph on our hand, since we can move on into the lab and best of all, also move out to the best classrooms of all – the true nature and environment. This is the best situation but might for many students also be the most challenging situation.

In the teaching situation in field, I always try to argue for the students to think in three dimensions – spatial, topography and depth. Then, as next step, also to think in timelines, when and where did it happen. Also, be a "landscape detective", use signs above ground surface, telling you what's going on under the ground surface – vegetation, water, moist, signs of depressions and pressing up and much more. Let the show begin, see the processes, changes,

impacts in a grand movie in the mind of understanding. Finally, maybe, you also take action that has to be taken if necessarily. But of course, this also demands basic theoretical knowledge in appropriate fields and more information from studies, mapping, sampling, analyzing, testing etc. And testing we shall do much in teaching situation, in the field and in the lab.

It is one thing to look in the book, on the illustration, at the diagrams and figures. But a completely different thing to "read" the real soil profile, to sense the material in your fingers and to judge and classify, to describe it and know how to take the right samples. But it is the strongest of feelings of confidence to be able look out over a landscape or to work with a soil profile and knowing what it tells you. You know another and very exclusive language. This language grows with knowledge and by time also experience. Then, of course, not being scared of getting mud or clay on your boots and fingers (Figure 1).



Figure 1

Understanding takes time though. In my part of the world for example, similar to many other parts of the world, we have for example to relate to previous repeating periods of glaciations and sea level changes, having enormous impact on the landscape. These

Quaternary deposits, developed through glacial processes and sea level changes through land uplift, basically dominate the landscape. And then we add postglacial processes with water and the human impact on that. This also means a starting point for the change of the landscape and development of soil; it can't happen before the glacier is gone or the landscape is raised above sea level (Figure 2).



Figure 2

So, for us, who more or less dedicates our lives to issues like soil, sediment and water, we feel great joy and satisfaction to observe, feel, collect and analyze samples. Who have not felt the satisfaction of seeing amazing and stratigraphically sediment layers or a perfect well-developed soil with clear horizons. This is what we want to bring about for the students. I always hope to inspire students to test, explore and to appreciate this and understand why we owe our existence to a six-inch layer of topsoil and the fact that it rains.

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Conflict of Interest

No conflict of interest.