

## My Earth science educator story – Dirk Felzmann

### What I did, why I did it and what happened



Standing on the Dachstein-glacier.

#### **My own conceptual change about geoscience topics**

When I was a child I collected fossilised shells and ammonites in the “mountains” of southern Germany. I imagined how this landscape had been filled with water and how the dead shells were deposited on the ground, where I stood. In my imagination, the relief of the landscape, with its mountains and valleys, had the same shape as today; it had not changed much at all in the past 200 million years.

However, when I studied geography and biology this landscape changed dramatically – within my head. In my mind, the previous static landscape became a very dynamic one with a very eventful history. The mountains were no longer mountains, they were peneplains with incised valleys. And during this incision older rock formations became eroded and revealed, including “my shells”.

Another big conceptual change occurred for me during a geographical excursion in northern Germany. Before the excursion, I had just seen a flat landscape with some hills. But after the excursion, this landscape had gained a relief and

structure caused by the different Pleistocene ice sheets.

It is often difficult to reflect on our own learning processes, since they happened long ago. What did I know before and what was really new? But for geoscientific issues like those above, I can still remember how it felt to gain a completely new insight into structures and causes. This was a good feeling.

#### **My own conceptual change about how to teach geoscience topics**

During my teacher training, my biology instructor highlighted the importance of understanding students’ conceptions for successful learning. This perspective may seem to be trivial, but it is not. As a young teacher, this perspective changed my own thinking and teaching. Again. I had the feeling of having learned something fundamental.

Around the year 2000 the idea of student conceptions was quite unknown in German geography education – in contrast to science education in Germany. So when I focussed on students’ conceptions in my geography lessons, this was a type of experimentation. For example I let pupils paint and describe their thinking about the origin of the topographic relief around their school. This school was situated in northern Germany in a landscape dominated by processes of the second last ice age. This work showed that some pupils thought that the landscape has always been the same but filled with water...

I saw that the pupils liked these phases of reflecting on their own conceptions when they were confronted with a new topic. They noticed that they, with their prior knowledge and experiences, were being taken seriously. They could reflect better too, about what they had learned – and what they had not learned.

### **Doing conceptual change research**

As a geologist finding fossilised shells at the surface, you may want to gain a better understanding how to explain these findings. Probably you would try to “go deeper” in the place where you found the shells. You might drill down to get more information. In a similar way I wanted to gain a better understanding how to explain the learning processes of my pupils; this was why I began my PhD project. Since we are not allowed to drill into students’ heads, I used more indirect ways to get into their brains. By using teaching experiments, I could observe the development of students’ conceptions in response to detailed instructions. This involved phases of interview and phases of instruction for small groups of pupils while all their discussions were videotaped. I focussed on the topic of “glaciers and ice ages” because this is a very common topic in geography teaching in northern Germany, particularly where I lived.

I began my PhD project when I was still working as teacher. However, in 2009 I moved to Leibniz University in Hanover for five years, to work as a research assistant in the department of geography education with Professor Christiane Meyer. At this time, conceptual change research had found its way into German geography educational research, so interesting discussions between different researchers became possible. Simultaneously the biology education group of Professor Harald Gropengießer at the University of Hanover began using the conceptual metaphor theory to interpret students’ conceptions. Fortunately I was able to work very closely with the biology education group too. An inspiring environment developed, during which I

completed my PhD thesis into the educational reconstruction of the “glaciers and ice ages” topic.

When I left the University of Hanover, I did not know whether to continue working as geography education researcher or to become a geography and biology teacher again; I liked both jobs. This was like the geologist finding a fossilised shell. He can walk further, collecting further fossils, to get a very broad view of the landscape, or he can drill deeper at the place where shell was found. At first, I tried to do both: going a little bit further and drilling a little bit deeper. But now I have decided to go back to geography education at university. In 2016 I begin as “Juniorprofessor” (assistant professor) of geography education at the University of Gottingen, the place where my student experience of my own geoscientific conceptual changes began.



My first international lecture, the International Geoscience Education Organisation (IGEO) conference, Johannesburg, 2010.

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