Digital Classroom, light microscopy, mineralogy

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1. Carl Zeiss Microscopy

Digital Microscopy in a Digital World

The world we are living in is changing rapidly, as digital technology is more and more integrated into our everyday lives. Smart phones are common possessions for most, big data is shared, analysed and interpreted around the world using "Cloud" technology and people are continuously connected via the world wide web. It is therefore safe to say, that in the last 10 years, we have truly undergone a third industrial revolution; the digital revolution.

Digital technology is now revolutionising the way we educate and communicate. These digital capabilities are now being applied to Geoscience education and specifically, in this paper, for the microscopy and mineralogy education.

Optical Mineralogy Education with the ZEISS Digital Classroom

The digital classroom allows the supervisors to connect to all Primotech microscopes in the classroom. Using the Zeiss Matscope iPad application, the supervisor is able to view all the images from the microscopes at any time, giving him a comprehensive overview of the students microscopes. The supervisor has the capability to select and share anyone of the student' s microscope images by projecting the image onto the screen.

A simple example of the application of this technology, may be the following scenario. A supervisor is showing his class the features characteristic of an olivine on his light microscope. Now the students will aim to recreate the steps in search for the same features that are used to distinguish an olivine. Whilst overseeing the students microscopes, using the Zeiss Matscope iPad application, the supervisor notes one of the students has an olivine which has been cut perpendicular to the c axis and is showing maximum birefringence. This student' s microscopic image can be easily selected and projected on the front screen, to show the rest of the students this example. Another student may have, in plane polarised light, what appears to be an olivine with high relief, fractured texture and colourless pleochroism; the birefringence is black-grey in colour.

Both examples can be projected live from the students' microscopes and be used to provide examples of the difference in birefringence based on the orientation of the crystal relative to the crystallographic axis. This is not just a better way of sharing information but also, by involving the students in such exchanges the supervisor can invoke an element of peer-on-peer teaching and greater student engagement with what is being taught.

In addition, students have the benefits of having iPads, which can wirelessly be connected to the microscope. Typically, students within the lecture make observations with the microscope, taking notes and making sketches based on their observations. This is a time intensive process and can result in students spending more time drawing and making notes than interacting with the microscope and the samples. The Zeiss Matscope iPad application therefore allows students and supervisors to acquire and save images, so they are able to build their own library of images. With the Zeiss Matscope iPad application students have the ability to perform measurements, annotate the images or record short

videos based on their observations. Therefore, supervisors can create practical exercises, where measurements can be taken to ensure students note the relevant features and observe specific details within the sample. The Matscope iPad application thus allows the students to spend more time focused on the sample and its features and acquiring data from the samples.

Summary Remarks

The digital world we now live in provides us with a great opportunity to revolutionise our education provisions. The ZEISS Digital Classroom is one such evolution taking advantage of the digital technology available today. The capabilities of the ZEISS Digital Classroom lead the future of how optical mineralogy and microscopy education are evolving.