

Teaching and Learning with Digital Images: The Image Annotation Tool

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Summary by Chhandasi Pandya, Rapporteur

Dr. Letty Moss-Salentijn, an oral histologist, sat in a meeting room filled with colleagues and students and jokingly admitted that she isn't the most technically capable person she knows. As she made these remarks, she presented the Image Annotation Tool (IAT), a web-based application her ideas helped develop and one that students and professors are now successfully using in fields ranging from dentistry to the humanities. The IAT is designed to allow users to easily upload, annotate and share images online, thus creating a learning environment that promotes precision, participation and convenience.

The IAT's initial application was in the field of histology, the anatomical study of tissues. The tool allows students to look at images of tissues online and label parts of the structure they are viewing. The application allows students to review the work of others and learn about the anatomy of tissues and cells by zooming in on various portions of a given image. In doing so, the IAT has changed the way students learn about tissue anatomy, Dr. Moss-Salentijn said. Traditional teaching methods involved microscopes and atlases of images students were supposed to recognize. Such lab work, however, proved ineffective at times, as students were unable to translate what they saw on an atlas to what they were seeing under a microscope.

While Dr. Moss-Salentijn said she spent long hours peering into a microscope, the histologist's primary tool of trade, analyzing various slices of tooth structures, today's histology students don't hold the instrument in the same esteem. She noted that some of her students arrive the first day of class not knowing how to use a microscope or not being accustomed to spending long hours in front of it.

As Dr. Moss-Salentijn began wondering about the future of microscopy as a learning tool, she began conducting experiments about learning styles. The experiments that eventually led to the development of the IAT were two-fold. The initial approach of the project was to analyze a large number of images, using interactive labeling, under two different conditions. In this first version, students were divided into two groups, one using microscopy and the other using a predecessor to the IAT, the CU Analyzer. The students were divided into two groups further, Dentin and Enamel.

For each group, students were divided into web users and microscope users and given practical examinations to test how they absorbed information about the slides (and atlases) they were given to study. The results of the study showed that over the course of the experiment, students in both groups – microscope and web-based – performed almost equally the same. This first experiment with the web-based CU Analyzer had glitches, Dr. Moss-Salentijn explained. The labels on the digital atlas students were working with were 1.5 inches away from where they should have been. This may have confused students. Also, the web-based images the students were given were largely from Dr. Moss-Salentijn's own, earlier work in composing the atlas "Orofacial Histology and Embryology."

Above all, the number of images used, while large, wasn't large enough, according to Dr. Moss-Salentijn. What the next experiment needed was an even larger sample and interactive labeling. The next study, this time using the IAT, divided students again into an electronic and non-electronic group. The web-based tool, however, had changed. The introduction of digital annotation and a large set of images allowed students to work together and with the instructor in a more interactive environment. The result of the study was clear: the electronic group performed better.

"The students seemed to really enjoy using the tool. It is really a great way to learn," Dr. Moss-Salentijn said. "The students were eager to annotate slides as soon as they had been put online."

The IAT tool's annotation feature, along with its zoom feature, has made it an important tool for use outside of the field of histology as well. Users can annotate according to color and size, and professors can create libraries of specific collections to send out to students. The image collections can also be viewed as a slide show. The IAT is also being used in an English course at Barnard College.

For Dr. Moss-Salentijn, the tool has been a promising start to changing the way students learn histology. She hopes the creators of the IAT can develop a three-dimensional function to the application. "When students look at sections of structures of teeth, you can't see the 3-D version and it can be hard. My dream is to 3-D reconstruction programs to get to the third dimension so that you can see how a tooth is put together by different sections," she said.