

# Medical Histology: Analog microscopy in the digital age

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## Goal:

The overarching goal of this ongoing project is to improve the delivery of histology content at VTCSOM by pairing 'old' school microscopy with 'new' school technology.

## Introduction:

The recent advancements in digital microscopy, have led to a sea change in the approach medical schools use to teach histology content in undergraduate medical education<sup>1-5</sup>. Since the inception of Virginia Tech Carilion School of Medicine (VTCSOM), a fully virtual microscopy platform has been the mainstay of histology content delivery with little didactic instruction. Although this e-learning approach, in which students assimilate histology content independently in a virtual microscopy laboratory session, is preferred by our M1 students, it appears to foster an illusion of learning.

- Students consistently have performed below the national average on standardized assessments.
- Students have also consistently reported low satisfaction levels with histology content on independent surveys;
- Students they have not had the opportunity to learn basic microscopy skills.

## Methods:



We acquired student-quality light microscopes  
Project funded by Center for Excellence in Teaching and Learning

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Created complete histology slide sets (murine and bovine)



Created pre-recorded videos, using PowerPoint, with voiceover recorded using Explain Everything™, addressing structure and function (<10 min) and posted to YouTube



During class sessions, students were given a microscope, drawing paper, and colored pencils; together with a list of subcellular, cellular or tissue level structures to identify and draw.

## Assessment:

Outcomes were assessed using:

1. Student performance on NBME histology questions
2. Likert item added to end-of-block assessment: "Please indicate the extent to which microscopes were useful for your learning of histology"
3. Open-ended question on end-of-block assessment asking students to rate their satisfaction with the delivery of histology content

Performance on NBME questions and student satisfaction were compared between Academic Year 2017-2018 and AY 18-19 (after implementation).

## Results:

In Block I of AY 18-19, student performance increased to the national average. In Block II, performance was 2 points above the national average, and 6 points above Block II performance in AY 17-18.

76% of students either agreed or strongly agreed with the statement that microscopes were useful for their learning of histology.

Student satisfaction data are pending. In AY 17-18, 77% of students reported being satisfied with histology content delivery. Our goal for AY 18-19 is to achieve >90% student satisfaction.

## Discussion:

By bringing glass slides and light microscopes back to the classroom, while incorporating short, flipped lectures viewed at the students' own pace and convenience, we have seen improvements in student understanding and retention of the material, and positive feedback from students regarding this approach. By taking advantage of the best aspects of traditional and new approaches to delivering this content, our students have a stronger foundation on which to build, and an enhanced appreciation for histology.

## Conclusions:

Combining "old" technology (microscopes) with a "new" approach (online flipped lectures) has improved histology outcomes for VTCSOM students.

Adoption of new practices in education should be done with consideration for what may be lost in discarding the old.

### References:

1. Pratt, R. L. Are we throwing histology out with the microscope? A look at histology from the physician's perspective. *Anatomical sciences education* **2**, 205-209 (2009).
2. Krippendorf, B. B. & Lough, J. Complete and rapid switch from light microscopy to virtual microscopy for teaching medical histology. *The Anatomical Record Part B: The New Anatomist: An Official Publication of the American Association of Anatomists* **285**, 19-25 (2005).
3. Bloodgood, R. A. & Ogilvie, R. W. Trends in histology laboratory teaching in United States medical schools. *The Anatomical Record Part B: The New Anatomist* **289**, 169-175 (2006).
4. Goldberg, H. R. & Dintzis, R. The positive impact of team-based virtual microscopy on student learning in physiology and histology. *Advances in physiology education* **31**, 261-265 (2007).
5. Blake, C. A., Lavoie, H. A. & Millette, C. F. Teaching medical histology at the University of South Carolina School of Medicine: Transition to virtual slides and virtual microscopes. *The Anatomical Record Part B: The New Anatomist: An Official Publication of the American Association of Anatomists* **275**, 196-206 (2003).