



ORIGINAL ARTICLE

## From slide sets to sound bites: teaching and learning pathology in the digital age

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Educational evolution is particularly important in pathology, particularly cytopathology, due to the vast amounts of independent learning required to master this field. In this study, learning challenges faced by pathology residents were addressed through a variety of educational modalities including 24 short (~10 minute) online tutorials (dubbed “Sound Bites”) covering selected topics in cytopathology as well as other areas of anatomic and clinical pathology. Additionally, residents were provided with an annotated glass slide set covering pediatric pathology with an associated multiple choice self-assessment as well as multiheaded microscope slide review sessions. Use of these modalities was tracked and residents surveyed about their experiences using them. All 20 residents (100%) reported using Sound Bites either from work computers, home computers, or mobile devices. Residents reported that easy accessibility, brevity, and opportunities for self-assessment were important variables contributing to this use, and that Sound Bite use would make them more likely to benefit from in-person teaching through lectures and/or slide sessions. Within 12 months of the release of the first Sound Bite, individual Sound Bites were accessed a total of 1169 times (mean: 49 times per Sound Bite). In contrast, slide sets were only accessed about once a month and were only employed by 30% of residents (6 of 20) for independent study; only 20% (4 of 20) completed the accompanying multiple choice self-assessment. All residents attended multiheaded microscope slide review sessions.

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Whereas traditional educational methods remain valuable tools in pathology education, these data suggest that short, web-based tutorials represent a valuable adjuvant teaching tool.  
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## Introduction

The last decade has seen considerable changes in medical education teaching style, with a shift from hierarchical, lecture-centered instruction to more learner-directed modalities. Much of the impetus for these changes centers on the needs and preferences of Generation Y, also known as the Millennials, who prefer interactive and technologically sophisticated educational methods and often eschew traditional teaching. Online learning tools such as podcasts, blogs, and wikis have been particularly important in shaping the curriculum changes geared toward this new generation of medical trainees, and a host of studies have demonstrated the value of such “eLearning” in medical education.<sup>1-5</sup> However, many of these studies focus on medical students, and specific recommendations for specialties are lacking.

## Evolving medical education

Educational evolution is critical in the field of pathology and particularly cytopathology, because residency training in this discipline requires a considerable amount of independent learning. Historically, this could be accomplished largely through reading textbooks, reviewing journals, and studying slides. Although these methods are still necessary for the success of a pathology trainee, the volume and complexity of knowledge required to master the scope of the modern AP/CP Pathology curriculum make it difficult for residents to tackle their independent learning responsibilities using these tools alone. The trainees’ difficulties are compounded by the fact that many begin residency with only a few weeks of rotation experience in the field. Furthermore, as medical school curriculums shift away from traditional

cytology and histology teaching, new residents often lack the most basic foundations for their chosen career.

At the University of Virginia’s Department of Pathology, we sought to address some of the learning challenges faced by pathology residents through a variety of modalities. We enlisted several educational tools: annotated glass slide sets, written question self-assessments, guided slide sessions, and short (10-15 minute) online tutorials, which we dubbed “Sound Bites.” We tracked use of these modalities and surveyed residents about their experiences with the different learning tools.

## Methods

### Sound Bites

Twenty-four audiovisual tutorials covering selected anatomic and clinical pathology topics were created using Camtasia Recording Software (TechSmith, Okemos, Mich). These Sound Bites averaged ~10 minutes in length (range: 7-15 minutes). They were based on PowerPoint presentations (Microsoft Inc., Redmond, Wash) with overlaid voice recording. Overarching topics consisted of cytology, breast ductal proliferations, bone tumors, clinical chemistry biomarkers, glomerular kidney disease, non-neoplastic lung, molecular testing, and microbiology (Table 1). Each Sound Bite featured an unknown case at the end and/or multiple choice “checkpoints” in the middle of the tutorial. Most Sound Bites were written and recorded by 2 pathology fellows (A.M. and M.M.N.) and all were created in concert with expert faculty in the discipline being discussed. Sound Bites were housed on the online storage website [screencast.com](http://www.screencast.com) and were made accessible to residents through links on the Educational Resources section of the University of

**Table 1** Summary of Sound Bite subjects, subtopics, and expert reviewers

Subject	Subtopics	Expert reviewers
Bone tumors	Osteoblastic, chondroblastic, giant-cell rich, and fibrous patterns	S.M., R.L.
Breast	Ductal proliferations	K.A.
Clinical chemistry	Biochemical bone markers, renal markers (I and II), vitamin D	J.B, D.H.
Cytology	Salivary gland tumor morphology, Bethesda criteria for thyroid FNA, fluid interpretation, pancreas FNA	K.A., E.S.
Microscopy	Tutorial on microscope anatomy and Kohler illumination technique	M.S.
Medical kidney	Introduction, normal-pattern, mesangial, endocapillary, and crescentic patterns	H.C.
Medical lung	Interstitial fibrosis pattern	M.S., M.W.
Molecular	Lynch syndrome testing, FISH	K.A., C.M.
Microbiology	Malaria, organisms in respiratory specimens	K.A., M.P.

Abbreviations: FISH, fluorescence in situ hybridization; FNA, fine-needle aspiration.

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