

Creating an Inverted Ophthalmology E-Learning Classroom

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Abstract

Based on a review of recent evidence and a commitment to innovation, the Department of Ophthalmology and Vision Sciences has undertaken a project to update the delivery model and medium for its clerkship curriculum. Medical and general educational literature was reviewed for novel curriculum delivery modes and the evidence for inverted classrooms and electronic learning (E-learning) was reviewed. The resultant ophthalmology clerkship website is then described in the context of the review findings.

The 21st century of medical education has seen a shift from traditional classrooms to novel learning platforms and models. Concrete lecture halls are becoming virtual classrooms and the paradigm of information flow is changing. These transformations are rooted in a commitment to innovation and a number of challenges in medical education, namely decentralized medical schools, increasing class size, and financial constraints.¹

E-Learning

Study of online education, or E-learning, has provided evidence to support the move to online platforms as a viable solution to these challenges. Chumley-Jones and colleagues reviewed 76 studies from medical, nursing, and dental literature on the utility of web-based learning.² They found that E-learning yields equivalent learner achievement in knowledge when compared with traditional methods. Additionally, in about one-third of studies, E-learning was significantly better than traditional methods. Regarding costs, savings of up to 50% have been demonstrated in a substantial amount of non-medical literature.³ Finally, studies consistently verified that learners are satisfied with, and positively evaluate, E-learning initiatives.² Overall, the literature describes E-learning initiatives as a viable and beneficial alternative to traditional educational platforms.

Inverted Classrooms

Bloom's Taxonomy (Figure 1)⁴ is a foundational classification system used in education. It provides a hierarchy of learning objectives organized by cognitive complexity. The hierarchy is divided into knowledge, comprehension, application, analysis, synthesis, and evaluation. Each level is a prerequisite for the next and the goal of education is for students to reach the most intellectually demanding evaluation stage. The first two stages have been termed transmission. These stages include recall of facts, terms, and basic concepts, and the organization, comparison, and interpretation of them. The third through sixth stages have been termed assimilation. These stages comprise problem solving, making inferences, and forming opinions based on judgments.

To effectively move students through all of Bloom's objectives, there has been a recent shift from traditional lecturing formats to a new model of learning. In a traditional paradigm, education begins with a content expert transmitting facts, terms, and basic concepts and students absorbing this information. Students then independently assimilate the knowledge. In this model, students have access to content experts for the least cognitively demanding stages, and must

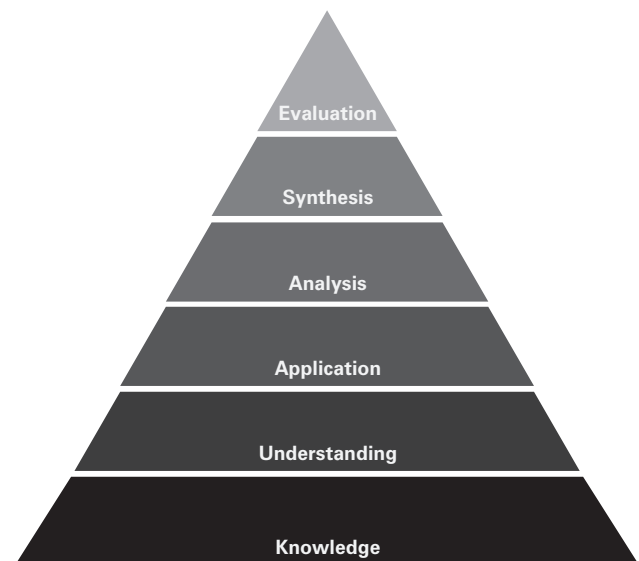


Figure 1. Bloom's Taxonomy

work through the most intellectually demanding steps with less support. A newer model of education flips these steps. “Inverted Classroom” is a term coined by Dr. Eric Mazur, a physics professor at Harvard University.⁵ Mazur noted that traditional lecturing reduces education to a transfer of information. Students amass content and rely heavily on rote memorization. Referring back to the Bloom system, students only achieve transmission with the help of the teacher and must assimilate independently. To combat this, Mazur used instructional time for discussions, peer interactions, and time to problem solve and think. He shifted the responsibility for the initial Bloom steps onto students via readings before class. Based on his model, an inverted classroom was piloted at Pennsylvania State University in 2008.⁶ Of students in this pilot, 75.3% agreed or strongly agreed that spending class time solving problems rather than listening to a lecture helped them learn.

Ophthalmology Clerkship Website

The current ophthalmology clerkship curriculum is delivered using a traditional portal-based platform and a lecture-based model. Students from two campuses (St. George and Mississauga) in four academies (Wightman-Berris, FitzGerald, Peters-Boyd, and Mississauga) have a half-day of lectures and are then directed to the University of Toronto (U of T) portal for reference. The portal contains the syllabus and 25 cases.

The cases present a chronological sequence of information using a click-through format. The syllabus is a conventional text-based PDF that provides information on ophthalmology clinical care and pathophysiology.

Based on the evidence for inverted classrooms and E-learning, the Department of Ophthalmology and Vision Sciences at the University of Toronto sought to update the ophthalmology clerkship experience by creating an inverted, online classroom for third year clinical clerks (Figure 2). The inversion requires students to access the website (eye.utorontoeit.com) and watch clinical skills videos as well as review course content before the didactic half-day and clinical week. Students are then equipped with foundational knowledge to utilize content experts during the teaching half-day and the remainder of the rotation. The website also contains updated cases that leverage University of Toronto-developed case software, the Virtual Interactive Case (VIC) system (<http://pie.med.utoronto.ca/VIC/>). VIC cases are clinical reasoning problems that provide a bridge between theory and practice. The students receive feedback on the quality of their assessment as well as on their selection of the diagnosis and management of the presenting complaint. The cases serve as a conduit for accessing the syllabus, clinical skills videos, and an image atlas. All the material is housed within the online course environment, which provides an element for social interactivity. Students can comment on cases and syllabus sec-

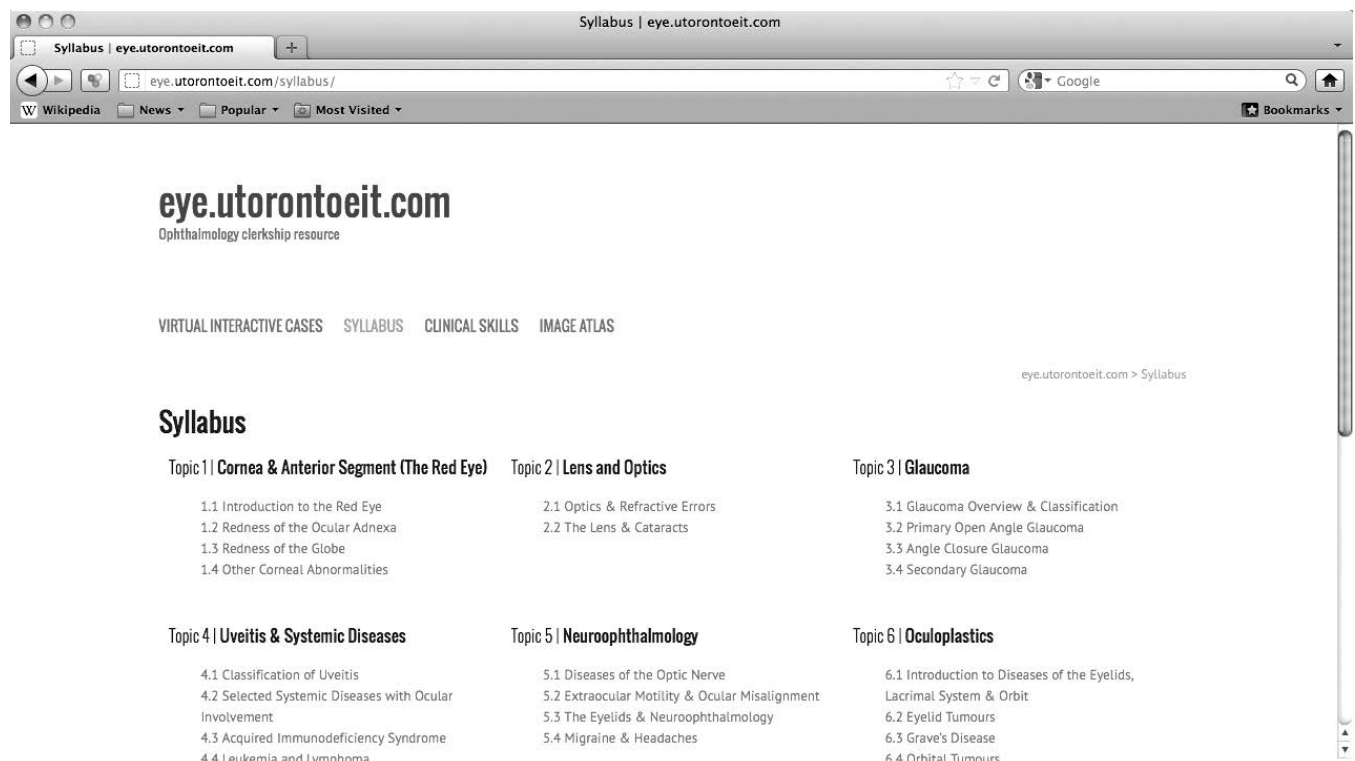


Figure 2. University of Toronto’s Ophthalmology Clerkship Website, syllabus index

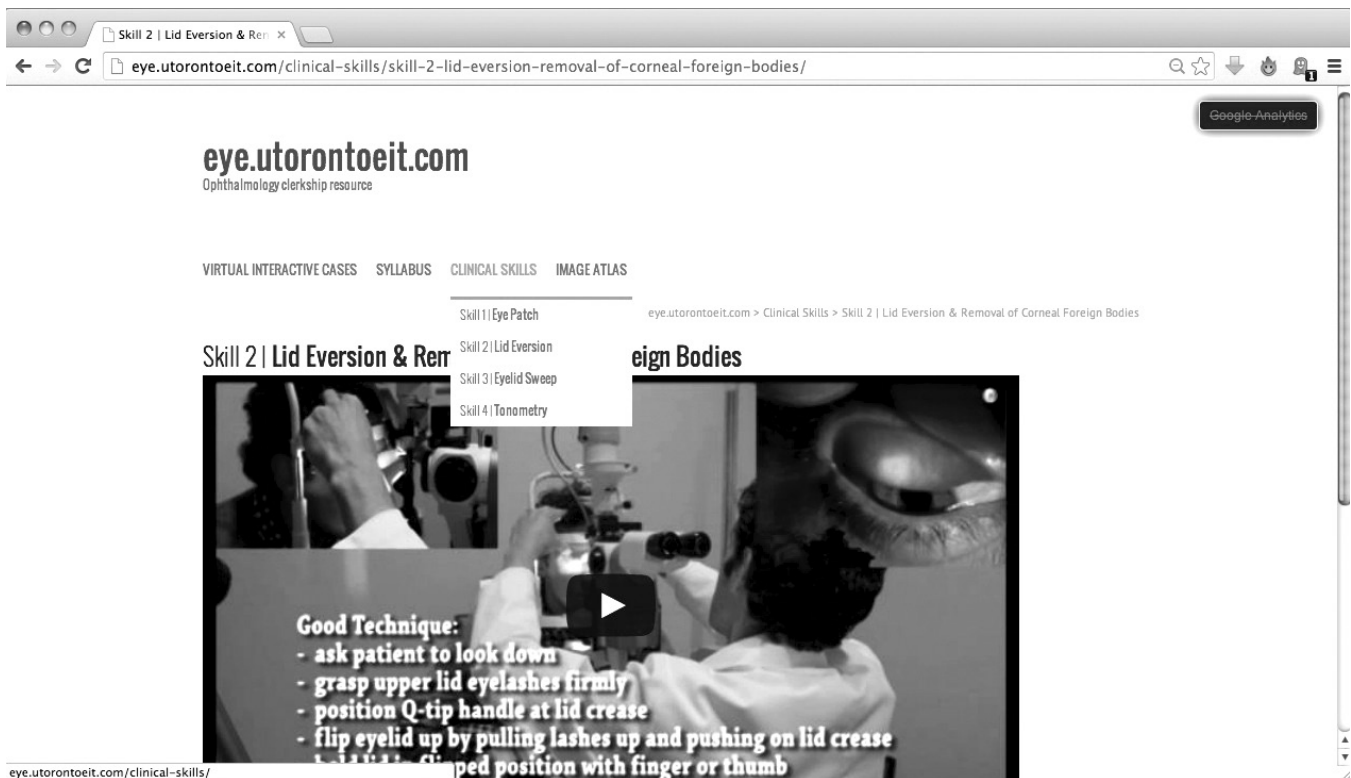


Figure 3. University of Toronto’s Ophthalmology Clerkship Website, clinical skills video

tions and post questions. This allows real-time feedback and interaction between course faculty and students.

Overall, with limited time resources, the ophthalmology rotation is able to focus on providing assimilation support and help students achieve complex Bloom objectives, such as evaluation, synthesis, and analysis, while the inverted E-learning platform provides foundational understanding before the rotation begins.

The website, which is in the final stages of completion, will be piloted at the end of the 2013-2014 academic year.

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