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Development of a “Stress in Medicine” Education Module: Learning from the Aviation Industry

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The aviation industry designed and implemented assessment and training programs to improve employee attitudes and performance in the areas of leadership, interpersonal communications, teamwork, stress management, conflict resolution, and decision-making. The goal of this project was to develop and implement curricular modifications at the University of Illinois at Chicago College of Medicine (UIC COM), utilizing the aviation model, to increase medical student proficiency in these non-cognitive and social skills shown to improve patient safety.

The objective of the initiative funded by the U.S. Department of Education was to create and implement a three year longitudinal program similar to the aviation educational modules; validate the results of learning in simulated team exercises; and demonstrate the curricular effectiveness through assessment of students' recognition of the importance of these non-technical skills in medical practice, and eventually the translation of these skills to clinical practice.

The first M1 learning module developed and piloted was “Stress in Medicine”. Historically, plenary content delivered in the Essentials of Medicine (ECM) course was not linked to small group activity, nor did faculty members participate in preparation prior to facilitating small groups. For this inaugural module, faculty preparation was held immediately before the plenary session and the small group session followed the plenary. Faculty facilitators were required to participate in preparation, plenary and small group; students were required to attend the plenary and small group.

The plenary capitalized on the use of an interactive large group discussion for students to begin thinking critically about the physiology of stress, signs of burnout, and how stress can impact a physician's attitudes, job performance and patient outcomes. During the small group, students participated in an airplane hijacking simulation designed to continually increase stress levels of the students during the simulation. Stressors included introduction of “bombs” on the airplane requiring time limited dismantling; murder of the pilot; and a passenger suffering a cardiac arrest. Intensive debriefing focused on personal and team reactions to stress and impact on performance. Student assessments and module evaluations completed by faculty and students were extremely positive regarding the integration of aviation training methods into the medical curriculum.

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Grand Rounds as a Teaching Modality in Neuroscience for M1 Students

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Innovations in educational technologies have driven medical education as traditional forms of instruction are revised. During the past two decades, course directors and medical educators have developed curricula that integrate numerous interactive learning strategies. Among these strategies are enhanced standard laboratories, computerized instruction, patient simulators, small group learning exercises, and interactive teaching in a large group forum. We have used the latter method to provide a clinical foundation in Neuroscience, a first year basic science course. First year medical students, in white coats and professional attire, are required to attend Neuroscience Grand Round exercises in a hospital classroom throughout the course. The exercises are provided by faculty from the Department of Neurology, include the use of clinical patients, and are student-friendly. Educational objectives focus on the process of and criteria for diagnosing neurological patients in an actual clinical case. Each case provides a solid medium for auditory and visual cues in patient evaluation and underscores the value of a neurological examination and history. The presentations allow a format that requires interactive exchange between medical students, clinical faculty and residents, and neurological patients. Clinical assessment of the patient, discussion of a plan for intervention and understanding eventual case outcome provide a foundation for critical thinking skills. Evaluation data demonstrated numerous course comments that were positive, including “This course was by far my favorite course of the M1 curriculum. I like that the physiology was integrated with the medical and pharmacological aspects of neuroscience. One of the highlights of the course was the Grand Rounds presentations. It was great to see patients with the diseases we were studying.” The integration of this type of Grand Rounds into a basic science course is an innovative patient-centered approach that promotes an understanding of those factors that characterize both acute and chronic neurological illnesses. This innovative approach furnishes a format for clinical faculty and residents in medical education/academic medicine and provides medical physicians-in-training experience in discussing clinical cases, problem solving and interacting with patients.

Development of a Database to Streamline Access and Manipulation of Images in a Web-based Histology Atlas

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Medical educators benefit from Web-based, database-driven search engines, such as Google™ or PubMed, but they have failed to harness database technology to improve computer-assisted instruction (CAI) applications. At Vanderbilt University School of Medicine, an interactive, Web-based histology atlas was created to place the students' laboratory manual on the Web and to display hundreds of histological images via the use of Hypertext Markup Language (HTML). The atlas was converted into a database-driven tool using a Web programming language (PHP) and a MySQL® database (http://www.mc.vanderbilt.edu/histology/atlas/chapters/example). The conversion streamlined the development and modification of the atlas, and it enabled the implementation of advanced features.

Small PHP programs were constructed to extract the images and descriptions from each of the hundreds of existing HTML files. These data were then loaded into the database. A single PHP file was then created to replace the hundreds of individual HTML Webpages by querying the database for the image-specific information (e.g., slide number, magnification, stain, and tissue depicted). With minimal time invested (Table 1), advanced features, including a search function, a student self-test, and a slide list that enabled students to see which chapters referenced every glass slide, were created and implemented. Moreover, the database structure permitted the content expert (e.g. medical educator) to streamline the construction, editing, and manipulation of data associated with the atlas using Microsoft® Word and Excel. The conversion also allowed these steps to be accomplished without the medical educator being familiar or proficient with computer programming and without the continual reliance upon a technical expert. Finally, the database-driven nature increased the interactivity of the tool by creating multiple methods to navigate throughout the CAI application and the ability to monitor (and ultimately assess) atlas usage.

Our experience shows it is possible and efficient to convert existing CAI applications created without database technology to an underlying database structure. The database structure permitted maintenance and upgrades without continual reliance upon a technical expert. Such a conversion maximizes the capability, functionality, and adaptability of a CAI application while saving time in construction and editing.

Table 1. Time developing selected histology atlas features with the database technology in place.

Feature	Time To Develop
Data extraction from HTML files	3 hours
Adding a watermark to each glass slide	2 hours
Electronic lab manual navigation	2 hours
Student self-test	2 hours
List of chapters	30 minutes
Glass slide list	15 minutes
Search function	15 minutes

Cinema in the Classroom

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Clinical videos illustrating deficits produced by brain disease are commonly used in medical and other health professional neuroscience courses. Although of value, they are often of low image quality, show compliant patients who follow physician commands without noticeable feelings, and sometimes do not effectively demonstrate the deficit. As a consequence, I have begun using cinema to more dramatically illustrate the emotional as well as physical impact of neurological disorders upon the patient and family. Some also demonstrate the inner workings of the human mind. Commercial DVDs that I recommend include:

1) Coming Home (Metro-Goldwyn Mayer, 1978). Segments are used to show the environment of a rehabilitation ward and the progression of the character played by Jon Voight as he returns from Viet Nam and struggles to live meaningfully with his war-induced paralysis.

2) Hilary and Jackie (Universal Studios, 1999). The 35 minute sequence which I show illustrates the somatomotor skills of the classical cellist, Jacqueline DuPre; and her loss of those skills as she succumbs to multiple sclerosis. No fewer than seven symptoms are effectively portrayed by the actress Emily Watson.

3) Iris (Buena Vista, 2001) The entire film is shown in class to illustrate the devastation of Alzheimer's on the mind of the English novelist Iris Murdoch, brilliantly played by Judi Dench; and the impact of the disease upon her husband and family.

4) Sylvia (BBC, 2003). The final segments of this film evoke the quiet descent of the poet Sylvia Plath towards suicide after a life-long battle with major depression. The film is particularly effective in showing the failure of those around her to recognize or react to her impending suicide.

5) 2001: A Space Odyssey (Metro-Goldwyn Mayer, 1968). I use the opening sequence, "Dawn of Man", to illustrate both the creativity of the human imagination and also the brilliant characterization of the evolution of the human brain and behavior.

Student evaluations suggest that students find that these cinematic experiences: 1) teach empathy for the patient's condition; 2) dramatically demonstrate the full constellation of symptoms; 3) connect the physical symptoms with the emotional experience of the disease process.

Scavenger Hunts in Microscopic Anatomy

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The yearlong Microscopic Anatomy course at Drexel University College of Medicine includes four group activities known as scavenger hunts. A scavenger hunt is a lab exercise in which each five-person lab group is assigned five structures that they must locate on glass slides from the student slide collection. They may consult textbooks, atlases, lecture notes, lab manuals, histology websites, or any other resources except their instructors. They must come to consensus within their group and then have their lab instructor confirm each identification. Each group member receives one point toward the final grade for every correct identification. Scavenger hunts are thus the equivalent of collaborative, open-book lab quizzes.

To encourage creative thinking, items on a "hunt list" are often presented in the form of second order questions. For example, we might ask students to find "hyaline cartilage that has no perichondrium" instead of asking for articular cartilage. Some questions have more than one correct answer. If asked to find "simple squamous epithelium in the kidney", students would receive credit for identifying the parietal layer of Bowman's capsule, endothelium, or the thin limb of Henle's loop. Lab instructors are encouraged to ask follow-up questions that are not graded, but do help students assess the extent of their knowledge. In the previous example, instructors might ask the students to name other examples of simple squamous epithelium in the kidney.

The logistics of a scavenger hunt are relatively simple. Each hunt covers the material from three or four labs. Our labs are taught in multiple cubicles, each containing seven lab tables. Thus, by generating only seven different hunt lists, we are able to give a different list of structures to every group within a given cubicle.

Scavenger hunts have been enthusiastically received by students and faculty. They are an exceptional evaluative tool because they require a level of discussion and consultation that fosters active learning and team building during the testing process. They consistently receive high ratings in course evaluations, and are unique among our testing modalities in that they are widely enjoyed by students and faculty alike.

Quizzes are for Learning not just Evaluation

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In the Medical Microbiology and Immunology course, which I direct, I have included 6 quizzes during the semester with 2 between each Block Test. To make the quizzes a more meaningful educational experience for the students, I have designed them to provide subject discussion as well as evaluation of knowledge. Each quiz consists of two parts- “First take” (FT) and “Second take” (ST). First take is taken individually and has 10 questions for 15 minutes and is worth 10 points. The FT is handed in to the proctors and then the ST is distributed. The Second take consists of another 10 questions on the same subjects as FT but crafted to be more difficult and requiring some discussion for solution. On the ST, groups of students collaborate on knowledge but have no study aids permitted. The groups can be assigned or allowed to form freely. I prefer to have them do it whatever way they choose, and some students have huge groups, while others do it in smaller units. The groups are allowed 35 minutes for ST. The discussion is usually lively and loud. The groups arrive at a group answer for each question, hand individual answer sheets in to the proctor, and ST is worth 5 points. Technically, after discussion most everyone should receive 5 points, but some receive or transmit faulty information and receive less. Such students usually seek out other groups or accept other opinions. The ST provides students with an in depth discussion of the subjects covered by the quiz, cements vital concepts into their mind beyond just answering a multiple choice question and handing it in, and also develops group dynamics which will be useful later. Students accept this method readily and feel it helps them in acquiring and retaining information for subsequent tests.