IM1

USE OF GROUP QUIZZES TO ENCOURAGE APPLICATION OF BASIC SCIENCES ISSUES RELATED TO CLINICAL PROBLEMS IN PROBLEM BASED LEARNING GROUPS

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UTMB has recently instituted a multimodality, miltidisciplinary medical curriculum in which PBL is an important component. The Molecules, Cells, and Tissue (MCT) course is one of the basic science courses offered in the first year. The MCT course has three weekly, 2-hour PBL sessions, with groups consisting of 8-9 students and one faculty tutor. Because students have viewed the PBL grade as highly subjective and "easy", we desired to enhance and better assess problem-solving skills, to increase the emphasis on PBL, and to add an objective component to the PBL grade. In addition, because we perceived that these first year students had difficulty with Board-style, higher order exam questions, we wanted to have students practice and model for each other this aspect of problem-solving in a low stakes environment. To this end, a weekly "quiz" was instituted during the last hour of a given PBL case in an open book, open-note, open discussion format. Faculty tutors had no advance knowledge of the quiz questions; their role during the quiz was to evaluate student participation and thought processes only. Quizzes, composed of 4-5 multiple choice questions, stressed basic science issues relevant to the course objectives in biochemistry, histology, pharmacology, molecular biology, genetics, cellular physiology, and developmental biology. Quizzes were designed to test the application of concepts that could be generalized from the case, rather than strict recall of factual material. As an example, during a week when the PBL case centered on Type I and Type II Diabetes Mellitus, the quiz questions asked about pathophysiology of gestational diabetes. The objective quiz component counted for 15% of the overall grade, compared to 15% for PBL evaluation, 30% for midterm exam, 30% for final exam, and 10% for lab practical. End of course survey completed by approximately one quarter of the class (49 students) included questions about the PBL quizzes. Student reaction was overwhelmingly favorable. Nearly 80% of students responded that the quizzes provided a valuable learning experience, and 73% disagreed with the statement that "quizzes used valuable study time". Only 13% of students felt the quizzes were too easy, while 18% found them too difficult. 65% felt that the quizzes were weighted appropriately towards the final grade. Faculty tutors noted that the quizzes set the tone for self-directed learning and inquisitiveness. The tutors also noted that student interactions and discussion markedly increased during the quiz sessions. We conclude that open book PBL quizzes provide an effective way to enhance the PBL experience.

IM2

COMBINATION OF VIDEOCONFERENCE SYSTEM BASED ON SATELLITE COMMUNICATION AND E-MAIL TECHNOLOGY IN AN ARGENTINE SCHOOL OF MEDICINE

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In a previous presentation (Barcelo HA, Feldstein CA. Basic Science Educator 2001; 11) we made the description of our system based on satellite communication by single channel carrying out teaching activities for videoconference between the headquarters and a branch of our School of Medicine in La Rioja province distant 740 miles. When incorporating at year 2002 a new branch in Corrientes province, 521 miles from the Buenos Aires headquarter, at the end of the year 2001, we implemented a new system with the main objective of optimizing the quality of videoconferences. We use two channels, one satellite for the transmission of the image and sound, which is projected in a screen in front of the audience, while for Internet, using a software of remote access, the faculty controls the emission of support images. The didactic material is previously digitized and sent by mail before the event and is projected in another screen in front of the audience. Hence, the material that is customary used for a presentation in the classes in Medicine, as slides, transparencies, videos, can be appreciated with the same quality in those three connected places emulating what happens in a presence class, since in both cases it is programmed to see the faculty on one hand and the images didactic for other, being eliminated the degradation of quality that takes place when capturing and transmitting via satellite. By means of this system in the year 2002 we have carried out 1202 videoconferences (408 on basic sciences, 637 on clinical cycle and 157 on coordinating areas), with higher degree of quality, acceptance and satisfaction than using the previous system of a single channel satellite communication and at the same time, the number of videoconferences in an annual period has been increased in 48.7%.

IM3	**STRATEGIES FOR TEACHING HUMAN PATHOLOGY TO ALLIED HEALTH PROFESSIONALS USING WEB-BASED INSTRUCTIONAL MEDIA** **Bruce A. Fenderson, Ph.D.***, Anthony Frisby, Ph.D., and Emanuel Rubin, M.D., Department of Pathology, Anatomy, and Cell Biology, and Academic Information Services and Research, Thomas Jefferson University, Philadelphia, PA, 19107 U.S.A. Distance learning programs for pathology were created for undergraduate (medical coding) and graduate (M.S. and Ph.D. program) students using teaching materials that we developed previously for our medical students. These web-based programs have greatly improved the ability of our students to learn pathology. The programs are structured so that students feel comfortable completing homework assignments online (weekly quizzes, weekly essays, clinical vignettes, and case studies). The programs include lectures with Flash animation, learning objectives, glossary of keywords, histology slide review, access to pharmacology data online, and more. Our first program was designed to supplement a lecture-based curriculum - to make a graduate pathology course more "three-dimensional". However, we now offer a separate, distance learning course for graduate students in Nursing. An interesting feature of these ORACLE-based programs is a "web board" that allows students to learn from essays posted online by fellow students. Outstanding essays are distributed to the class for review. We have been running these web-based pathology courses for five years with great success. Course evaluations show high levels of student satisfaction with the pathology images and the guidance of homework. Most students spend approx 4-5 hours online each week in self-directed independent study. There is no difference in student performance on written examinations between those learning pathology online (distance learning course) and those who attend a weekly lecture (traditional on-campus course). The same core curriculum has now been adapted to the needs of undergraduates learning human pathology as part of a program in medical coding. For these students, lecture, computer program, and pre-test review provide the core content that is assessed on written examinations. In contrast, graduate students using the same computer program rely more heavily on assigned reading for core educational content. Our experience with adapting a common curriculum to the needs of divergent groups of students suggests a general strategy for assessing educational value and outcome. This formula may allow educators to adjust the objectives of their course to match the educational needs and backgrounds of their students. A careful match of learning expectations with methods of assessment is essential to assure a quality educational experience.
IM4	**MULTIPLE SITES OF NEUROSCIENCE INTEGRATION WITHIN THE MEDICAL CURRICULUM: A TEAM LEARNING TO TEACH APPROACH** ***Jim Johnson, Ph.D.,*** *Department of Neurobiology & Anatomy, Wake Forest University School of Medicine, Winston-Salem, NC 27517-1010 U.S.A.* The Wake Forest University School of Medicine (WFUSM) combines features of both a problem based learning (PBL) as well as a more traditional medical curriculum. Multidisciplinary Neuroscience (neural development, neuroanatomy, neurophysiology, neuropharmacology, neuropathology and human behavior) is taught at multiple times and at progressive stages of medical student development. At the beginning of medical school, students integrate the study of the spinal cord and brainstem with the dissection of the CNS blood supply and the peripheral course of spinal, autonomic and cranial nerves. During the second year, all students return for a six week block on the essential concepts of Neuroscience applied to Neurology, Neuroradiology, Neuropathology, Neurosurgery and Psychiatry. In the third year, students complete required clinical clerkships in Neurology, Anesthesia and Psychiatry as well as the related Nervous System components of other required clerkships (i.e. Surgery and Radiology). During the final year, students select areas for advanced training. Basic Neuroscience during the first two phases of the curriculum is taught using a "team learning to teach" approach. Students are divided into small groups (6 students). Pairs of students within each small group are assigned separate case studies using the textbook Neuroanatomy through Clinical Cases by Hal Blumenfeld, M.D. Ph.D. (Sinauer Associates, Inc., Sunderland, Massachusetts). Using the well crafted cases from this text, each pair first masters an assigned task within a timed learning period and then in turn teaches the newly acquired principals through a patient presentation made to their group. Finally, the entire group is tested together in a short quiz that requires the consensus discussion and clinical application of newly learned concepts through a group PBL task. This group test validates authentic learning through small group interaction. A core value of peer teaching is shared responsibility for learning so that "no one is left behind". This team learning to teach method resulted in the enhanced mastery of competency concepts in Neuroscience across the entire class (as measured by individual student performances on similar standardized questions from previous years).

	COMPARISON OF TEAM BASED LEARNING TO DIDACTIC LECTURE IN SECOND YEAR MEDICAL EDUCATION ***Kathryn K. McMahon,Ph.D.,*** *Department of Pharmacology, Texas Tech University Health Sciences Center, Lubbock TX 79430 U.S.A.* Team Based Learning (TBL) is an active learning educational method that has students work individually, in small teams and as a whole in one session. In the TBL session students and teams are graded in their work as a formative incentive for participation. This project was designed to compare 3 TBL sessions to 3 didactic lecture session in regards to student participation and engagement. Trained observers monitored 2-hour learning sessions using an instrument that focuses on student and instructor behavior and apparent engagement with the learning task. The behavior was broken down to type of behavior (i.e. talking, writing or reading) as well as where the behavior was directed (i.e. self, instructor or group). The engagement was broken down into the proportion of the enrolled students in attendance, the type of engagement of students present (i.e. number of questions ask on content versus procedural issues) and nature of engagement (positive, neutral or negative engagement). Both quantitative and qualitative (observers comments) data were collected in 5-minute intervals over the 2-hour sessions. Attendance was much lower for didactic lectures compared to the TBL sessions. As expected by the structure of the two methods instructors were the main focus of students' attention and students were relatively passively engaged in lectures. By comparison, students were more focused on other student comments and team discussions and generally more actively engaged in the TBL sessions. While students were more actively engaged in TBL sessions, they were also more negatively engaged in these sessions. Faculty engagement shifted from few questions to more questions to students. Student attendance is higher at TBL sessions. Students are more actively engaged but not necessarily with positive attitude to the usefulness of the session. Faculty tended to ask more questions, both procedural and content, in the TBL sessions compared to the lecture sessions. Confounders to the interpretation of the results include incentive for attendance, student and faculty familiarity with the education method and resistance to change.
IM6	**ASSESSMENT OF THE NEUROANATOMY MODULE AT MANIPAL** ***Narga Nair M.D.,*** *Associate Professor, Kasturba Medical College, Manipal, Karnataka 576119 INDIA* Neuroanatomy is one of the most fascinating, complex and ill understood fields in human morphology. Neuropathology is better understood if there is a good understanding of normal neuromorphology. Thus it is pertinent to assess the understanding of concepts of neuromorphology amongst first year students of Medicine. Having completed their 3 week module on human neuroanatomy (that comprised lectures in gross, microscopic and developmental aspects of neuroanatomy as well as practical sessions in gross and microscopic study of neuroanatomy) , the first year students of Medicine were administered an objective test of completion type test items. The items tested the most fundamental concepts in neuroanatomy. The difficulty index and the discriminative index of each item was assessed. The results of this study will be presented at the conference and will be used to make appropriate changes in the delivery and ongoing assessment of the neuroanatomy curriculum at Manipal.

IM7

USE OF TEAM LEARNING IN A FIRST YEAR GROSS ANATOMY AND EMBRYOLOGY COURSE

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Team Learning (TL) is an active-learning modality, developed for business school curricula, which has had limited use in undergraduate medical education. Conceptually, it should be adaptable to the medical education setting since it reduces reliance upon large class lectures, involves students in small group work without requiring additional faculty, and it provides the faculty the immediate opportunity to know a great deal about what and how the students are learning. We introduced TL into our Human Structure course (nine weeks of gross anatomy and embryology for first year medical students), incorporating its key features: a) preparatory assignments and objectives; b) individual and group readiness assurance tests (IRAT and GRAT); c) group application problem solving; and d) peer evaluation. All of these activities were graded and TL scores counted toward 25% of the final course grade. Twelve two-hour TL activities were scheduled, each covering a well-defined area of material. Sessions included a ten question IRAT (12 minutes), the same quiz administered as a GRAT (~20 minutes); RAT question discussion (20-30 minutes), application problems (~30 minutes) and problem discussion (~30 minutes). Three teams of 5-6 students attended each session; 6 sessions were required to cover the whole class.
Student evaluation data indicated strong support for the TL method as it was implemented in the course. The greatest concerns expressed were related to peer evaluation, which required discrimination between team peers. Faculty response to TL was also positive, with all participating faculty noting improvements in students' day-to-day preparedness and group problem solving skills. Faculty also felt they were able to better identify academically at-risk students early in the course. A significant positive correlation between IRAT scores and major exam performance was noted. Team GRAT scores were also correlated to the team members' IRAT scores. Team performance on the application problems, however, was not correlated with the teams' GRAT performance, or team members' IRAT or exam performance. Student mean scores on major exams were not significantly different from those of previous years. There was, however, a substantial decrease in the course failure rate compared to the three previous years. In conclusion, TL implementation in our anatomy course was considered a success based on several subjective and objective criteria.

IM8

AN INTEGRATED SKILLS TRAINING AND COMMUNITY BASED PROGRAM USING PROBLEM BASED LEARNING* AS A MAIN INSTRUCTIONAL STRATEGY IN PRECLINICAL YEARS

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For the past ten years, PBL has been used as a main instructional strategy in a Basic medical Propedeutics course (history taking and physical examination) in order to give meaning to the teaching and learning process and encourage the students in preclinical years. During the last year, a new implementation was done; a community program was organized in rural and suburban areas combining the learning objectives of the course and the main community problems, in order to achieve an earlier exposition of the students to an authentic professional field, making the subject meaningfully through the perception of the real health status of the community. The design of the model is as follows: Each student receive two families to work with; for a two and a half year period of time; they must visit the families once every three weeks, and apply the knowledge acquired during the skills training theoretical PBL course, using a medical preventive orientation and also contributing to the improvement of the health status of the community. Each student is supported by a given tutor during the visits the whole semester, and must elaborate a written report after each visit. A survey using a Likert scale was applied in order to look for the perception of the students. The surveys showed the students clearly perceived the subject of study in a meaningfully way, making them conscious about the community health problems and also the need of the acquisition of the knowledge in a practical way; this encourage them to actively act as a change agent for the improvement of the community; at the same time as the teaching-learning process is occurring.

IM9

INTRODUCING INNOVATIVE TEACHING MEASURES TO A TRADITIONAL UNDERGRADUATE CORE ANATOMY PROGRAM: WERE THEY EFFECTIVE?

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The undergraduate anatomy course (Anatomy 401) introduces students coming from different disciplines to the basic concepts related to the structure and function of the human body. The course is lecture-based, offered during the fall, and has been successfully taught for decades. The average annual enrollment size is 145 students. One of the regular, and indeed critical, challenges always present, has been the diverse educational background of students taking the course. This issue has been unfavorably reflected on the levels of motivation and performance of more than 50% of the students. Innovative teaching measures were introduced during the last semester to address this issue and to re-emphasize the course's goal in acquainting students with the essential and integrated anatomical facts that will be useful in their careers and everyday life. These measures included 1. Regular quizzes. 2. Frequent visits to the gross anatomy lab to expose students to pertinent plastinated specimens.3. Specific lecture objectives. 4. PowerPoint lecture presentations that sometimes included animations of basic anatomical concepts.5. "Coursetools" web site that included lecture objectives and presentations; schedules; announcements; and a discussion forum. 6.Three required modules that utilized plastinated specimens and covered essential course concepts.7.An informal meeting was scheduled with a representative group of students and held around the midterm to address their concerns. 8. Questionnaires to evaluate the effectiveness of these measures and to collect feedback data during and at the end of the semester. The aim of introducing survey questionnaires during the semester was to focus attention on specific emerging issues that needed prompt management while the course is still running. Results showed that the majority of students favored the weekly quizzes (71%); lab visits (60%); PowerPoint presentations (64%); and lecture objectives (80%). They agreed that these measures were helpful in promoting understanding. Also, there has been a significant improvement in students' performance following the introduction of these measures. Plans to further interpret the results and refine the above measures towards a more effective application have already been set out. We believe that these measure though may not have significantly raised students' mean performance in relation to previous years but had definitely aroused students' motivation and interest to learn anatomy.

IM10

TEACHING MEDICAL NUTRITION THROUGH THE USE OF WEB-BASED LECTURE REPLACEMENT MODULES

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In addition to traditional lectures, we have altered the structure of our Nutrition course to include both mandatory and optional Web-based lecture replacements (dubbed "Netrition"); these replacements are designed to completely prepare students for the examinations which assess those topics. Each online lecture is divided into 5-7 sections followed by multiple choice questions (with annotated answers) for self-assessment. Links to journal articles, Web-resource sites, or side-bar information are given in context. Ready access to a course bulletin board or email contact with the instructor is available on every page, allowing a student to request assistance. Interactive graphics encourage student interest and involvement. Provision for auditory learning is made through icons which access streaming audio files in which the text is read. Each page provides access to an index, to "Commonly Asked Questions", and to "Hot Papers" on the topic. Assessment and feedback to the student are provided through sets of annotated multiple choice quizzes and short essays with model answers provided. In addition, practice exams are accessed through a link to WebCT™, a distance learning software package, which allows for controlled exam conditions and detailed reports to the instructor on student performance.

Two topic modules were available during the 2001-2002 academic year and an additional six were provided this year (of 16 lecture hours in the entire course). In end-of-course evaluations, dramatically increased acceptance was noted in this second year over the first year, with the percentage of students finding the Web-based units "as good as live lectures" increasing from 45% to 75%; about 1/3 of the respondents this year reported the Web-based modules "better than live lectures". Data concerning the effects of online modules on exam performance will be analyzed, but substantial numbers of narrative comments suggest that a significant proportion of the student body enthusiastically embraces this teaching modality because of its flexibility and appropriateness for their learning style. Unlike textbooks or CD-ROM, the online files can be quickly revised and updated. Similarly, the scope and content of the content files could be readily altered using HTML editing software to facilitate their use by other schools.

IM11

INTERNET MOVIE CLIPS AS PART OF POWERPOINT PRESENTATIONS ON NEUROBIOLOGY FUNCTION

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Many concepts about function in the nervous system are dynamic and can best be illustrated using brief movie clips as supplements to PowerPoint or similar presentations. Guidelines for use of Internet movie clips in neurobiology and physiology are discussed in the following areas:
(1) concepts for which such presentations are most appropriate, (2) choice of search engine and search terms, (3) criteria for selection, (4) methods for copying, saving, and inserting (5) student learning measures associated with the use of movie clips. This project describes the selection and utilization of such animations or video presentations as part of the first-year, first-semester Neurobiology course for medical students at The George Washington University School of Medicine and Health Sciences. To illustrate this instructional method, an example is used of a presentation on auditory function with movie clips from Internet websites. The Google search engine was queried using appropriate search terms, resulting websites were viewed, and the most useful selections were bookmarked and downloaded on the computer Desktop. Each movie clip was then keyed to an appropriate place in the PowerPoint presentation. In the example shown, pressing keys produces sounds and shows the resulting sound waves at various fundamental frequencies; traveling waves in the basilar membrane are shown for high and low frequencies; and the movement of hair cells in the Organ of Corti is shown by animation and micro-videography. Different formats are factors in the usability of movie clips. Some movie clips can be downloaded and then inserted into a PowerPoint slide. Others are written in JavaScript and are more easily viewed on-line. When selected and utilized appropriately, brief animations and video segments can be effective tools that contribute to student learning.

IM12

DEVELOPING A VIRTUAL PATIENT WITH SPINAL CORD INJURY TO LINK CLINICAL AND BASIC SCIENCE TOPICS

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To provide basic scientists with a tool to illustrate clinical correlations of basic science topics, and to provide an opportunity to reinforce basic science concepts in clinical courses, we have developed a CD ROM based "virtual patient" teaching resource focused on spinal cord injury. In consultation with basic scientists and clinicians a real life spinal cord injury patient's case was adapted to ensure that critical basic science and clinical issues emerged. Uniquely, the patient ages over time, providing a longitudinal perspective on changes over a 30-year period following injury. Case details were transposed into a video script, with each scene less than two minutes in length to allow ease of insertion into existing curriculum. The video was digitized for ease of access on a CD-ROM that also includes images, radiographs, lab results, and other files that highlight specific aspects of the case. To facilitate access, the CD is indexed by specific topics (e.g., sensory nerves) or by course (e.g., physiology). For example, the patient's neurological findings can be used in an Anatomy or Neuroscience lecture on spinal dermatomes, and can also be used later in clinical clerkships to teach neurological examination. In a Microbiology talk on Proteus, faculty can insert images to show how the Urease-positive property of the organism and its related ability to make the urine alkaline can contribute to producing kidney stones seen in the X-ray of this patient. A scene with the patient refusing to be turned in bed for skin care can be used to discuss decision-making capacity in a Medical Ethics course. The same scene can be used later in a clinical rotation to stress positioning after paralysis or to discuss patient compliance. Response by faculty to Virtual CD-ROM Patients has been very positive at our institution. This approach to integrating basic and clinical sciences provides faculty, and ultimately the students, the ability to quickly and easily link basic concepts to clinical applications while providing needed exposure to the unique issues faced by patients with chronic disabilities.

IM13

CONCEPT MAPPING IN A PROBLEM-BASED LEARNING PATHOPHYSIOLOGY COURSE

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Based on our current experience using problem-based learning (PBL) in a single discipline we are currently developing a project aiming at the introduction of concept mapping as a learning and evaluation instrument. During the current year the students of a single tutorial group received information about the way how to construct concept maps and were asked to do one at the end of an analysis of a patient problem, emphasizing on the pathophysiological mechanisms. This map was compared with one designed separately by a senior student who assisted the tutor during the tutorial sessions. The students had no information about the map developed by their older colleague who helped them in the design of their map. In the end both maps were discussed and the students were asked to evaluate their learning process taking into account: identification and hierarchy of concepts and also relations between concepts and the overall arrangement of the map. The results of the analysis of five maps will be reported together with a proposal on how to apply this methodology to the overall class of 140 students.

IM14

HOW TO ENGAGE AND INVOLVE THE LEARNERS IN BASIC SCIENCE LECTURES

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"Tell me, and I forget. Show me, and I remember. Involve me, and I understand." (Chinese proverb)
Adult learning is enhanced by active participation of the learners. Additionally, the attention span of most learners in the traditional basic science/medical lecture begins to wander shortly after the lecture begins, limiting the potential for information retention. Various student-centered methods for engaging and involving the learners in the large-group, traditional basic science/medical lecture setting will be described, including: the use of graphic organizers to organize content and as a closure activity, using interactive handouts, and the use of "game-show" formats including "Price Is Right"® and "Jeopardy"®. Engaging and involving the learners in your next lecture will enhance their learning and retention.