AT&T FACULTY-STAFF AWARDS IN INSTRUCTIONAL TECHNOLOGY
2010-2011 Faculty-Staff Competition
Course APPLICATION FORM

Course Identifier: __NOP552___________________________

Course Name: ___Medical Neuroscience________________________________________

Department: _Neurology/Ophthalmology and Radiology___  College: __Human Medicine and Osteopathic Medicine_______

Primary contact name, phone number, and email (normally this will be the lead instructor)
___Kathryn Lovell, 517-353-7208, lovell@msu.edu_______________

Faculty and Staff Involved in Developing and Offering the Course please list full name, position at MSU, email address, and project role for each person

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Health Information Technology Educational Technology staff

Type of Course:
___ FULLY ONLINE (no required face to face component)
_xx_ BLENDED/HYBRID (some face to face time is replaced by online learning)
___ TECHNOLOGY-ENHANCED FACE-TO-FACE (a face-to-face course which uses technology for teaching and learning in an innovative way)
Semester(s) offered in 2010-2011 and number of students enrolled:

SEMESTER  Spring 2011  # STUDENTS:  534

Please address these categories:

I. Course Description (400 word limit)

NOP552 (Medical Neuroscience) is one of the required basic science courses for first-year medical students in the Colleges of Human Medicine and Osteopathic Medicine. The course teaches the fundamentals of clinically relevant medical neuroscience, including neuroanatomy and neurophysiology. The organization of the course follows the hierarchical organization of the nervous system from simple circuits to complex systems, from the spinal cord to the cerebral cortex. One of the important learning features is for students to understand the 3-dimensional relationship of nervous system structures and pathways. Clinical correlations, including case examples and presentation of live patients are given during the course to provide medical relevance. The course meets on average 4 times per week for lecture, with laboratory sessions conducted at three times during the semester. There is a coursepack provided with information and images related to each lecture, and laboratory objectives.

Student performance is assessed by two multiple choice online quizzes (delivered through ANGEL), three multiple choice written exams, and three laboratory practical examinations (short answer). Practice questions are given online or in the coursepack.

Ten of the course lectures have been replaced by online modules that students may view anytime during a period of days in the unit. Since students enrolled in the course are located in four separate campuses across the state (East Lansing, Grand Rapids, Macomb University Campus, Detroit Medical Campus), classroom lectures are videoconferenced to each location, and also digitally recorded to be available streaming live and also after the lecture. Two quizzes are delivered online through ANGEL, available during a 24 or 48 hour time period. These include images for many of the questions. Other technology-enhanced features include two interactive online atlases to integrate with both the laboratory and lecture objectives, case study examples to help students understand localization, video tutorials to help students understand how to use the atlas, and help students practice learning structures in different planes of section, video tutorial for the most difficult laboratory aspects, histology online tutorial using the Virtual Microscope program with practice questions.
II. Learning and Interaction Goals of the Blended Course

(what learning and interaction outcomes did you hope to achieve in your use of technology, why is this an award-worthy course)

The goals of the blended course are to help students master the fundamental concepts of an extremely complex nervous system and build a foundation for life-long learning in this fascinating area of study. This course is taught during a demanding semester and we wanted to provide flexibility when possible in student time commitment. The challenge is not only in the amount of information in this field, but also understanding the 3-dimensional relationship of structures and pathways, to be able to translate from a 3-dimensional framework to the 2-dimensional sections that are viewed by a clinician in radiology and pathology to determine the location of an abnormality and thus the diagnosis and treatment for the patient. Students take the course with a large variation in background and with different learning styles, not only for traditional content but also for the ability to visualize 3-dimensional structures and translate to a 2-dimensional world. A number of different technology approaches have been used for different goals in this course.

A variety of rich media content elements and interactive learning objects were used, either from websites or programs developed by others and made available under Creative Commons permission, or through interactive online materials developed at MSU for this course. These varied types of rich media content elements (websites, video tutorials, and video demonstrations) were utilized at optimal places in the course to help integrate lecture and laboratory content, and help students visualize relationships and pathways in the nervous system. The course was also enhanced by sessions in which a neurologist brought a patient to the class session so that students hear the patient story, understand the relationship between the patient and clinician, and see the content elements of the course applied to real patients.

The blended course included the following elements that were major features in the effectiveness of this course, allowing students to better achieve goals:

- Websites with directed use:
  - Online Functional Neuroanatomy atlas (developed by PA Stewart, U. Toronto, available through Creative Commons permission) allows students to compare views of radiology images with labeled sections (labels turned on by “mouse over”) in different planes and to correlate with a view of the whole brain to get perspective on where the sections were obtained, their relationships with other structures, and their blood supply. 3-D representations of the brain provide an overall context. A glossary allows students to see the function and appearance of the many challenging terms describing the nervous system.
  - Online interactive class digital atlas (developed by JJ Johnson, MSU) used as part of the laboratory objectives of the course for spinal cord, brainstem and forebrain – this These online atlas sections can be compared with gross brain sections in the anatomy laboratory to understand how the structures interact with each other. Some students find this intuitive and others need much more time and practice to understand the relationships.

- Video tutorials for orientation to laboratory objectives (developed by KL Lovell, MSU), with targeted integration between function and structure and different types of sections.
Short tutorials were recorded with Camtasia Studio to “walk students through the
correlation between 3-D structure and appearance in 2-dimensional images, and well as
reinforce basic functional concepts. These were developed to “bridge the gap” between
multiple types of materials available in lecture, gross laboratory specimens, and online
atlases. They were made available to students in several formats: streaming video,
downloadable to laptop/hard drive, downloadable to iPhone/PDA for mobile use. The
goal was that students could view the materials anytime/anyplace to enhance preparation
and understanding of difficulty laboratory objectives.

- Practice questions for location of structures in cross-sections, which could be used as a
  ppt program (downloadable) or in a pdf file that could be printed double-sided to use as
  “flash cards.” (developed by KL Lovell, MSU)

- Neuroscience Virtual Microscope online unit: An online tutorial to emphasize important
  histology (microscopic) aspects of the course content was developed for spring 2011.
  This utilized the Virtual Microscope program which students have used in Physiology
  and Cell Biology courses in the Year 1 medical student curriculum. The Virtual
  Microscope acts like a real microscope, and for the digitized slides, students can navigate
  through different areas and change the magnification. In the Physiology and Cell
  Biology courses, laboratory session are scheduled to help students master the concepts.
  For NOP552, an online neuroscience histology unit was created to review and reinforce
  concepts previously covered in fall semester, and to introduce new concepts using the
  same methodology. The online unit was made concise, with specific objectives described
  for students, but still facilitating the option for students to explore the tissue
  characteristics. To focus the required concept, 10 integrative review questions are
  presented and students can click to see the answer to the questions. Development of
  review questions relates to comments from students that practice questions are very
  helpful and to recent scientific studies that retrieval of information through quiz questions
  enhances learning and memory. (developed by KL Lovell and S Way, MSU)

- A video recording (by W Falls, MSU) to introduce difficult laboratory objectives in the
  forebrain lab was developed for spring 2011. This was in response to student comments
  about the challenging material, and was designed to demonstrate structures on a
  laboratory specimen and the orientation of the specimen and relationship to other
  structures. Students will view the video recording anytime in the anatomy laboratory to
correlate with their inspection of the specimens.

- Online cases for problem-solving practice related to localization of lesions

- Selected online modules to replace classroom lecture time on specific topics.

III. Points of Interest and Innovation

Functional Neuroanatomy Atlas – Interactive computer program to help understand
neuroanatomy, available at all medical student computer labs, in the gross anatomy labs, and
available free for installation on PC student computers. This was developed by P.A. Stewart of
Univ. Toronto. The screen shot below left shows the menu of the program, allowing students to
choose from many options. For the choice of different types of sections of the forebrain and
sections of brainstem and spinal cord, students can step through sections and see where they
were obtained. 3-D views (below right), surface elements, blood supply, animated pathways,
and a glossary are also available. In all parts of the program, students can click on the name of a structure to highlight it, or can click on a structure to see the name (as shown for the structure highlighted in blue, below right). In addition to making the program available, a short video tutorial, recorded at MSU using Camtasia, was available online to illustrate the features of the program that will be most effective for NOP552 students.

Interactive class digital atlas ([http://learn.chm.msu.edu/NeuroEd/NOP552/index.html](http://learn.chm.msu.edu/NeuroEd/NOP552/index.html)) illustrates brain and spinal cord sections taken at different locations and in different planes, and...
correlated with radiology images, to help students learn the 3-D anatomy. This website is correlated directly with the laboratory objectives for the three lab sessions in the course, and images are included on laboratory practical exams. The screenshot above shows a partial menu for the website, indicating the planes of sections and two types of staining. Each section can be viewed (toggled) in either stain, with structures labeled or unlabeled, as shown below.

**Video tutorials for orientation to laboratory objectives**, with targeted integration between function and structure and different types of sections: Short tutorials recorded with Camtasia Studio were designed to “bridge the gap” between different views of the brain and between 3-D and 2-D view of structures. They were recorded using Camtasia Studio, with annotation during the narration to show the correlation between different views. Care was taken to integrate elements that can be effectively used in an online environment and that are considered to be good instructional design practices in the use of computer-aid instruction for medical education. Screenshots shown below indicate the types of views that were integrated, but do not illustrate the annotation or narration to help students understand the relationships.
Practice questions for location of structures in cross-sections, which could be used as a ppt program (downloadable) or in a pdf file that could be printed double-sided to use as “flash cards”. The image with circled structure and numbers was presented first for students to try to name the structures, and then the answers were presented with a smaller version of the image (as shown in the screenshot below). These questions are analogous to laboratory exam questions.
Neuroscience Virtual Microscope online unit - New for spring 2011: An online unit was
developed to reinforce relevant content from a previous course (PSL534) and to provide new
content and practice questions related to the Medical Neuroscience content. This was done using
the Virtual Microscope website established for the Year 1 Physiology/histology courses, and the
same template was used, with new slides. As students proceeded through the unit, all content
was delivered online, and students could move around on the microscopic “slide” and change the
magnification to explore the concepts. There were 10 questions, with answers provided for
students to review the material. http://elvmweb1.com.msu.edu/Websites/NOP552_Histology/

“Neurons“ website for cellular neurobiology: http://icarus.med.utoronto.ca/neurons/index.swf
- This website was recommended for students to review material from previous courses and learn
new aspects of the NOP552 content. It has 8 chapters, each with descriptions, diagrams and
animations to illustrate important fundamental concepts. For example the screen shot below
shows a diagram of a presynaptic terminal, with specific illustrations of each element when a
student clicks. Other segments show, for example, animations of the process of synaptic transmission.

Interactive practice questions for localization of lesions – two formats are available on a public website designed for neuroscience materials. The question sets were also made available on the Neuropathology Navigator site (learn.chm.msu.edu/neuropath) as a review for Year 2 medical students,
Online Modules replacing classroom lectures and live lectures captured during delivery. The audio/screen video of all lectures, including mouse pointer and screen annotations (e.g. circles, text) in PowerPoint, were made available for students to watch by streaming video or by download. Some students attended live lectures and, in addition, watched all of part of the lecture recordings to better understand the content or review difficult parts. Some students commute long distances or have partial time conflicts and watched the recordings instead of attending lecture. Students indicated in this course, and in past surveys, that the use of the technology gave them an opportunity to accommodate their different learning styles.

Multiple uses for ANGEL:

- Two online quizzes that count toward the course grade – administered online because of the difficult exam schedules for students in the two colleges and to ensure that students master prerequisite material before proceeding in the course.
- All course materials and communication available through the course ANGEL site, with a discussion forum to post faculty answers to student questions so that all students have access.
- Other websites recommended for specific topics
- Links to practice exams for both lecture and laboratory content

IV. Accessibility

The website was designed for use by medical students that meet standards for acceptance into medical school. It was set up, after pilot testing by students, for ease of access, downloading when desired. Colors were selected so that text, images and annotations could be seen by colorblind users.

V. Evidence of Effectiveness with Students

Overall student comments about the course were laudatory; the comment that “this is the best course so far in Medical School” was quite common in 2010. Students express appreciation for the case studies, patient presentations, and wide range of online material to meet student needs.

Students were asked to complete a survey in 2010 at two campuses after the second laboratory session. The survey asked about the usefulness of the online tutorial orientation to lab objectives and the self-assessment practice for the lab exam in ppt format and for printing as “flash cards.” Of those who used the materials, about 2/3 rated them as “very useful”, and the rest replied “moderately useful”. There were 0 students answering “not useful.” Some representative comments from the written survey are given below.

- THANK YOU for the videos, power-points, and practice questions you posted. They were a big help, especially the videos you prepared. I was having trouble putting everything together 3-D and they helped me picture it.
• I just wanted to let you know that these were really helpful in walking through the cross sectional anatomy of the brain. Your recordings were really helpful in helping me get a better appreciation of 3 dimensional relationships. Thanks! In particular the PowerPoint slide quizzes were helpful in testing our knowledge. Also, your Camtasia recordings of structures were more helpful in explaining relationships than the animated presentations in the class atlas.

• The trial material was fantastic. It really helped me to figure out the 3-d orientation of the objectives. With the amount of cross-sections on this exam, the tutorials helped tie together where to look in different cross-section views, a concept I was struggling with for several of the objectives.

• I thought the recordings were extremely helpful, for me it's especially hard to visualize unless someone is pointing things out to me so it was very very helpful.

In a focus group held in April 21, 2010 there was consensus that:

• New Camtasia recordings very helpful in visualizing 3D structure and putting into perspective of appearance on 2D cross section
• New Powerpoint/"flash card" review files – very helpful in learning cross-section objectives
• The Stewart atlas program (Functional Neuroanatomy) is very good.

Thus the overall feedback from students from new technology initiatives made each year has been very positive in contributing to the positive view of the course.

VI. Plans for Sustainability

Support from Health Information Technology Education Technology unit is stable for support for the medical school courses. The continued assistance of Susan Way is essential for development and maintenance of Neurohistology Virtual Microscope online materials and other types of technology innovation in this course. The instructors in this course have cooperated over many years to create and maintain multiple types of online rich media content that is directly targeted to student needs and to meet multiple learning styles.