Review of Year 1 Neuroscience course

- Course occurs in the spring term of Year 1
- Course Director – Rand Swenson, MD, PhD
- Course has 70 curricular hours
- Course was last reviewed Sept 30, 2008

Course Objectives – Content Review

There are 19 course objectives that fulfill Geisel competencies as follows:

- 11 address specific knowledge in the preclinical domain, and seem appropriate
- 1 address clinical care skills
- 1 address communication skills
- 3 address components of professionalism
- 3 address personal improvement

Currently no course objectives are mapped to Geisel competency domain #6: health care systems (appropriate for this course).

Course Objectives – Content Review

- Course objectives are provided in the syllabus and are written in the correct format (see below)
- Course objectives seem appropriate for the course

1. Define the terms commonly used to describe the nervous system and its functions.
2. Explain the cellular and molecular basis for excitability, conductivity, synaptic function and plasticity of the nervous system.
3. Identify and describe the major features of the brain that are identifiable on gross inspection and in coronal, axial and sagittal sections.
4. Identify the organization and distribution of the major blood vessels of the brain and describe the regulation of blood flow and the transport of nutrients into and out of the brain.
5. Describe general concepts in development and map of functions of the nervous system and consequences of disruption of these processes.
6. Explain the formation and flow of cerebrospinal fluid.
7. Describe the major tracts of the brain and identify the functions and the consequences of damage to the tracts.
8. Describe the major components of the sensory systems of the nervous system and predict the consequences of damage to these systems.
9. Describe the major components of the motor systems and predict the consequences of damage to these systems.
10. Describe the substrate for the major behavioral and cognitive functions of the brain and predict the consequences of damage to these systems.
11. Describe the control of autonomic functions of the brain including chemoreceptor function, autonomic control, emotional regulation, appetite, and sleep.
12. Describe techniques and tools in study of the structure and function of the brain including neurophysiological and neuroimaging.
13. Practice and demonstrate problem-solving skills.
14. Practice communication of neuroscience concepts with fellow students and faculty.
15. Practice core skills, including respectful, responsible and professional participation.
16. Take responsibility for his or her own medical education and accept responsibility for his/her own actions.
17. Search efficiently for and obtain relevant, high quality, relevant medical information and scientific literature to solve problems.
18. Read critically, evaluate, and assess medical information and scientific literature about important bedside topics and questions.
19. Help colleagues by contributing constructive suggestions during peer review.
Objectives: Step I Brochure

• The Neuroscience course content was mapped to the NBME’s basic science content on Step 1 for neuroscience.
• The course provides a solid foundation for understanding neural structures and functions, and achieving the prerequisites for the Year 2 neurology and psychiatry courses.
• Generally speaking, the course covers the NBME topics associated with normal anatomy and function of the brain, embryonic development of the nervous system, spinal cord, brain stem, sensory and motor systems, CNS, ANS, and nerve tissue structure and function.
• The course does cover diseases, such as Parkinson’s, Alzheimer’s, and Huntington diseases, and neurodegenerative disorders. However, most of the disorders listed on the NBME Step 1 document, as well as the peripheral nervous system, peripheral nerves, and the repair, regeneration and changes associated with life stages are covered in Year 1 HAE, CTO, and Year 2 neurology and psychiatry courses.

Session Objectives

• Session objectives are provided for most sessions – the following sessions are missing objectives:
  Sleep and wakefulness I and II
  Neuroanatomical correlates of behavior and its disorders
  Laboratory sessions
• Session objectives that are provided are written in the correct format, however they are found in different locations depending on the faculty member (beginning of the notes, end of the notes, in the slides, in a separate document); a consistent location would be ideal for students to easily locate them
• Students felt that some session objectives were “vague” and could benefit from increased clarity

Unplanned redundancy

• The curriculum database was used to assess redundancy in the curriculum regarding various topics in the course (e.g. action potentials, cerebral cortex, neuroglia, basal ganglia, etc.)
• For many topics redundancy was not present; some redundancy existed that was planned (e.g. material introduced in HAE or CTO and then expanded upon in Neuroscience)
• Redundancy existed that was complementary (structure of the thalamus/hypothalamus in Neuroscience and function in Endocrine Physiology)
• Redundancy existed in the topics “cerebral circulation” and “blood-brain barrier” (Neuroscience and Cardiovascular Physiology); it was not clear if this was planned or unplanned so course directors should communicate regarding their coverage of this topic (during our subcommittee meeting Dr. Swenson confirmed that he had already done this and students confirmed there was not an issue of unplanned redundancy)
Summary regarding Objectives

• Course objectives are provided in the syllabus and are written in the correct format using verbs with measurable outcomes
• Most session objectives are provided to students, however a few are missing; a consistent location for objectives should be implemented, and some objectives could benefit from improved clarity
• Course objectives correlate well with material in the Step I brochure
• Significant unplanned redundancy was not found in this course

Course Learning Opportunities

• Lecture 54 hrs. (77%)
• Small group conferences 4 hrs. (6%)
  TBL is used in one session; Jigsaw is used for the other session
• Laboratory 6 hrs. (8%)
• Clinical Correlation 2 hrs. (3%)
• Out of class preparation time 4 hrs. (6%)
  Time given to students to prepare for the small group conferences

Optional reviews are offered to students prior to quizzes

Course Learning Opportunities

• Course provides numerous resources to students for learning including an extensive website and a collection of practice questions
• In the last few years the course director has introduced some novel sessions using TBL and Jigsaw pedagogy (students rated these very favorably)
• Course director has recognized that students need time to prepare for small group sessions and has allotted some class time for this purpose
Summary regarding Pedagogy

• The percentage of traditional lectures in the course is higher than is desired (goal 40-50% of course hours) but has decreased over the last few years; the course director should continue to replace lectures with sessions allowing active engagement
• New pedagogy introduced into the course facilitated engaged and peer learning
• Numerous resources in the course allow students to assess their progress

Assessment

• Written Quizzes (3) – 40% of grade
  lowest quiz is weighted half as much as other two quizzes
• Written Final Exam – 35% of grade
• Final Lab Exam – 15% of grade
• TBL exercise – 10% of grade
• Jigsaw session – opportunity to earn 2% extra credit

Assessment – Quizzes

• All quizzes used multiple choice questions
• 2/68 questions used “negative” formats (e.g. Which of the following is NOT correct)
• ~26/68 questions used lists of True/False statements (e.g. Which of the following is True?); this was especially prevalent in Quiz 2
• ~19/68 questions required application of knowledge
Assessment – Final Exam

• Written portion consists of multiple choice questions; practical portion is structure identification
• 1/77 questions used a negative format
• 16/77 questions used lists of True/False statements (e.g. Which of the following is correct?)
• ~25/77 of questions on the final exam assessed application of knowledge

Correlation of Assessment Questions

• Correlation between content assessed on quizzes/exams and session objectives was very good
• Some session objectives are more “vague” and others are very specific; faculty should make sure their session objectives clearly elucidate expectations regarding the material (e.g. the level of detail expected)

Assessment – TBL Exercise

• Students are given five cases in advance to work through with their group; groups are randomly chosen to present one case during the small group conference
• Score for this exercise is based on four components: pre-test, presentation, post-test and group score
• Students evaluate their teammates at the end of the exercise regarding their participation, communication skills and team skills
Summary regarding Assessment

- In general, assessment questions are written in acceptable formats; course director should work on reducing the number of MCQs that use lists of true/false statements.
- Many questions (~1/3 on the final exam) provide opportunities for students to apply their knowledge.
- The TBL exercise provides an opportunity for students to give peer feedback.

Measures of Quality – AAMC GQ

“Indicate how well you think that instruction in Neuroscience prepared you for clinical clerkships and electives.” [1=poor; 2=fair; 3=good; 4=excellent]

<table>
<thead>
<tr>
<th>BASIC SCIENCES</th>
<th>Geisel mean 2008</th>
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<th>Geisel mean 2011</th>
<th>Geisel mean 2012</th>
<th>All schools means 2012</th>
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Measures of Quality – Step I

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<tr>
<th>SYSTEM BASED TOPICS</th>
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<th>2012*</th>
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*values reported for core disciplines are SD above the US/Can mean for Geisel mean scores
# Measures of Quality – Course Reviews

**scale [1=poor; 2=fair; 3=good; 4=very good; 5=excellent]**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Neuroscience AY 2010-11 (81%)*</th>
<th>Neuroscience AY 2011-12 (38%)*</th>
<th>Neuroscience AY 2012-13 (56%)*</th>
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<tr>
<td>Overall satisfaction of course</td>
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<td>Overall usefulness of lectures</td>
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<td>Overall usefulness of conferences</td>
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<td>Overall usefulness of course materials</td>
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<td>Congruence of assessment questions to material emphasized in course</td>
<td>3.98</td>
<td>3.47</td>
<td>3.52</td>
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*student participation rate on course evaluation

## Measures of Quality – Course Reviews

### Strengths: Faculty

“Excellent teaching with fascinating material. The professors did a great job presenting difficult material.”

“Each instructor seemed passionate about their subject and very concerned with helping us learn the material as best possible. They had each obviously put time and thought into how to explain and present these difficult concepts.”

“The lecturers were very good. They pretty much always tried to engage the students and clearly knew their stuff. One of the strongest departments at Geisel!”

## Measures of Quality – Course Reviews

### Strengths: Course Materials

“I really appreciate the quiz website and the atlas and thought they greatly helped me focus my learning. Having those types of resources lets me assess what I know and plan my studying accordingly. I also really enjoyed having notes for each lectures in addition to the PowerPoint and felt the consistency of those resources was a huge asset to the class.”

“The course had the 4 useful components of written materials. Written materials should be: 1) ppt 2) Notes 3) Schema, Flow Charts, De-labeled Diagrams 4) Questions and Answers; In this regard, this course is a model for all other courses.”
Measures of Quality – Course Reviews

• Strengths: Small group, TBL, and Jigsaw sessions

“TBL was overall a very valuable experience - I don’t think I would have considered the subjects in it so thoughtfully without it.”

“I enjoyed TBL. It helped to cement a lot of concepts in a way that wasn’t quite possible with just staring at a tract. It really helped to work through problems.”

“The concepts that were learned in class could be applied to actual cases through the TBL and jigsaw exercises. This was good because it helped solidify the concepts of the lectures that were covered in those exercises.”

Measures of Quality – Course Reviews

• Suggestions for Improvement: Overall Organization

“The topics were presented in an unorganized way so it was sometimes hard to make connections between different systems or different levels of detail until the final came around. If the topics that covered similar idea were presented at the same time it would be more useful.”

“Overall organization could have been executed better to help the material flow together. In the beginning the course was very disorienting because we had so little context of terms and structures being referenced.”

“Students would benefit from a restructured introduction to the course. It would be great to spend the first week of the course focusing on basic neurophysiology, cell biology, and neuroanatomy with an emphasis on nomenclature and key concepts that are used throughout the course.”

Measures of Quality – Course Reviews

• Suggestions for Improvement: Amount of content

“This course is too difficult. While we were exposed to a TON of material, I would have learned and retained so much more of it if the course had emphasized a simpler, slower, more basic understanding of neuroscience and neuroanatomy…”

“…I felt unprepared for the final because there was too much information and not enough time to go through it all. We learned twice as much for neuro than we did for any other class this year. After reviewing USMLE aids for neuro we don’t need to know it in quite as much detail. So cutting it down a little would be helpful.”

“Information overload - though interesting and relevant in some way, the amount of information in certain lectures was overwhelming and often did not correlate with the level of detail tested.”
Measures of Quality – Course Reviews

• Suggested Improvement: Emphasized Material vs. Test Questions

“I felt that many questions on quizzes and the final exam did not seem to be related in any way to the main points emphasized in class…(questions) focused on minutiae.”

“The exam questions were not representative of what I learned. I think it was exhausting to read a stem that was a paragraph long and then read 4 answer choices that were also a paragraph long that had maybe 90% right except for one word or phrase that is wrong.”

“In preparing for quizzes and exams, we waste far more time than we should trying to distinguish what is important vs. what is trivial.”

• Suggested Improvement: Course Materials - Standardization, Jargon, User Experience

“There could have been more formalization of notes/power point format. Some lecturers relied on extensive documents of notes, whereas others managed to put most information on the slides.”

“It’s critical that all lecturers sit down and be very clear about the jargon and terminology they want us to know…AVOID including additional synonyms, structures, or pathways that are above and beyond the scope of the course.”

“The practice multiple choice questions are great, but they’re kind of a pain to use. If you take a break, it loses your session (or crashes) so you have to start over again. It’d be nice if they were on an updated web app platform.”

• Suggested Improvement: Stress of TBL Sessions

“Though I really enjoyed the structure of the TBL, I felt that there was a lot of pressure built up for it beforehand (no notes, no discussion with other groups, etc.). I think for next year if TBL is still done, there should be able to be more collaboration between groups and there should be a more relaxed feel to it.”

“I think TBL would have been a more enjoyable experience if we had been allowed notes while we gave the presentation or been assigned a specific case. I understand we have to learn to deal with high stress situations but I do not think that 1st year neuro is the right time to do that.”

“While the TBL is a nice idea, I think everyone is too stressed out about the grading aspect that you don’t get too much out of it.”
Measures of Quality – Course Reviews

- Suggestions for Improvement: Course/Session Objectives

“Sometimes the lectures are all over the place and really difficult to understand. More concisely following the objectives would be nice.”

“The objectives were often diffuse and unhelpful (or non-existent!). I kept asking myself ‘what do they want me to learn?’ I had to rely on a textbook to do my primary learning.”

Summary regarding Measures of Quality

- Students benefit from the enthusiasm and strong teaching skills of the faculty as well as the numerous resources provided in the course
- Students consider small group sessions to be a major strength in the course
- Some improvements could be made with respect to the organization and content of the course, the way materials are distributed and the correlation between what is emphasized in class vs. material assessed

Summary of Recommendations

- There are no significant problems with the course objectives; course director should ensure all session objectives are provided to students and can be found in a consistent location
- While the course has recently reduced its percentage of traditional lectures, more reduction is needed to reach the target of 40-50% of course activities
- Overall, assessment questions are well-written and correlate with course objectives; some improvement could be made in the correlation with the material emphasized in class
Summary of Recommendations

- Dedicated course faculty are to be commended for their efforts in the course.
- The course is very heavy in content; the faculty should reevaluate the level of detail appropriate for Year 1 learners.
- Students would benefit from a more comprehensive introduction to basic terminology/concepts; if the organization of topics can’t be adjusted, perhaps this could be provided as self-study resource.

Action Plan

- Session objectives: The session objectives for each session will be posted directly in the folder with the materials for that session.
- Excessive lecture: Will use much more TBL and “flipped classroom” (change 18 sessions).
- Assessment questions: Review exam questions.
- Content heavy: Review the level of detail of sessions.
- Course introduction: Scheduled at the beginning of the course, with intro video.
- Student concerns about stress in case sessions: Use a more traditional TBL model.