COURSE PORTFOLIO

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Introduction

I teach two dramatically different courses, Anatomy A215 (Basic Human Anatomy) and Anatomy A550-551 (Gross Human Anatomy). Anatomy A215 is a large (300+ student) undergraduate course, and this course is required for many pre-nursing, pre-allied health and HPER (Health, Physical Education and Recreation) majors. The students who enter this classroom have a diverse range of capabilities and prior experience with course materials. In contrast, Anatomy A550-551 is a year-long course for approximately 30 1st-year medical students. Virtually all of these students have impressive academic credentials, and these students rarely had difficulties during their undergraduate studies. These students tend to learn the material well, irrespective of the instructor.

Although these two courses are quite different, they share a common thread in that I want to inspire interest in the subject of anatomy. My methods for inspiring this interest will be discussed in each of the course portfolios. To date, only the Anatomy A215 course portfolio has been written. In the near future, I will prepare a portfolio for Anatomy A550-551.

Teaching Philosophy

Early in my teaching career, I naively thought a good lecturer and a good teacher were synonymous terms. Within the past several years, however, I realize how wrong my "misconception" was. Some lecturers may be clear and concise – but does that necessarily make them a good teacher? More importantly, do the students learn effectively from lecturing?

I realize now that in order for students to learn the material presented, they must become active participants in the classroom, and take a responsibility for their own learning. In a large lecture course (like Anatomy A215), this can be problematic. Students often feel like they can be "anonymous" in large classes, or perhaps not attend the lecture at all without penalty.

While the large lecture is a challenge to work with, it is not impossible to incorporate active learning in the classroom. One of my goals as a teacher is to increase student engagement in class, whether the class has 30 students or 300. I try to make students feel like they count, that no matter how large the class, I will provide them with personal attention. I want students to enjoy coming into my classroom, to be prepared to work with their classmates, not just hear me drone on for 50 minutes. I recognize it will take time for me to completely "shed" myself of the sole lecturer philosophy. In the meantime, I am taking steps to incorporate student interaction in my classroom, and to create a more active learning environment.

Purpose of the Anatomy A215 *(Basic Human Anatomy)* Portfolio

Course portfolios may be either "benchmark" portfolios (which take a "snapshot" of a course at a given time), or "inquiry" portfolios (which identify a pedagogical problem to study, implement methods to address the problem, and analyze the results). This portfolio is meant to be an

"inquiry" portfolio. This portfolio will describe teaching interventions I implemented in the course, and examine whether these teaching interventions were effective. As this portfolio is modified and revised over the years, a list of the interventions will be presented, along with the data used to analyze the efficacy of these interventions. Thus, this portfolio is a capsule summary of some of my scholarship of teaching and learning research in this classroom.

Introduction to the Course

Student Composition

Anatomy A215 (Basic Human Anatomy) is a 5-credit, one-semester undergraduate course, with lecture and lab components. Before any withdrawals, class size has ranged from 263 students (Fall 2000) to 367 students (Fall 1997) (details). It is a prerequisite for admission into many health programs, such as nursing, dental school, nutrition, athletic training and physical therapy. (details) Most students need at least a "C" in order to meet the admission requirements for their programs. The majority of students who take anatomy are sophomores and juniors, and women outnumber men in the course by 3 to 1. (details)

Most students have had no prior experience to anatomy courses prior to this one. In fact, only a small proportion of the class has had previous college-level biology and/or chemistry courses. Thus, for many students, this is their first science course. Many students come in with the erroneous impression that they have to be "good memorizers" in order to do well.

We have a web site for the course that provides lecture outlines, a copy of the syllabus, and access to the secure grade posting system. Please note: in the spring semester 2003, another instructor teaches the course, so his lecture notes are on this site. However, the learning exercises you see (also replicated below) are my own, and the syllabus is similar to the one used during the Fall semester.

Information about the Instructor(s) and Teaching Styles

Until the Fall 2000 semester, lecture was taught serially by two instructors (each would teach one half of the semester) and material was presented in traditional lecture format (at 8 am MWF). While there is only one big lecture session, there are multiple lab sections for the course. Each lab has a maximum of 34 students, and is overseen by two Associate Instructors and an Undergraduate Teaching Assistant. Final grades were based on students' performance on four (4) 100-point lecture and four (4) 100-point lab exams (for a total of 800 points).

Beginning Fall 2000, I became the sole instructor for lecture during all fall semesters. I believed (and still believe) that a single instructor could do a more effective job of helping students learn, rather than two instructors who taught in a "tag-team" fashion. In addition, being the sole instructor gave me the freedom to implement teaching interventions throughout the entire semester.

Beginning Fall 2000, lecture meets in a different classroom from previous semesters and the class begins at 10:10 a.m. MWF. Course material is still presented in lecture format, but I also

use non-graded, interactive learning activities to complement each lecture. The same type and number of lecture and lab exams (800 points total) are used to assess student grades. Thus, the primary classroom intervention was the use of these interactive learning activities. (details)

Learning Goals

- **Learn the names and functions of anatomical structures**.

This course is designed for students to be able to name, identify, and understand the function of body tissues, organs, and organ systems. I want students to leave the classroom with a good working knowledge of anatomy terminology and a good idea of how body systems work. I do NOT want them merely to memorize and regurgitate terms. In lecture, I try to incorporate activities (see below) that go beyond the mere naming of structures. I try to bring in clinical relevance, and help students see how these systems work together. I tell students ways to LEARN the material, not merely MEMORIZE random terms.

- **Learn anatomical structures AND concepts that will help students succeed in their college programs.**

Students are required to learn and understand enough human anatomy, so they may progress in their health programs. Most students will go on to take Physiology P215, which discusses in detail some of the functions of the systems we explore in anatomy. Students should be able to name anatomical structures, as well as understand how these structures work and how these structures interact with other components of the body.

- **Understand "the big picture" of how anatomic systems work together.**

It is not sufficient for students merely to be able to regurgitate a bunch of terms. Students should be able to understand how the anatomic structures work together and make the body function. Several learning exercises, such as the G.I. innervation exercise, try to get students to think about this "big picture."

- **Understand the clinical relevance of anatomic structure.**

I want the students to think about what clinical conditions or problems could affect the anatomic structures we discuss. Most of the students in Anatomy A215 will go on to be nurses, doctors, physical therapists, athletic trainers. They not only need to be able to understand the "normal" anatomy, I want them to start to think about how injury or disease may affect that anatomy. To that end, I try to incorporate some clinical information in many of my lectures. For example, when we discuss cranial and spinal nerves, I also have them discuss and think about what dysfunction would occur if one of these nerves were damaged. (Lecture notes 1 and Lecture notes 2)

All of these learning goals are met through a variety of ways. Lectures emphasize the key anatomical structures and concepts, and try to tie together multiple concepts so students can get "the big picture". The 4 multiple-choice lecture exams ask questions that not only assess ability to identify structures, but also assess ability to group key anatomical concepts together.

Beginning Fall 2000, I incorporated the use of interactive learning exercises in lecture to further reinforce these concepts (see Teaching Interventions section). In the lab, students use 3D models, microscope slides, and prosected cadavers to learn anatomical structures. The 4 lab exams require students to identify "pinned" structures on some of the anatomical models.

Challenges

- **Students think anatomy is a "killer course."**

Anatomy A215 is often viewed as a "killer course" by many undergraduates. There is a lot of content covered, and the anatomic processes can be difficult to understand for many. Many have chalked up their poor performance to the fact that they are "poor memorizers".

- **Students believe they have to be "good memorizers" to succeed.**

While Anatomy A215 **does** require the student to learn content (i.e., names of anatomical structures, muscle movements, etc), I view the course as so much more than a mere "memorization" course. In class, I try to get the students to understand anatomic and physiologic **processes**, not just disjointed anatomical names. I try to get them to see "the big picture" whenever possible, and try to emphasize that once they understand "the big picture", rote memorization is not necessary.

Unfortunately, the lab component of the course encourages the misconception that students need to be good memorizers in order to succeed. Students merely identify and name structures on models, microscope slides, and cadavers. There is no critical thinking or application of their knowledge, beyond identifying structures for an exam. The lab portion of the course is under the guidance of another instructor (a lab director), which makes implementing changes a bit more problematic. However, one of my future goals for this course is to make the lab less "memorization" based and more "inquiry" based.

- **Most students have trouble reading and using a science textbook.**

Another challenge is to assist students in reading the textbook. Reading an anatomy textbook is not the same as reading an historical document, nor is it the same as reading a novel. Most of my students are unfamiliar with how to review the text in a way that can best help them. I tell several students to focus on the tables and the images, rather than the written prose of the text.

- **Multiple lab Associate Instructors and Undergraduate Teaching Associates mean student learning in different labs may vary.**

Anatomy A215 typically employs anywhere from 12-18 Associate Instructors for our 9-12 anatomy lab sections. In addition, we have an undergraduate teaching associate (UTA) in each lab. Since we have a number of different instructors in each lab, it would be naïve to think that the levels of student learning and understanding in each lab were exactly the same. We try to control for this by implementing a series of detailed instructions for each lab. However, I worry that these "rules" may hamper instructor creativity in the lab.

- **The large size of the course is the utmost challenge!**

The foremost challenge is the size of the course. A lecture hall filled with over 300 students can be daunting for them and me alike. Until the Fall 2000 semester, student engagement was very low in lecture, and attendance was poor. Although I give personal attention to all who ask for it, I still felt like many hard working students were "slipping through the cracks" because they were intimidated by the large size of the class. One of my long-term goals is to make this class more welcoming and personal for the students.

Teaching Interventions

There are numerous teaching interventions that I would like to implement in the Anatomy A215 course. All of the interventions listed are ones that already have been implemented. Below each intervention will be the following:

- The dates the interventions were implemented
- A brief summary and description of the teaching intervention
- The key course objectives that are addressed by this teaching intervention
- a list of the assessment data that is used to determine if the intervention was successful.
- Reflection about the efficacy of the teaching intervention

As some assessment data (e.g., exam scores) may be used for multiple interventions, this data is listed in the next section.

Teaching Intervention #1: Develop and Use Interactive Learning Exercises in Anatomy A215 lecture

Date Implemented: Fall 2000 – present

Summary/Description:

Starting Fall 2000, four kinds of interactive learning activities were used throughout the lecture portion of the course: 1) memory matrices, 2) learning exercises, 3) sample exam questions, and 4) "muddiest point" surveys. Memory matrices (Angelo & Cross, 1993) were two-dimensional grids that help recall and organize information from lecture. One example was a body tissues memory matrix . Body tissues were given in one column, and in the next two columns students had to list the tissue characteristics and a body location of the tissue. Learning exercises helped students understand anatomical processes. For instance, one learning exercise asked students to make an ordered list of the pathway of blood through the heart and blood vessels. Sample exam questions were used in every lecture. The class would choose the correct answer and then we would discuss why the other answers were incorrect. The "muddiest point" survey (Angelo & Cross, 1993) was modified into a group (versus individual) activity. Students were asked to write down an unclear point of lecture, work in a small group to see if they could clarify points of confusion, and write whether the group was successful. If I felt the majority of the class was unclear about a particular subject, I would take time during the next lecture to review the material.

One or more interactive learning activities were administered during every lecture session. In-class student participation always was voluntary, done in groups, and anonymous. While the students were working, I would walk around the room and answer questions. Instructor feedback was given either during the present lecture or the following lecture (after I had a chance to collect and review group responses). Five to ten minutes of each lecture was allotted for the activities. In addition, all learning activities were on the A215 Web site, so these activities could be reviewed as "homework" assignments.

Course Objectives to be addressed by this teaching intervention:

1. Increase student engagement in lecture
2. Improve lecture exam scores
3. Improve overall student performance in Anatomy A215
4. Decrease withdrawal rate in Anatomy A215
5. Increase student-student interaction in lecture
6. Create a more personal and friendly atmosphere in lecture
7. Improve my teaching efficacy

Data Used to Assess if the Teaching Intervention addressed the Course Objectives:

(please refer to the appropriate portions of the next section for this data)
Several different types of assessment measures were used. Assessments from the Fall 2000 and 2001 semesters (the "innovative" classes) were compared to those from Fall 1997, 1998 and 1999 semesters (the "traditional" classes). The following performance measures were examined (please see the assessment section for detailed descriptions of these assessment measures):

1) Anatomy A215 World Wide Website data
2) Mean lecture exam performance
3) Mean total points earned
4) Withdrawal rates
5) Merit Success Rate
6) Mastery Rate
7) Instructor evaluations and written comments

Reflection about the efficacy of the teaching intervention:

Firstly – was student engagement increased? Yes, it was! By getting the students into groups and participating, student engagement was increased. Students were talking to students and they were asking me more questions during the activity. Although the activities were voluntary, anywhere from 80-100% of the class would participate, because they knew the activities helped them learn the material. I have further evidence

that students were utilizing the activities outside of class. By examining the Anatomy A215 Website data (details), one sees that the number of "hits" on the WWW site rose dramatically during the Fall 2000 and 2001 semesters. Most of the users who accessed the site were from Indiana.edu addresses, further supporting the hypothesis that Indiana University students (and not outsiders) primarily were accessing the site. Each learning activity page had an average of 180-250 "hits" per semester, and the number of web 'hits' per student (details) rose dramatically in the Fall 2000 and Fall 2001 semesters.

Table 2 shows that Fall 2000 and 2001 semesters scored consistently higher on their lecture exams than the classes that did NOT have the interactive learning exercises. Typically I hold a review session the morning of each exam. In Fall 2001, I was out of town one day and could not hold a review session the morning before Lecture Exam 3. Interestingly, the Fall 2001 class did NOT do as well on this exam.

Withdrawal rates have remained relatively constant over the years. So, the teaching intervention does not appear to affect whether students remain in the course. This is a factor I would like to examine further. Student retention is a problem in this course, and it appears the teaching interventions are not sufficient to correct the problem.

The Fall 2000 class performed consistently better than all of the other classes. I was surprised to see the Fall 2001 not do better, despite utilizing the interactive learning exercises. It should be noted that the scores below reflect student performance on both lecture **and lab** exams. If you check table 4, you will see that the Fall 2001 class had the lowest mean lab scores, which is why their merit success rates and mastery rates were lower as well. At this time, it is unclear as to why the lab scores would be lower. Granted, the interactive learning exercises primarily addressed lecture performance. However, I would not expect lab scores to drop as a result. Please see the next section for further addressing of this matter.

Although past evaluations also have been positive, the Fall 2000 and 2001 classes had the most enthusiastic, consistently positive comments thus far. Most students felt they learned a lot, and they felt that the different teaching methods were at least partly responsible for their success.

Will this teaching intervention (or assessment thereof) be changed or modified, based on my reflections above?

I realize now that some assessment data used were not the best tools to determine the efficacy of this lecture-based teaching intervention. Since the interactive learning exercises were primarily for the lecture portion of the course, I should NOT have used assessment data that included both lecture AND lab scores. In the future, I need to use some of these assessments (like total mean points) with caution.

I plan on collecting at least one more semester's worth of data about this teaching intervention during the Fall 2002 year. Since the data from Fall 2000 and Fall 2001 semesters weren't exactly similar, I need to determine where the discrepancy lies. Could it be that larger classes (Fall 2001 was larger than Fall 2000) tend not to do as well, if all other factors are equal? Why are the lab scores so low for Fall 2001? One of my

Associate Instructors suggested that Associate Instructor workload may be to blame for this. Several of our A.I.s had "overload" assignments, and one A.I. said it was difficult for him to be as enthusiastic about the material when he was teaching his 3rd lab section. If time permits, I would like to exam lab scores, sorted by lab assignments, to see if lab performance and Associate instructor assignment are linked somehow.

I believe these interactive learning exercises had a positive effect on students perceptions of the course, student interaction during lecture, and my evaluations. I will continue to use these exercises, and try to incorporate them even more into lecture.

Teaching Intervention #2: Utilize an Undergraduate Teaching Associate (UTA) in the Lecture portion of the course

Date to be Implemented: Fall 2002

Summary/Description:

Undergraduate Teaching Associates (UTAs) have been utilized in the laboratory portion of Anatomy A215 for many years. These students have previously taken Anatomy A215 (and performed well), and assist Associate Instructors in the lab. Traditionally, these UTAs have not provided a great deal of input in the lecture portion of the course.

During the Fall 2002 semester, I will utilize an Undergraduate Teaching Associate in lecture. This student will be present during lecture to assist me, help run some group activities in lecture, and be another "source" for the students. The UTA also will hold scheduled office hours and assist students outside of class. It is my hope that students who may feel hesitant to speak to me, will be more willing to see the UTA for assistance. In addition, I hope that the lecture UTA will help make group activities in lecture run

Course Objectives to be addressed by this teaching intervention:

1. Increase student engagement in lecture
2. Improve lecture exam scores
3. Improve overall student performance in Anatomy A215
4. Decrease withdrawal rate in Anatomy A215
5. Increase student-student interaction in lecture
6. Create a more personal and friendly atmosphere in lecture

Data Used to Assess if the Teaching Intervention addressed the Course Objectives:

Several different types of assessment measures will be used. Assessments from the Fall 2002 semester will be compared to the Fall 2000 and 2001 semesters, to see if a lecture UTA appears to have an effect on the following assessment measures:

1. Mean Lecture Exam Performance
2. Withdrawal rate
3. Mean Total Points Earned
4. Merit Success Rate
5. Mastery Rate

Teaching Intervention #3: Develop and Implement use of an "Anatomy Virtual Lab" that students may use outside of class

Date to be Implemented: still under development (prototype chapter to be used in Fall 2002)

Student, Instructor, and Course Assessment Data

The above teaching interventions are assessed with different kinds of assessment data. A listing of the assessment data is presented below:

Tables 1a and 1b contain pre-course data (such as SAT scores, previous math/science courses taken) for the students in these classes, to see if class populations are significantly different from year to year. As one can see from the data, the class populations are very similar. The Fall 1998 class tends to have the strongest students, as evidenced by SAT scores, prior GPA, High school rank, and number of High school math and science units taken.

Table 1a: Pre-Course Data Comparisons

	SAT-Verbal	SAT-Math	Prior GPA	Credit Hours Taken
2001	519	526	3.03	**46**
2000	516	536	2.95	45
1999	518	534	2.94	42
1998	**533**	**545**	**3.04**	45
1997	524	534	2.98	44
Grand Avg.	523	535	2.99	45

Table 1b: Pre-Course Data Comparisons (con't)

	%age male	High School Math units	High School Science units	High School Rank	Students Repeating
2001	24	3.89	3.03	73	25
2000	24	4.07	2.95	64	**26**

1999	22	3.93	2.94	76	25
1998	25	**4.11**	**3.04**	**62**	25
1997	25	3.97	2.98	72	25
Grand Avg.	24	4.00	3.09	69	25

Note that Fall 2001 has much lower SAT Math scores and the fewest units of high school math taken. It would be interesting to see if these two pre-course values could be good predictors of performance in Anatomy A215.

Table 2 lists mean lecture exam performance for each year. Fall 2000 scored the highest on 3 of the 4 lecture exams. Fall 2001 scored similarly well (with the exception of lecture exam 3, where I was out of town that day and did not hold a review session that day).

Table 2: Mean Lecture Exam Performance

	Exam 1	Exam 2	Exam 3	Exam 4	Overall Lecture Avg
2001	78.6	75.2	75.6	**84.1**	**77.7**
2000	**80.3**	**75.3**	**79.6**	81.2	79.0
1999	74.4	72.5	76.5	76.9	75.1
1998	71.6	71.8	78	82.4	75.9
1997	74.7	69.8	75	78.3	74.5

Table 3 lists the other performance measures. These performance measures include:

Mean total points earned. Each semester had a maximum of 800 total points to be earned. Numerical scores were compared among semesters.

Withdrawal rates. Withdrawal rates were defined as the number of students who withdrew divided by initial class enrollment.

Merit Success Rate: Most anatomy students need a "C" or better in order to be accepted into their career program (nursing, physical therapy, etc). The Merit Success Rate was the total number of A's, B's and C's, divided by the initial enrollment number for that semester.

Mastery Rate: Mastery Rate was defined as the total number of A's divided by the initial enrollment.

Instructor evaluations and written comments. Although instructor evaluations are affective measures, their quantitative features make them useful as comparative measures of instructor performance assessment. Evaluation questions were given a point value

(1=lowest, 5=highest evaluation). The grand mean of all questions was calculated both for the Fall 2000 and 2001 semesters, and compared to means from the Fall 1997-1999 semesters.

The Fall 2000 class performed consistently better than all of the other classes. I was surprised to see the Fall 2001 not do better, despite utilizing the interactive learning exercises. It should be noted that the scores below reflect student performance on both lecture **and lab** exams.

Table 3: Other Performance Measures

	1997 (n=323)	1998 (n=303)	1999 (n=257)	2000 (n=237)	2001 (n=298)
Mean Total Points Earned	609.0	616.5	616.9	626.4	615
Withdrawal Rate	13.1%	9.0%	10.1%	10.6%	10.7%
Merit Success Rate	66.5%	70.5%	68.4%	72.6%	66.1%
Mastery Rate	19.9%	24.0%	21.1%	29.7%	22.1%
Instructor Evaluation Score	4.07	4.08	4.21	4.73	4.71

Both Fall 2000 and Fall 2001 showed dramatic improvements in my instructor evaluation scores. The comments on the year-end instructor evaluations were equally positive. Students found the combination of lectures, notes and learning activities to be appealing to their style of learning. A sampling of comments follows:

> "She made learning easier by using different teaching techniques"
> "She gave more personal attention in a class of 250+ than many do with much smaller classes. She consistently made us feel she wanted to succeed, and that she would go the extra distance to make that happen"
> "Dr. O'Loughlin is an excellent teacher. I speak as a humanities student who might turn to science if every science instructor were like her."

Table 4 shows the mean lab exam performance among the semesters. Fall 2001 has the dubious distinction of having the lowest overall lab average. The reasons for this are as yet unclear (please see reflections for teaching intervention #1 as to possible causes for this).

Table 4: Mean Lab Exam Performance

	Lab 1	Lab 2	Lab 3	Lab 4	Overall Lab Avg.
2001	75.4	76	73.6	80.5	76.4

2000	79.3	80.1	**77.9**	83.6	**80.2**
1999	81.5	78.3	77.6	82.2	79.9
1998	79.8	**82.1**	77.3	79.8	79.8
1997	**82**	72.4	76.5	**85.7**	79.2

Pedagogical Goals for the Future

Overall, I am pleased with the general improvement in student and instructor performance scores. In the future, I also want to improve the lab portion of this course. Currently, the lab only encourages students to believe that anatomy is merely "rote memorization". I would like to develop other activities, and perhaps redesign the exam format, so students won't retain this misconception.

Do the students come away with a long-term retention and understanding of anatomy material? This type of question can only be answered if I examine the performance of these students in other courses, such as Physiology P215. Clearly, such a project would be intensive and involve multiple faculty working together.

As an instructor, I have enjoyed teaching Anatomy A215 more and have had more fun once I started incorporating the interactive learning exercises. Student feedback indicates students appreciate them as well. The data above indicate there is more to be done, however. I believe that the size of the class had a direct effect on many of those performance measures. Perhaps one of the reasons why the Fall 2000 class performed better was because they were the smallest class? If this is the case, then I must examine additional ways to make the large lecture course **feel** more personal, and develop additional ways for students to take more responsibility for their learning.

Key References

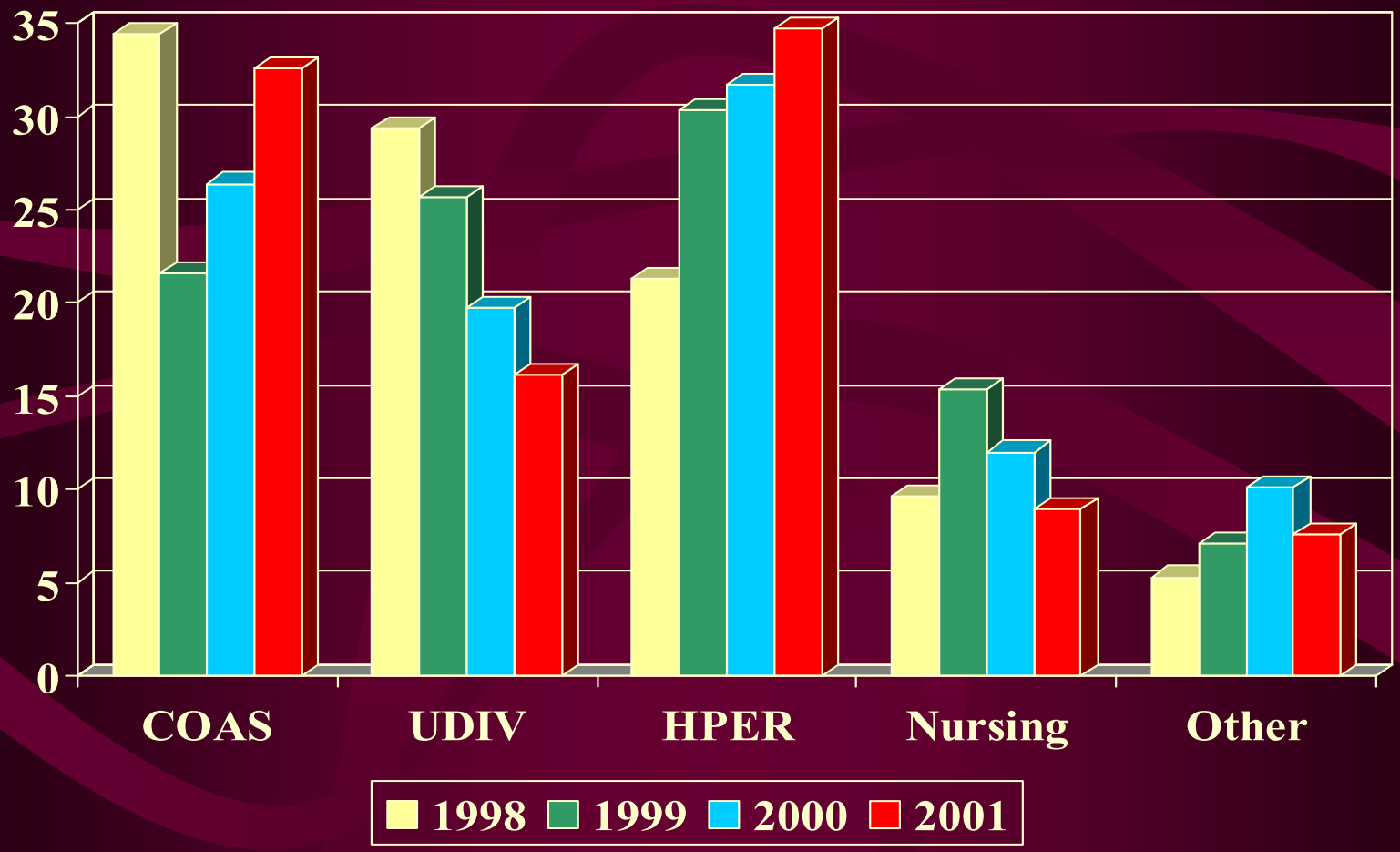
Angelo, T. A. & Cross, K. P. (1993). Classroom Assessment Techniques: A Handbook for College Teachers (2nd ed.). San Francisco: Jossey-Bass Publishers.

O'Loughlin, V Dean (2002) Assessing the Effects of Interactive Learning Activities in Anatomy A215. Indiana University Scholarship of Teaching and Learning presentation (300Kb PowerPoint presentation)

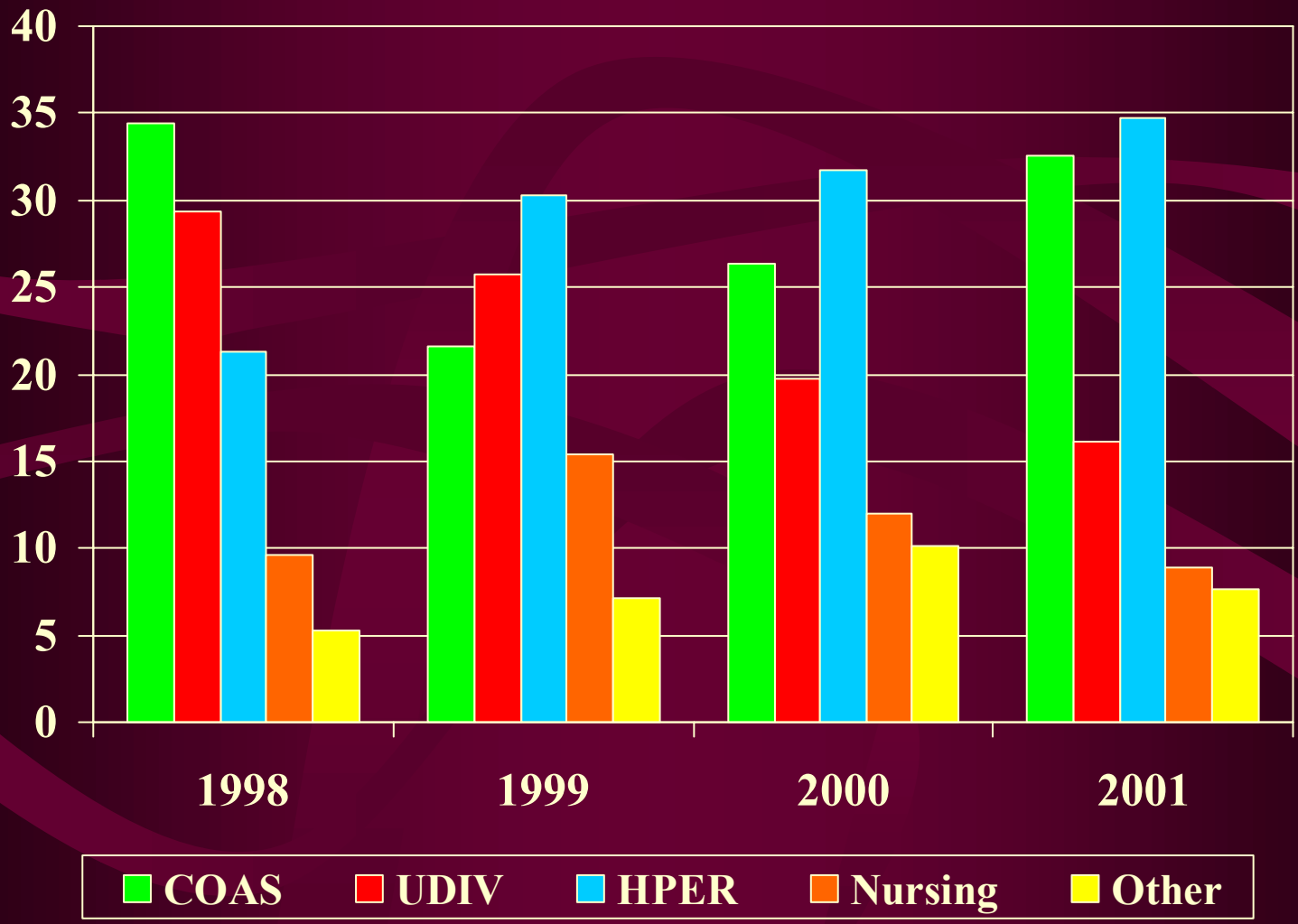
History of Anatomy A215

- Large science course (260-400 students per semester), with lecture and lab components
- Pre-requisite for many health fields (dental, nursing, physical therapy)
- Two instructors for lecture
- Traditional lecture format
- Very content-intensive and challenging

What students take A215?



A215 Class Composition



Fall 2000, 2001 vs. Fall 99-97: Pre-course data comparisons

	SAT-V	SAT-M	GPA	Credit Hours
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1998	**533**	**545**	**3.04**	45
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Pre-course Comparisons (con't)

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1998	25	**4.11**	**3.19**	**62**	25
1999	22	3.93	3.03	76	25
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2001	24	3.89	3.05	73	25
Grand Avg.	24	4.00	3.09	69	25

"Traditional" vs. "Innovative" A215

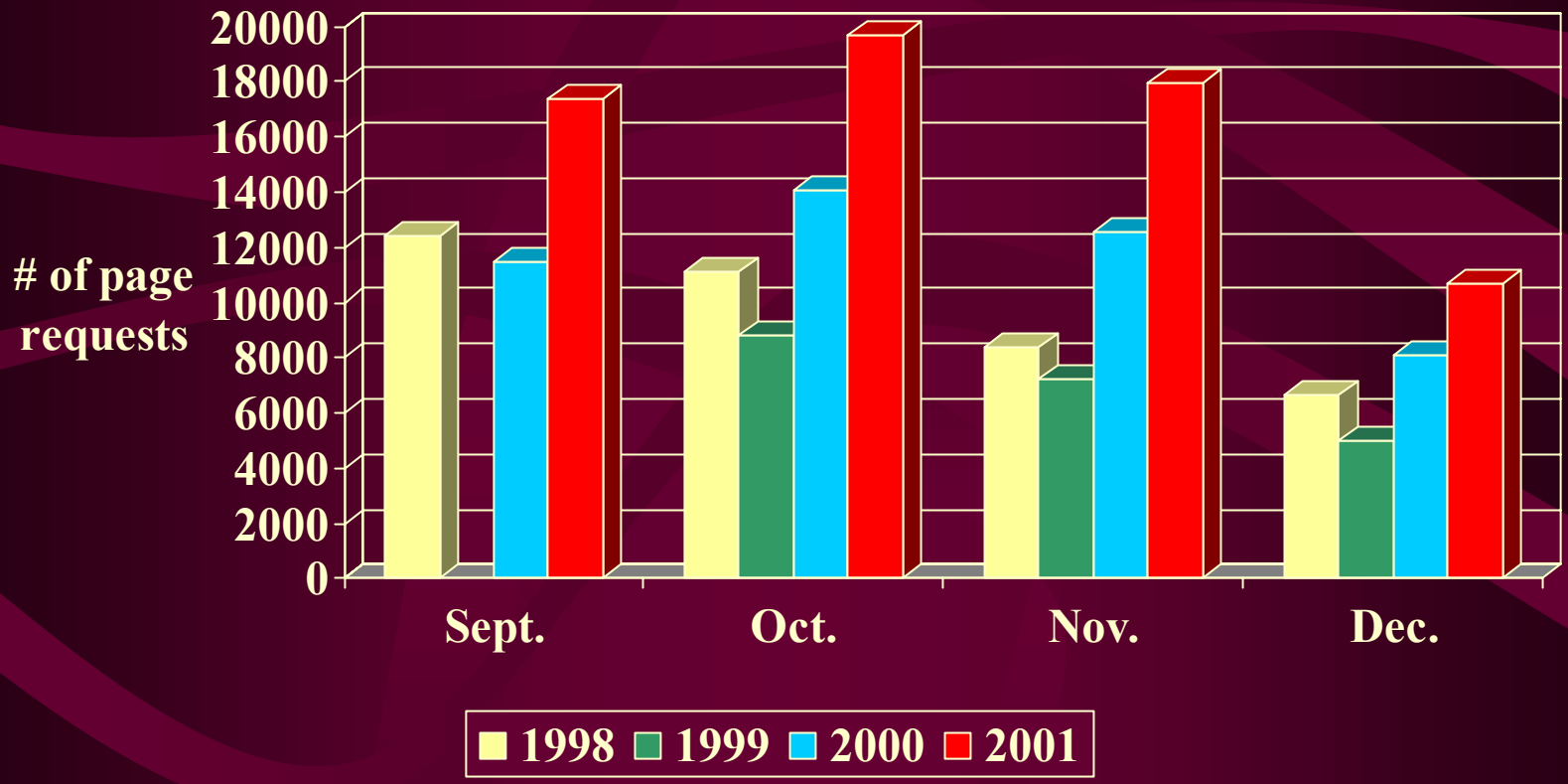
"TRADITIONAL" (Fall 1997-1999)

- Team-taught (serially)
- 4 lecture, 4 lab exams (800 pts total)
- 8 am lecture
- Lecture format

"INNOVATIVE" (Fall 2000, 2001)

- One instructor
- 4 lecture, 4 lab exams (800 pts total)
- 10:10 am lecture
- Lecture format plus non-graded, interactive learning activities

Overall A215 WWW Activity: Fall 1998-2001 Semesters



* No Web data recorded for September 1999

Fall 1998 vs. Fall 2000, 2001 Total WWW Page Requests (September – December)

Fall 1998: 38,582 page requests

116.2 requests/student

Fall 2000: 26,278 page requests

175.96 requests/student

Fall 2001: 65,682 page requests

220.4 requests/student

Individual learning activity pages each had approximately 180 -250 Web requests during the Fall 2000 and 2001 semesters!

Anatomy A215 Learning Exercises

One problem that many students encounter in Anatomy A215 is trying to learn the MASSIVE amount of material. It can get very overwhelming. I know - I remember my days as an anatomy student too!

In an effort to help you organize and learn this material, I have prepared a series of "learning exercises". I will present many (but not all) of these during class, and you will have the opportunity to work on them in groups. Each group will turn in their exercises to me, and I will review them by the next lecture and clarify any points of confusion. It is my hope that these exercises will help YOU better understand and learn the material, and will help ME know where common points of confusion lay (and hopefully clarify these points of confusion BEFORE the next exam!).

Below is a list of the learning exercises, organized by lecture exam topics. You can print these out and have them as an additional study aid. Just click on the learning exercise topic, and that will take you to the appropriate exercise. Use the "Back" button in your Web browser to return to this page.

Good luck!
Dr. Valerie O'Loughlin

Learning Exercises: Exam 1

- Endochondral Bone Growth Learning Exercise
- Bone Shape Learning Exercise
- Articulations Memory Matrix
- **EXAM 1 REVIEW SHEET!!**

Learning Exercises: Exam 2

- Myology Learning Exercise
- Myology Memory Matrix
- Muscles of Head, Neck, Trunk Memory Matrix
- Muscles of Upper Limb Memory Matrix
- Muscles of Lower Limb Memory Matrix
- Neurons Memory Matrix
- Supporting Cells Memory Matrix
- Spinal Cord Learning Exercise
- Telencephalon Memory Matrix
- **EXAM 2 REVIEW SHEET!!**

Learning Exercises: Exam 3

(I went a bit crazy here folks... This should keep you busy for a while...)

- Eye Components Memory Matrix
- Eye Muscles Memory Matrix
- Ear Components Memory Matrix
- Inner Ear Learning Exercise
- Cranial Nerves Memory Matrix
- Nerve Plexuses Memory Matrix
- Spinal Nerves Memory Matrix
- A.N.S. Learning Exercise 1: Sympathetic vs. Parasympathetic Structures
- A.N.S. Learning Exercise 2: Parasympathetic Division
- A.N.S. Learning Exercise 3: Sympathetic Division
- A.N.S./Cranial Nerves Memory Matrix
- A.N.S. Organ Effects Memory Matrix

- Endocrine System Memory Matrix
- Formed Elements Memory Matrix
- Blood Pathway Learning Exercise
- Blood Vessels Memory Matrix
- Heart Blood Flow Learning Exercise
- Heart Components Memory Matrix
- Lymph Flow Learning Exercise
- Lymphatic Components Memory Matrix
- Conducting vs. Respiratory Portion Memory Matrix
- Phonation Learning Exercise
- Bronchi vs. Bronchioles Memory Matrix
- Respiratory System: Epithelium Memory Matrix
- Air Flow Learning Exercise
- Respiratory Components Memory Matrix
- **EXAM 3 REVIEW SHEET!!**

Lecture Notes: Exam 4

- GI Innervation Learning Exercise
- Food Flow Learning Exercise
- Digestive System: Epithelium/Function Memory Matrix
- GI Tunics Memory Matrix
- Accessory Digestive Organs Memory Matrix
- GI Secretions Memory Matrix
- Hepatic Portal System Learning Exercise
- Kidney Blood Flow Learning Exercise
- Urine Flow Learning Exercise
- Urinary Organs Memory Matrix
- Sperm Cell Development Memory Matrix
- Sperm Flow Learning Exercise
- Male Reproductive Structures Memory Matrix
- Ovarian Structures Memory Matrix
- Reproductive Organ Homologues Memory Matrix
- Female Reproductive Structures Memory Matrix
- Reproductive Hormones Memory Matrix

- Primary Germ Layers Memory Matrix
- Human Developmental Structures Memory Matrix
- **EXAM 4 REVIEW SHEET!!**

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Anatomy A215: Basic Human Anatomy

Fall Semester 2001

Instructors	
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Lecture Notes: Exam 1

- Introduction
- Cell & Cell Division
- Tissues I and II
- Integument
- Bone I and II
- Articulations

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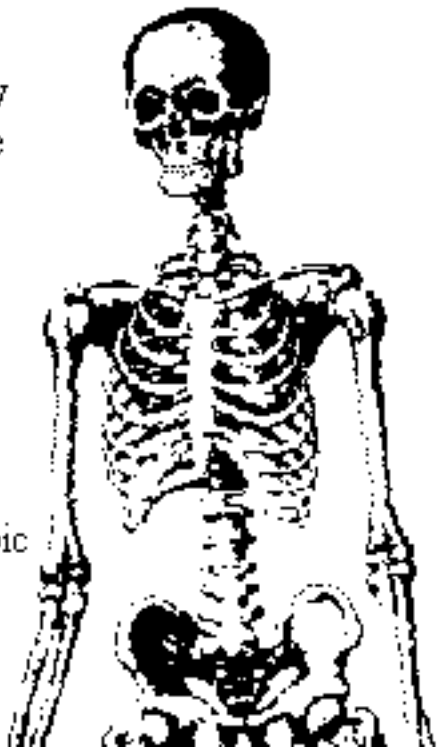

Click on the Lecture Topic you wish to view.

Lecture Notes: Exam 2

- Myology
- Muscles of Head, Neck & Trunk
- Muscles of the Upper Limbs
- Muscles of the Lower Limbs
- Nervous System I: General
- Nervous System II: General
- Nervous System III: Spinal Cord
- Nervous System IV: Brain Stem & Cerebellum
- Nervous System V: Diencephalon
- Nervous System VI: Telencephalon & Receptors

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Lecture Notes: Exam 3

- Nervous System VII: Eye
- Nervous System VIII: Ear
- Nervous System IX: Cranial Nerves
- Nervous System X: Spinal Nerves
- Nervous System XI: Autonomic N.S.
- Endocrine System
- Circulatory System I: Blood and Vessels
- Circulatory System II: Heart
- Lymphatic System
- Respiratory System I and II

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Lecture Notes: Exam 4

- Digestive System I and II
- Urinary System I and II
- Reproductive System I: Male
- Reproductive System II and III: Female
- Reproductive System IV: Development
- Reproductive System V: Pregnancy and Labor

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Neat Medical & Anatomical Web Sites!

- Want to learn about more Anatomy and Physiology-related courses at IU? Interested in Medical School? Then go to the Medical Sciences web site to learn more!
- The Discovery Health 3D Interactive Medical Atlas has short animations to help you learn about common ailments of all of the body systems!
- Review your bones by checking out the Osteo Interactive Web site!
- Review Histology at the Chicago Medical School Web site
- More Histology review may be found at the University of Kansas Histoweb site .
- Check out 2D and 3D pictures of brains, thoracic viscera and knee joints at the Digital Anatomist web site!
- Get information about medical conditions, health and wellness, and the latest health news at the Web MD web site
- TB, cancer, and other pathologies can be seen at the Internet Pathology Library at the University of Utah.
- This site has it all: Martindale's Health Science Guide

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Last updated: August 15, 2001
URL: http://www.indiana.edu/~anat215
Send comments to Valerie Dean O'Loughlin, Website Manager

Anatomy A215: EPITHELIUM Memory Matrix

Epithelial Type	***Characteristics***	***Places in the body where this tissue is found***
Simple Squamous		
Simple Cuboidal		
Simple Columnar		
Pseudostratified (ciliated) Columnar		
Keratinized Stratified Squamous		
Nonkeratinized Stratified Squamous		

Transitional

GI INNERVATION Learning Exercise

In class I briefly told you that the parasympathetic nervous system increases GI activity, and the sympathetic nervous system decreases it. Now I want YOU to take this information further and figure out for yourself the following: How SPECIFICALLY will the parasympathetic and sympathetic divisions affect the following functions?

GI Action	*Parasympathetic division will:*	*Sympathetic division will:*
Salivary glands (will secretion be increased or decreased?)		
Peristalsis (increased or decreased?)		
Gastric Glands (increase or decrease secretions?)		
Bile Production (increased or decreased?)		
Pancreatic juice secretion (increased or decreased?)		

Sphincters (will it open or close the GI sphincters?)

Overall blood flow to GI tract (which ANS division will send MORE blood to the GI tract? which will send less or inhibit excess blood flow to GI tract?)

Heart Blood Flow Learning Exercise

Blood flows through the heart in a specific sequence. Venous blood first enters the heart via the right atrium. In the exercise below, number the structures according to when blood passes through them. Some of the structures have already been numbered for you.

_____ Right Ventricle

_____ Left Ventricle

_____ Pulmonary trunk and pulmonary arteries

_____ exchange of gas occurs in the lungs

_____ aorta and arteries throughout body

_____ pulmonary veins

__1__ right atrium

_____ left atrium

__9__ veins throughout body, back to right atrium

NOW, make your own flowchart, and rewrite this sequence out in order - this will help you remember the blood pathway!

CRANIAL NERVES

INTRODUCTION

-- 12 pairs of cranial nerves

-- Table 13.2 lists each nerve in detail

CN I: OLFACTORY:

-- sensory nerve fibers only
-- function: smell (olfaction)

-- olfactory nerves synapse in olfactory bulb

-- olfactory bulbs connect to olfactory tracts

-- test for nerve damage: test smell

CN II: OPTIC:

-- sensory nerve fibers only

-- function: vision

-- optic chiasma

-- optic tracts

-- test for nerve damage: test vision

CN III: OCULOMOTOR:

-- somatic motor and parasympathetic motor

-- functions:
1. somatic motor: supplies 4 eye muscles (superior rectus, inferior rectus, medial rectus, inferior oblique) and a muscle in the upper eyelid (levator palpebrae superioris)

2. parasympathetic motor: supplies iris, will help constrict pupil

-- test for nerve damage:
1. does pupil constrict?

2. does the person's upper eyelid droop?

3. Does person have diplopia?

CN IV: TROCHLEAR:

-- somatic motor fibers

-- function: supplies superior oblique

-- test for nerve damage: diplopia?

V. CN V: TRIGEMINAL:

-- somatic motor and sensory fibers

-- functions:
1. somatic motor: muscles of mastication

2. sensory: anterior part of scalp, entire face, nasal cavity, oral cavity, teeth

-- test for nerve damage:
1. test person's chewing ability

2. person able to detect touch on face?

CN VI: ABDUCENS:

-- somatic motor nerve fibers

-- function: supplies lateral rectus

-- test for nerve damage: can person abduct eye (move it laterally)?
* patients have diplopia

NOW YOU CAN REVIEW THE INNERVATION OF THE EXTRINSIC EYE MUSCLES: DO THE EYE MUSCLES MEMORY MATRIX .

CN VII: FACIAL:

-- somatic motor, special sensory, and parasympathetic motor

-- functions:
1. somatic motor: muscles of facial expression

2. sensory: TASTE to the anterior 2/3 of tongue

3. parasympathetic motor: increases secretion of lacrimal gland, most salivary glands

-- test for nerve damage:
1. is there paralysis of facial expression muscles on one side

2. test taste on anterior 2/3 of tongue

3. is there decreased salivary secretion, decreased tearing?

CN VIII: VESTIBULOCOCHLEAR:

-- contains sensory nerve fibers only!

-- functions: hearing and equilibrium

-- test for nerve damage:
1. test for hearing loss/deafness

2. is person experiencing vertigo, lack of balance, dizziness, nausea/vomiting?

CN IX: GLOSSOPHARYNGEAL:

-- contains somatic motor, general & special sensory, and parasympathetic motor fibers!

-- functions:
1. somatic motor: supplies one pharynx (throat) muscle

2. general sensory: touch and TASTE sensation of post 1/3 of tongue

3. parasympathetic motor: increases secretion to parotid gland

-- test for nerve damage:
1. decreased taste sensation on posterior 1/3 of tongue?

2. decreased salivary production

CN X: VAGUS:

-- somatic motor and parasympathetic motor

-- functions:
1. somatic motor: supplies most pharynx (swallowing) muscles and larynx (voice box) muscles

2. parasympathetic motor: supply muscle in the heart, lungs, most abdominal organs

-- test for nerve damage:
1. does person have difficulty swallowing?

2. does person have a hoarse voice, permanent loss of voice

CN XI: ACCESSORY:

-- contains somatic motor nerve fibers

-- functions: innervates trapezius and sternocleidomastoid

-- test for nerve damage:
1. have person shrug shoulders

2. have person turn head from side to side

CN XII: HYPOGLOSSAL:

-- contains somatic motor fibers

-- functions: supplies intrinsic tongue muscles and most extrinsic tongue muscles

-- test for nerve damage: have person protrude tongue

REVIEW THE FUNCTIONS OF THE CRANIAL NERVES WITH THE CRANIAL NERVES MEMORY MATRIX .

REVIEW THE CRANIAL NERVES USING YOUR STUDY PARTNER CD-ROM:
1) Run the CD-ROM

2) Click on "Chapter 13: The Peripheral Nervous System and Reflex Activity"
3) Do the following exercises:
a) location of cranial nerves
b) quiz (answer only those questions that pertain to lecture material)

Before you get a cavity filled in your tooth, you HOPE that the dentist will anesthetize (numb) a branch of this nerve:

a. CN IV (trochlear)

b. CN V (trigeminal)

c. CN VII (facial)

d. CN IX (glossopharyngeal)

e. CN X (vagus)

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SPINAL NERVES

I. INTRODUCTION

-- A spinal nerve comes directly off of the spinal cord

-- 31 pairs of spinal nerves

-- on each side: 8 cervical spinal nerves, 12 thoracic spinal nerves,
5 lumbar spinal nerves, 5 sacral spinal nerves,
and 1 coccygeal spinal nerve

II. REVIEW OF SPINAL NERVE STRUCTURE

-- each spinal nerve is formed from:

1. ventral (anterior) root: axons from motor neurons

2. dorsal (posterior) root: nerve fibers from sensory neurons

-- when a dorsal root and a ventral root unite, they form a spinal nerve

* motor and sensory

* spinal nerves split into two main branches:

1. dorsal ramus:
   * innervates skin of back, deep back muscles

2. ventral ramus:
   * innervates everything else from the neck inferiorly!
   * also forms nerve plexuses:

-- def. of nerve plexus: a network of converging and/or diverging nerve fibers

III. CERVICAL PLEXUS

-- ventral rami of C1-C4

-- innervates the following:
1. sensory: SKIN of neck, ear and shoulders

2. motor: anterior neck muscles

-- phrenic nerve (receives SOME fibers from cervical plexus)

* C3-C5

* supplies diaphragm

IV. BRACHIAL PLEXUS

-- ventral rami of C5-T1

-- primarily innervates upper limb

-- each nerve has both motor and sensory components

A. Axillary Nerve:

-- sensory:

-- motor: deltoid and teres minor

B. Musculocutaneous Nerve:

-- sensory:

-- motor: most muscles on anterior surface of ARM:
1. coracobrachialis
2. biceps brachii
3. brachialis

C. Radial Nerve:

-- sensory:

-- motor:

1. posterior ARM muscles

2. posterior FOREARM muscles

D. Median Nerve:

-- sensory:

-- motor:

1. almost all anterior FOREARM muscles

2. THENAR muscles

3. lumbricales going to fingers 2, 3

E. Ulnar Nerve:

-- sensory:

-- motor:

1. 1 1/2 anterior FOREARM muscles:
   a. medial 1/2 of flexor digitorum profundus
   b. flexor carpi ulnaris

2. most intrinsic muscles in hand:
   a. hypothenar muscles

   b. lumbricales to fingers 4, 5

   c. palmar and dorsal interossei

V. LUMBAR PLEXUS

-- ventral rami of L1-L4

-- innervates inferior abdominal wall, part of lower limb

-- each nerve has motor and sensory components

A. Femoral Nerve:

-- sensory:

-- motor: anterior thigh muscles

B. Obturator Nerve:

-- sensory:

-- motor: medial thigh muscles

VI. SACRAL PLEXUS

-- ventral rami of L4-S4
-- innervates the buttocks, pelvic structures, and majority of lower limb
-- each nerve has motor and sensory components

A. Sciatic Nerve:

-- splits into:

1. Tibial Nerve

-- sensory:

-- motor:
a. most posterior thigh muscles (hamstrings)

b. posterior leg muscles

c. muscles on sole of foot

2. Common Peroneal (Common Fibular) Nerve:

-- sensory:

-- motor:
a. anterior leg muscles

b. lateral leg muscles

c. muscles on dorsum of foot

REVIEW THE DIFFERENT NERVE PLEXUSES BY COMPLETING THE NERVE PLEXUSES MEMORY MATRIX .

REVIEW SPINAL NERVE FUNCTIONS WITH THE
SPINAL NERVES MEMORY MATRIX

REVIEW THE SPINAL NERVES USINGYOUR STUDY PARTNER CD-ROM:

1) Run the CD-ROM
2) Click on "Chapter 13: The Peripheral Nervous System and Reflex Activity"
3) Do the following exercises:
a) formation and branches of spinal nerves
b) quiz (answer only those questions that pertain to lecture material)

Which nerve most likely would be damaged if you were unable to flex your forearm/elbow joint?

a. axillary nerve

b. median nerve

c. radial nerve

d. musculocutaneous nerve

e. ulnar nerve

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