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_HAPS-EDucator_ is the official publication of the Human Anatomy and Physiology Society (HAPS) and is published four times per year. Major goals of the Human Anatomy and Physiology Society are: to promote communication among teachers of human anatomy and physiology in colleges, universities, and related institutions; to present workshops and conferences, both regional and national, where members can obtain information about the latest developments in the health and science fields; and to encourage educational research and publication by HAPS members. HAPS was established in 1989.

Annual membership dues are $50. Annual membership renewals shall be due on January 1, April 1, July 1, or October 1. New members shall renew on whichever date most closely follows the date of their initial membership. **HAPS Hotline:** (800) 448-HAPS (4277). Information on membership, meetings, and more! Send correspondence to: HAPS, 222 S Meramec, Suite 303, St. Louis, MO 63105. Check out our new webpage at: [http://www.hapsweb.org/](http://www.hapsweb.org/)

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Papers for publication, requests for information, positions available and wanted and letters to the editor are welcomed. Articles submitted on 3.5” double density disks are preferred - please include a hard copy as a backup. If references are included, please follow the methods suggested in _Scientific Style and Format: The CBE Manual for Authors, Editors, and Publishers_. 6th Edition, Style Manual Committee (Council of Biology Editors) Cambridge, Cambridge University Press. 1994.

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**DEADLINES FOR SUBMITTING MATERIAL TO HAPS-EDucator:** June 1 (August issue); September 1 (November issue); December 1 (February issue); March 1 (May issue).

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Fall term is winding down and I imagine you have as many students at your door as I do this time of year. Many students are anxious to convince me that they have spent all night studying for one topic (which they just failed) while pleas for extra credit abound. My challenges at this time of year seem not to be related to teaching as much as they are to listening with interested (yet somewhat detached) empathy. If I didn’t have the HAPS list serve discussions to buoy my spirits, I would be Scrooge indeed!

Your Board of Directors has been extremely active discussing various issues on a weekly basis. During our October and November conference call and emails, the guidelines for the Software Review Subcommittee (under chairperson Martha Depecol Sanner’s Technology Committee) were revised and adopted. We hope to see helpful reviews of software programs available for use in anatomy and physiology very soon in future issues of the HAPS-EDucator. The Technology Committee has been continually updating the software list (available on the HAPS web page) as well as compiling a list of A&P related videos. This has been a very active committee and their hard work is greatly appreciated.

We hope to see policies and guidelines very soon from the Distance Education and Cadaver Use committees as both have been very hot topics. As the HAPS Policies and Procedures manual is undergoing continual revisions, we have decided to place it in Windows format on the HAPS web page. Our webmaster Jim Pendley will be formatting the manual for us, so please look for it soon and print it out for your convenience. As always, if you have any concerns or questions, please feel free to contact me or any member of the Board.

At the annual business meeting during HAPS 1999 (the Baltimore conference) the membership discussed the idea of tiered membership dues. Kerry Openshaw of Bemidji State University had suggested a model that Steve Trautwein, past-president, used to develop four different combinations of new and renewed memberships for the Board to consider. In summary, it was concluded that tiered memberships could be implemented without a detrimental effect on the budget (which the membership approved at the general meeting). Therefore, I am happy to announce that beginning with the next fiscal year of July 1st, the following membership tiers will be instated:

- Full-time faculty member - $50.00
- Part-time faculty member - $30.00
- Student - $20.00
- Retired - $20.00

Of course, you may be wondering how we can possibly enforce a person’s honesty regarding their employment status. We simply trust that the good folks in this organization work by the honor system. (We can’t all send in twenty bucks - some of us have to be gainfully employed!)

Several changes have occurred in our election process which will make ballotng, return and tabulation much easier. Beginning with the next election of officers, ballots will be mailed to members and then returned to and tabulated by HAPS Headquarters. The President-elect (currently Henry Ruschin) and Nominating Committee will still be responsible for the candidate search and preparation and assembly of the ballot. Thankfully, this comes just in time to eliminate potential problems that Henry might have had in coordinating American and Canadian postage. An accompanying change in the HAPS Constitution with regards to election procedure will be presented for vote at the annual business meeting in Charlotte this coming June.

As you know, the Board of Directors, in conjunction with the Annual Conference Committee, felt it necessary to poll the membership regarding the possibility of holding our annual meeting in Hawaii in the year 2001. Normally, the Board would not interfere with the decision-making process of the Conference Committee but felt that this was a special case since it would involve additional expense for many HAPS members to travel to Hawaii. A meeting in Hawaii sounds like a great idea, but we needed to make sure people would show up! I am extremely pleased to announce that the HAPS Headquarters received a 40% return on the survey that was mailed to each member. In case you don’t recall the survey, a return postcard asked you to indicate “yes” or “no” to the following questions:

1. “Should HAPS 2001 be in Hawaii”
2. “If held in Hawaii, would you attend?”

The response was as follows:

- 47% replied “yes” to questions 1 and 2
- 12% replied “yes” to 1 and “no” to 2
- 33% replied “no” to questions 1 and 2
- 1% replied “no” to 1 and “yes” to 2

In summary, 59% indicated that the meeting should take place as planned in Hawaii while 34% disagreed (7% of the total did not vote for question 1). With that in mind, the Board and Conference Committee agreed to go forward with plans for 2001 in Hawaii. I can’t imagine a more beautiful place to see for the first time with my HAPS colleagues, but I think we had all better make a pact to attend at least one workshop between luaus. Aloha and my best wishes for a safe and joyous holiday season to you all.
Teaching and Learning Complex Physiological Processes in Introductory Science: Biology 100 - The Human Body "Muscle Dance"

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Introduction

The teaching of introductory anatomy and physiology classes includes many challenges. The vast amount of material to be covered can be daunting, and many of the physiological processes are themselves quite complicated and interdependent. Often the students in these classes are not science majors or do not have strong science backgrounds, further compounding the challenges of effectively presenting the information.

An especially difficult concept to teach is the sliding filament theory of muscle contraction and its relationship to nerve impulse transmission. Traditionally, these topics are explained one at a time, with the sliding filament theory introduced during the discussion of the skeleto-muscular system and the nerve impulse transmission taught during the nervous system discussions. The neuromuscular junction is alluded to in both sections and may be discussed briefly at the end of the entire unit on the skeleto-muscular system. I have found this order to be disjointed, leading the students away from making the natural connection between the events occurring at the sarcomere and those events leading up to contraction.

In looking for a way to explain the entire sequential process without overwhelming the non-science majors in the class, it became obvious that a technique other than didactic lecture was needed. These two physiological processes are heavily term-laden, as well as experimentally difficult to demonstrate to large groups of students.

Current science education pedagogy holds that experiential learning is an effective means of reinforcing science content (Svinicki and Dixon, 1994). David Kolb is an adamant advocate for this form of learning (Kolb, 1994). Experiential learning emphasizes the important role that experience plays in the learning process. The core of this theory is that learning is a cyclic process, involving concrete experience, observation and reflection, formation of abstract concepts and generalizations, and testing of those concepts in new situations. This necessarily requires student participation.

According to David Karp and William Yoels (Karp and Yoels, 1994), most students choose to remain uninvolved in the discussions and questions that are presented in the college classroom. This low level of commitment on the part of the student is accompanied by a failure to actually absorb and deal with content as it is being presented. The point made by this article was that, in fact, students are adept at making a show of participation. They nod occasionally and laugh at appropriate times. The truth may be that they are not actually committed to learning the material being presented. There is no direct incentive for them to become personally involved with the content. The challenge then in introductory science classes is to present complex material in such a way that students are forced to participate and interact with the content.

Having taught Introductory Human Anatomy and Physiology for ten years, I have been constantly faced with the prospect of teaching non-science majors the fundamentals of intricate physiological processes. The sliding filament theory of muscle contraction and nerve impulse transmission are both complicated physiological processes that can cause even veteran science students conceptual difficulties. Straight lecture presentation of this material ensures that I cover the information but does not allow for the low caliber science student in the

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introductory class an opportunity to grasp the meaning of these processes.

While looking for ways in which to effectively involve the students in learning these physiological processes, I have tried many activities. The following description outlines a method for teaching these processes that guarantees student involvement and has thus far demonstrated a high degree of student understanding and retention of the material. I began using portions of the “dance” six years ago at Iowa State University (ISU) and have continuously added to the choreography. Moving from ISU to Maui Community College has provided me with smaller classes and the academic freedom to refine this technique to the point at which it is presented here.

The students enjoy learning this way and retention (as measured via a comprehensive final at the close of the semester) is enhanced. Very few students who have participated in this process are unable to correctly list the steps involved in the nerve impulse, neuromuscular junction, or sarcomere contraction. The students' abilities to think critically about these processes seem to be improved. They can mentally manipulate the processes and determine how drugs or pH shifts will affect the outcome.

Methods

This teaching technique involves three steps: 1) didactic presentation of the information; 2) student acting out of the processes; 3) group participation in creation of an outline of events.

The lecture portion of the process takes approximately 30-45 minutes, depending on the number of questions fielded during the talk. At this point in the presentation, I clearly tell the students there are a large number of sequential events to follow in this process. I list them using visual media (board, overhead, PowerPoint, etc.) as I explain the entire sequence. I cover the nerve impulse, neuromuscular junction and sliding filament theory all at once. Most of the students make a concerted effort to stay up with the lecture, writing notes at a furious pace. This portion can be covered in any format, but it is essential that the students have some appreciation of the steps to be learned, and a rudimentary outline of what is happening at the microscopic level.

The second portion of this process is much more fun! After the lecture is concluded and the process has been talked through at least one time, I outline the major “players” on the board. This outline includes Z lines, actin, myosin, calcium, acetylcholine, sodium gates, sodium ions, potassium gates, potassium ions, sodium/potassium pump, and ATP. If you have a larger class or go into more detail in your lecture, other steps can be added. I have added students as troponin and tropomyosin without losing the effects of the dance. It does take longer as you add more detail but is not impossible.

Counting the number of students in the class, I then assign roles to each student. They begin to panic as they realize they will have to know what their particular role is in the entire process. This causes them to review their notes, focusing on their assigned role.

After all students are given a role, we move to an outside area with a large open space. First I set up the sarcomere. The Z lines link arms and are reminded not to let go of one another. The thin filaments are set up on the Z lines and are also reminded not to let go of one another or the Z line. The myosin filaments are placed in the center of the sarcomere. Once the sarcomere is in place, we run through a simple contraction. I use apples as ATP molecules, handing them to the myosin at rest. The rest of the class “directs” the action of the sarcomere by announcing that calcium has been released, uncovering the actin active sites. The myosin cross bridges grab the actin (shoulder) directly in front of them, give up their apples and pull that shoulder one “tug” toward the center. In order to let go of that actin, the apples must be returned to the myosin. I usually make the sarcomere slide at least twice. The first time I take an active role in the directing, and the second time I let the students direct it on their own. Some classes require a third “slide” to properly figure out how it works.

Once the muscle contraction is well rehearsed, I set up the nerve above the sarcomere. I have used sidewalk chalk and streamers pinned to the dirt (using dissecting probes!) to outline the neural axon terminal end bulb.

The students assigned to represent gates take up positions on the nerve membrane, facing one another holding hands. The students assigned to play potassium and sodium are given opposing color balloons and told to arrange themselves in the resting neuron state. This means that potassium congregate within the membrane and sodium remains outside. The one student assigned to play acetylcholine is sent to the terminal bulb and sits inside the neuron.

At the initiation of an impulse, the two students representing the sodium gate open (release hands and move apart), and the students carrying the sodium balloons visibly flood the neuron. The potassium gate students then open, allowing the potassium balloon-carrying students to leave the neuron. The two students assigned to play the role of the sodium/potassium pump immediately begin realigning the sodium and potassium “ions” by physically grasping shoulders and transporting the students carrying the balloons to opposite sides of the membrane. As this wave of movement reaches the end bulb, the acetylcholine is released from the bulb and walks to the sarcomere. The sliding filament dance is performed once again.

This entire dance is usually performed at least two times. Invariably, the students get confused with the first attempt and laugh at one another. With the second run-through, they begin to see what is happening. The more time you have to perform the entire dance, the more understanding you create in the students. Once they understand the process, you can add all sorts of twists for them to decipher.

Conclusions

Student feedback on this activity has been very positive. At the end of each semester, I ask for the best and worst of the class. The dance that we perform is often listed as “the best” and so far has not shown up on the list of “the worst.”

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Some student comments include:

I felt that the diagram on the board was understandable, but combined with actually demonstrating the functions and steps ourselves made retaining and comprehending the process much easier. It gave us a visual image to relate to when recalling the process from memory. I walked out of that class knowing in detail the nerve impulse reaction and how and why it caused the contraction of muscle. (Female sophomore, 3.5 GPA)

Learning the muscle dance was a great learning tool. I was able to visualize and create a mental picture of each process of the sliding filament theory. The muscle dance is a creative approach to hands-on learning. (Female sophomore, 3.0 GPA)

This has helped me understand more how my body works. I can list the steps and understand what is going on at each one. It goes through a process. (Female freshman, no GPA, non-science major)

My role in this dance was that of a Z line, so I had from my location a good view of the entire sarcomere and the neuromuscular junction. I was able to see by this example the nerve impulse happen, the exchange between the interior and the exterior of the axon, the movement of sodium and potassium ultimately releasing the Ach from the nerve cell, crossing the synaptic cleft and flooding the muscle membrane with calcium...I believe watching as a part of the sarcomere was a good way to teach this theory and even more revealing to see the whole process from a viewable distance. Once back in the classroom putting all the steps together and writing them out step-by-step made the whole process clear and identifiable. (Male freshman, no GPA, pre-nursing program)

In the final evaluation, students were able to correctly describe these processes using proper terminology. Their essay answers were correct and demonstrated an understanding of these processes that I had not seen prior to teaching with the dance.

Finally, some of my students at Maui Community College were videotaped performing the dance. The students received 10 points extra credit for performing the dance in the studio so that a video could be made.

References


Bicycles are easier to pedal uphill when the chain is moved by the derailleur to a larger rear sprocket wheel. Similarly, leg extension is easier for the quadriceps femoris because its tendon runs over the top of the patella before attaching to the tibia. Both patella and sprocket wheel provide a mechanical advantage.

This concept is difficult to visualize, so we constructed a model that allows students to feel the mechanical advantage.

The model is a stylized knee joint (Fig. 1) that is extended by pulling a cord. The cord can be looped over the model’s patella (Fig. 2), or over a pulley located below the patella (Fig. 3). Students find the model extends much more easily when the cord is looped over the patella.

Contact Mark Eberle (meberle@cocc.edu) for free set of construction plans.
Web Anatomy: A Truly Free Anatomy and Physiology Review Program on the World Wide Web

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The Internet offers a wide array of “free stuff” that actually seems pretty expensive. For example, you can now get a “free” computer if you agree to a contract that requires you to use a specific Internet service provider for 2 or 3 years and also look at the advertising that they place on your computer’s desktop on a daily basis. I have created an Internet based anatomy and physiology review program that is as close to free as I can get. In order to use it, you do have to have a computer connected to the World Wide Web that runs Netscape, Explorer, 3.0 or better. But once you have these items, the rest is truly free with no contracts and no advertising.

A Description of WebAnatomy
WebAnatomy is a set of approximately one hundred anatomy and physiology review activities that use a simple programming code called JavaScript to pose questions to its users. The programs are very easy to use; an average student can learn to use it in about fifteen seconds, and even the most computer-phobic students are able to comfortably use it after one or two minutes of help.

Each WebAnatomy program screen contains three sections. First, an area containing either a still graphic picture (hearts, brains, vessels, etc.), a short QuickTime movie (muscle contraction), or a short essay on a physiological event. The second area contains pull-down menus to enter answers. (See Figure 1 for a sample WebAnatomy screen.) The number of answer options in each menu varies with the difficulty of the program. For example, an easy activity may have only four or five answer options per question, whereas more difficult activities may contain up to thirty or forty options. All option sets are arranged in alphabetical order so students can easily locate the answers, if they know what they’re looking for! The third area of the screen shows all of the student’s selected answers and, after pressing a “correct it” button, also displays the correct answers. This area provides simple feedback, e.g., “8 out of 10 correct, study more and try again.”

How I use WebAnatomy
On the first day of class I announce an upcoming quiz on the skull. Then I use WebAnatomy to show specific bones and sutures, followed by how to study for the quiz using the WebAnatomy program. I also tell students that WebAnatomy is completely confidential—I don’t know which students are using it, how long they are using it, or any of their scores on the activities. One key element of WebAnatomy’s popularity with students is that there is no performance pressure; they can use the programs as many times as they wish and never have to be concerned with time limitations or worry about someone seeing how poorly they are doing. To reinforce the use of the program, my first quiz of the quarter uses the same images and questions as those found in WebAnatomy skull programs. After the first quiz, I expect all students to use WebAnatomy as much or as little as they wish. I do not require that they use it, but student opinion data collected at the end of the semester shows that over 80% of my students used the program at least five times per week and almost 100% reported that the program was “easy to use” and “helped me prepare for exams.”

A Brief History
I started creating WebAnatomy programs five years ago after a friend created the root programming code for a math activity in his class. The code was easily moved from his math activities to the WebAnatomy activities. (In exchange for the code, I bought my friend a couple of tacos.) During the first semester that the programs were available, my students encouraged me to keep making more. Now I have programs for nearly every topic covered in my freshman level course.

Individual programs are organized on the WebAnatomy directory according to systems (cardiovascular system, digestive system, etc.). Also included are sections on areas such as histology, medical professions, body regions, common medical terms, etc. Within each system, programs are further arranged from “simple to complex.” It is very important to note that all the programs were created with my students in mind (freshmen), and more advanced students would not be too challenged by them—although I have had a couple of medical students send me messages saying that the programs provide a quick review of basic anatomy and physiology.
How to find WebAnatomy

www.gen.umn.edu/faculty_staff/jensen/1135/webanatomy/

Web addresses are frequently long and complex. There are two ways to find the WebAnatomy activities without typing the whole address into your browser. First, go to a search engine, such as Lycos, Yahoo, etc., and type in either “WebAnatomy” or “Murray Jensen” and you should be able to locate the site. The second way to find WebAnatomy is to first type www.gen.umn.edu into your browser and the General College home page should load. Next locate and click on Faculty and Staff, then Murray Jensen, then GC 1135, and finally WebAnatomy.

Over the past year or two, I have received hundreds of e-mails from people around the world (mostly students) who have used WebAnatomy and frequently have favorable things to say about the activities. The more e-mails I receive about WebAnatomy, the more my boss likes me – he thinks that the programs provide good exposure for our college (General College at the University of Minnesota) and he is also in favor of keeping the site open for anyone to use FOR FREE! ✶

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**Figure 1. An example WebAnatomy screen.**

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**CD? See me!**

As a HAPS educator, would you be interested in receiving a CD with anatomy and physiology contributions from your colleagues? The CD could include items such as graphics, video segments, PowerPoint presentations, textual information as well as other material of interest to HAPS members.

The CD is not yet in production. Before proceeding, we need to know if there is interest not only in receiving such a valuable resource, but also in CONTRIBUTING to the CD project. If you are interested in helping or in receiving such a CD, please e-mail Robert Jubenville at rjubenville@mvcc.edu. Indicate in the body of the message whether you are interested in HAPS pursuing a CD production and/or whether you have materials to contribute to the proposed CD.

We will keep you informed of the progress!
Reinforcing Connections in A & P: Creating an Integrated Self-Study Environment

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Anatomy and physiology (A&P) offers all biology undergraduates a valuable learning opportunity, regardless of whether or not they are interested in health careers. By its very nature, the material invites students to identify conceptual connections between different levels of structural and functional organization in living systems. Unfortunately, anxiety over the sheer volume of factual detail in A&P often discourages students from seeking patterns or viewing facts in a larger context. We present our ongoing efforts to create an integrated self-study environment that addresses this curricular challenge. We combine traditional learning aids and high-tech multimedia facilities in a newly renovated A&P Study Room. We are developing audio-tape modules that guide students as they navigate between different materials (slides, models, display boards, texts, study guides, software) available in the room. Each module poses a series of questions that arise from the interaction of systems or levels (e.g., the adaptive nature of skeletal design) to stimulate the formulation and evaluation of hypotheses. Our goal is for students to move beyond factual recall to scientific prediction and explanation. We predict that regular, structured use of the Study Room will increase the students’ motivation, improve their problem-solving skills, and lead to improved scores on both the HAPS Competency Test and our own essay exam questions.

Relationships between Success in Introductory Anatomy-Physiology and Students’ Academic Language Proficiency

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Students across the U.S. students are increasingly arriving at undergraduate institutions under-prepared for college work. Among other things, students may lack preparation in academic language - the language of the lectures and textbooks used across disciplines. Academic language is distinctly different from the spoken language of everyday discourse. While students are fluent in their oral language, they may not be proficient in academic language. This lack of proficiency is found in both second language learners and native speakers of English who are entering college.

In this study, students enrolled in two sections of an introductory anatomy and physiology course at a private, liberal arts university were presented with several academic language tasks at the beginning of the semester. These tasks included self-assessment of vocabulary from the first chapter of their textbook, a dictation of words and sentences from the first chapter, and a matching task for common prefixes, roots and suffixes related to academic and scientific vocabulary (e.g., therm-, hem-, epi-, trans-, lipo-, dent-).

Students’ final course averages were positively correlated with these language tasks, with correlations ranging from a low of .33 to a high of .50 for the roots, etc. of the science terms. The two self-assessments of vocabulary knowledge correlated .37 and .41 with the course average. The language scores of students who received a course grade of A or B compared with those who received course grades of C, D, or F were statistically significantly higher on all five academic language tasks.

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Comparison of the academic language scores of all students who persisted in the class, including those who received D or F grades, with those who dropped the course during the semester showed that those who persisted had higher language task scores, and for some tasks, the scores were statistically, significantly higher.

The results suggest that student persistence and student success are related to the academic language proficiency level students have when they begin college. Improving the academic language skills of under-prepared, entering freshmen may increase student success and persistence by removing the language-related barriers to academic success.

How to Make an Anatomy and Physiology Resource CD

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With the continued infusion of technology into the curriculum, faculty in the Life Science Department at Mohawk Valley Community College are producing a Life Science Resource CD for use in anatomy and physiology and other departmental courses. This is a work in progress, but a number of tutorials are available on the CD. The CD is made available through the college library and may be checked out by students for use at the college or at home. The poster sessions acquainted conference participants with the specifics of producing a CD for their courses.

Use of Web-delivered Graphics to Supplement Laboratory Materials

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Traditionally, students at Tyler Junior College have had access to laboratory materials (models, specimens, and microscope slides) only during the two and one-half hours of their scheduled laboratory periods each week. Because approximately 600 students are enrolled in the A&P courses each semester, access to lab materials for extra study is insufficient to accommodate students' needs. Although materials are made available on Friday afternoons during "Open Lab," not all students are free at that time, and space restrictions would limit access.

We have used other methods of increasing access, including allowing students to study models out in the hall, keeping models in faculty offices for review by students during faculty office hours, and photographing the microscope slides to create carousel slide sets and recording those slides and dissection specimens on video. The video, which covers both A&P I and II, is popular with students, because it is narrated with only assigned structures identified; however, students must fast-forward and rewind a lot to reach the section for each week.

Our latest effort to increase access builds on the idea of having materials with labels tailored to our course. We have begun posting unlabeled and labeled images of specimens and models on the college web page. Specimens and models are photographed using a digital camera. The images are imported into a graphics program, so that labels can be added and various features highlighted. Then, the images are linked to an index page for each system or component. Students access the pages either at home or in a campus computer lab, where they can view, download to disk, or print the images. Because the images are original, copyright restrictions are not a factor and because they are indexed, students can quickly access the specific unit under study. Currently, we have parallel labeled and unlabeled images of the following models, specimens, and organs: bovine and porcine eye, fresh and preserved porcine heart, human heart model, and human circulatory model. Plans for the immediate future include cat dissections, with labels for organs and vessels, and various other organs that are currently studied in lab (sheep pluck and sheep kidney, for example). The images that are currently available are on the World Wide Web at http://www.tyler.cc.tx.us/Science/course/Biology/A&P/Anat.htm, listed under the "Anatomy Images" link.

In the future, we plan to add labeled/unlabeled images of microscope slides and digital video clips of dissections, so that students can jump directly to the unit-of-study rather than having to speed through an entire video tape.

Computerized Data Acquisition in Human Physiology: An Experimental Approach

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In 1995 and 1996, Elon College submitted a NSF-ILI proposal to promote independent learning in the teaching of human anatomy and human physiology. In June of 1997, we were asked to modify the original proposal to include only the physiology
component. The final proposal resulted in funds for seven Macintosh computers and six MacLab data acquisition units. The use of computers and digital data acquisition enables our students to collect data, analyze it, prepare graphs, lab reports and presentations while using these computer workstations. These computers are connected to the Elon campus network and the Internet. This project promotes the learning of experimental design by having students pose a hypothesis for each experiment, record the data, determine if the experimental evidence supports the hypothesis and make brief presentations to initiate discussions. Through these additional experiments, our students learn how to formulate and test hypotheses through independent laboratory projects in addition to prepared lab exercises. We have written a new lab course pack for Human Physiology that helps students learn how to operate the equipment and prepares them for their own experiment on each weekly topic. After pilot use during fall, 1998, we have expanded the use of these exercises to the 6 physiology laboratory sections taught during the spring semester, 1999.

**Ease into Technology**

**Dr. Nancy G. Kincaid**  
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Do you want to move forward into technology, but hate to trade in all your worn lecture notes for a multimedia projector? Do you want to be able to show your students how an electrical impulse travels down an axon, but have a hard time "encouraging" them to study available A.D.A.M. Interactive Physiology modules in their spare time? Two problems exist here, one of integrating the multimedia into the lecture and the second of making the student responsible for the material covered with multimedia. I am in the middle of trading in some of my lecture notes for great animations I hope will remain in my students’ minds long after they forget the terminology. I have not rewritten my whole lecture class around multimedia material, but little by little I am moving ahead. For introductory cellular metabolism (yes we have to cover the Krebs cycle) I have found a great animation covering metabolism in the A.D.A.M. Interactive Physiology CD-ROM for the Muscular System. To make all the students feel responsible for the material, I have resorted to graded homework assignments worth only a few points each. It has been remarkable in bringing my students into the lab after hours to work on the programs. Our 150-200 students each quarter use our six A&P lab computers and software including: A.D.A.M. Interactive Anatomy, Dynamic Human 2, A.D.A.M.-Benjamin/Cummings Interactive Physiology modules, PhysioEx, and a histology program.

**The Mitochondrion: Its Anatomy, Ultrastructure, and DNA Dynamics**

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Mitochondrial inheritance, especially of a number of disease conditions, is the object of extensive research. The poster presented background material including the normal anatomy and physiology of a typical mitochondrion. This was followed by a look at the map of the mitochondrial genome, showing sites where DNA mutations lead to human disorders. mtDNA was then compared and contrasted with nuclear DNA. Homoplasmic and heteroplasmic segregation of mitochondria following mitosis was illustrated. This was enhanced by a presentation of micromanipulation therapy to “cure” mitochondrial disorders by IVONT (in vitro ovum nuclear transplantation). Observers took a “pop quiz” asking them to determine which of five families is passing a trait on to their offspring by mitochondrial inheritance.

**College Science Outreach to Home-schooled Secondary Students**

**Dr. Nancy P. Nekvasil**  
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For the second year, a science laboratory experience has been offered to local home-schooled students in grades 8-12 at Saint Mary’s College, Notre Dame, Indiana. This experience consists of sixteen weeks of instruction, three hours per week for 16-20 students. At the conclusion of the term, students receive an official Saint Mary’s College certificate which states the total number of hours the students have spent in the lab. Most students complete between forty-five and forty-eight hours of science laboratory work. It is easiest to adapt anatomy and physiology labs for these students since my physiology lab is the site of our work. However, we have also included basic biology and chemistry labs, as well, so the students can get a real hands-on introduction to “life in the laboratory.”
Computer-assisted Data Acquisition and Analysis of Isometric and Isotonic Skeletal Muscle Contractility Using the Biopac Student Lab

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In a physiological sense, contraction of muscle means any form of muscle activity in response to an adequate stimulus. A common definition of the word contraction is “to draw together” (such as the ends of a muscle), or “to shorten.” However, when a skeletal muscle responds to an adequate stimulus, the muscle may or may not shorten externally.

If the muscle is stimulated but cannot shorten because of immovable attachments, the muscle will generate force during the contractile response as it attempts to shorten but its length will not change. This type of muscle contraction is called isometric contraction (iso - equal, metric - measure ). Isometric contraction exercises are commonly employed in physical training and rehabilitation programs to accelerate the development of muscle strength.

During isotonic contraction (iso - equal, tonic - tension ), the muscle externally shortens while the tension or force developed during the shortening remains constant. When a skeletal muscle contracts isotonically, one end of the muscle, and whatever is attached to it, moves as the muscle shortens. Movements of the skeleton, such as in walking or lifting a weight, are produced by isotonic contractions of skeletal muscle.

Under appropriate laboratory conditions, an isolated skeletal muscle, such as the frog gastrocnemius, can be stimulated to isometrically contract or isotonically contract. Generally speaking, however, in vivo contractions of skeletal muscles are often mixed. For instance, when the biceps brachii is used to lift a weight by flexing the forearm, the muscle contracts isometrically at first until it has generated a force sufficient to move the weight, then continues contraction isotonically to move the weight a given distance. The combining of isometric and isotonic skeletal muscle contraction helps to minimize unnecessary generation of force, that is, force in excess of that required to perform the task.

Student-performed exercises and experiments with contraction of skeletal muscle in undergraduate physiology laboratories traditionally have been performed using frog muscle-nerve preparations such as the gastrocnemius-sciatic nerve. A strip-chart recorder coupled to a force transducer or a displacement transducer frequently is used to record individual isometric or isotonic contractions respectively but not mixed contractions from the same muscle. A computerized data acquisition and analysis system, the BIOPAC Student Lab, now can be used to record mixed contractions of an isolated frog muscle, or in vivo mixed contractions of human forearm skeletal muscle. The student can easily record and analyze data regarding latent periods, isometric and isotonic contraction and relaxation periods, changes in muscle length, performance of mechanical work, and the influence of initial length on the ability of the muscle to do work.

In the Spirit of Discovery: Investigative Labs in Anatomy and Physiology

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Over the past decade, many proponents of science education reform have called for a new direction in laboratory education. Reports such as Fulfilling the Promise: Biology Education in the Nation’s Schools (National Research Council, 1990), Project 2061 (American Association for the Advancement of Science, 1989), and Beyond Biology 101 (Howard Hughes Institute, 1996) recommend that laboratory experiences should reflect how science is actually done and should emphasize skills such as critical thinking, interpretation and application of data; the ability to pose questions and design experiments to answer those questions; the ability to work collaboratively with a peer group; and a focus on longer-term projects. These suggestions have largely been overlooked in many anatomy and physiology lab manuals which provide “cook book type” physiology investigations and tend to overemphasize anatomy. In our poster and handouts, we provided specific examples of anatomy and physiology lab experiences that use an investigative approach and engage students in formulating hypotheses and designing and conducting experiments to test their hypotheses. These investigations require data collection, analysis and interpretation, involve group work, and cover a variety of body systems. We also showed how some of the standard, “tried and true” A & P labs, such as microscopy, diffusion in agar, osmosis, etc., can be modified to make them investigative. These labs are targeted to introductory students and can be accomplished in the context of multiple section labs. The skills developed in investigative labs are essential for health professionals who not only need a command of the factual information, but also need to know how to apply that knowledge and use it to solve problems. M
The Clerks Behind the Counter of the Education Store

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The March/April (1999) issue of the Journal of College Science Teaching includes a letter from Werner G. Heim, Professor Emeritus of Biology from The Colorado College in Colorado Springs, that raises some interesting points about some trends at educational institutions that he feels have been detrimental and have contributed to grade inflation. This article very eloquently summarizes some of the same concerns I have had about changes at my institution, Madison Area Technical College (MATC), since I started teaching lo' those many years ago.

One trend that disturbs Heim is the shift in student status toward that of a “customer” of higher education. Heim states:

This move has dislocated the grading system upward. Because even first-quality institutions increasingly compete for students and view them as “customers” rather than persons in search of education, the notion of “give the customer what he or she wants” has begun to pervade academia. And what the student wants, of course, is a high grade.

Further, this more commercial view of academia has led universities to adopt various practices from the business world, among them student (or customer) evaluation of teaching. Faculty members need good evaluations for tenure and promotion. High grades or a reputation for assigning high grades lead to better evaluations, ergo grade inflation.

Certain other pressures also arise from this new “student consumerism.” One is that an institution’s applicant pool will shrink if that institution is known to award high grades less frequently than other, similar institutions. Another is the changed view customers (formerly students) have of the meaning of grades. Students-and some administrators-are beginning to equate high grades with product quality. Students are beginning to say “If I don’t get a high grade, it’s because you didn’t teach me well” and “I pay high tuition, and I expect a high grade.”

A second trend that disturbs Heim is what he refers to as “the deprofessionalization of the professorate.” Heim writes:

Professors used to be professionals, i.e., individually responsible to their own conscience and their peers, collectively making at least the academic and curricular decisions for their institutions. This deprofessionalization is rooted in many causes, including the professionalization of higher education administration, the exercise of more power by boards of trustees, changes in the law, closer identification with particular disciplines, a persistent oversupply of candidates for academic positions, a certain disdain for ancient forms and ceremonies, and the changing economics of the academy.

Rather than being individually and fully professional and collectively the central body of a college or university, professors have in the last two or three decades become increasingly just another category of institutional employees. Consequently, their loyalty to the ethics of their profession that once gave them the means to resist grade inflation has seriously eroded. As they increasingly become merely the clerks behind the counter of the education store, they increasingly succumb to the ethics of the marketplace.

While I have never really given much thought to how the popularization of the “business paradigm” in education might result in grade inflation, I have felt very uneasy about viewing education as a business. Several things bother me about this paradigm.

One trait with which teachers must constantly struggle is the “learn me” attitude that some students have. This is the notion that the student does his/her part by paying fees and physically appearing in the classroom; it is the teacher’s role to somehow impart them with knowledge. Of course, education
is not a passive process on the part of the learner; one must actively engage one’s mind to actually learn something. Simply transferring information from the notebook of the teacher to the notebook of the student without having passed through the mind of either is transcription, not education. As my colleague D.B. Shaw is known to say, “you can’t just sit on your textbook and learn by assimilation.”

To me the business paradigm just reinforces this misconception. If, as a customer, you contract with a business to clean your carpet and your carpet is not adequately cleaned, you should get your money back. If, as a student, you contract (pay tuition) with a school to be “educated” on a particular subject and you do not adequately master that subject, should you also get your money back? There have certainly been recent examples of lawsuits filed with just that contention. We have also seen edicts in recent years from our State Vocational Technical and Adult Education Board that have told us that we cannot charge tuition at MATC to students who are taking “high school equivalent” courses, since a high school education is supposed to be free. How long is it supposed to be free? Should a student be able to take a course over and over again without cost? I would agree that if a student fails to learn what is deemed necessary or sufficient that there has been a failure of the educational process. However, the educational process involves many participants, with one of the most important being the student him/herself.

The educational institution certainly has some responsibilities to the student; but the student has his/her own responsibilities for his/her education. If the educational process has failed, it is not necessarily the educational institution that is responsible. Perhaps the student had too many demands on his/her time, or the student was ill or under a lot of stress, or the student was in over his/her head (inadequate preparation), or the student had poor study skills, or the student just didn’t put forth the necessary effort. There are a myriad of possibilities.

“Customer satisfaction” is another business concept that does not translate well into the educational environment. I have always valued students’ comments and input in the course I teach; and, over the years, I have received many good ideas and suggestions that have been incorporated into my teaching. However, student comments do not always drive what I do or how I do it. The “customer” is not always right. We receive frequent comments on our course evaluations about “trick questions” on exams. Usually this means questions that require not only the knowledge of specific facts, but also the use of those facts to answer a question not previously encountered (is the buzzword “critical thinking” now coursing through your brain?). That’s definitely “tricky” as in difficult, but is not “tricky” as in attempting to fool someone. Another “trick question” could be true-false or multiple choice questions where one of the options is a commonly held but erroneous misconception. That’s “tricky” because those who are not clear on the concept will answer it wrong. But that’s the point of the question! Do you really understand or do you just have superficial knowledge?

Heim talks about his concerns with using student evaluations as a means of evaluating instruction. Again, I would view student evaluations as one aspect of evaluating instruction; but there are certainly problems. A positive evaluation may reflect good teaching. It may also reflect a pleasing personality or, as Heim fears, a willingness to give high grades (and no “trick questions”!). Similarly, a negative evaluation does not necessarily reflect poor teaching.

Finally, I dislike the business paradigm on a gut-reaction level, because to me it deems what we do (see Heim’s comments on deprofessionalization). We teach. We are just not the “clerks behind the counter at the education store.” We don’t simply dispense a product to our customers. I would like to think that what we do and the way we do it can help our students in their quest for knowledge. Teaching is a profession - part knowledge, part skill, and part art. A good teacher has to know his/her subject matter well, have some teaching skills, and have the insight to be able to blend them together to create a good learning environment. While not insuring that students will learn, it sure helps. We are not just manning the counter.

Heim doesn’t offer any magic answer to the problems he perceives. He feels that the problems are pervasive and that it would be very difficult for an individual institution to solve these problems. I guess I can’t offer any great ideas either. Time goes on and paradigms come and go (bungee paradigms?). Hopefully, we can take what is useful from the business paradigm and not suffer too much from the negative aspects. Use what is beneficial, throw out the rest, and keep on truckin’!

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**Board Contributes to Fund**

In honor of the outgoing HAPS President Steve Trautwein (1998-1999), the Board members of HAPS presented a check for $200 for the Bob Anthony Scholarship Fund.

The Board commends Steve on an outstanding year as President and hopes that the funds contributed to the Bob Anthony Scholarship will help serve the ongoing needs of HAPS members.

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**OOOPS!! OOOPS!!**

**HAPS-ED Experiences Delivery Problems**

There were some HAPS members who did not receive their August edition in a timely manner. The printer was in the process of making software changes which resulted in some problems with addresses on the newsletters. If you have not received your August edition of the HAPS-ED, please contact the editor (Caryl Tickner, ctickner@stark.cc.oh.us 330-494-6170 ext 4915) who will ensure that you receive a copy. We apologize for the inconvenience.
Have all of the recent publishing company take-overs caused your head to spin? You don’t know WHO to contact concerning your favorite textbook? The following information was provided by textbook vendors at the 1999 Annual HAPS Conference in Baltimore and should be up-to-date. Due to space limitation, not all textbooks from each publisher are listed. A more complete listing should be available on each publisher’s web site. In the meantime, we’ll keep you posted as they keep us posted!

Publisher: **Addison Wesley Longman Science Division - Benjamin Cummings**
A&P Books Published:
- Marieb. *Human Anatomy and Physiology 4/e*
- Marieb. *Essentials of Human Anatomy and Physiology 6/e*
- Kapit & Elson. *The Anatomy Coloring Book 2/e*
- Kapit, Macey & Meisami. *The Physiology Coloring Book 2/e*
Phone Number: (781) 944-3700 x 5100
Fax Number: 1-800-284-8292
Website Address: www.awlonline.com/be/courseList/exam@awl.com

Publisher: **John Wiley and Sons**
A&P Books Published:
- Tortora & Grabowski. *Principles of Anatomy and Physiology 9/e*
- Tortora. *Principles of Human Anatomy 8/e*
Toll-Free Number: 1-800-225-5945
Fax Number: 212-850-6088
Website Address: www.wiley.com/college
E-mail Address: broesch@wiley.com

Publisher: **Kendall/Hunt Publishing**
A&P Books Published:
- Holtzmieier. *Applied Anatomy & Physiology*
- Kimbrough-Archer. *Human Physiology*
- Lenoff. *Conception to Birth*
- Pierce. *Anatomy & Physiology Lab Manual 1470*
- St. John. *Human Anatomy Study Guide*
- Bizuneh, et al. *A&P Lecture Notes I and II*
Toll-Free Number: 1-800-228-0810
Fax Number: 1-800-772-9165
Website Address: www.kendallhunt.com
E-mail Address: srooney@kendallhunt.com

Publisher: **McGraw-Hill Higher Education**
A&P Books Published:
- Van De Graaff. *Human Anatomy 5/e*
- Fox. *Human Physiology 6/e*

Publisher: **Mosby**
A&P Books Published:
- Thibodeau & Patton. *Anatomy and Physiology 4/e*
- Thibodeau & Patton. *The Human Body in Health and Disease 2/e*
- Thibodeau & Patton. *Structure & Function of the Human Body 10/e*
Toll-Free Number: 1-800-325-4177 ext. 4780
Fax Number: 314-453-4743
Website Address: www.mosby.com
E-mail Address: janet.blanner@mosby.com

Publisher: **Prentice Hall**
A&P Books Published:
- Martini. *Fundamentals of Anatomy and Physiology 4/e*
- Martini & Karleskint. *Foundations of Anatomy and Physiology*
- Martini & Bartholomew. *Structure and Function of the Human Body*
- Martini & Bartholomew. *Essentials of Anatomy and Physiology 2/e*
- Martini, Timmons and McKinley. *Human Anatomy 3/e*
- Silverthorn. *Human Physiology: An Integrated Approach*
Toll-Free Number: 1-800-526-0485
Website Address: www.prenhall.com

Saladin. *Anatomy and Physiology: The Unity of Form and Function*
Shier, Butler & Lewis. *Hole’s Human Anatomy and Physiology 8/e*
Shier, Butler & Lewis. *Hole’s Essentials of Human Anatomy and Physiology 7/e*
Seeley, Stephens & Tate. *Anatomy and Physiology 5/e*
Seeley, Stephens & Tate. *Essentials of Anatomy and Physiology 3/e*
Van De Graaff and Fox. *Concepts of Human Anatomy and Physiology 5/e*
Van De Graaff, Fox and LaFleur. *Synopsis of Human Anatomy and Physiology*
Gunstream. *Anatomy and Physiology with Integrated Study Guide 2/e*
Mader. *Understanding Human Anatomy and Physiology 3/e*
Sheeler. *Essentials of Human Physiology 2/e*
Toll-Free Number: 1-800-338-3987
Website Address: www.mhhe.com/biosci/abio
E-mail Address: webcomp@mcgraw-hill.com or heather_wagner@mcgraw-hill.com
EXHIBITORS
1999 HAPS ANNUAL CONFERENCE - BALTIMORE, MARYLAND

The Human Anatomy and Physiology Society wishes to express its appreciation for the support provided by these exhibitors:

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1949 Landings Dr.
Mountain View, CA 94043
888-965-6040

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Melville, NY 11747
800-466-5967

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+44(0)-171-434-4300

**The Science Learning Workshop**
31 South Dr.
Hastings on the Hudson, NY 10706
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**Virtual Anatomy**
624 N. 300 W
Salt Lake City, UT 84103
801-534-7545

**Zahourek Systems Inc.**
2319 West 17th Street
Loveland, CO 80538
970-667-9047
Have you ever wondered where you could obtain a standardized anatomy and physiology test? Or maybe you are thinking about an educational project and are looking for funding? Do you feel strongly about a particular issue and would appreciate an opportunity to discuss it with other HAPS members? The following committee chairs invite input from HAPS members and will willingly provide information on the activities of their committees.

ANIMAL USE COMMITTEE
Craig Clifford, Chair
Northeastern State University
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Tahlequah, OK 74464
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clifford@cherokee.nsuok.edu

A three-year plan includes widely distributing the HAPS policy statement, developing animal use internet links on the HAPS Home Page, monitoring relevant legislation, and creating a resource packet for HAPS members. Suggestions and questions from members are welcome.

COMPETENCY TESTING COMMITTEE
Sam Drogo, Chair
Mohawk Valley Community College
1101 Sherman Dr.
Utica, NY 13501
(315) 792-5409
sddrogo@mvcc.edu

This committee recently completed and tested an approved HAPS Standardized Test for Human Anatomy and Physiology. Any HAPS member may obtain a copy of the test by writing to the Chair.

CORE CURRICULUM AND ASSESSMENT COMMITTEE
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This committee has developed a second, revised edition of the HAPS "Human Anatomy and Physiology Course Guidelines." The second edition includes new guidelines relating specifically to the laboratory component of the course.

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Members of the HAPS-EDucator Editorial Advisory Board provide advisory and support services to the HAPS EDucator editor such as writing articles and proofreading the final draft of the HAPS-EDucator before it goes to press.

GRANTS AND SCHOLARSHIPS COMMITTEE
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This committee is responsible for reviewing all grant and scholarship proposals, selecting proposals to receive funding, and submitting its recommendations to the Board of Directors for approval.

MEMBERSHIP COMMITTEE
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San Diego, CA 92126-2999
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Committee members assist the Chair with recruiting members and compiling membership information.

NOMINATING COMMITTEE
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ruschin@admin.humber.on.ca

The committee chair is always the current President-Elect. The responsibility of the committee is to recruit nominees for the elected offices and appointed positions of the HAPS organization.

ANNUAL CONFERENCE COMMITTEE
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Northern Virginia Community College
3001 North Beauregard Street
Alexandria, VA 22311-5097
(703) 845-6004
nvpark@nv.cc.va.us

The primary responsibilities of this committee are development of a standardized fees structure for the annual conference, formulation of guidelines and assistance for the conference coordinator, and generation of a calendar of conference sites.

REGIONAL CONFERENCE COMMITTEE
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Trinity Valley Community College
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Terrell, TX 75160
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bracken@tvcc.cc.tx.us

Lisa Lupini, Co-Chair
Baker College of Flint, Dept. HHS
1050 West Bristol Rd.
Flint, MI 48507
(810) 766-4194
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The committee provides mentoring assistance to coordinators of regional conferences. Anyone interested in hosting a regional conference should contact the Chair.

TECHNOLOGY COMMITTEE
Martha DePecol Sanner, Co-Chair
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Jim Pendley, Co-Chair
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Imperial, CA 92251
(619) 352-8320 x 303
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The committee monitors and reports on technological changes influencing anatomy and physiology teaching, such as advances in instructional software and data acquisition equipment.

DISTANCE LEARNING POLICY COMMITTEE
Tom Lanchart, Chair
St. Peters burg Junior College
Natural Science
P.O. Box 13489
6605 Fifth Ave. N.
St. Petersburg, FL 33733
(813) 341-4797
lanchart@email.spic.cc.fl.us

This committee is responsible for developing and distributing a HAPS position paper on distance learning.

SAFETY COMMITTEE
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The Safety Committee is developing standards for safety in the laboratory.

CADAVER USE COMMITTEE
Jay Druecker, Chair
Chadron State College
1000 Main St.
Chadron, NE 69337
(308) 432-6422
jdruecker@csc1.scs.edu

The goals of this committee are to develop guidelines for use of cadavers in anatomy and physiology instruction.
HAPS 14th Annual Conference
June 9-15, 2000

Host:
UNC Charlotte
Charlotte, NC 28223

Proposed Topics:
Advances in cardiovascular studies
Ovarian cancer update
Genetics
Immunology
Advances in liver physiology:
  Mechanism of injury and repair
Building assessment tools into educational technology learning environments

Watch for updates on the HAPS web page:
www.hapsweb.org

For more information contact:
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