Strategies for Success

A BENJAMIN CUMMINGS PUBLICATION FOR SCIENCE INSTRUCTORS

SPRING 2005 NO. 43

In This Issue

About The Newsletter

Strategies for Success **is published as a service to undergraduate science instructors. It is intended to stimulate ideas, disseminate solutions to common obstacles, and update readers on recent developments and findings. We welcome comments, contributed articles, and suggestions for future issues. Please contact the Editor at strategies@aw.com or via fax at (978) 465-6658. Past issues of the newsletter are available on our Web site at www.aw-bc.com/events/strategies.**

REFINING THE LECTURE COMPONENT

A visit to a science classroom today might prompt a paraphrase of a memorable advertisement, "It's not your parent's lecture!" Yet, the art of lecturing and the craft of composing an effective lecture remain skills that our readers work hard to master and improve. In this issue, we examine one of the newest technologies being used in lecture—classroom response systems—as well as the pros and cons of one of the most established, PowerPoint. You'll also find ideas for using popular culture to connect your students to the lecture, and a way of thinking about your lecture topics to keep them fresh and thought-provoking.

The importance of this topic is also reflected in the many and varied responses we received to last issue's Sound Off question. Check out what our readers had to say about lively lectures on page 7, and send us your answer to the new question for our fall issue (see page 8).

We are deeply grateful to our contributors and to those of you who "sound off" for making this newsletter possible. It is a sincere pleasure to report on such dedication to the art and craft of lecturing and to bring you the fruits of your colleagues' efforts. May this issue help you make your lectures as enjoyable and informative as they can be!

BUT THERE WEREN'T ANY "HOLE" PROBLEMS ON THE HOMEWORK!

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Are you satisfied with how your class is going? Are the students as enthusiastic as you would like them to be? Are they learning material in the depth you expect, and can they apply what you've taught them in situations different from those discussed in class, or those met in real life? You may not know the answer to the last question. A physicist tells of spending considerable class time teaching about gravity, motion, and falling bodies. On a quiz he asked the students to figure out what would happen when an absent-minded professor walked into a large hole, and fell. Some students complained: "But there's weren't any "hole" problems on the homework!" Those students had worked many "falling body" problems, but were not able to see that dropping something to the ground or dropping something to the bottom of a hole involved exactly the same physics. They had worked the homework, but they didn't really "get it."

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But There Weren't Any "Hole" Problems

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If you answered no to any (or all!) of those questions, I'd like to recommend two strategies for success which work particularly well when combined. They are wireless student response systems ("clickers," as they are often called) and peer instruction. Clickers allow you to ask your students a question any time you want during class and get instant feedback on what students are thinking. Each student has an inexpensive wireless transmitter, usually purchased at the college bookstore. The transmitter allows a student to give discrete answers such as a, b, c, d, e, or the numbers 1-10. Receivers installed in the classroom instantly record the results and send them to a computer where they are presented as a bar chart. With an LCD projector this can be shown to the class so that everyone immediately knows what everyone else answered.

The simple use of clickers turns the passive lecture experience into an active one. When students take part they become much more involved and usually more enthusiastic. If you use some imagination in the kind of questions you pose (and Benjamin Cummings is working hard to compile good questions for all science fields), student involvement can become quite lively. For instance, every once in a while I pose a question with no right answer. An example in astronomy is the current search for life in the universe. Suppose that we hear signals someday from intelligent life. Should we a) answer – it is an amazing opportunity to learn; b) don't answer – what if they weren't friendly?; c) just listen – they are probably so much more advanced than us that they might consider us to be like insects or some lower form of life. In subjects like biology, genetics, the environment, there are many open-ended questions.

If your goal is to increase student participation "clickers" are wonderful tools. In this case it behooves you to reward wrong answers as well as right. Clicker systems let you decide how to grade. I give two points for a right answer and one point for a wrong one. (Two points if the question has no definite right answer).

It is also essential for you to describe why you are using clickers, and what your expectations are. Research I conducted at the University of Chicago (described in Appendix 2 of *Clickers in the Classroom*) showed that students believe that scientists almost always give correct answers and are rarely uncertain. This inhibits them from conjecturing what the right answer might be or from making an intelligent guess. If you want all students to participate you have to make it clear that while you are happy with a correct answer, an intelligent guess is welcomed as well. (Giving one clicker point for a wrong answer helps). The "classroom climate" is up to you to set.

One of your main goals probably is that as many students as possible learn the material deeply enough that they truly understand and remember it. In that case, I recommend the enormous power of peer instruction. Here's how it works. When you give a thought provoking clicker question, and find that only a fraction of your class gets the correct answer, you will be tempted to re-explain the subject in another way, figuring that this will teach those who haven't yet understood. While multiple explanations are certainly good, peer instruction provides a more powerful strategy. Ask your students to turn to their left and their right (in the lecture hall, right now) and convince each other who is right. Once the students understand that you really do want them to talk in class, the entire room will erupt into animated discussion – a lot like scientists talking with each other during a coffee break at a professional meeting. And that is the trick: learning from peers is very powerful, and the students are each others' peers. You have just turned them all into teachers, and we all know that teaching a subject helps you learn it. Eric Mazur describes more details in his book, *Peer Instruction: A User's Manual* (Pearson Prentice Hall, 1997), which I highly recommend. He has remarkable data on how much student learning increases. As some thoughtful students say on video he is compiling as part of his ongoing research, "Professor Mazur is a brilliant scientist and teacher – one of the best at Harvard. But of course it is preferable to learn from your peers, because they think more like you."

In my opinion, incorporating peer instruction is much more difficult than just introducing clickers. It is just plain weird, at first, to be standing in front of a large class and listening while they all talk. You may hear the complaint we have heard, "I expected you to teach me… I didn't know I would have to learn." But much research shows that this method produces more learning than any lecture. So I encourage you to experiment with spending some of your lecture time as this sort of "guide on the side," rather than always being the "sage on the stage." ■

Editor's Note: Dr. Duncan shares his research and provides benefits, tips, and techniques for using classroom response systems in *Clickers in the Classroom* (Benjamin Cummings, 2005, ISBN 0-8053-8728-5). To order a copy, please visit www.aw-bc.com.

Popular music can enliven your classroom

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No subject in the science curriculum intersects with today's popular culture more than biology. As teachers, we can take advantage of the current "golden age of biology" by emphasizing the myriad ways that curricular content relates to students' lives outside the classroom. Biology abounds in movies (travel to the Galapagos Islands with Russell Crowe in *Master and Commander* or consider a near-future society where genetic makeup determines social status in *GATTACA*), television shows (*CSI* reigns as the most popular show in America, and medical-themed shows can be seen nightly on the Discovery Channel), and music. Most students today are popular culture sponges; it is what they think about during their free time. By making references to these media, we can remind our students that biology exists outside the four classroom walls. We can also entertain and enliven the teaching/learning environment—benefits of particular importance in the non-majors introductory course, where gaining and holding students' attention can be half the battle.

One easy way to bring popular culture into the classroom is to play music before class. In my introductory courses (one for science majors and one for non-science majors), I play a song relevant to each day's lesson before the period starts. I then ask the same set of questions: Who can name the song and artist? Why am I playing this particular song today? Students enjoy the brain teaser of making the connection between the song and the subject under discussion. As a teacher, it is always gratifying to realize that students are thinking about the course material before the opening bell. This technique also allows you to create a loose, interactive atmosphere without sacrificing any actual class time.

During my lecture, I add the song (at half volume) to the PowerPoint slide that most closely relates to the song's significance. The recurrence of the song can provide an "Aha!" moment for students, and some have said that the aural connection helps them remember the topic.

There are popular songs that intersect (often frivolously) with almost every topic in the introductory biology curriculum, either through the song title, the content of the song, or the name of the artist. Some are fairly obvious ("Do the Evolution" by Pearl Jam), others require a bit more thought ("More Than Words" by Extreme, used when discussing archaea), and a few induce groans ("I've Got You Under My Skin" by Frank Sinatra when discussing anatomy, or "Tiny Bubbles" by Don Ho when discussing protists). Here are a few more:

- **Introduction to Science:** "She Blinded Me With Science" (Thomas Dolby), "Weird Science" (Oingo Boingo), "The Sounds of Science" (Beastie Boys)
- **Introduction to Biology:** "Wonderful World" (aka "Don't Know Much Biology" by Sam Cooke), "Alive" (P.O.D.)
- **Nutrition and Digestion:** "Sugar Sugar" (The Archies), "Eat It" (Weird Al Yankovich), "The Middle" (Jimmy Eat World)
- **The Cell:** "Tainted Love" (Soft Cell), "Golgi Apparatus" (Phish)
- **Photosynthesis:** "Don't Turn Off the Lights" (Enrique Iglesias), "Walking on Sunshine" (Katrina and the Waves)
- **Reproduction:** "Reproduction" (*Grease 2* soundtrack), "Let's Talk About Sex" (Salt N Pepa)
- **Cloning:** "I Think I'm a Clone Now" (Weird Al Yankovich), "Hello Dolly" (Broadway musical soundtrack)

For a list of over 60 relevant songs that I have compiled (with the help of many colleagues)—or to contribute your own suggestion to this list—please email me at esimon@nec.edu.

If you are not familiar with popular music yourself, you can easily turn this idea into an active learning exercise for your students. After you've played a few songs in class, you can offer your students one bonus point for each relevant song they suggest. Few professors would begrudge a student extra credit for actually thinking about biology during their free time!

One easy (and free and legal) way to play music in a computer-equipped classroom is to access music sites like itunes.com or amazon.com. There, you can play free samples of songs (typically 30 seconds). These sites also provide search engines that can find song titles or artist names containing relevant keywords (try entering "cell" into the iTunes search engine for a lot of interesting band names!).

While popular music is unlikely to impart content knowledge to your students, it can help grab and retain their attention, show the relevancy of the subject matter to the world around them, and perhaps even cause them to engage the subject matter outside the classroom. Among introductory students, such small victories can be significant. ■

Editor's Note: Eric Simon is co-author of *Essential Biology, Second Edition* (Benjamin Cummings, 2004) and *Biology: Concepts and Connections, Fifth Edition* (Benjamin Cummings, 2006).

POWERPOINT: FRIEND OR FOE?

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We haven't met anyone who uses PowerPoint and doesn't feel ambivalent about it—except maybe our preteen daughter and niece, who use it to make presentations like "What I Would Really Like for My Birthday this Year" or "Why I Should Be Allowed to Wear Makeup to School," complete with explanatory visuals and bullet-point justifications.

Does PowerPoint contribute to student learning or does it make our students passive and lazy? You can find arguments on both sides, although in the last two years it has been more common to hear criticism than praise. If you want to see how common PowerPoint-bashing is, do a Web search using that other ubiquitous program, Google. A recent search for "PowerPoint" yielded 17,000,000 hits. A search for "PowerPoint is evil" got 4,870 hits; "PowerPoint is good" got only 438.

The most well known and possibly most thoughtful critique of PowerPoint is a 28-page essay by Edward Tufte, a professor emeritus from Yale whose specialty is information design (available for $7 from his Web site, www.edwardtufte.com, or amazon.com). Entitled *The Cognitive Style of PowerPoint*, its basic argument is that PowerPoint oversimplifies, emphasizes form over content, and creates passive audiences. On the flip side are arguments that PowerPoint is just a tool—a tool that can be used well or poorly, depending on the skill of the user. Our experience is somewhere in between. We prefer to think of PowerPoint as a lesser demon; useful if carefully controlled and constantly monitored, but capable of taking over a classroom and destroying active learning and critical thinking. We will start with what is good about PowerPoint, and how PowerPoint can contribute to learning in your classroom.

PowerPoint: Friend

PowerPoint can help you make your lectures more organized and easier for students to follow.

If you tend to go off-topic easily, PowerPoint's built-in structure can help you stay on track. If you have trouble gauging how much content you will be able to cover, a few weeks of using PowerPoint will give you a good estimate of the number of slides you can get through per class. If you don't write clearly on the board, or if your classroom is so large that students in the back have difficulty seeing the board, you can create PowerPoint slides listing the most important concepts in your lecture, helping students take better notes. Our colleague MerriLynn Casem inserts questions and discussion prompts between content slides to allow for more thoughtful comprehension checks than simply "Any questions?"

You can increase the quality of the images you present to your class with PowerPoint.

Particularly in large lecture halls, students are often unable to clearly see images shown on an overhead projector. And who has the time or technical support to make slides these days? If you are having students work with data or figures, you can show it in PowerPoint to supplement their handout. You can then lead them through the handout and emphasize points that might be lost in a black and white photocopy. In addition to static images, you can layer figures and graphs and incorporate animations directly into a PowerPoint file. We have found that students understand some concepts, such as mitosis, meiosis, and DNA transcription and translation, much more easily if they are first shown an animation of the process, then introduced to each step with a static image, then re-shown the animation.

You can easily provide students with lecture notes in a variety of formats.

If you are teaching a content-heavy course, such as anatomy, providing lecture notes before class will allow you to cover more material in each class session, since you don't have to slow down so that students can write down everything you have said. On the other hand, students do not get the experience of translating your lecture into their own words during note-taking, which research has shown to increase retention. Offering lecture notes also helps students prepare for exams. We have many first-generation college students, and students from not-so-great high schools, and they need a lot of support as they learn to take class notes and study for university exams. The structure of PowerPoint lecture notes (see above) helps them identify what is (and is not) critical in our lectures. Offering lecture notes is also helpful to students who miss a class. We are on a commuter campus with many non-traditionally aged students, and they sometimes miss class through no fault of their own, because of traffic tie-ups or family emergencies. Being able to print out PowerPoint lecture notes makes their already difficult lives a little less difficult. One caveat: students sometimes believe that, because they have access to lecture notes, there is no need for them to come to class.

Let's now discuss some of the problems people have with PowerPoint, and ways that it is possible to minimize these problems. We will discuss these poten-

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PowerPoint: Friend or Foe?

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tial difficulties in the order that you are likely to experience them.

PowerPoint: Foe

The initial investment of time to turn your lectures into PowerPoint presentations can be high.

This includes time to turn slides into digital images, to scan photos, to prepare graphs and other figures, and to outline your lecture. Be sure to schedule enough time—either between terms or with release time—to do this. Many universities have mini-grants or offer workshops to support incorporating technology into teaching. If yours does not, you might speak to your department chair or dean about support. After you have learned how to work in PowerPoint and developed your presentations, it does not take much time to update or modify them. It is easy to then become obsessed with tinkering—adding bells and whistles such as elaborate slide templates and fancy transitions. Beware. This can become an enormous time sink and it is well documented that these flourishes interfere with students' understanding of the material. It is unfortunately much less easy to completely re-think a lecture when it is already set up in a clear, compelling, linear way. More on this in the fourth point below.

There are many potential technical problems that can interfere with a successful PowerPoint presentation.

From the file itself, to the software program, to your computer, to your computer's interface with the projection system, to the projection system, there is many a slip between cup and lip. You never run out of chalk, the worst thing that happens with an overhead projector is that a bulb burns out, but everyone has experienced "the blue screen of death." The standard recommendation is to have overhead transparencies to back up your PowerPoint slides. We don't do this, because we are often updating our PowerPoint presentations minutes before class time. It also feels wasteful. What we do is print out a copy of our presentation in "Notes" format. Since we try not to design lectures that are too dependent on visuals, this has worked for us. You can amuse students by saying, as Eric Simon of New England College does, "Today you get teaching—UNPLUGGED!" (If you don't understand this reference, ask your students.) Before classes begin, you should do a couple of trial runs in your assigned classroom, so you don't hysterically call in tech support when you have plugged in your laptop to the wrong outlet or something similarly embarrassing. (Always be nice to your tech support, because you never know when you will need them.) Incidentally, students are very unforgiving of these technical glitches and this will show up on your evaluations, even if it isn't your fault.

It is very easy to include too much material in PowerPoint slides.

As you develop your presentations, keep chanting "Less is More." Students want to write down everything on a slide. You will know you have written too much if there is a chorus of "Wait! Go back!" when you move on to the next slide. A slide should only include an outline of the points you want to make, not complete sentences. Watch the font size on your slides—PowerPoint automatically decreases it as you add content, a clue that you have too much content. Another sign of too much content is if students in the back of the classroom have difficulty reading the slides. Similarly, figures and graphs should not contain too much information. Tell students when the figure can be found in the textbook or elsewhere—this will alleviate their anxiety about getting it all down. You will probably want to simplify any PowerPoint slides that come with your textbook. In our experience, these contain far too much information per slide, but they are modifiable.

The most serious problem with PowerPoint is the ease with which it becomes the focus of the classroom.

Have you ever tried to converse with someone while a television is on? It is very difficult to stay focused on the conversation. PowerPoint can have a similar effect in the classroom. Rather than being referred to as needed to support your lecture or guide students in group activities, a PowerPoint presentation seems to draw all eyes toward it, all the time. If you are at all tired or distracted, you may find yourself reading from the screen. If this happens even once, students will believe that they can get just as much from the PowerPoint lecture notes and will miss class in droves. Consider turning off the projector when you do not absolutely need to have a slide up. The downside of this strategy is that we have had difficulty re-starting a presentation after turning it off. A related problem is that dimming the lights to help students see the screen can put them to sleep. This is especially problematic for early morning classes and those immediately after lunch. Sleepy students are passive students. It is easier to keep the lights up if you have simple figures and stick with large, black print on a white background. Finally, the clarity and linearity of a PowerPoint presentation make

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it less likely that you will explore interesting possibilities brought up by student questions, and this can squelch discussion. After a few class meetings like this, students will become less active participants in the classroom. This requires constant vigilance. You may want to schedule "Unplugged" class meetings to maintain an interactive atmosphere.

The Bottom Line

We keep using PowerPoint, even with our many concerns, mainly for the ability to show better quality images to our large (100+) classes. Once a year or so, we say that we're not going to use it anymore, because it is so easy for it to become the focus of the classroom experience, rather than the support for good teaching, active learning and critical thinking that it should be and can be. But then, to paraphrase Al Pacino in *The Godfather*, "Just when you think you're out, PowerPoint pulls you back in." So if, like us, you are already a PowerPoint addict, we suggest following our instructions for minimizing the dangers. If you are considering adopting PowerPoint, make sure that it is for the right reasons. If, on the other hand, you feel that you "ought" to use PowerPoint (because all your colleagues are, or your Dean wants you to be more tech-savvy), we recommend that you introduce Personal Response Systems (aka "clickers") into your classroom instead. In our experience, clickers involve a bit more investment in start-up time, and they have more technical problems, but they can significantly increase the quality of learning in your classroom. "Clickers are evil" got only one Google hit—the minutes of a fraternity meeting. ■

Editor's Note: The author would like to thank MerriLynn Casem, Bill Hoese, Judy Kandel, Elaine McClanahan, and Joyce Ono for their contributions to this article.

Freshen lectures by connecting unrelated concepts

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For most students, the concept of "lively lectures" is as meaningful as the thunderous silence we experience at the end of most lectures. It is an oxymoron. Unfortunately, some instructors still approach the act of teaching using the Middle English concept of lecture—"the act of reading". Worse are those who have adopted Webster's second definition, "a lengthy rebuke or scolding." We fare no better when we investigate the synonyms for the word "lively"—and there are many: vigorous, full of spirit, marked by animated intelligence, invigorating, refreshing, sparkling, effervescent, dynamic, full of life and energy." Need I continue? Each of these words suggests the single ominous antonym for the word, namely DULL!

Following my own advice to communicators, I will address my remarks to the audience for whom this newsletter is written: those who are willing to work to become better at their craft! When I die, "dull as a doorknob" would not be my preferred epitaph! And while technology has added the possibility of innovation and freshness to the classroom, a bad teacher will be a bad teacher whether they have a piece of chalk or a laser pointer in their hand.

I will use *Darwin's Concept of Natural Selection* to illustrate one way to freshen your lectures. We all know what needs to be presented, and even how and where it is covered in our text. But sometimes a change of place and context will add a refreshing element of interest to our presentations. Why not put this essential concept in the context of the equally important concepts of biotic potential and population growth curves? And then add a dash of information on Darwin's ability to do lateral thinking? Do I have your attention now?

Let's see how this can apply to the five essential parts of Darwin's thinking.

1. Populations tend to increase at an exponential rate.
2. Over time, populations tend to remain remarkably constant.

These are obviously ideas Darwin gleaned from the famous essays on human populations penned by Thomas Malthus. In modern terms, number one above is the J-shaped curve for biotic potential, while number two is the S-shaped curve for normal population growth and stabilization. Hence, we have a curve representing potential growth and one representing real growth. For me, cockroaches work well here, but you can use whatever great example of exponential growth excites you. In each case, there is the potential for billions in a short period of time, yet the reality is far less than the potential. The difference between the two curves is best explained by individual competition for limited resources. Thus Darwin's third idea:

3. Competition exists between individuals of a species.

The beauty of this approach is that we can add the concept of lateral thinking. Leaving the ideas of Malthus, Darwin shifts to his experience with the artificial selec-

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tion techniques used by breeders. From this experience he deduces his fourth idea and conclusion:

4. No two individuals in a population are exactly the same genetically, thus:
5. Those individuals with the most favored genetic characteristics will survive, passing these characteristics to their offspring, and subsequently changing the genetic makeup of the population.

And what is the importance of adding lateral thinking to the process? Most of us just keep digging deeper in the same hole when stymied by some difficult problem. What characterizes the genius of Darwin and others like him is their ability to dig a new hole and then connect seemingly unrelated concepts. When a World War II bomber crew lost their hydraulic fluid to flak, they were saved because someone shifted their thinking and suggested that the hydraulic system be filled with urine instead—something they could produce themselves. Darwin was able to connect seemingly unrelated concepts from genetics and population studies to develop his now famous concept of natural selection!

Perhaps this strategy will stimulate you to consider new approaches, ideas, and technologies in your lectures—things that bring to the classroom and your students your passion and excitement for the subject! ■

OUR READERS SOUND OFF … LIVELY LECTURES

Here is a selection of readers' responses to, "How do you enliven your lectures?" To read more and longer versions of the responses, visit www.aw-bc.com/events/strategies.

I invite two guest speakers from the community to speak on a topic which relates to the current material. For example, after we covered the skeletal system, the Director of Emergency Services for Erlanger Hospital and the Emergency Medical Services staff came in and talked about fractures.

—Jane Wallace, University of Tennessee at Chattanooga

Magic is a hobby of mine and chemical magic can easily be used to supplement lectures. Non-chemical magic tricks can also be adapted to chemical topics on occasion. Contact a local magic shop or magic organization in your area for ideas.

—Jim Braun, Clayton College & State University

I sometimes have students get in groups and review the material by being creative—creating games, contests, etc. One group last week based their game on *Who Wants to Be a Millionaire* and one of the lifelines was "consult the teacher." They reviewed the concepts very well!

—Kaki Bates, Chattanooga State Technical Community College

I play "Speed ID" in my Anatomy class. I spend two to three minutes flashing PowerPoint slides of anatomical structures. We go around the room and have students call out IDs. I time it just for fun.

—Cheryl Black, Aiken Technical College

I always have a different student bring a news article or miscellaneous topic to discuss during class. I've had great discussions on Splenda and Orange Glo.

—Carnetta Skipworth, Western Kentucky University

I include a variety of special topics of relevance to Chattanooga students by introducing them with a photo in a PowerPoint "teaser" slide, which I then incorporate into the day's topic. I also use a number of props and demonstrations.

—Richard Clements, University of Tennessee at Chattanooga

Collect short video clips (humorous and less than two minutes) and show them at the beginning of lecture (to get their attention) or at the end (to keep them expecting the next class). The Internet is a good source for clips, but check for copyright restrictions.

—Edna Steele, Converse College

I incorporate forensic technology/applications into lecture. I adapt a forensic anthropology technique to teach bones and markings.

—Lynda Leppert, The University of Memphis

When discussing resonance structures in organic chemistry, I stress the that the "actual" structure is an average of the resonance structures. I give the analogy of a mule being an average of a horse and donkey. A male doesn't switch back and forth between donkey-horse, donkey-horse. The students find this analogy humorous.

—Susan F. Hornbuckle, Clayton College & State University

I play "Pass the Chalk." I write a list of terms on the chalkboard or overhead transparency. I pick a number and go to the gradebook to find the student's name by that number, then pass the chalk to that student. The student will choose any term from the board, define or identify it in some way, and, if it is correct, cross out that term. The student then picks another to pass the chalk, and the game continues.

—Janet Gaston, Troy University

In the news

Many instructors find that students are more engaged in learning about science when the course material is related to current events. In our next issue, we'll share ideas on this topic and your responses to the question:

How do you incorporate current events into your life science or chemistry course?

Sound Off entries will be entered in a random drawing to receive a $100 American Express gift certificate. To enter, please send an e-mail to strategies@aw.com, or fax your response to 978-465-6658 by August 1, 2005.

The ongoing legacy of Neil Allison Campbell (1946-2004)

Neil A. Campbell, 58, devoted husband, father, brother, gifted educator, and world-renowned author passed away from complications following a heart attack on October 21, 2004. Dr. Campbell was a source of inspiration for many, and all of us at Benjamin Cummings are better for having worked, lived, and laughed with him.

Ever the visionary, Dr. Campbell leaves behind a rich legacy of scholarship and an immeasurable contribution to the education of millions of students of biology at the high school and college levels. Now his work will be carried forth by his team of dedicated co-authors and editors, who will keep alive his exceptional body of work and continue to interpret the field of biology for students around the world.

A Memorial Scholarship Fund has been established in Dr. Campbell's honor to recognize and support undergraduate students who aspire to pursue an education in the sciences at the University of California at Riverside. Please see the next column for details of other scholarship awards that are sponsored by Benjamin Cummings.

Student scholarships

Do you know of an outstanding student to nominate for a Benjamin Cummings scholarship award? For the online nomination forms and details, please visit www.aw-bc.com/scholarships.

- The Biology Prize Scholarship gives 4 student grants of $1,000 each; nomination deadline is May 6, 2005.
- The Environmental Science Scholarship gives 10 student grants of $500 each; nomination deadline is June 6, 2005.
- The Allied Health Student Scholarship gives 5 student grants of $1000 each; student applications are due November 1, 2005.

Upcoming conferences

ASM Conference for Undergraduate Educators
June 3–5, 2005, Emory University, Atlanta, GA
www.asmcue.org

American Society for Microbiology (ASM)
June 5–9, 2005, Atlanta, GA, www.asm.org

Human Anatomy and Physiology Society (HAPS)
May 28–June 1, 2005, St. Louis, MO, www.hapsweb.org

230th American Chemical Society (ACS)
August 28–September 1, 2005, Washington, DC
www.chemistry.org

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