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Conflict & Controversy in Science

Finding the Teachable Moment

Today's headlines provide endless opportunities to turn students on to biology. In any given week, our students are likely to see or hear news stories about biological weapons, genetically-modified foods, stem cells, and a host of other subjects that involve the life sciences. Our challenge, as teachers, is to use these resources from the media to harness our students' natural curiosity in a way that helps them to understand the relevance and personal importance of truly understanding biology.

As many teachers know, the mere act of bringing today's controversies into the classroom doesn't always make for quality teaching. Without adequate preparation, students may just posture, taking positions without any interest in seeing another point of view or in learning the science behind the story.

The key is finding the "teachable moment," the point at which students are ready and willing to act on their interest in a headline-grabbing story to actually explore the science behind it. There's no perfect way to do this every time, but there is a growing list of resources designed specifically to make this possible.

In our textbook, Joe Levine and I have written a total of 18 special "Issues" and "Science & Society" pages for the Dragonfly book, focusing on everything from the privacy of genetic information to the use of herbal drugs and stimulants. Many of them deal with highly-controversial issues such as stem cell research and GM foods, and others introduce new technologies that will affect the lives of your students in the years ahead. The Issues features present the scientific background of a story, and then present two contrasting views for students to consider.

Taken by themselves, these features make it possible for you to bring the headlines into your classroom and laboratory, and our book's Teachers' Edition is filled with helpful hints of how to lead student discussions and projects based on each of 18 pages. Today's students, however will want to go farther. That's where the web comes in. Joe Levine and I have put together detailed resource pages for each and every one of these features on our own personal web site.

Visit **millerandlevine.com** and click on the home page for the Dragonfly book. Right on the front page you'll see a pull-down menu listing each of the 18 features for our textbook:

Click on any of the features, and you'll be taken to the resource page that Joe and I have put together to supplement that feature for you and for your students:

For example, one of the issues we have written into the Dragonfly book (on page 484) is whether or not our country should vaccinate everyone against the threat of a bioterrorism attack using the smallpox virus. This is a complex issue, since vaccination itself carries considerable risks. What we've done is not to tell your students the "right" answer, but rather to assemble the resources they can use to help make up their own minds.

Click your way to our page on this issue, and you'll find links to the CDC and other research labs on the issue of bioterrorism. We've given students point-counterpoint articles weighing the risks and benefits of vaccination, and we've even included material on the history of smallpox and Albert Jenner's first vaccinations against the disease. In short, there's everything you would need to energize your

students to research the nature of the disease, the history of vaccination, and finally the crucial question of what we as a society should do to protect ourselves against a bioterrorism attack.

Incidentally, you don't need to be a user of our textbook to make use of this web site or these pages. Each of them includes a printable copy of the Issues page, so if your class is using a different book you can simply print the page out as a handout for your students, and use the web-based resources as a supplement.

Other Resources on the Web

The features built into our textbook represent only a tiny fraction of the resources available on the web for instructors who wish to bring controversy into the science classroom as a teaching tool. I've described several other resources below. For today's workshop I've set up a page with hot links to each of them at my web site: http://www.millerandlevine.com/controversy

SCOPE

http://scope.educ.washington.edu/

Make no mistake about it — if you're seriously interested in using controversy as a regular teaching too, SCOPE is the place to start. You'll have to sign up for a password (which is free) so that the folks running this NSF-sponsored project can document the numbers of instructors using the resource, but once inside the instructor's portion of this site you'll find resources on 6 different areas of controversy within science, hints on how to incorporate them into your classroom and lab, and even a discussion forum where you can exchange how-to (and how not-to) hints with other teachers around the country.

Whether it's Global Warming, GM foods, DNA and privacy, or some other issue, SCOPE, based at Washington University in St. Louis is the one national project dedicated to supporting the use of controversy as a teaching tool in high school biology. SCOPE also has its own national staff, available by e-mail, to help you with the implementation of controversy-based lesson plans.

Science Friday

http://www.sciencefriday.com/

Science Friday is an NPR radio program that is broadcast nationally on public radio stations each Friday afternoon at 2 PM (Eastern time). While you may not be able to listen to the program live, SciFri has a great web site that contains on-demand audio archives of all previous shows. A quick tour through that archive will enable you to find resource material (in addition to the programs themselves) to supplement your teaching on a wide variety of controversial subjects. The SciFri archive can be used for individual student work on special projects, or as "assigned listening" for a whole class. Programs over the past few months include:

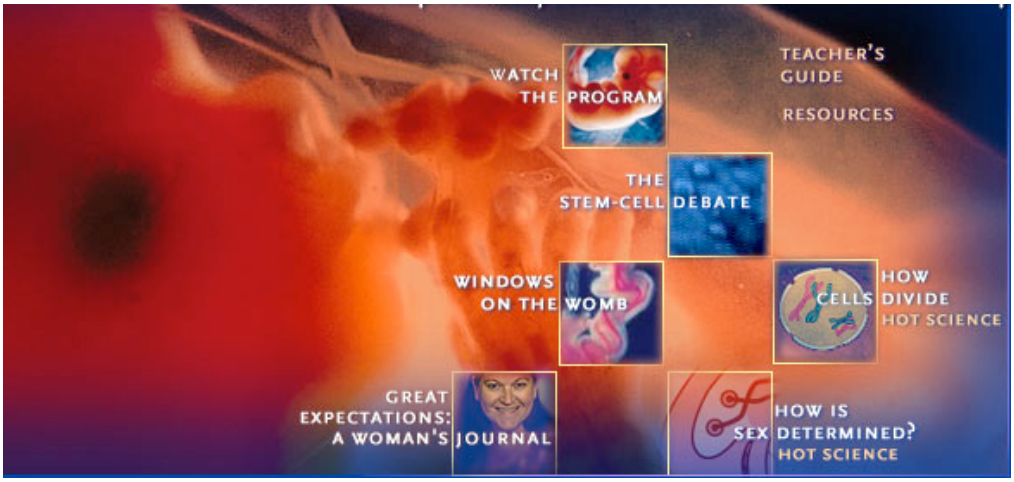
March 2, 2007: Patenting Genes / Gardening / GM Plants
March 9, 2007: Declines in the wild bee population
March 30, 2007: Global climate change / Dinosaur extinctions & the rise of Mammals
April 6, 2007: Converting banked blood from one blood type to another
April 27, 2007: Updates on stem cell research

The Story of DNA

http://www.pbs.org/wgbh/nova/photo51/

In 2003 NOVA aired a wonderful program on the role that Rosalind Franklin played in helping to solve the structure of DNA. Besides the videotape (which is available from the WGBH-TV in Boston), I strongly recommend the web site for the program , which contains a number of interactive features and QuickTime video clips from the show.

Stem Cells and Human Development



http://www.pbs.org/wgbh/nova/miracle/

Several years ago, NOVA aired an excellent program on human development, featuring the role of stem cells in differentiation. The web site for the program is an excellent resource for anyone interested in helping students to understand the scientific background of the stem cell issue.

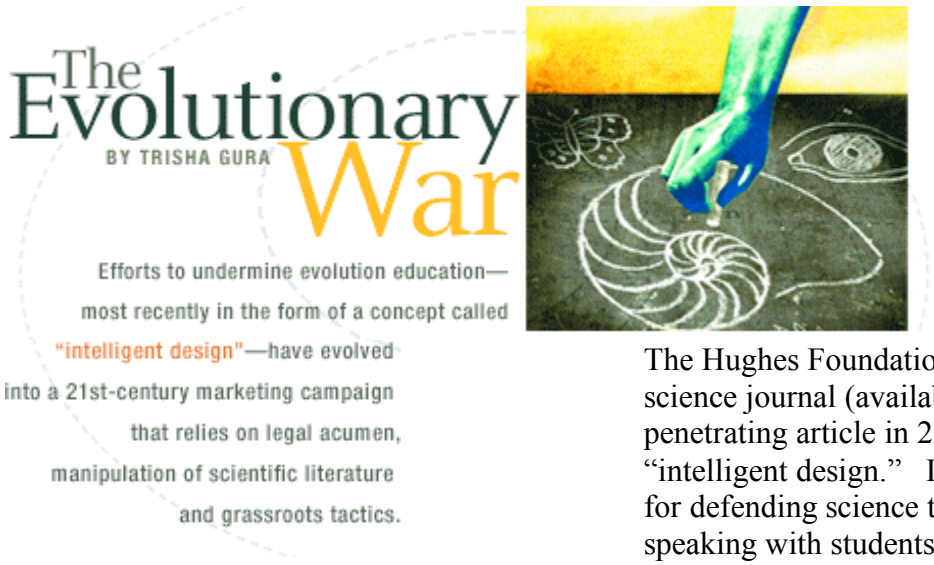
Resources on Evolution

http://www.pbs.org/wgbh/evolution/

The web site constructed for the 2001 NOVA series on evolution is by far the best interet resource available for the teaching of evolution. Segments of the web site deal extensively with the controversies surrounding the teaching of evolution, and contain resources that can be used by students for whom evolution presents serious religious and ethical issues.

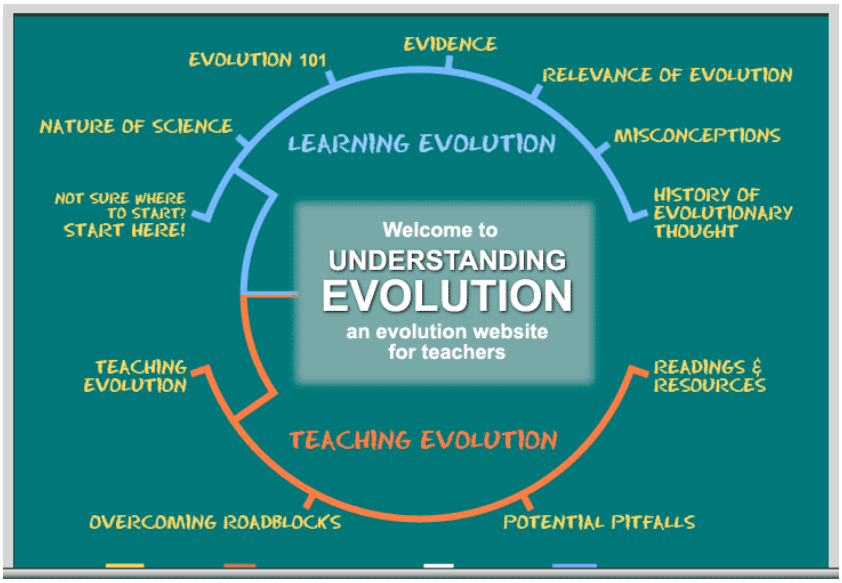
http://www.becominghuman.org/

Donald Johansen, the discoverer of the famous Lucy fossils, has established an organization to promote education on human ancestry. Becoming Human, the organization's web site, is filled with educational resources, teaching tools, and even interactive games that your students will enjoy.



The Hughes Foundation's regular on-line science journal (available for free) wrote a penetrating article in 2002 on the issue of "intelligent design." It's an excellent resource for defending science that may be useful in speaking with students and parents concerned about evolution

http://www.hhmi.org/bulletin/sept2002/evolution/index.html



Cal-Berkeley's museum of Paleontology has constructed a web resource on the teaching of evolution (and associated controversies) designed specially for teachers. The lesson plans, hints, reading, and resources are especially valuable for anyone bold enough to use evolution as an example of scientific controversy.

http://evolution.berkeley.edu/