Exploring New Ways of Knowing - Preparing Youth for the 21st Century

CANADIAN INTERNATIONAL YOUTH LETTER

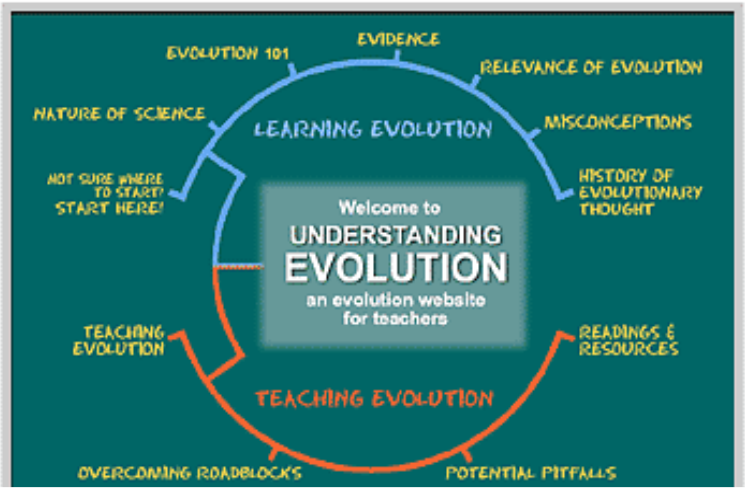
Sciences & Humanities ♦ Innovation & Sustainable Development ♦ Technology & Global Bioethics

Understanding Evolution

This universe of which we human beings are particles may be defined as a living, dynamic process of unfolding. It is a breathing universe, its respiration being only one of the many rhythms of its life. It is evolution itself. Although what we observe may seem to be a community of separate, independent units, in actuality these units are made up of subunits, each with a life of its own, and the subunits constitute smaller living entities. At no level in the hierarchy of nature is independence a reality. For that which lives and constitutes matter, whether organic or inorganic, is dependent on discrete entities that, gathered together, form aggregates of new units which interact in support of one another and become an unfolding event, in constant motion, with ever-increasing complexity and intricacy of their organization. The unity of nature, the unity of knowledge, and the unity of humanity are but three aspects of a single reality. Each aspect helps to justify the others.

Ruth Nanda Anshen, Founder, World Series Perspectives in Humanism: The Future of Tradition

The debut in February 2004 of a new University of California, Berkeley, Web site devoted to evolution provides a much-needed resource for teachers as schools across the USA are being challenged to kick evolution out of the classroom or pair it with instruction in non-scientific alternatives, such as "intelligent design." The "Understanding Evolution" website is funded by the National Science Foundation and the Howard Hughes Medical Institute (HHMI) and created jointly by UC Berkeley's Museum of Paleontology and the National Center for Science Education.. It debuted just as Georgia's Superintendent of Education advocated eliminating the evolution "buzzword" from the state science curriculum and the Ohio state Board of Education voted to include some aspects of intelligent design in lesson plans about evolution.



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For teachers caught up in the imbroglio, or those who just want to brush up on their understanding of the theory or find an engaging lesson plan for their students, the Web site is the place to go. "Many K-12 teachers don't have a strong science background, so there is some discomfort in teaching evolution, which is perceived by some as controversial," said Judy Scotchmoor, director of education and public programs at the UC Museum of Paleontology and a 25-year veteran of 7th and 8th grade science classrooms. "We provide a comfort zone. Teachers can use this Web site to increase their confidence level so they can teach evolution enthusiastically in the classroom."

One Tennessee science teacher who stumbled on the new site e-mailed the museum with his praise. "Your gorgeous, content-rich site absolutely knocked my socks off! Don't know who the genius was who knew exactly what middle-schoolers would be interested in while learning real science, but I am totally impressed! The content is superb and the graphics beyond belief." Scotchmoor and UC Berkeley integrative biology professors David Lindberg and Roy Caldwell worked closely with six teachers and numerous graduate students to assemble a site that would be "a one-stop shop" for teachers, and eventually students and the general public, on the theory of evolution. "We're dealing with evolution as a science and how it fits into today's society," said Lindberg, who also is chair of the UC Berkeley Department of Integrative Biology. "We see and read about evolution in action all the time, but we don't often think about it."

The site is replete with practical examples of how evolution impacts our daily lives, including lesson plans about bunny breeding, the problem of antibiotic resistance in disease organisms, and the conservation and breeding of endangered species.

"To understand why we have to get a yearly flu shot, or why we need to manage rainbow trout and steelhead populations together, you have to understand evolution," Lindberg said.

One of those who worked on the project, Al Janulaw, an elementary and middle school science teacher for 32 years, thinks that many teachers are reluctant to teach evolution and, as a result, present it as just one explanation among many for change over time.

"When I look out at my middle school students, I tell them that this is the history of life on Earth, but I think it's common for other teachers to be more wishy-washy about it," said Janulaw, the immediate past-president of California Science

Teachers Association and co-director of the North Bay Science Project located at Sonoma State University. "The intent of this Web site is to give teachers a background understanding of evolution, opening the door by giving them strategies for teaching and responding to misconceptions and roadblocks."

Lindberg noted that the site avoids a defensive or confrontational attitude toward those who do not accept evolution. Suggestions on dealing with religious or other objections are offered in a respectful way in a section called "Overcoming Roadblocks." Nevertheless, the site is clear that "There are no alternative scientific theories to account for the observations explained by evolutionary theory."

The heart of the site is Evolution 101, which can serve as a primer to evolutionary theory or an intensive course in the nitty gritty details of speciation, micro- and macroevolution, and ongoing research into how evolution happens.

"This is what every science teacher should know about evolution," Scotchmoor said. "There are textbooks that cover the process, but we put it all in there, including discussions about the nature of science and the history of evolutionary thought, which has built on itself from the 1700s to today."

"Textbook publishers must market to many states, so you're going to get common-denominator coverage of evolution," Lindberg said. "We deal with evolution as a science."

Anna Thanukos, who recently received her Ph.D. in science and math education from UC Berkeley and who drafted most of Evolution 101 over the past two years, said that it "provides context for teachers. Even if teachers plan to discuss only the tip of the iceberg of evolution, to teach effectively they need to understand all parts of the iceberg."

One of the knottiest issues the site's creators dealt with was how to define evolution. Even Lindberg and Caldwell, the scientists on the development team, initially couldn't agree on a definition. After many brainstorming sessions, they finally agreed on a concise and compact definition: descent with modification, both in the short run, as gene frequency changes from generation to generation (microevolution), and over many generations, leading to new species (macroevolution). This definition distinguishes evolution from mere "changes with time" - a phrase Georgia wanted to substitute for evolution - and emphasizes a central theme of the theory of evolution, that we all share common ancestors, Scotchmoor said.

One of the "coolest" parts of the site, according to Thanukos, is the ability to search for lessons aimed at various grades. A second grade teacher, for example, can find 18 lessons that teach some aspect of evolution, from simple exercises that get kids to use their senses to explore the natural world to elementary displays of the concept of geologic time and extinction.

More than 900 teachers across the country are now part of the evaluation process as the development team continues to improve the Web site. HHMI's funding was primarily to build on the teacher site to develop companion sites for kids and for the public. In doing so, the team is experimenting with evolution comic books (one is titled "Survival of the Sneakiest"), the first of perhaps hundreds of personal stories about ongoing research on evolution, more online lesson modules for teachers, and video and Flash graphics to enhance the photos and cartoons now illustrating the site.

"This site is a long-term investment," Lindberg said. "We believe firmly that the way to ensure that evolution is taught in schools is to give teachers the resources, information and activities that they need to do a good job teaching evolution. This is a proactive stance, not reactive." Eugenie Scott, director of the National Center for Science Education (NCSE), praised the efforts of Scotchmoor and her collaborators. For Scott, the evolution Web site offers an alternative to fighting the constant anti-evolution flare-ups around the country - in seven states, at last count.

"What we do at NCSE is hand out fire extinguishers to help people address anti-evolution issues," Scott said. "But what we'd really like to do is cut the brush. If people just understand what evolution is, and that nothing bad happens when their children learn evolution, then hopefully we won't have so much controversy."

http://evolution.berkeley.edu

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