Doing Biology
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National standards and many states’ curriculum frameworks now refer to teaching of the “history and nature of science.” The SHIPS (Sociology, History and the Philosophy of Science) Resource Center at the University of Minnesota has sought to provide classroom resources that address these content standards. One of those resources is the recently released Doing Biology CD and companion Web site (http://www.doingbiology.net). The Web site states:

We present 17 historical cases studies in a guided inquiry format. We have aimed to address several proposals for reforming science education. Textbooks teach biological content. We want students learn more: about the history and nature of science, about science in practice....

Doing Biology is a textbook disguised as a digital resource. The CD is organized into 17 chapters. Each chapter features a PDF of one of the chapters from the 1996 release of the Doing Biology textbook. The CD and associated Web site are virtually identical. The resource is user friendly, with easy-to-follow links to each chapter’s PDF. An index of science “themes” is provided to assist teaching by linking scientific ideas to specific stories. For example, the idea “burden of proof” is visited in chapters 6, 12, and 17. The Web site displays a table of contents with individual scientists’ stories arranged in four broad headings: Evolution & Diversity, Cellular Biology, Organismal Biology, and Ecology & Behavior.

Each of the chapters provides detailed historical perspective and background information for a specific scientific discovery or breakthrough. The stories of the personalities of the scientists are told with a clear voice. The book does a very good job of explaining how wildly unpopular and controversial ideas can become mainstream scientific thought in a relatively short time and why ideas that are commonplace today may have been unpopular when originally proposed. All in all, these stories make for pleasant and informative reading. While the stories are compelling and interesting for those who wish to know the personal story behind the discovery, the CD and companion Web site do very little to bring those stories to life. Each PDF chapter is 10–15 pages of scanned text. The textbook chapters, albeit well written, are difficult to read because of scan quality issues. The “guided inquiry” format mentioned in the preface is nothing more than strategically placed framing questions printed in bold type. In traditional textbook style, each chapter is followed by several questions for assessing comprehension. For something that proposes to help us teach “outside the textbook,” this looks and feels very much like a textbook.

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Evolutionary Evidence
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Evolutionary Evidence is an original, intelligently designed, amusing and informative part of SimBio’s instructional series, Virtual Labs. The CD-ROM comes with a student workbook with easy-to-follow, step-by-step instructions. Evolutionary Evidence is divided into five exercises: Organizing Organisms, Designing Lizards, Evolving Lizards, Predicting Patterns, and Testing Darwin’s Theory, each with its own screen selected from a pop-up menu. Evolutionary Evidence uses a “laboratory notebook” grid as a background, a sort of gameboard. There is also a set of tools (select–arrow, delete–trash, copy–camera, pencil, and spade) for the student to click on and employ, and a control panel that “advances” and “stops” time, simulating evolution.

The first exercise screen, Organizing Organisms, instructs the student in the basic strategy of the CD, which involves three steps: (1) identifying traits, (2) grouping organisms with shared traits, and (3) inferring ancestral relationships between the organisms. Organizing Organisms displays pictures of seven organisms of varying degrees of complexity, from amoeba to bird. By double-clicking on a picture, the student views a pop-up window with a list of traits (eukaryotic cells, amniote egg, jaws, etc.) belonging to that organism. The student then infers relationships among the organisms by comparing their shared or absent traits and uses the pencil tool to show these relationships by making connecting arrows or surrounding the pictures with rings (lines can vary in pattern, length, and color). The copy–paste feature, “camera,” allows the student to “photograph” her lab notebook page with pictures and ancestry diagrams and insert it into a word document for later viewing.

In the next two exercises, Designing Lizards and Evolving Lizards, the student is invited to “design” lizards, choosing from an eight-trait palette, adding traits in sets of two and three to a base-model lizard that is shown on five different islands. If the student selects “dewlap,” the lizard immediately changes its appearance – eye candy in service of an important idea. The student continues to modify the other plain lizards on the four remaining islands, making sure that each lizard differs from the previous one by at least one trait. Then the passage of time is simulated, causing the different lizards to multiply like crazy on each of the islands. As in the first exercise, the student is asked to look for patterns, grouping lizards with similar traits.

The fossil record makes its appearance in the form of a pit, in which lie the remains of 720 years of lizard evolution on seven islands. In the exercise Predicting Patterns, the student is presented with a nested series of lizard traits whose order of evolution is predictable and the spade tool for unearthing the buried traits. The student predicts the level the student will find the remains of each lizard and then ‘digs’ them up. If the student’s predictions are correct, the spade reveals the trait. This is a connect-the-dots lesson in which the inference of ancestral relationships among the lizards leads to the understanding that the traits shared by the fewest lizards must have evolved the most recently, and the converse.