

## ENVIRONMENT-FRIENDLY EDUCATIONAL TECHNOLOGIES

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Shall we continue to sacrifice or inflict painful treatments on innocent animals in the name of science? Shall we continue to pour polluting waste chemicals into the environment? We face a dilemma because, though crucial to learning, scientific investigations often infringe on animal rights and produce toxic by-products. **With the help of educational technology, however, teachers can reduce, refine, and replace, and yet continue to effectively pursue, the study of life and physical sciences.**

A couple of years ago, I took a course on the use of animals in research. The most important thing I learned was the need to avoid the mistreatment of animals and to reduce the number of animals being used. I have since done my best to refine my methods in order to inflict the least pain or stress to lab animals, and to replace live animals with models, video clips, prepared slides, or software applications. In the process, I have discovered that software applications and electronic books in the field of anatomy are abundant.

In a different course on the safety rules and the handling of hazardous materials in the laboratory, I learned to *reduce* amounts of reagents used, to *refine* laboratory procedures, and to *replace* the experiments with equivalents that produce fewer pollutants. With software applications such as java applets, a wet laboratory may not be required. In a chemistry course I took this year, half of my laboratory experiments were ‘dry labs.’ My instructor used computational chemistry to design java applets, which are applications that help students visualize, ‘build,’ and thereby learn the features of complex models such as the molecular orbital theory. Similar to a “real” experiment, data is recorded and analyzed, and a laboratory report is written. This experience proved to me that technology can be used in place of scientific experiments to enhance the study of physical sciences.

I have capitalized on this convenient resource to help my students improve their study of the physical sciences. Even though I know how to develop java applications, I have not had to do any development myself because so many very useful java applets are available to the general public. I have taken advantage of these resources and encourage you to do the same. All you have to do is ‘google’ your topic of interest with the phrase ‘java applet.’ For example, if you need applications on converging lenses, you would type into your search window: ‘converging lens java applet.’ Our laboratory at Greaves Adventist Academy cannot be easily darkened in the daytime. Therefore, even though the optical benches and mirror, prism, or lens sets required for investigations are available, most of our optics experiments take place on the screen. After searching for the appropriate applet, I take my students to the school’s computer laboratory for a ‘dry lab.’ Once there, they go to the specified URL, view the applet, change the parameters (such as focal length, radius of curvature, and position of object), and record data, which they later analyze.

We are living in the global warming era. It is our civic duty to consume responsibly, even in learning. Technology can assist in this endeavour. It is up to us to seize this opportunity and contribute to the protection of the environment.

I challenge the North American Division or TDEC to compile and distribute a directory of publicly available applets that meet the NAD curriculum standards and *Journey to Excellence* documents so that individual teachers will not have to search for these applications to use with their classes. In the meantime, please feel free to contact me with your questions and comments at: [anel@rocketmail.com](mailto:anel@rocketmail.com).