Workshop: Hi Tech – Lo Tech: K-12 Science Visualization

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Abstract

Integrating multimedia applications in the classroom can be overwhelming. Grants may address the cost of computer hardware, but where can instructors find the time to explore available software? Many visualization programs are free or low cost, but students will not grasp the importance of what they are viewing without proper conceptual introduction. Furthermore, many K-12 instructors are now expected to teach topics, including basic chemistry concepts, in which they may lack proper training.

The STArt! teaching Science Through Art program was developed to help teachers prepare for these educational challenges. Using an "Artist in Residence" format, workshops are developed in collaboration with participating teachers. Specifically, STArt! focuses on basic concepts addressed in the new California K-12 Science Content Standards. The program introduces molecular visualization software using narrative discussions, educational animation, and hands-on workshops using art materials and everyday objects. By exploring different learning modes, it makes basic science concepts more understandable to a broader audience. Furthermore, by collaborating with instructors within their classrooms, the program provides a creative resource for teachers in meeting the academic standards.

1 Technology Reuniting Science and Art

Despite its cultural importance, art is often considered expendable in grade school education. Art is among the first subjects to go with budget cuts, for example. Even more disheartening, in contrast to our increased reliance on technology, scientific literacy in America has been on a thirty year decline. Is there any wonder students have trouble "thinking visually" about science concepts?

An underlying principle of the STArt! program is that not only are art and science key elements for understanding the world around us, but the two are intimately related. Artists have intuitively used scientific methods, such as testing one variable at a time and noting the results, to develop artistic techniques with strong visual impact. Similarly, scientists use visual graphics and hands-on models to help conceptualize their research. The helical form of the DNA molecule, for example—whether represented through illustrations, sculptural models, or visualization software—is critical to understanding its genetic function.

Technology is reestablishing the relationship between the visual arts and science. In fact, some biochemistry professors are now requiring that their students be proficient in computer graphics.

2 How Many Atoms in the Entire World?

STArt! creates a model for integrating art and science education in a way that's exciting, meaningful and accurate. Molecular models of familiar substances, such as colors and smells, are explored using the visualization freeware, WebLab Viewer Lite.

While presenting the STArt! program to a third grade class one student asked, "Wow, if there are 55 carbon atoms in one chlorophyll molecule, how many atoms are there in the entire world?" After just one session viewing molecular models, the student was already applying the information to the world around him. Children's curiosity and hunger for knowledge is boundless. With a creative approach to visualization software, students will begin to understand the scientific context of their everyday lives.

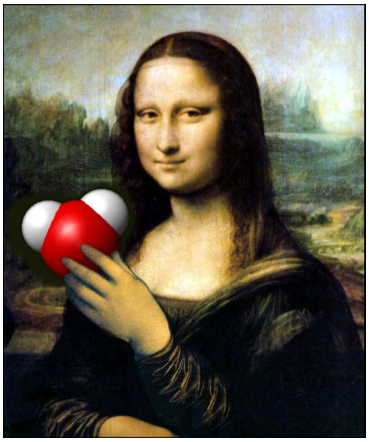

Figure 1 The STArt! program integrates art and molecular visualization software in K-12 science education.

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