Computers and the Core Curriculum

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The T+L conference in 2007 was held in Nashville, Tennessee. As with most other educational technology conferences, an active exhibit hall had numerous tools on display reaching a variety of subjects, grade levels, and needs. Some of the exhibits focused on highly directed curriculum, others explored tools for student (and teacher) creativity, yet others provided rich supplemental materials, and some provided tools that supported the teaching of core concepts without imposing a structure or pre-defined curriculum on the teacher.

These latter tools are few in number, yet they provide some of the greatest benefit to educators since they function as rich support tools that can be used by teachers during the presentation of content, and can also be used by students when they do presentations on a particular subject for their classmates (as a result of a student-directed project, for example.)

One of the most powerful of these tools is the family of products created in Brazil by P3Dy in support of the science curriculum. Subject areas covered by P3Dy include geography, biology, chemistry, and others in development. Central to all these tools are detailed models of various objects (e.g., DNA strands, the human heart, the Earth rotating around the Sun to explore seasons). These high-quality renderings allow the user to manipulate and annotate these models as they see fit. Because these models are three-dimensional, objects can be "grabbed" and rotated, even as they are moving on their own (e.g., planetary motion).

Models, not Movies

The flexibility to move, stop, start, annotate, and otherwise manipulate these models makes this family of products different in fundamental ways from other tools that just provide pre-defined animations of various phenomena.

The key is to note the core distinction between models and movies. A movie can be started and stopped, and even rewound to play again. One can not, however, change the point of view in a pre-defined animation. The user is at the mercy of the person who created the animation. With models, the situation is completely different. The user can not only stop and annotate a working model, she can "grab" the virtual object and rotate it to look at it from another perspective. She can zoom into the model, navigate through the model, and perform all kinds of rich activities while the model is working. Imagine, for example, going inside a cell and looking around at the various components, being free to explore in as much or as little detail as you want.

Models, for this reason, are far more powerful than movies.

Another, related, reason models are more powerful, is that movies imply a fixed curriculum. The creator of the animation has pre-determined which aspects of an object are worthy of detailed exploration, and which are not. This is not the case when using models.

For example, suppose you look at a complete model of the skeletal system. A primary grade teacher might use the model of the human skull to show the teeth and explore the importance of brushing. An anatomy professor in a medical school might use the same skeletal model to show the relationships among various bones. The model (if sufficiently accurate) remains the same, and its use changes based on the subject being explored, and the development of the learners. Models support this type of use; movies do not.

Many educators who take the time to explore the power of the "model" concept are amazed at its power. They see this as a tool that lets them teach in ways that are simply not possible with the historical tools of chalkboards, or even teacher-created computer presentations with static flat 2D illustrations. Animated models that can be stopped, rotated, zoomed, and otherwise explored reach learners through a variety of sensory pathways that increase engagement and foster deep understanding. Multiple representations, for example, of seasonal changes, help students truly understand why, when it is summer in the Northern hemisphere, it is winter south of the equator. More importantly, concepts learned through the manipulation of accurate models are far more likely to be retained than disconnected facts presented in a static manner by a teacher without access to these powerful tools.

This is why some educators are amazed when they see this kind of software for the first time. They truly "get" what these tools allow.

That said, there are some educators who see these tools as somehow "supplemental" aids in the classroom, not as tools which help form the core of instruction.

These tools go far beyond supplemental aids. They are foundational tools that, for the first time, bring abstract scientific topics to life for students and teachers alike. They form core components of a science curriculum at many grade levels.

About the Author

Dr. Thornburg has been active in the world of educational technology for nearly thirty years. While his primary work is focused in the United States and Brazil, he has literally done work in the field of educational technology around the world. He is as comfortable in governmental halls of power as he is in village schools in the Cambodian rain forest. He has a strong background in STEM, and the role of technology in the teaching of science and mathematics.

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