Why "Why" is More Important Than "What" in Education

David D. Thornburg, PhD
Executive Director, Thornburg Center for Space Exploration
dthornburg@aol.com
www.tcse-k12.org

In late May, 2010, I had the pleasure of attending the International Space Development Conference where the dual themes were returning to the Moon, and space-based solar power – two topics of broad interest today. Because the funding for NASA's heavy launch program (Constellation) had recently been canceled, there were lots of hallway conversations about whether the private sector could do the job without the historical experience of NASA behind them. Others wondered how NASA's manned flight programs had fallen out of favor.

One critic of NASA's failure to get the project funding restored said: "NASA operates in the following way: Manned space flight is the answer – What is the question?"

He pointed out that the directives from Eisenhower and Kennedy were driven by compelling questions: How to reassert US superiority in the STEM fields in a way that impresses the whole world. Because of our engagement in a cold war with the Soviet Union, this rationale was easy to convey. And, as history showed, we were amazingly successful. Kennedy set a ten-year goal of sending men to the moon and returning them safely. As a result of the Apollo missions, twelve people have left footprints on that distant object. We met our goal and reaped amazing side benefits. We are still using many of the innovations developed for those missions, and the rapid improvements in our education system of the time resulted in a growth in innovation that led to virtually every high-tech goody we use today. Those of us

who were children of the October Sky had new science curricula in high-school, and some of us went on to invent the future, even though we weren't part of the space program. The benefit of the educational transformation can not be overstated.

But today, the speaker argued, NASA has seemed to be more articulate about the "Why?" of manned space flight. Without a clear vision for the project, it is at risk. By focusing on the mechanics of getting us to the Moon or Mars, we miss the rationale behind the mission, and thus also lose the chance to explore other things at the same time. It isn't because "Why?" questions are hard to find (for example, why does Mars release huge plumes of methane gas every year, and is this a sign of life?)

Any grand adventure involves asking "Why?" When Columbus set out for the new world, he was not looking for a new land, but for an easier trade route to India. This was a fairly easy sell, even though it was quite risky. He did not just say, "I'm going to sail west until I hit land." He made the point that this trip would, ultimately, lead to increased wealth of Portugal and Spain. This rationale was enough to get the trip funded. And, as with the space program centuries later, the impact of his trip was greater than anyone could imagine. In 1493, he wrote a book, *On the New World or Landscape Recently Discovered by the Illustrious King of Portugal Through the Very Best Pilots ...* (A complete copy of this amazing book can be found at www.wdl.org/en).

As a result of Columbus' small book, other explorers felt encouraged to make the trip themselves. As a result, by the early 1500's the Eastern coast of the Americas had been fairly well mapped out.

Which brings us to today and a challenge facing education. Our curriculum and examinations are still driven largely by "What," the declarative world. The process world (characterized by "How," and "Why?") is largely uncovered. As tempting as it would be to lay the blame on NCLB, that would be unfair – the curriculum has remained largely as it was when I attended school. The details have changed, but the pedagogy has largely remained the same – especially when viewed through the lens of educational narratives. When students ask "Why do I need to know this?" they are asking the same question that resulted in NASA's loss of funding for manned space flight.

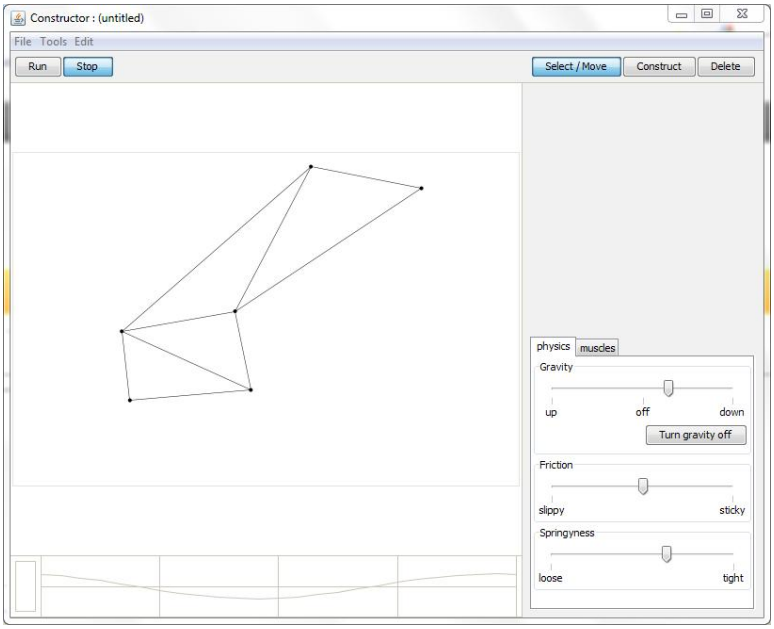
There are two problems with our current "standardized" approach. First, you can Google the "What?" questions – so why memorize them? Second, because "Why?" questions lead to more open-ended student involvement, it is hard to guarantee the achievement of standards testable with standardized tests. Why is this second point important? Very simply because if

something can be standardized and measured against standardized norms, it can be outsourced. Reading X-rays requires a lot of skill, but the process can be learned without much reference to "Why?" As a result, many orthopedic doctors outsource the analysis of X-rays to India where local radiologists read the digital X-rays and send their results back though the Internet. (I found this out first hand a year or so ago when I broke my foot.)

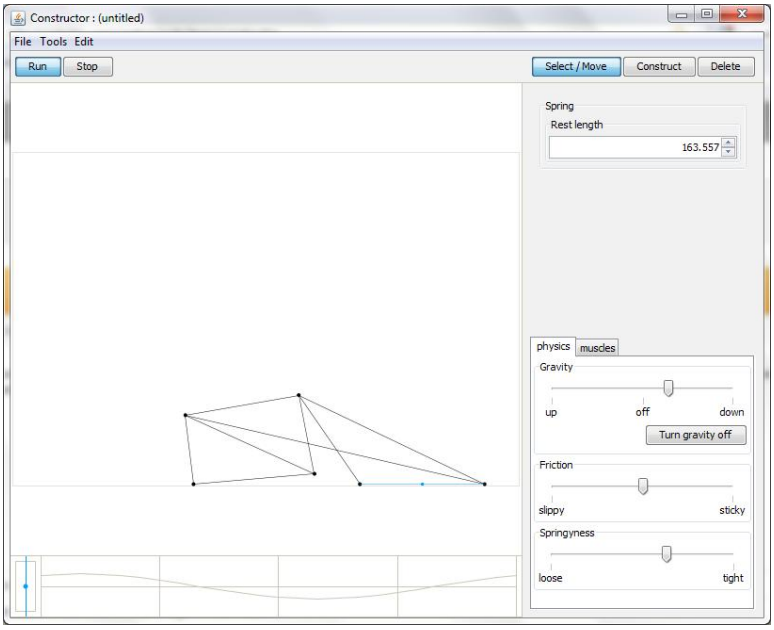
There is a solution. As educators we can choose to move from a "What?" driven curriculum to one driven by processes – the "How?" and "Why?" questions. If we make this our focus, we will see that the "What" of a subject is explored in depth and in context, automatically. There is no need to explore content first. The content will come as it is needed for students to explore compelling questions.

A beautiful tool illustrating this approach is SodaConstructor (sodaplay.com). This Java program lets anyone explore structures made with "springy" rods and nodes and experimenting to see what makes a particular design stable under the force of gravity. By playing with this tool, middle-school and high-school kids explore some topics covered in a college engineering course on mechanics – all without any directed instruction. Kids casn change the "springiness" of the rods, floor friction and "muscle forces" if you want to make an object that walks or behaves in other desired ways. The conversations around the idea of walking as a controlled form of falling can be amazing! In the course of playing with this program, and exploring the "How?" and "Why?" questions, students not only learn good mechanical design, but also learn how to be articulate in their descriptions of their designs and the process by which they were created. In this context, SodaConstructor is an example of what David Shaffer calls an epistemic game where students gain some of the knowledge, skills, and epistemology of mechanical engineers (epistemicgames.org/eg/).

For example, here is a picture of a model structure we can test for stability. It has lots of triangles in it, which students find is generally a good sign.



However, when the object is dropped, it does not retain its original shape!



The question most students ask at this point is "How can I make this structure stable?" No physics lectures will make up for the power of learning how to answer this question through experimentation. But just when do we provide access to this kind of software in our classrooms? And, more importantly, how do we learn how to help young people formulate and find answers to their own compelling questions? How, in essence, do we transform

education in ways that truly meet the present and future needs of every learner?

We live in a time of great economic challenge, and it is imperative that we recognize that innovation, creativity, the asking (and answering) of compelling questions can not be outsourced. Our curriculum needs a complete overhaul. Content is overrated. As Mcluhan wrote in his seminal book, *Understanding Media* (1964) (and I thank David Shaffer for reminding me of this): *The content of any medium is the juicy piece of meat carried by the burglar to distract the watchdog of the mind.*

And that is why "why" is more important than "what".

About the author:
David Thornburg, PhD
David is the Founder and Director of Global Operations for the Thornburg Center. He is an award-winning futurist, author and consultant whose clients range across the public and private sector throughout the planet. His razor-sharp focus on the fast-paced world of modern computing and communication media, project-based learning, 21st century skills, and open source software has placed him in constant demand as a keynote speaker and workshop leader for schools, foundations, and governments.

His current work is in helping educators transform the spaces in which learning takes place through his Educational Holodeck project.

As a child of the October Sky, David was strongly influenced by the early work in space exploration, and was the beneficiary of changes in the US educational system that promoted and developed interest in STEM (science, technology, engineering, and math) skills. He now is engaged in helping a new generation of students and their teachers infuse these skills through the mechanism of inquiry-driven project-based learning. (For details, visit www.tcse-k12.org.)

His educational philosophy is based on the idea that students learn best when they are constructors of their own knowledge. He also believes that students who are taught in ways that honor their learning styles and dominant intelligences retain the native engagement with learning with which they entered school. A central theme of his work is that we must prepare students for their future, not for our past.