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# Epic Education



## Teaching College Science with a Connection to Personal Meaning

BY TODD DUNCAN

*Editor's Note (PG): On our Cosmogenesis listserve in October 1999 Todd Duncan posted a description of a thought-provoking assignment, "Describing Your Universe," which he uses in his teaching. Here he shares this assignment with Epic newsletter subscribers and also discusses the assignment's context: his meaning-based, university science course, "Cosmology and the Universe."*

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*"Learning the Epic" will be the name of the cyber version of our Epic Education department. Previous education articles will be available on the Epic website <[www.epicofevolution.org](http://www.epicofevolution.org)>, and new items will con-*

*tinue to be added to the site to make it a useful resource for Epic educators, both experienced and new. I welcome your ideas and written contributions for the website! Please contact me at [pgordon@johnabbott.qc.ca](mailto:pgordon@johnabbott.qc.ca).*

There are probably many reasons for the distaste most students have for the science courses that are part of the general education requirements at many colleges and universities. But high on the list must be the feeling that such courses are dry and irrelevant. They are seen as without connection to the typical student's major concerns in life.

This is a shame because, as those involved with the Epic of Evolution are well aware, science's grand story of the universe, in which we each play a part, can provide a meaningful context for our lives. Students who are not given the opportunity to see science in this light are missing an important piece in their education, and educators who don't take advantage of this "big picture" or "story" aspect of science have missed an opportunity to hook students on a core offering of science.

In one way or another, we are all engaged in a personal search for meaning

### Student Commentaries

*For the most part, students recognized and appreciated the opportunity to enter into a new relationship with science. These excerpts from student writing convey some of these attitudes.*

- I never thought of cosmology in this sense. It is far more profound than I had ever imagined. It's wonderful!

- I started reading Brian Swimme today after class. I can't believe that I am going to take a class for credit in a subject that has interested me for years. After years of taking physics and math and technical courses, it is refreshing to be able to think beyond the equations. Occasionally you can get past the technical rigor and be creative in your thinking, but rarely have I been able to do it.

- I'm in this class because it ties together humanity and the universe, and I'd like to know what others think about

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throughout our lives. But most people are left to stumble through this search without the benefit of information about the universe provided by science. For most people, any connection which exists between science and personal meaning is a negative one: science is widely viewed as being opposed even to the idea that there is any meaning to be found. So if students are to latch onto and benefit from this aspect of science, they need to be shown rather directly that science provides a great deal of insight essential to any sincere and realistic attempt to find meaning. In this article, I describe my cosmology course, "Cosmology and the Universe," which focuses on this connection with personal meaning.

The course is part of the general education curriculum at Portland State University (PSU). It is one of several elective courses that meet the science requirement for non-science majors. As part of the Science Cornerstones project at our university ([www.corners.pdx.edu](http://www.corners.pdx.edu)), science courses have been developed or modified during the past three years to form a cluster of courses that meet this requirement.

The defining characteristic of my course is that it begins with and centers on the students and their questions and beliefs. In contrast, most science classes, even those for non-science students, generally organize the material primarily around the logic suggested by the particular scientific discipline. The latter approach makes sense in classes for students majoring in the subject of the course. They need to learn the tools and techniques of their future trade in the most efficient way possible. But for students with little background or interest in science for its own sake, the result is often a course which takes place, for them, in an abstract realm to which they have no means of connecting. The material, if learned at all, is repeated back for the test and soon forgotten. It never makes any real contact with the students' own thoughts and lives, and never gets a chance to mean anything significant to them.

My approach is to focus on the students and on those insights from my field of science that might be useful to them, rather than on a complete and comprehensive presentation of my subject. Although a significant part of the course still consists of standard science, the focus is always on questions relevant to class participants and on students' beliefs and attitudes. The science is brought in only to help answer questions that are of clear value and meaning to most students.

Of course, this means that the class is much more open-ended than a standard science class, and there is a significant risk that many ideas from my field, important to me and to other physicists, will not be covered in the course. But far more important than complete coverage is that a few key ideas from science have a chance to really take hold in students' minds, and that their overall attitudes and perspectives about science are changed. This approach seems to work well at drawing in students who never felt any connection to science before. As one class participant commented in her learning journal, "So here I am taking a physics class, expecting it would be some medieval form of torture, and I love it. I feel as if I've discovered a new me!"

The stage for this approach is set with the very first homework assignment, "Describing Your Universe," which is introduced as follows:

*The purpose of this assignment is to make you more conscious of your own beliefs about how the universe is set up. This will help you to focus your efforts during the term on taking out of the class the ideas that are most meaningful to you. You'll be better able to see where the "scientific universe" connects with your own. The idea here is not to see who is "right" or "wrong" in their beliefs. The most important thing for this assignment is that you be as honest and clear as possible about what you really think.*

*Describe, as carefully and clearly as you can, what you think are the essential properties of the universe you live in. If you get stuck on what to write about, you might imagine what you would see if you closed your eyes and floated out away from Earth. What would you see as you moved farther and farther away?*

*You can describe anything you think is important, but here are some possibilities to discuss: How big is the universe? Does it have an edge somewhere? How is it arranged? (For example, are things spread uniformly throughout, or are some parts of the universe very different from others?) How many stars do you think are in it? Has it existed forever or, if not, how old do you think it is? Are there other planets? Are there other creatures besides those on Earth? What are the most important laws that control what happens in your universe? Can events among the stars foretell what will happen on Earth? How do humans fit into the scheme of things? Do*

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## "Student Commentaries"

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what I think, and to see if I'm alone in my thoughts.

- "We had the sky up there, all speckled with stars, and we used to lay on our backs and look up at them, and discuss about whether they was made or only just happened" (Huckleberry Finn). I liked this quote because, regardless of people's age, language, or religion, the night sky is a great mystery. Civilizations across the globe look up at the night sky and play with ideas of how this magnificent event occurred. Ancient cultures have tried to explain the origins of the earth and human population through forms of religion and worship. I couldn't imagine being so superstitious. Who knows what kind of ceremony we would take part in at the sight of Hale-Bopp?

- I know that this will be one of those classes to stay with me and motivate me to educate myself further on the subject of the cosmos! It's been a great class.

- I am a scientist at heart, but there are always the little bits of wonder that science cannot explain, and this fascinates me. Why do we fail to grasp simple ideas in the name of science, but yet explain the most complex so easily?

- We still have not gotten beyond the dimensions of the universe in class, but this is not such a bad thing. I mean there are so many questions that come to mind when you discuss such topics that it will be hard to get past this section.

*Some students also expressed insightful concerns, questions, and even outright criticisms of this approach to science. We would do well to keep some of these in mind when conveying Epic ideas to others.*

- The fundamental basic knowledge of the universe and our meaning in life comes from each of our own experiences, beliefs, ideas, etc. So where is the science in this?

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## **"Teaching College Science"**

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*we have a specific role to play? Are we important, or not important?*

*The idea is simply to spell out your own worldview: how you think the universe operates and what you think are the most important features and properties of our universe. Have fun and see what you can discover!*

What do students think of this approach to science? Most are surprised at being asked to assess their beliefs in a science class, but are fairly receptive to the idea. After all, part of the reason they don't like science is that they don't see it as relevant to their personal lives in any way. So they warm up quickly to the notion that it might be relevant. There's some initial resistance because the question is open-ended. Not surprisingly, most expect that a science class is about getting the "right answer," so they're

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uncomfortable and ask a lot of questions aimed at making sure they do the assignment "right." For example, I have to work pretty hard to move some people away from answers that consist entirely of statements like, "I seem to remember from a high school astronomy text that the nearest star is about four light years away."

Once they catch on during the term that I really do want to know what they think, most open up and many are pleasantly surprised that they can actually "connect" with science. The majority are very positive about it by the end, and say that they see science in a completely new (hopefully better!) way.

Interestingly, the few who have been mildly hostile to having their personal beliefs dragged into a science course have tended to be science majors, especially those who consider themselves "hard-core" physicists. Although we do plenty of math and "real physics" in the course, they expect a traditional physics course (with problem

sets and right and wrong answers for everything) and have resented the "wishy-washy" philosophy dragged into it. In defense of the scientists, this certainly has not been a universal phenomenon: most have found it interesting to have the opportunity to think beyond the equations. (A more complete presentation of reactions and sample comments from student writing is provided in the sidebar.)

The course continues in the style set by the first assignment. Lectures present some of the key facts about the universe. In-class labs and evening observations of the sky help them understand that the methods by which these facts were discovered are ultimately tied to direct observations of the world around them, observations that they could make every day if they stopped to notice. Most importantly, the class is dominated by open discussion of each new scientific idea, in an attempt to answer the question, "What does it mean to me, if the universe is like that?"

A difficulty with this type of course is the selection of a textbook. The first time I taught the class, I used a standard astronomy text, with its encyclopedic coverage of material, organized around the classifications convenient in astronomy: planets, stars, galaxies, etc. I tried to set the tone and context with my own handouts and through class discussions and lectures, using the text as supplementary background material. This worked to some extent, but since the tone and emphasis of the text didn't match that of the course, I felt I was always fighting against the book to keep students in the right frame of mind toward course material and focused on what was important.

Last term, I used Brian Swimme's *Hidden Heart of the Cosmos* as the main text, supplemented with my own material to teach the astronomy content. This worked better because Swimme's book provides students with clear examples of the types of questions and issues that are appropriate for the course. Still, to really propagate this type of course, a text is needed which integrates more standard astronomy content with the meaning/worldview perspective. I'd love to hear from anyone (Brian?) who would like to collaborate on a project to produce such a text. In the meantime, much of the content of the course is available at the website shown below. Epic readers should feel free to make use of any of the materials or ideas in their own courses.

[www.scienceintegration.org/cosmo\\_home.html](http://www.scienceintegration.org/cosmo_home.html) ☺

## **"Student Commentaries"**

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• Why do I have an aversion to cosmology? I wrote in my homework, "Describing Your Universe," that cosmology is pure escapism, and then I went on to say we should be concerned with more immediate things like suffering and strife, etc. While I still feel this is true, I probably should mention that I am just as guilty as anyone as far as succumbing to escapism. I am not Gandhi. I have to constantly remind myself to be a good person. I drink and stay up all night, and enjoy many other self-destructive activities. Anyway, escapism is healthy in moderation. Cosmology is a better hobby than watching TV or doing drugs. I think I am just reacting to the Saganesque all-importance of astrological [sic] things. It is easy for a rich white man living in the most powerful nation in the world to think that cosmology is really important.

• What good is myth and superstition in the sciences? Are we to believe that the correct side won the Scopes Trial? I hope not. Although the happy little tales people told around campfires in the absence of television are swell, and give liberal arts majors areas to study on grants, they are only scientifically good so far as illuminating the methodology used for observation and fine-tuning those methods for future scientific use. Ideas of purpose and morality come from within one's own connection with religion or philosophical extension outside of the physical cosmos, and that is outside the purpose of physics.

• In our discussion about science and religion, I have to think about my grandfather, who is a scientist. He was involved in the development of the Manhattan Project and he never discusses this with anyone, nor does he discuss his position on religion and his own spirituality. As if he must deny one to fully accept the other. But Swimme seems to work at having both exist simultaneously. How do we apply both to our lives without being hypocritical? ☺