

Science: Patterns and Wonder

What if learning about flowers led to wonder?

Amy wanted her students to not only master facts in her science class, but also experience moments of wonder at how it all fit together, and ask big questions about why.

“This is one of my favorite lessons! It never fails to amaze the students, and bring out those real ‘wow’ moments that we all hope for when a light gets switched on in a student’s understanding.

“I asked the students to bring in some flowers (I checked for allergies first!), but provided some myself for those who forgot or had little access to flowers. We then collected data, counting the number of sepals, petals, stamens, stigmas, and seeds. Their table of results is usually made up almost exclusively of the numbers 1, 2, 3, 5, and 8.

“Then, I introduced the Fibonacci sequence of numbers (discovered by Indian mathematicians and made known in the West by a 13th-century Italian). When I gave them this string of numbers (1, 1, 2, 3, 5, 8, 13, 21, 34, ...), I got them to circle any in the sequence that also appeared on their results table. The students quickly recognized that their results were numbers from the Fibonacci sequence. That puzzled them! Then we looked at who Fibonacci was and his work, and students tried to work out how the sequence works (each number in the sequence is the sum of the previous two numbers).

“The next section of the lesson was deliberately very slow and reflective. We looked very closely at a dried sunflower seed head, because this is what inspired Fibonacci to discover his sequence of numbers (a close-up online photo works if a sunflower seed head isn’t available). I asked, ‘What did Fibonacci see that was so special?’ We spent a long time looking at the patterns the seeds make. Eventually, someone noticed that the seeds are in a spiral pattern—actually, two sets spiraling in different directions (clockwise and counterclockwise).

“The Fibonacci numbers related to the sunflower seed head were amazing. If you count the total number of seeds, it is a Fibonacci number; the number of clockwise spirals is a Fibonacci number; the number of counterclockwise spirals is the next Fibonacci number; the number of seeds in each spiral is a Fibonacci number. This realization was a very

special moment. It inevitably lead to questions like, How did that happen, and why? We discussed that Fibonacci must have asked the same questions many centuries earlier. 'What did he conclude?' I asked. 'Is it just an accident, or does it suggest, as Fibonacci believed, that there is a Creator with a plan and purpose for everything, even something as small as a seed?' Students then went to see what they could find by looking closely at a pinecone or a pineapple."

What's going on here?

Amy saw her science lesson as a way of highlighting the unity of knowledge, making space for attentiveness, wonder and praise, and stimulating her student's curiosity in relation to big questions.

She engaged learners in reflection through progressive discoveries and in approaching the world attentively, making connections, experiencing wonder and asking big questions of life, faith and values. (Fibonacci numbers and spirals in biology, stimulating questions).

She reshaped her practice by planning the timing of the various stages of discovery and the pace of each phase of the lesson, and by using natural objects, creating opportunities for insight and reflection (use of images/real sunflower seed heads, slow observation).

What does this have to do with faith, hope, and love?

Christians put their faith in God the Creator. They believe that God created the world and all that is in it, though they may believe differently about how this was achieved. This single source of creation provides an underlying unity to knowledge. It also means that the created world can reflect something of its Creator in its design. The love of God for his world is reflected in the beauty and complexity of creation, and that includes the beauty of the mathematical structure of much of creation.

What difference does it make?

This science lesson brought in an element of wonder by linking math and science. Other combinations can bring wonder; for example, math, art, and the golden ratio.

Where could we go from here?

This topic of study can be extended more deeply to look at the occurrence of spirals in nature. It can also be broadened to make connections with patterns in other elements in the science curriculum. Looking at this bigger picture raises questions about a Creator God, and students often reflect that it takes more faith to believe that such things as patterns in nature occur randomly, by accident, than to believe they result from the work of a Creator.

Digging deeper?

The Bible opens with the words “In the beginning God created the heavens and the earth” ([Genesis 1:1](#)). It ends with “Behold, I make all things new” ([Revelation 21:5](#)). God is Creator first and last, and in between he sustains all that is ([Psalm 65:9-13](#)). For Christians, creation reflects the wisdom of God in its complexity and design ([\[6Psalm 104:24-256\]](#)), and the universe responds in wonder and praise ([Psalm 96:1](#)).

Although beautiful and complex, the universe is not now as God created it. It is spoiled by sin, since God gave people the freedom to choose between right and wrong. However, the universe is still able to tell of a wise creator. It may be flawed, but it is not completely disfigured.

If the universe is so bad, how on earth did human beings ever come to attribute it to the activity of a wise and good Creator? C. S Lewis

For the Christian and many others, the universe points to a Creator or Designer in some form.

I'm not an atheist. The problem involved is too vast for our limited minds. We are in the position of a little child entering a huge library filled with books in many languages. The child knows someone must have written those books. It does not know how. It does not understand the languages in

which they are written. The child dimly suspects a mysterious order in the arrangement of the books but doesn't know what it is. That, it seems to me, is the attitude of even the most intelligent human being toward God. We see the universe marvelously arranged and obeying certain laws but only dimly understand these laws. Albert Einstein (First published as "What Life Means to Einstein," Saturday Evening Post, October 26, 1929. Quoted in Walter Isaacson, Einstein: His Life and Universe [New York: Simon & Schuster, 2007], p. 386.)

Next: Chemistry and Wonder

What is there were moments of wo...

