

Teacher Tune-up

Quick Content Refresher for Busy Professionals

Why do traditional cell modeling activities often fail?

After weeks of studying the cell, students can leave a biology unit still not understanding some basic facts. Here are a few of the misconceptions students often demonstrate in middle school:

- All cells are the same size and shape, i.e., there is a generic cell.
- Cells do not carry out essential life functions for the organism they are part of.
- Cells of living organisms do not make molecules for their own growth and repair.
- Animal cells do not eliminate their own wastes.

*From the Project 2061 AAAS Science Assessment database
American Association for the Advancement of Science*

(see more at assessment.aaas.org/topics)

Perhaps it's not surprising that students harbor these misconceptions if their introduction to the cell consists mainly of memorizing a long list of unfamiliar terms, like mitochondria, ribosomes, and Golgi apparatus... Reducing cell biology to rote memorization of structures robs our students of the chance to fall in love with the idea of a cell. A cell is not a shoebox. It's not a static box full of junk. More than a set of structures, it is a set of processes, a dynamic, self-replicating chemical system.

To be alive is amazing! Life is active. Emphasizing what cells do, instead of just what their myriad pieces are called, more readily engages students. Cell form follows cell function: what problems do all these pieces solve? What's it all for?

SciGen's introduction to cells focuses on four essential functions of life. As the smallest unit of life, the cell is the most reductive, basic thing in nature that performs these four functions. To invite students to think about these life functions in naturalistic terms, SciGen uses the metaphor of cells as self-reproducing robots. The greater complexity of multicellular organisms arises from cooperation among component cells, as they form tissues, organs, and interacting organ systems. Imagining one's cells as a team of blobby, self-guided robots all working together to keep us alive positions students to think the way cell biologists do.

In this short, charming video (see link below), we meet cell biologist Bruce Alberts. He discusses his robot metaphor for the cell, and how his own grandchild inspired him to think of another way to teach about cells in terms of the functions of the cell rather than the usual static diagramming of the cell. Professor Alberts, who literally "wrote the book" on cell biology (as lead author of *Essential Cell Biology* and *Molecular Biology of the Cell*, two best-selling microbiology textbooks) is former Editor-in-Chief of *Science* magazine, past President of the National Academy of *Science* magazine, and was awarded the National Medal of Science in 2014 by President Obama. He also happens to be the chairman of SERP's board of directors, and he has been actively involved in the development of SciGen, from conception through publication.

Teaching your students about cells in a way that breaks from traditional practice might be a bit disorienting for some teachers. We hope this video of Dr. Alberts' comments on this necessary shift in classrooms encourages you to experiment. Please share these and other ideas you have with colleagues to liven up learning about these basic yet remarkable units of life.... cells!



<https://vimeo.com/242658385/8743593d80>