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Models are a very important part of science, they allow scientists to share information about ideas or objects that are often too large or small to be seen with the naked eye. Models also help with representation of processes that cannot be seen at all, such as much of photosynthesis. But unfortunately, models often create misconceptions such as the misrepresentation of the solar system, cells, and volcanoes. This article discusses the values and misuse of models.

Science and Children : Methods and Strategies Using Models Effectively A Simple Exercise Reveals the Way Students Think About Scientific Modeling. By Laura Ruebush, Michelle Sulikowski, and Simon North

Teachers need to explicitly discuss with students the value of models and also their limitations. This Models Laboratory Exercise will help students understand that models are fallible but very useful, and provide critical tools for studying and communicating science. Meta!Blast provides a 3D model of the cell, that can be incorporated into this lab.

One way to have a discussion on biological models with your class is to demonstrate an idea through the use of a model. The teacher may bring in pictures of models or have the students do a black box activity. Black box activities are a great way to demonstrate many ideas about the nature of science especially models. Teachers can have students create models about what they think is inside of the black box. Here are just a few articles from National Science Teachers Association (NSTA, <http://www.nsta.org/>) to help teach about black boxes:

Inside the Black Box By: Yvonne S. Kao, Anthony Cina, and J. Aura Gimm
Film Canister Science By: Andrew Ferstl and Jamie L. Schneider

The teacher can then have a discussion with students in which all their ideas are able to be heard and seen – this is usually shown by putting student's ideas on the board. Have students make a list of what they think about when they hear the word model. Once they're focused, answers may include words like model trains, plastic car models, dioramas, etc. If you don't get some science examples rephrase your question. Science examples might include models of DNA, the solar system, the cell, landscapes and so on.

Once the class creates a thorough list of ideas from the students, the teacher can elicit from them some of the common features of models. Features might include: models are smaller than real life, bigger than real life, simplified relative to real life, etc. Those are some of the key features as they help scientists to visualize, explain, test and predict.

It may also be important to spend some time talking about how models need not be a physical entity- that they can and often times are in science, completely incorporeal. This helps them to expand their definition of the word model to something much more abstract.

Discussing models before starting topics such as the cell and photosynthesis may help students understand the limitations of their book and the drawings depicted. And while all models have limitations, MetaBlast is a great way for students to see a cell, and its organelles and processes such as photosynthesis on a three dimensional plane. This can help students understand the fluidity of the cell, as well as how these processes such as photosynthesis are occurring all around them and not just in one part of one thylakoid.