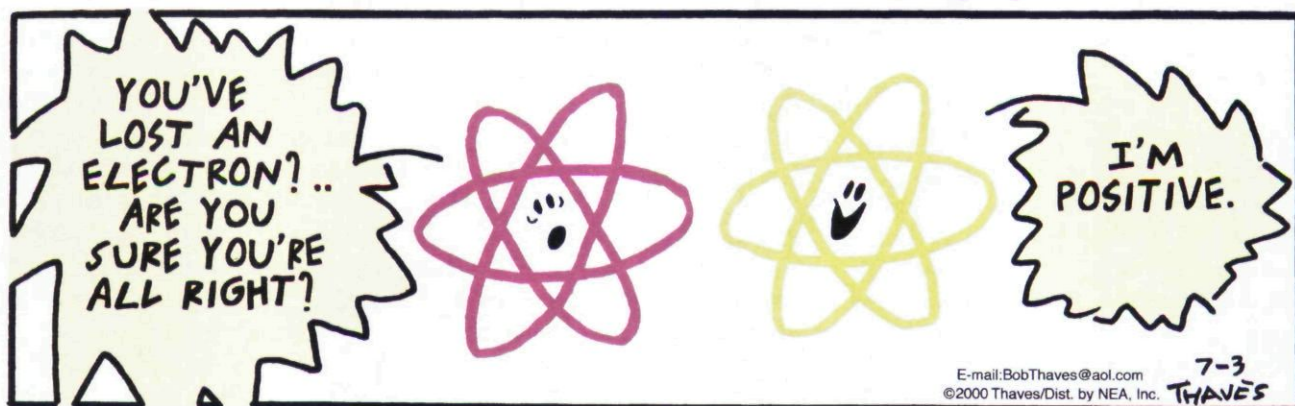


Using Comics in the Science Classroom

A Pedagogical Tool



By Kerry Cheesman

Comic strips found in newspapers and magazines can be used to assess both student and teacher understanding of science concepts. They can also be used to get students' attention, introduce a new topic, and stimulate critical thinking and ethical discussions in the classroom.

I watch with amazement as my two college-age sons read the daily newspaper. Invariably they start by reading the comic page, then backtrack to the world and local news. One of them explained that it is easier to digest the news if one's spirits are lifted first. In a similar way, I like to start my classes by sharing a comic because it tends to put my students in a more receptive mood for the lesson that follows. There are many ways to use comics in the classroom, but most fall into one of two broad categories—attention getters and critical thinking stimulants.

Using comics as attention getters

Displaying a comic at the start of the class helps focus students' attention and sets the tone for the lesson that follows. You can even display the comic just prior to the start of class and remove it when class officially begins to encourage students to arrive on time. Having the comic on display when students enter the room

quiets and focuses the class so the lesson can begin.

The crazier the comic used as an attention getter, the better it works. Often there is silence for a few seconds as students focus on the display and try to figure it out; then laughter (or groans) slowly begins to roll through the group. Students who like the comics appreciate that you are doing something for them, and those who think your sense of humor is warped are still establishing a more personal relationship that can only help foster a climate of learning within the classroom.

Whenever possible, the opening comic should be related to the lesson of the hour. This allows direct entry/focusing of the mind to the subject being studied. In courses such as general biology or genetics, I have no difficulty finding relevant material. But in immunology, biochemistry, and other upper division biology courses I have struggled to find enough relevant comics, even after collecting them for more than 15 years. In these cases I often use comics about education in general (there are lots of these) or about college life.

A second place to use attention-getting comics is as a topic transition (An example of a topic transition comic is The Far Side panel (Gary Larson) titled "Embarrassing moments at gene parties". Here, one gene at the party points to another that is becoming grossly deformed and says "Oh my goodness... Vinnie's mutating!" This leads to a discussion of what a mutation is, what can cause a mutation, and if it is possible to see a mutation taking place.). Often we find ourselves finishing one topic/chapter in the middle of the hour and then starting the next one immediately. A comic not only introduces the new topic with a smile, but allows students a quick breather to refocus their attention and their energies.

Most of us have experienced the pain of returning an exam to a class that has performed poorly. Comics are a great way to ease the pain. For instance, when students do well on questions from classroom material, but poorly on the questions from textbook material not specifically talked about in class, I use a *Funky Winkerbean* comic strip where the

Above: Example of context in a general chemistry or biology class comic. Do the students "get" the joke? ("Frank and Ernest" © Thaves. Reprinted with permission of Bob Thaves.)

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student says to the teacher, "You mean we had to answer the questions *and* read the chapter?" This not only eases tensions, but also sets the stage for a healthy discussion of the value of reading the assigned material. I don't need to say as much to students because many of them see themselves in the comic strip and sort out the issues on their own (active learning).

Finally, comics can be used to see if students are paying attention in class. A simple cartoon that, on quick glance, appears to be a normal diagram, but contains silly or contradictory pieces, helps to do this nicely. One example is a comic by Sidney Harris showing the cell and its parts. The twist is that it includes a cell door, cell windows, and cell floor. Another is a panel by Long showing the geologic layers of a hillside, but adding labels such as "special sauce" and "all-beef patty" in addition to Upper Permian, Mississippian, and Devonian. By displaying the comic as if it were a normal diagram and beginning to talk about cell parts (for instance), one can quickly gauge which portion of the class is paying attention and which is not. Hearing the laughter (or moans) from part of the class often wakes up those who were daydreaming and gets them back on track.

Starters for critical thinking

A second use of comics in the classroom is as a starting point for discussion. These discussions may take any form (large class or small group, in-class or homework, etc.) but are tied to the scenario and concepts presented in the comic shown.

One use of this technique is in probing a class to determine understanding of a concept. For instance, following discussion of the scientific method in a freshman biology course, I use a comic that gives me feedback on what students have learned. That comic is a *Peanuts* strip by the late Charles Schulz showing Snoopy's brother Spike in the desert (Figure 1). He holds up a

boat oar and says, "This proves my theory that this whole desert used to be under water." Then he says, "Or my other theory that someone somewhere is missing an oar." The first question I pose is, are these really theories? Most students have no difficulty responding in the negative, and recognizing that at best they are hypotheses (separating the scientific use of the word "theory" from the vernacular use). My second question is, can we have competing theories in science? Or, more specifically, can competing theories be espoused for the same data and observations? This is a more complex question, and after students share their opinions, I have them break up into small groups to discuss what they heard. By the time we are finished, students achieve a much higher level of understanding of theories and hypotheses than they were able to before I started using comics to teach this concept. As an extension, I often follow up with a class discussion of the use of the word *prove* in the comic strip.

An example of an appropriate physics comic is a *Garfield* strip by Jim Davis in which Garfield rides on Odie's back holding his ears like reins. After building speed through three panels, Garfield yells "Stop!" and is flung through the air. Which of Newton's laws is demonstrated here? Where some students have difficulty relating real-life examples to what is taught in class, they may find it easier to relate to a comic strip scenario that they enjoy reading on a regular basis. Figure 2

provides another example of a critical thinking stimulant and discussion starter for a physics class.

An example for chemistry is a *Far Side* comic by Gary Larson showing cavemen drawing a molecular formula on the cave wall. The caption is "Early chemists describe the first dirt molecule." In spite of Larson's background in the sciences, the molecule contains bond pairings that cannot actually exist. Simple questions—What's wrong here? Can this molecule actually exist? Where would you place *De* (the symbol given for dirt) on the periodic table?—can lead to small group discussions that help students see whether or not they grasp the principles of chemical bonding and the interrelationship of the elements.

A different form of critical thinking can lead to ethical discussions in science. Here a scenario is presented via a comic that serves as the basis for relating science to the world around us. This is very easy to do in genetics, for instance, with contemporary issues such as cloning, embryo screening, implications of the human genome project, genetically modified foods, and so on. Other areas of biology, chemistry, and physics can also generate ethical debates and help students see why understanding the underlying science is so important to these discussions.

Questions that might be asked from such comics are: Is this accurate? What does this mean for our society? Could this happen to us? It is important to remember that the purpose of infusing ethics into

FIGURE 1
Peanuts comic strip used to help students understand the concept of a theory in science (*Peanuts*: © United Features Syndicate, Inc.).

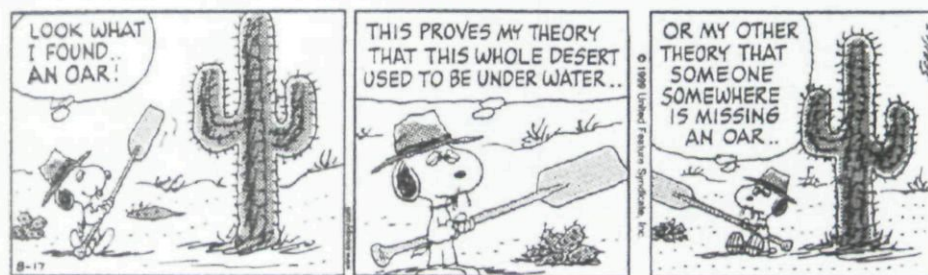


FIGURE 2

Another example of a critical thinking stimulant and discussion starter comic from physics ("Frank and Ernest" © Thaves. Reprinted with permission of Bob Thaves.)

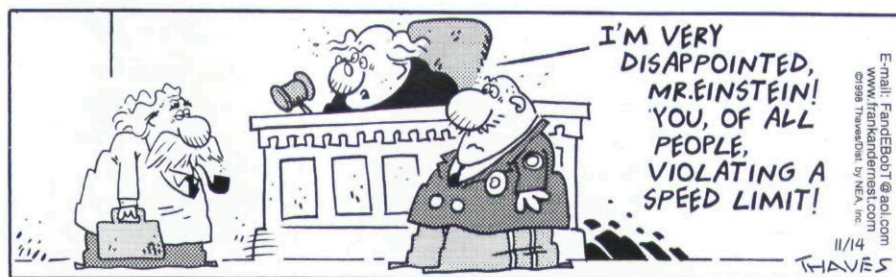
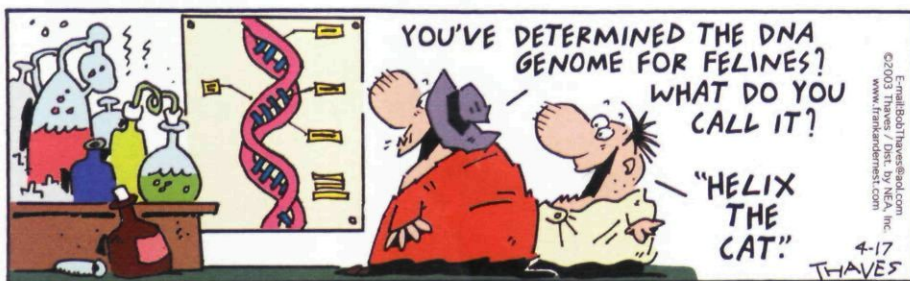


FIGURE 3

A biology comic that may elicit as many groans as laughs ("Frank and Ernest" © Thaves. Reprinted with permission of Bob Thaves.)



undergraduate science classrooms is *not* to teach students a particular value system or to get everyone on the same page about a given ethical problem. Rather, it is to help students examine their own values in light of the scientific evidence and see where there may be both agreement and conflict. It is also to help them see that, in many cases, the science itself may yield ambiguous results (thus helping them to learn more about the process of science). Finally, such discussions help students to sort out what is science and what is technology (the applications of that science), and grapple with age-old issues, such as where responsibility lies when science is used for less than admirable goals.

Comments from students

Over the past decade I have periodically solicited comments about the use of comics from students during end-of-semester evaluations. More than 200 comments have been re-

ceived, in both lower-division and upper-division science courses. Of these more than 80% have been positive, with 64% being extremely positive. Less than 5% of comments have indicated a negative opinion about the use of comics in the classroom; the rest of the comments were generally neutral or ambiguous (a student that liked their use in some areas but not in others).

Student comments heard frequently include the following:

"The comics helped me to focus on the lesson for the day."

"Using comics really set the mood for the class—always a positive one."

"Many of the comics helped me to learn to think in a critical way. The questions that accompanied the comics were superb."

"It's good to see scientists who can use good humor. The comics really helped to make this a fun class."

"I really looked forward to coming to class on time (something I rarely did before)."

"The comics that were chosen really helped us to approach ethical dilemmas without the tension so often seen in our humanities classes."

Where to find relevant comics

Comics can be found in a variety of places. Most obviously, local newspapers publish several each day. Magazines—both news magazines and general purpose ones, as well as scientific journals—regularly publish comics. Read comics critically; very few are explicitly scientific. What you are looking for are ones that contain a concept that can stimulate discussion in a science class.

Comic series that have done well over time (such as *Peanuts*, *Garfield*, and *The Far Side*) are republished as books of cartoons, available at local bookstores. If there is a series that is a favorite of your students, a few dollars invested in these resources will provide you with a wealth of ideas for years to come. Sidney Harris has also published several books of scientific comics (found in *American Scientist*) and these are available from Sigma Xi (www.sigmaxi.org). Another source, especially for strips with smaller distribution or ones in specific areas of interest (science!), is the internet. Searching topics such as *cartoons* or *comics* yields a large number of sites that can often be sorted by terms such as *science*, *medicine*, *nature*, and so on. Some of these comics are available for no cost; others are available only for a fee. Check carefully the restrictions for those published on the internet.

Your students can also be a source of comics. Several times in the past I have had students draw comics that we have used in the classroom. If they possess such talent, encourage them to use it. Drawing is much like teaching—it is a great way for students to demonstrate to themselves that they indeed understand the material. Whatever your source for comics may be, please be careful to observe the fair-use guidelines, outlined below.

Fair-use guidelines

Several authors have done a good job of boiling down the legal statutes for teachers in the classroom. Among these are Simon and Saunders (2000), Simpson (2001), and Walker (1995). Several websites also contain good information for educators. These include www.utsystem.edu/ogc/intellectualproperty/clasguid.htm, www.libraries.psu.edu/mtss/fairuse/dalziel.html, www.cetus.org/fairindex/html, and www.ilt.columbia.edu/projects/copyright/ILTCopy0.html.

When using a comic in the classroom, there are surprisingly few restrictions. Comics may be used in any media (transparency, 35-mm slide, computer presentation, and so on) in front of the class. They may be stored by the instructor and used repeatedly, even over the course of many years. (This is helpful since it takes several years to build a useful library of relevant comics.) Comics may even be copied onto exams or quizzes, either as an icebreaker or in conjunction with a question. Regardless of the means you use to show students the comic, it is imperative that the appropriate copyright information be clearly attached and visible to the audience. This means copying carefully so as not to accidentally delete this information from the panel. Copyright may belong to the author or to a syndicate or corporation.

What may *not* be done in the classroom is to duplicate comics to give to students or other teachers. This implies that quizzes or exams that will be returned to and remain the property of the students may *not* contain a comic. Only those that are retained by and destroyed by the instructor can use comics in this way. It should logically follow, then, that copies may also not be given to other teachers for their use (although you can tell them where to get their own copy). If you have purchased a book or magazine and copied the comic for your own classroom use, you also may *not* lend that book or magazine to another teacher so that they may copy the comic.

Finally, comics that are copyrighted by others may *not* be placed on course websites or published in journal articles such as this one, without written permission from the copyright owner. In some cases obtaining such permission (especially for educational purposes) is quick and easy. In other cases it can be difficult and even costly. The bottom line—don't use other people's creative works for your own purposes without their knowledge and consent.

Suggestions for best use

There are several things to consider that will help to ensure that your experience with comics in the classroom is a positive and productive one.

- *First, use single-frame comics whenever possible.* These are the easiest for students to see, read, and comprehend. They are also the easiest to enlarge for projection in a large classroom. Multi-panel comics can take time to read and be harder to follow. Consider your intent and your audience before choosing.
- *Use as large an image as possible.* The intent and usefulness of the comic will be lost if the image or words cannot be easily seen by the student in the last seat. Use a copy machine to enlarge the image to a size that best fits your classroom needs. If enlarging an image on the computer, be aware of its format, as some images that look good on a website will become grainy and hard to read if enlarged to a room-size format.
- *Clean up newspaper images before using.* Many comics obtained from the newspaper will have stray marks or bleed-through from the other side. A simple technique to eliminate most bleed-through is to copy the image on top of a piece of dark-color paper. This fools the imaging system into changing its contrast pattern and produces a clearer image for classroom projection.
- *Remember, comics are only one of many tools.* Do not allow them to

dominate or take time away from the lesson. It is easy to get sidetracked with a desire to show lots of comics, but realize that if there is not a clear pedagogical reason to use a comic, it is probably not wise to do so.

- *Be sure that the comic used is appropriate for your audience.* Consider the age and background of students. Are there political inferences in the comic that may not be understood or may offend the audience? Are there sexual references or innuendoes? Is there a historical context that you understand but that your students may not? Any of these issues may cause your students to lose interest and fail to grasp the lesson that you have so carefully planned. Context is vitally important to any comic's being a useful teaching tool.

Final panel

As with any other pedagogical technique, not all students respond positively to the use of comics in the classroom. However, the majority of students do enjoy comics when used as a tool in the ways described above. Students eventually come to expect comics in certain courses, sometimes displaying disappointment when I forget to bring one to start the class. Likewise, many students entering upper-division courses also expect me to continue the tradition that they related to so well during their freshman year. Comics are *not* the way to teach science, but as a selected tool to teach key concepts and to help students participate in the classroom, they are a wonderful and powerful addition to the classroom. ■

References

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