

Rosemary Davidson

USING INFOGRAPHICS IN THE SCIENCE CLASSROOM

Three investigations in which students present their results in infographics

1



A good infographic tells a story or presents a position.

2



The title of the infographic stands out and fits the contents and message.

3



The text can be read easily and contrasts with the background.

4



Images are clear, relevant, original or copyright free, and credited.

5



Fonts, shapes, and colors are consistent throughout.

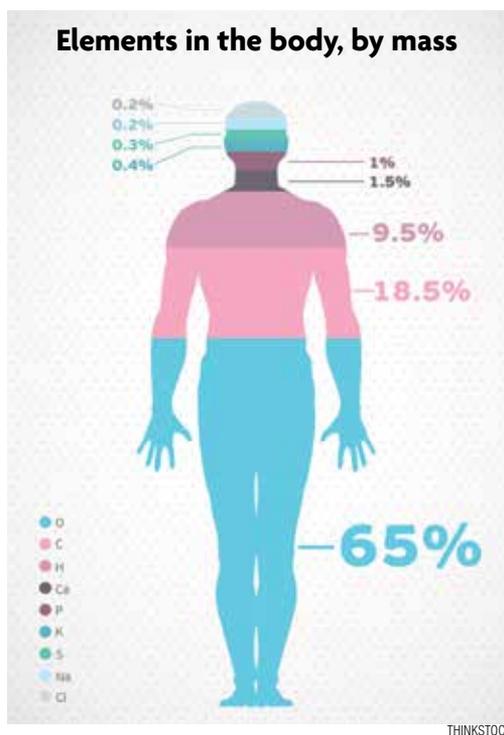
THINKSTOCK

I have found that *infographics* (information graphics) successfully engage my students in science—not only in carrying out the research for classroom projects but also in presenting the results of their research to their peers. This article will help you integrate student-created infographics in your own classroom.

Infographics incorporate art into the normally staid world of numerical information. Most newspapers, broadcasts, and news websites use these graphical representations to attract attention and present usable information. According to Visual.ly, an online community for sharing data visualizations, infographics

- ◆ present complex information quickly and clearly
- ◆ integrate words and graphics to reveal information, patterns, or trends
- ◆ are easier to understand than words alone
- ◆ are beautiful and engaging (Visual.ly, Inc. 2011)

I was first exposed to infographics in journalism through the Science Literacy through Science Journalism (*SciJourn*)



project at the University of Missouri–St. Louis (Polman et al. 2012). Eventually I developed most of my environmental chemistry curriculum around the use and student creation of infographics.

My students connect with infographics more deeply than they do with text or PowerPoint presentations. Creating infographics forces my students to decide what information is essential and requires them to find evidence to support their point of view. Creating infographics also addresses multiple science standards (Figure 1).

I begin by showing examples of infographics on topical subjects. For example, I use an infographic on the presence of various elements in the human body (Hamilton 2013) as we study classifications of matter. I direct students to evaluate the content of this infographic with questions such as, “Which element makes up most of the mass of the human body?” and “Which element most surprises you by its presence in the human body?” Then I direct student attention to the graphic, asking: “How well does this infographic present facts?” and “How could this infographic be made more interesting?” I also show my students an infographic I crafted myself addressing paper waste in our school (Figure 2, p. 36).

FIGURE 1

Addressing the standards.

Developing science literacy through infographics fosters the practices listed in *A Framework for K–12 Science Education* (NRC 2012) and the *Next Generation Science Standards* (NGSS Lead States 2013). “Science and engineering are ways of knowing that are represented and communicated by words, diagrams, charts, graphs, images, symbols, and mathematics” (NRC 2012, p. 74). “Students should be asked to use diagrams, maps, and other abstract models as tools that enable them to elaborate on their own ideas or findings and present them to others” (NRC 2012, p. 58). Many of the crosscutting concepts presented by the *Framework* and *NGSS* directly apply to infographics, especially “patterns,” “scale, proportions, and quantities,” “cause and effect,” and “systems and system models.” By creating infographics, students also gain experience with scientific and engineering practices such as “developing and using models,” “analyzing and interpreting data,” and “obtaining, evaluating, and communicating information” (NGSS Lead States, Volume 2, Appendix F, p.48). They analyze data, develop their own models to represent systems that they have studied as a part of their inquiry projects, and communicate this information to classmates and others.

Students creating infographics directly addresses the *Common Core State Standard* in English language arts for integration of knowledge and ideas. My students “translate quantitative or technical information expressed in words in a text into visual form” as they make their infographics and then “translate information expressed visually or mathematically into words” as they present their infographics to their audience (CCSS.ELA-Literacy.RST.9-10.7).

To find sample infographics online, Google “infographics” in specific content areas. Also review special websites that post various science infographics (see “On the web”). Even if you don’t focus on student-created infographics, these websites are useful for class discussions and student inquiry.

Another strategy is to task students with finding the “best” infographic on a particular topic, such as recycling. I have them find three to five relevant infographics online, decide which is best, then defend their decision and present the science content to the class. In class discussion, we reach consensus on what makes a good infographic and collaborate to list specifications to work toward. Students follow this *spec sheet* (example, Figure 3) when making their own infographics. In this way students form a collaborative community focused on the development of scientific literacy (Bransford, Brown, and Cocking 2000).

Three projects using infographics

My environmental chemistry students have created infographics on recycling, water pollution, and air quality. For each project I hand out a description of the activity and general guidelines for the anticipated product (see “On the web”). These guidelines outline the content to be covered by the infographic related to that particular environmental issue. Then we develop a spec sheet for the particular project. Students use these when polishing their infographic and when peer editing each other’s infographics before they are turned in to be evaluated.

Recycling coffee packaging

In the recycling project, students perform investigations together as a class, and then each student creates an infographic on resource use. This year we focused on plastic and foil waste created by coffee makers that use individually packaged servings of ground coffee. Students researched the individual serving cups and found them to be growing in popularity, difficult to recycle, and made by companies that have few plans to ameliorate their impact on the environment. We surveyed our own families and friends who use these products to find out how many bothered to recycle them. We dissected the cups themselves to study their structure and composition. We developed a method for users to recycle the cups. Then students created infographics about the use and recycling of the cups (Figure 4, p. 38).

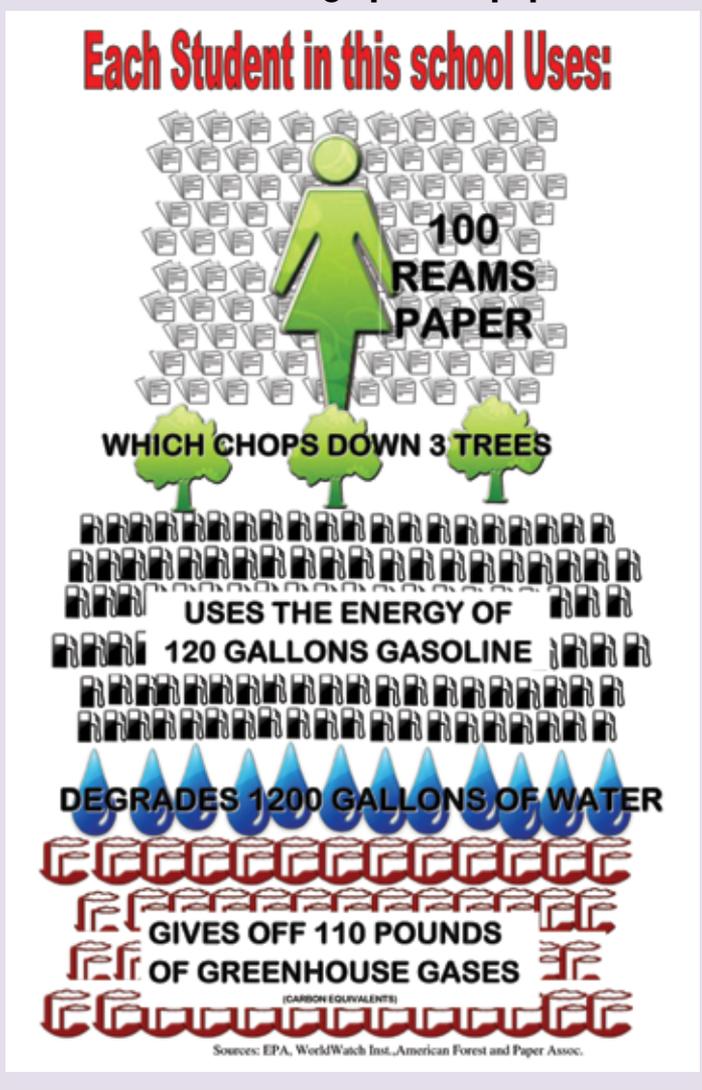
Students revised their infographics to address feedback from their peers. Then we moved on to the second infographic project.

Water pollution

We began as a class by covering aqueous solutions, the use of parts per million (ppm) as a concentration unit, and factors that

FIGURE 2

Teacher-created infographic on paper waste.



affect solubility, along with the other related topics. We tested water samples from our area for common pollutants and researched water pollution concerns in our community. Each student then researched deeper into a particular water pollution concern that caught their attention. Several students chose to find out more about the *E. coli* outbreaks in a popular summer lake used by many of the families in our school community (Figure 5, p. 39). Others researched why our two local rivers were listed in the top 10 most polluted rivers in the United States and why eating fish from those rivers would be problematic. Still others chose to research why some beach resort areas have pipes leading into the ocean and what might be released through those pipes. There were lively class discussions as we read through local news releases together that dealt with these and other water quality issues that directly affect their lives.

Air quality

The class's third unit, on air quality issues, began with the traditional coverage of the kinetic theory of gases and the gas laws and then moved into the investigation of our local area's smog and ground-level ozone. The students researched causes and effects and then developed and defended solutions to the problem. They represented their research findings and proposed solution on an infographic.

Choosing software tools

When creating infographics for these projects, my students have found their own methods of doing things. Many students use Microsoft PowerPoint to assemble charts and images and then save the completed slides as image files that can be inserted into a Microsoft Word document in a grid pattern. Other students use Microsoft Publisher, which provides layout templates. Similar tools are available for Apple computer platforms and tablets. Other programs students have found useful include Microsoft Excel, Prezi, Piktochart,

and LoggerPro, a product associated with the Vernier Lab Probes, which we often use to collect data.

The technology in such software (see "On the web" for related links) has helped my students enjoy the learning process. As Collins and Halverson pointed out, referring to the use of technology in the classroom, "Suddenly, when the drudge work of complicated tasks becomes contextualized and has new significance, students are more than willing to take the time to 'get it right'" (2009, p. 132).

Acquiring new skills

As the students worked on their infographics projects, they reached several literacy goals. They learned appropriate methods for filtering information to find credible sources. They learned how to locate copyright-free pictures or how to take their own in order to illustrate a point. They learned how to sort through a glut of data and interpret what they found and to decide what they could use to provide evidence for their claims. My students were required to include data from sur-

FIGURE 3

Specification sheet for coffee cup project.

Features to Include on K-Cup Infographic	Present, Missing or Needs Improvement
Shows creativity	
Tells a story	
Presents a position on the issue	
The information flows in an organized manner	
The information is clear and concise	
Uses charts, graphs, and statistics to present numerical information	
Addresses: What are K-Cups?	
Addresses: What are K-Cups made of?	
Addresses: What problems are caused by K-Cups?	
Addresses: How are K-Cups changing coffee consumption?	
Addresses: How can K-Cups be recycled?	
All information and images contribute to the message of the infographic	
Uses and cites multiple credible sources	
The title stands out and fits the contents and message	
The text can be read easily and contrasts with the background	
The amount of white space is appropriate	
Images are clear, relevant, original or copyright free, and credited	
Fonts, shapes, and colors are consistent throughout	

FIGURE 4

Example of student-created infographic on recycling coffee packages.



can be revised as often as necessary until they find the right combination of information and artwork to communicate their message. Developing media literacy enhances critical thinking, hands-on learning, and cooperative learning (Baker 2010, p. 145).

Final presentation

Students present their final effort to their peers. One method is the *gallery walk*, in which half the students stands beside a print-out of their infographics, answering questions as the other students circulate among the displays. This method works well if class time is limited. It becomes more interesting when outsiders, such as the principal or parents, participate. A more formal and time-consuming method is to have each student stand before the class and present his or her infographic individually.

Assessment

I use the spec sheet for each project as a grading rubric (Figure 3, p. 37). Each item on the sheet is worth 1 or 2 points. I deduct 1 point for features that need improvement and 2 points for missing features. Students are allowed to redo their infographics, earning half of the points deducted back with each revision.

Each of the three units using infographics takes 10 to 15 class days. This time frame includes the coverage of the content related to the topic being examined, carrying out lab activities on the topic, conducting surveys on the topic, crafting the infographic, peer edit-

Students craft their displays in minutes rather than the hours it would take for a traditional poster. They can reformat and change their design elements almost instantly.



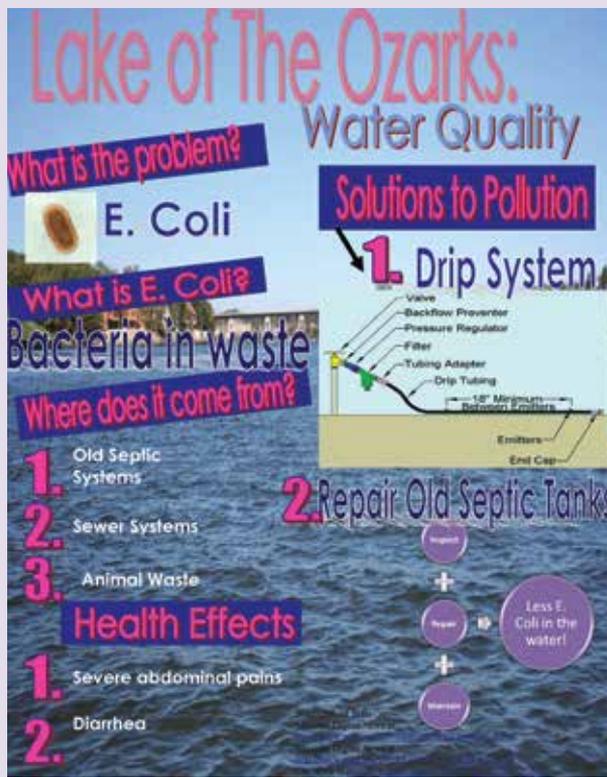
THINKSTOCK

veys as well as from laboratory investigations that they carried out themselves. They were required to interview stakeholders involved with the issue under study and were encouraged to find experts to interview in person, online, or by phone. They made multiple revisions until their infographics met the specifications that the class developed for the project.

In addition to science literacy, my students also develop their media and digital literacy through these infographics projects. Students craft their displays in minutes rather than the hours it would take for a traditional poster. They can reformat and change their design elements almost instantly. Their product

FIGURE 5

Example of student-created infographic on water pollution.



ing, and presenting the infographic to the class. The project timeline for the recycling coffee containers unit is typical (see “On the web”).

Conclusion

Many of my students became intrigued with the blending of art with science in our infographics projects. The infographic is just one of the emerging art forms in the developing field of data visualization. In his books, *Visual Explanations* (1997) and *Envisioning Information* (1990), Edward Tufte lays out general design principles of representing knowledge visually. He states: “To envision information—and what bright and splendid visions can result—is to work at the intersection of image, word, number, art” (1990, p. 9). David McCandless believes that “data is the new soil” and “data visualizations are the flowers” (2010). Using representational thinking is an important skill for students and can be developed with lessons that involve creating infographics. As the field of data visualization grows, it will attract and provide opportunities in STEM careers for our students. ■

Rosemary Davidson (rosedavidson@sbcglobal.net) is a chemistry teacher at St. Joseph's Academy in St. Louis, Missouri.

Acknowledgment

This material is based upon work supported by the National Science Foundation under Grant No. DRL-0822354. All statements are the responsibility of the authors.

On the web

- BitsofScience news feed with infographics: www.bitsofscience.org/science-infographics/
- Cool Infographics blog: www.coolinfographics.com/blog/tag/science
- GOOD.is blog with infographic examples: www.good.is/infographics
- Inspiration Software, Inc.: www.inspiration.com
- LoggerPro: www.vernier.com/products/software/lp
- New York Times* blog for teaching with infographics: <http://learning.blogs.nytimes.com/2010/08/25/teaching-with-infographics-science-and-health/>
- Piktochart Infographics: <http://piktochart.com>
- Popular Science* collection of science infographics: www.popsci.com/science/gallery/2012-12/10-best-science-infographics-2012?image=0
- Prezi, Inc.: <http://prezi.com>
- Recycling project timeline, score sheet, and specification sheet: www.nsta.org/highschool/connections.aspx
- Visual.ly collection of infographics: <http://visual.ly/science-infographics>

References

- Baker, F. 2010. Media literacy: 21st century skills. In *Curriculum 21: Essential education for a changing world*, ed. H. H. Jacobs, 133–152. Alexandria, Virginia: ASCD.
- Bransford, J. D., A. L. Brown, and R. R. Cocking. 2000. *How people learn: Brain, mind, experience, and school*. Washington, DC: National Academies Press.
- Collins, A., and R. Halverson. 2009. *Rethinking education in the age of technology: The digital revolution and schooling in America*. New York: Teachers College Press.
- Hamilton, B. 2013. The human body: Elemental composition by mass. Brooke Hamilton Visual Communicator. <http://openbookstudio.com/#/human-body-composition>.
- McCandless, D. 2010. The beauty of data visualization. Video. www.youtube.com/watch?v=pLqjQ55tz-U
- National Governors Association Center for Best Practices and Council of Chief State School Officers (NGAC and CCSSO). 2010. *Common core state standards. English language arts standards, science and technical subject, grades 11–12*. Washington, DC.
- National Research Council (NRC). 2012. *A Framework for K–12 science education: Practices, crosscutting concepts, and core ideas*. Washington DC: National Academies Press.
- NGSS Lead States. 2013. *Next Generation Science Standards: For states, by states*. Washington, DC: National Academies Press.
- Polman, J., et al. 2012. Science journalism. *The Science Teacher* 79 (1): 44–47.
- Tufte, E. R. 1990. *Envisioning information*. Cheshire, CT: Graphics Press.
- Tufte, E. R. 1997. *Visual explanations: Images and quantities, evidence and narrative*. Cheshire, CT: Graphics Press.

Copyright of Science Teacher is the property of National Science Teachers Association and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.