Science Journalism

Students learn lifelong science literacy skills by reporting the news

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Imagine the lives of Jane and John 15 years after graduating from high school. Jane's daughter suffers from severe allergies, having tried various diets and medications. Her church building committee wonders how much to invest in energy efficiency. John's mother worries about the risks of hormone replacement therapy. His community's school board is deciding whether "intelligent design" should be taught in the classroom. Both Jane and John plan to vote in an upcoming election in which the candidates hold widely different views on climate change; the ballot also has referenda tightening regulations on smoking and alcohol consumption due to health concerns. As Jane and John grapple with the issues affecting them, their families, and their communities, will their high school science educations help them make informed decisions?

Much of the National Science Education Standards (NRC 1996), aside from the inquiry and teaching sections, focus on content. Our call is instead to build standards that

focus on what students need to be scientifically literate in 10 or 15 years. Although a basic understanding of important scientific concepts and an understanding of how inquiry is practiced are immensely helpful, they are not enough. Students need ways to find, evaluate, and make sense of new scientific and technical information that we cannot predict with any degree of certainty.

Even in the present, students need skills that enable them to make decisions on technical issues and understand what takes place in cutting-edge laboratories and the papers generated directly from scientists' work. What standards and skills might support such understandings? This article reports on an initiative that addresses such needs.

The "Science Literacy Through Science Journalism" (SciJourn) project (Polman et al. 2010; Saul et al. 2012) explores how the practices of good science journalism can inform high school science education. As high school students report science news, they learn to gather and contextualize information and bring critical eyes to that which they read and write. This effort can be contrasted to the goal of making every student a "little scientist." Years after graduation, when John and Jane want scientific information to make informed decisions, they will not head to the lab but rather to the internet or the library.

The science of journalism

Ideally, journalists serve as public educators and interpreters of what is new and controversial. Reporters tackle questions of current interest to readers; investigate these questions by gathering information from multiple, credible sources; digest the information, including controversies and relevant technical details; and present the news without bias in a way that the general public can understand.

Who, what, when, where, and why

In a traditionally structured news article, a journalist covers what's most important and new in the first few sentences or paragraphs, quickly getting to the heart of the issue. Anything new or not common knowledge is attributed to a credible source or sources. This attribution helps the reader judge the information's reliability. It also leaves a historical trail, showing where ideas and inventions originated.

The journalist presents the news report's subject in context. For example, an article on a technological breakthrough should explain how many people it will affect, how much it will cost, how it differs from what came before, and so on. Details of the discovery follow, with comments from other reliable scientists and experts with no stake in the research. A good reporter knows how to find credible experts who can provide broad views on any new discovery, therapy, or technology; he or she can navigate scientific communities and understand experts' work and technical lingo, even without a science degree. Of course, this doesn't guarantee that the article is truthful or complete, but the article is likely to be more objective than a press release or an advertisement.

Gatekeepers

Reporters and editors play another important role: They are gatekeepers, striving to filter any unsubstantiated rumors, bad science, or false technologies. A good science journalist also recognizes when an assertion has reached the status of "consensus science," no longer needing an opposing view. Examples include media coverage of smoking's link to cancer and chlorofluorocarbons' effect on Earth's ozone layer.

Science journalism in the classroom

Recall the opening passage of the National Science Education Standards:

"In a world filled with the products of scientific inquiry, scientific literacy has become a necessity for everyone. Everyone needs to use scientific information to make choices that arise every day. Everyone needs to be able to engage intelligently in public discourse and debate about important issues that involve science and technology" (NRC 1996, p. 1).

Through an examination of expert science journalism practices and piloting of educative journalism in schools, the SciJourn project has sought to offer at least one way of critically thinking about both present and future. Students research topics of personal or civic interest using multiple, credible sources then digest this often complex information into news stories for a general audience. Typically, these articles are about 500 words long.

Draft articles typically receive feedback from student peers and teachers, then go through at least one edit by a professional science editor, who focuses on content issues. Revised articles accepted for publication are published in an online and print publication called *SciJourner* (see "On the web") or in local and school newspapers.

Finding a compelling topic

Topics for student articles are sometimes tied to the curriculum, but many teachers encourage students to write about any scientific topic they find compelling. This addresses Science Teaching Standard A: "Select science content and adapt and design curricula to meet the interests, knowledge, understanding, abilities, and experiences of students" (NRC 1996, p. 30).

SciJourner authors often pick topics they are connected to personally, such as tattooing, cochlear implants, the health hazards of a synthetic turf surface, or alternative medical therapies such as cupping. These subjects aren't found in

regular science curricula, but helping students understand the science behind such popular topics is a goal of the SciJourn project.

In fact, the goals we pursue in teaching science journalism are similar to those articulated in the National Science Education Standards (NRC 1996; Figure 1) and also fit with *A Framework for K–12 Science Education* (NRC 2011).

Evaluating information sources

Just as inquiry begins with a question or a problem (NRC 2000), so does student reporting (e.g., "Should a young person get a tattoo?"). Students then gather and evaluate information. They used to find science information in printed books and magazines; nowadays, they're more likely to go online. Most are already adept at navigating YouTube and social media websites but struggle to find solid science information.

Teachers sometimes restrict students with such rules as "no Wikipedia" and "Always use sources with a *.org, .gov,* or *.edu* web address instead of *.com.*" We encourage teachers to rethink these rules. For example, when looking for comparative information on hybrid cars, several *.coms* are valuable. WebMD offers expert medical information. The March of Dimes website has information on birth defects. And, though *.gov* and *.org* sites are typically credible, we encourage teachers to help students get started by targeting especially relevant sites, such as the Centers for Disease Control and Prevention for information on communicable diseases and the Environmental Protection Agency for background on environmental issues (see "On the web").

What we find is that young people, like all of us, solicit information from friends and family, listen to the radio,

watch TV and video clips, read blogs, and use sites such as Ask and eHow (see "On the web"). With so many sources of information available, evaluating them is challenging. Expert journalists look for cues such as who created the site, when it was last updated, and who sponsors it and why (Hargittai et al. 2010). Students need to develop similar critical-thinking skills, evaluating the source of information and not just the information itself. The ability to measure credibility, one of the goals of our project, is a life skill useful inside and outside the classroom.

Journalistic inquiry involves finding multiple credible sources and answers to questions that arise during research. The ability to develop further questions and seek deeper information is a hallmark of a scientifically literate individual. Offering and discussing models of good science journalism allows students to develop these literacy skills and learn science content by writing about it, which can improve student understanding (Hand, Yang, and Bruxvoort 2006).

FIGURE 1

Science journalism goals compared to education standards.

The National Science Education Standards (NRC 1996) tell us a scientifically literate person can	Students writing science news articles are expected to
Establish the relevance of STEM (science, technology, engineering, and mathematics) information in their own and others' lives.	Describe how scientific information is relevant to themselves and their readers.
Search effectively for and recognize useful STEM information from credible sources, especially on the internet.	Search effectively for and recognize relevant, credible information sources, especially on the internet.
Use multiple, credible sources and attribute the expertise and perspective provided by those sources.	Write articles based on multiple, credible, attributed sources.
Make sense of and accurately relate the important scientific concepts, methods, and explanations in STEM news.	Communicate information that is factually accurate and emphasize the most important elements.
Contextualize new STEM information in terms of societal impact or import and what is already scientifically established or tentative.	Contextualize scientific information, discoveries, and technologies and note broader implications and reflections on past and future understandings.

Adding politics to science

Journalism presents science news within the context of real-world problems. This means student journalists have to factor political and social implications into their news stories about scientific issues, such as climate change or communicable diseases. This, too, is an important part of scientific literacy. Placing a science topic into the context of the larger society can help students develop a coherent understanding of that topic (Zeidler and Sadler 2011).

Assessment

Assessing student writing is a challenge for science teachers. Before training, teachers were comfortable offering students feedback related to factual accuracy, but the SciJourn standards (Figure 1) have attuned educators to additional concerns related to attribution, credibility of sources, and contextualization. Plagiarism and other ethics issues also need to be addressed in teachers' feedback.

To help focus feedback, the SciJourn project has developed two guides. One, known as the Scientific Article Filtering Instrument, sends articles that have major problems, such as no attribution, inaccuracies, or plagiarized content, back to students to correct before the teacher reads further. The other instrument is our version of the Calibrated Peer Review system housed at the University of California, Los Angeles. Both of the instruments we use are available online (see "On the web").

Conclusion

Science journalism invites young people to serve as "translators" of science information for the general public. As such, students must dig into the science beneath issues of interest and importance, using multiple, credible sources. This project can lead to other "translation" activities that might include writing display labels for a museum, covering science events for a local broadcaster, or reviewing science books.

As new science standards are developed and evaluated, we continue to invoke science literacy for all as our overarching goal. Science journalism can provide opportunities for students to engage in inquiry that is relevant to them today while also preparing them for a scientifically and technologically advanced future. ■

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NSTA connections

Find detailed strategies and activities that support students participating in science journalism research and writing in the book *Front Page Science: Engaging Teens in Science Literacy* (Saul et al. 2012).

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On the web

Ask: *www.ask.com*
Calibrated Peer Review: *http://cpr.molsci.ucla.edu.*
Centers for Disease Control and Prevention: *www.cdc.gov*
eHow: *www.ehow.com*
Environmental Protection Agency: *www.epa.gov*
March of Dimes: *www.marchofdimes.com*
Scientific Article Filtering Instrument and the authors' version of Calibrated Peer Review: *http://teach4scijourn.org*
SciJourner: *www.scijourner.org*
WebMD: *www.webmd.com*
Wikipedia: *www.wikipedia.org*

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