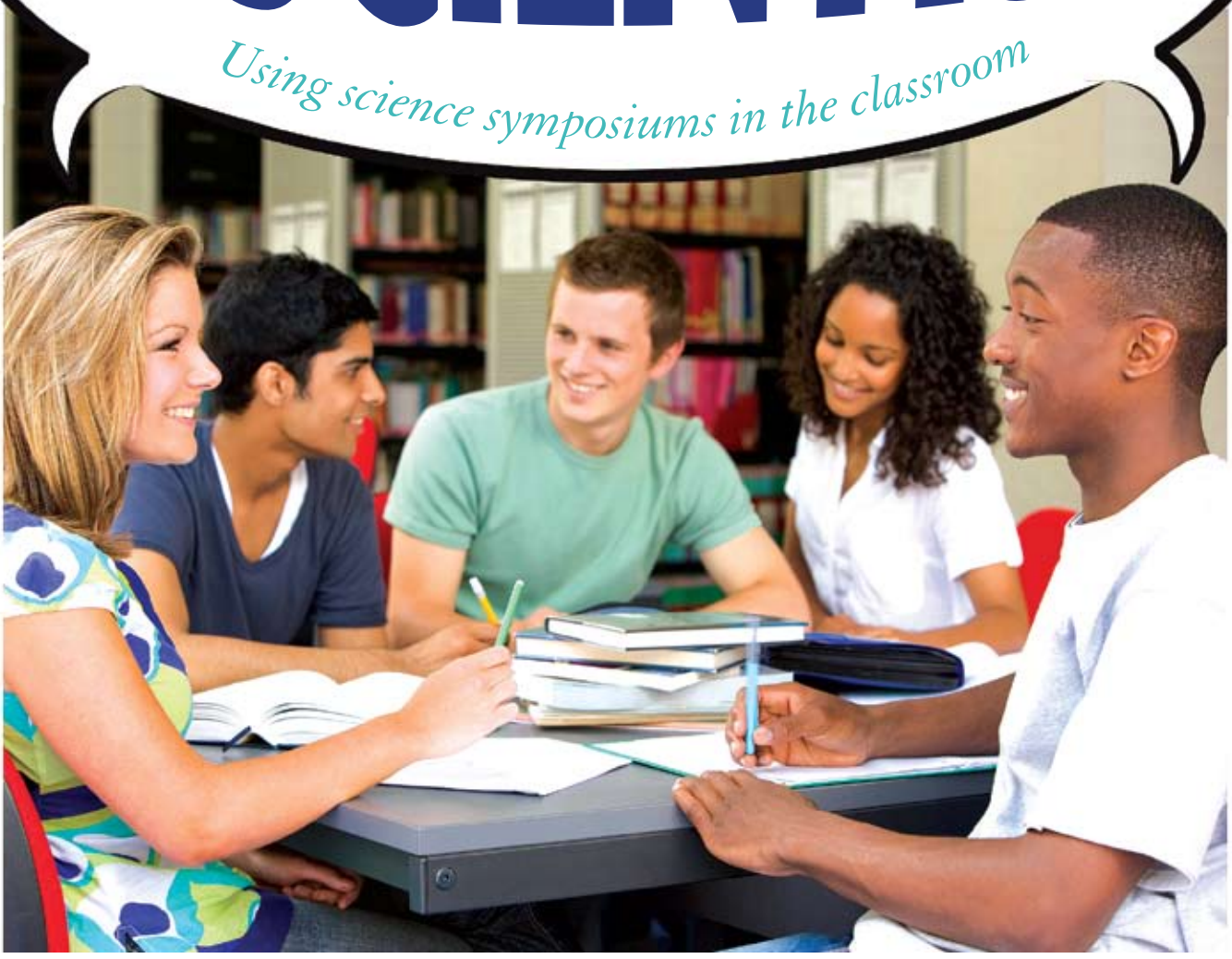
TALK LIKE A SCIENTIST

Using science symposiums in the classroom



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The National Science Education Standards (NRC 1996) call for scientific literacy for all. To help students become scientifically literate, we must model for them the way that scientists communicate. We accomplish this by asking students to write lab reports and read science texts—but how do we model "science talk"?

In the scientific community, the symposium is one formal structure of conversation. Scientists routinely hold symposiums to gather and talk about a common topic. To model this method of communication in my classroom, I designed an activity in which my students and I conduct our own science symposiums. In biology, we focus on rare genetic disorders or endangered species. In chemistry, we discuss nuclear storage solutions, and types, properties, and uses of alloys. In physics, we marvel at simple machines' impact on human labor and the works of great physicists. In environmental science, the topics are endless and include green energy, watershed management, and so on.

This article presents the science symposium as a useful classroom tool and includes rubrics and tips for incorporating symposiums in the classroom. Through these experiences, students learn to communicate like real scientists.

Introducing symposiums

The success of the classroom symposium is in the details: I choose a general topic for the symposium, such as green energy, and each student then chooses a specific subtopic in which to develop expertise, such as solar, wind, or geothermal power (Figure 1). (This also works as a small-group activity, in which two or three students work collaboratively on a subtopic).

Each student researches his or her subtopic and becomes the "class expert" in this area. Expertise is acquired in the library, where students find a cart of relevant books pulled from the stacks and a list of valuable websites compiled by our librarian. Working with the librarian or media specialist helps streamline the project and allows students to conduct online research safely and efficiently. Alternatively, students can be prompted to find resources on their own, but this takes more time. If this is the case, students should be briefed ahead of time on safe and appropriate web usage and how to assess the quality and validity of the web source.

Students are also given a guided research sheet to help them focus on the relevant concepts (see "On the web"). This includes space for general background information, interesting discoveries, societal impacts, and current research in the field, and helps students organize their ideas.

Symposium paper

After compiling their research, students prepare a symposium paper—an engaging and informative handout that summarizes their subtopic. This paper provides an overview of the research that students uncover and is presented in a newsletter format that is easy to read. In writing this paper, students must understand not only the science content related to their subtopic but also its impact on society and the planet. For example, a physics topic such as levers can lead students to consider their importance in everything from shovels, scissors, and wheelbarrows to boat paddles and the human arm. Research on green energy can help students focus on the technological advances needed for large-scale implementation of sustainable energy sources and prompt potential career interests.

The symposium also provides an opportunity for students to engage in scientific writing other than the traditional laboratory report. The symposium paper is one to two pages in length and should be engaging, informative, concise, and accessible to the student audience. Students are instructed to incorporate pertinent information from their "library research sheet" to produce a paper that is easy to read, comprehensive, accurate, and original. (See Figure 2 for complete student directions.)

FIGURE 1

Possible symposium topics.

Green energy	Endangered wetland plants	Alloys	Simple machines
Environmental science	Biology	Chemistry	Physics
Focus question: Is green energy a viable solution for our nation's energy crisis?	Focus question: Why is it important to protect the diversity of plant life in our wetlands?	Focus question: How have alloys "shaped" our world?	Focus question: What role have simple machines played in the creation of our modern civilization?
anaerobic digestion biomass power geothermal power small-scale hydropower solar energy tidal power wave power wind power	American lotus balsam poplar Bicknell's sedge blunt manna-grass bog aster Carolina willow colic-root cluster fescue elephant's foot horrible thistle lovage scouring rush swamp smartweed wild hyacinth	brass bronze duraluminium electrum magnalium pewter silumin stainless steel steel satellite sterling silver ultimet white gold	lever inclined plane pulley screw wedge wheel and axle

FIGURE 2

Student handout.

Introduction

Do scientists talk? The answer is a definite yes! Science is dynamic. New discoveries are constantly being made. Did you know that scientists regularly meet to share the results of their research with other scientists? Or that scientists who are working on similar problems eagerly gather to discuss their ideas and discoveries in a public forum? For example, in February 2010, the American Association for the Advancement of Science (AAAS) hosted over 4,000 of the world's scientists at its annual meeting in San Diego, California, where ideas and discoveries were openly shared. Before attending the meeting, scientists wrote papers about their discoveries and prepared presentations for the meeting. For these scientists, a common meeting format is the symposium.

sym·po·si·um [sim-*poh*-zee-uhm]

1. A meeting or conference for the discussion of some subject, especially a meeting at which several speakers talk on or discuss a topic before an audience.
2. A collection of opinions expressed or articles contributed by several persons on a given subject or topic (Dictonary.com 2010).

The AAAS states that "a successful symposium proposal is characterized by interesting topics that are thoughtfully developed and include capable and articulate presenters from a broad range of institutions who are representative of the diversity of science and society" (AAAS 2010a). Scientists often use the symposium format to talk about issues that are important for both science and society. For example, the AAAS 2010 Annual Meeting included the following symposiums (AAAS 2010b):

- Food allergies: The enemy within
- Can science feed the world?
- Up in flames: Fire in a changing environment
- Repairing our DNA: Bridging molecular mechanism and human health
- Children of assisted reproductive technologies: Their health and new genetic issues
- The science of well-being and implications for societal quality of life
- Can geoengineering save us from global warming?
- Biofuels' uncertain future: Unraveling the science and politics of indirect land use

In this class, we are all scientists! It is time we, too, gather to share our knowledge with one another. Prepare to participate in the "2010 Science Symposium"! The symposium will be held here in our classroom. Our theme this year is _____ and you will become an expert on a selected subtopic. To participate in our symposium, you must

- select a subtopic from the list provided—or propose one that is not on the list, and have it approved by the teacher;
- research the subtopic;
- prepare a symposium paper about your subtopic; and
- deliver a professional presentation.

On _____, we will convene the 2010 Science Symposium. We will video record the symposium, and I will collect your symposium paper for inclusion in the 2010 Conference Proceeding Booklet. This booklet will become a part of our class archives and our school's history!

Directions

Each of you must select a subtopic from the list and, ultimately, become the "class expert" in this area. You must understand the science content related to your subtopic and its societal impact. As you research, think about how your subtopic affects the lives of people, the health of our planet, and society as a whole. You are responsible for the following components:

- Library research: Use the "library research sheet" to guide your research.
- Symposium paper:

  1. Create a one- to two-page symposium paper for your subtopic.
  2. Incorporate pertinent information from your library research sheet.
  3. Prepare a paper that is easy to read, comprehensive, accurate, and original. You must cite all sources and beware of "cutting and pasting." Be sure to respect intellectual property rights and avoid plagiarism.
  4. Include a minimum of two pictures or graphics.

Symposium presentation

1. Your presentation will begin with a 3–5 minute talk and end with a question-and-answer session.
2. You may not read your presentation. You are the expert and, as such, should be able to talk about your subtopic without prompting.
3. To help you organize your ideas, you must prepare a short outline for your presentation.
4. Each person will be required to answer a minimum of two audience questions.
5. Dress the part! You are a professional, so on the day of the presentation, dress like one.

FIGURE 3

Symposium paper rubric.

	4	3	2	1
Accuracy	All information is extensive and accurate. There is evidence of extensive research.	All information is complete and accurate. There is evidence of adequate research.	All information is accurate. There is evidence of some research.	Information is either inaccurate, or there is a lack of research provided.
Organization	Information is organized with well-constructed paragraphs and subheadings.	Information is organized with well-constructed paragraphs.	Information is organized, but paragraphs are not well constructed.	The information appears to be disorganized.
Amount of information	All topics from the "library research sheet" are addressed, and all questions are answered with at least two sentences.	All topics from the "library research sheet" are addressed, and most questions are answered with at least two sentences.	All topics from the "library research sheet" are addressed, and most questions are answered with one sentence.	One or more topics were not addressed.
Quality of information	Information clearly relates to the main topic and includes several supporting details or examples.	Information clearly relates to the main topic and provides one or two supporting details or examples.	Information clearly relates to the main topic. No details or examples are given.	Information has little or nothing to do with the main topic.
Sources	All sources (information and graphics) are accurately documented in the desired format.	All sources (information and graphics) are accurately documented, but some are not in the desired format.	All sources (information and graphics) are accurately documented, but many are not in the desired format.	Some sources are not accurately documented.
Diagrams and illustrations	At least two diagrams or illustrations are neat, accurate, and add to the reader's understanding of the topic.	At least two diagrams or illustrations are accurate and add to the reader's understanding of the topic.	At least two diagrams or illustrations are neat and accurate and somewhat add to the reader's understanding of the topic.	The diagrams or illustrations are not accurate or do not add to the reader's understanding of the topic.

TOTAL _____/24

At the symposium's conclusion, I collect a copy of each student's handout and compile them in a booklet representing the "2010 Science Symposium Conference Proceedings." This booklet becomes part of the class archives and is an important feature of the symposium: Rather than writing for the teacher, students are writing for a wider audience—their peers and future students. With the knowledge that their writing will be read by others and preserved in the class library, students take more care to produce a high-quality paper. Student pride is evident when I present the final copy of the conference proceedings to the class. They enjoy seeing their own writing included.

Symposium presentations

On the day of the symposium, students gather to convene the "2010 Science Symposium." As the conference presider, I begin with an opening address, in which I welcome the audience of scientific experts and explain the format for the meeting. Students then hand out their individual papers to the other students in the class and are given 3–5 minutes each to orally present their findings. They are instructed not to read directly from their paper—as experts, they should be able to speak about the topic without prompting.

In a successful presentation, the presenter is confident in his or her knowledge of the subject and is able to talk freely about the topic without a "script" or elaborate presentation. To encourage this mode of conversation, I do not permit my students to use a slideshow or detailed outline. In contrast, students sit in a large circle and re-

FIGURE 4

Symposium presentation rubric.

	4	3	2	1
Research	Subject is researched extensively and is integrated into the presentation.	Research is somewhat integrated into the presentation.	Little research is integrated into the presentation.	No research was done, or research is not used in the presentation.
Use of evidence	Student expertly incorporates evidence to enhance presentation.	Student incorporates evidence to enhance presentation.	Student incorporates little evidence in presentation.	Facts are inaccurate, or no evidence is incorporated in presentation.
Organization	Presentation is well organized and maintains focus throughout. Presentation is cohesive.	Presentation is well organized, but occasionally wanders from focus.	Presentation is somewhat clear, but many aspects seem only slightly related.	Presentation is difficult to follow.
Speaks clearly	Student speaks clearly and distinctly at all times and does not mispronounce words.	Student speaks clearly and distinctly at times but mispronounces one or more words.	Student speaks clearly and distinctly most of the time and does not mispronounce words.	Student does not speak clearly and distinctly or mispronounces more than one word.
Duration of presentation	Presentation is between 3–5 minutes and does not seem hurried or slow.	Presentation is between 3–5 minutes but seems slightly hurried or slow.	Presentation is between 3–5 minutes but seems very hurried or slow.	Presentation is too long or short.
Attire	Attire is professional.	Professional attire is attempted, but detracts from presentation.	Attire is not professional, but appearance is clean and attractive.	Sloppy appearance detracts from credibility of presentation.

TOTAL _____/24

main seated when they present to their peers. Using only a short outline and their handout as a reference, they "talk" about their topic in this community setting.

Each presentation is followed by a question-and-answer session. The entire class is required to participate in this informal exchange. Students are assessed both on their ability to respond to audience questions after their presentation and on the quality of the questions they ask other presenters. This promotes the idea of a symposium as a conversation among experts. Figures 3 and 4 provide a rubric for the symposium paper and the presentation.

Talking science

Modeling scientific talk is an important part of achieving scientific literacy. Yet too often it receives little attention in the high school classroom. By incorporating a science symposium in your classroom, you can model for students the way that scientists communicate and the dynamic exchange of scientific ideas within the community. Students not only learn more about their assigned topic but also learn how to communicate their knowledge to their peers through the creation of a scientific paper and presentation. I encourage you to find opportunities to "talk science" in your own classroom by modeling how scientists communicate! ■

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On the web

Guided research sheet: *www.nsta.org/highschool/connections.aspx*

References

American Association for the Advancement of Science (AAAS). 2010a. Call for symposium proposals. *www.aaas.org/meetings/2010/program/symposia/submit*

AAAS. 2010b. AAAS Annual Meeting: 2010 program track listing. *www.aaas.org/meetings/2010/program/symposia/tracks*

Dictionary.com. 2010. Symposium. *http://dictionary.reference.com/browse/symposium*

National Research Council (NRC). 1996. *National science education standards.* Washington, DC: National Academies Press.