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Science Writing for the Masses: a Primer

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The subject of genetics is a science writers dream: there is mystery and intense drama in the lives of those affected. But most of all there is cutting edge science that we are only beginning to understand and of which we grasp the implications.

It's a bit harder to convince teenagers of that. Students pretty much view science as the classes they have to take to satisfy requirements. They know it affects them but it is a challenge for teachers to make direct connections with their lives.

It is a challenge that science journalists take onand master daily. New York Times Science Writer Natalie Angier says explaining research is "hard to do because science is very, very difficult. … The public really doesn't know anything about it, and it's the kind of thing where you never can make assumptions about what people understand." Angier says science writing is not simply translating into language that anyone can understand. It should be "skeptical, even critical." "It's not just bells and whistles and cheerleading," she said. "Science writers must "be able to critique science in the same way an art critic talks about painting."

Mary Mortimore Dossin wrote in a 1997 issue of College Teaching: "What I believe most students need is practice in the process of gathering information, analyzing and synthesizing that informationmaking their own sense out of itand then communicating their understanding to others."

Many in the education field believe that combining science with other subjects makes it more accessible. Gail Hall, a library media specialist in New Haven, wrote: "Integrating science and language arts makes the study of scientific concepts more familiar and less threatening."

The purpose of this unit will be to connect students to the basic science of genetics, current research and discoveries relevant to their lives and teach them a dynamic way to write about it. They will learn the basic properties of genetics and apply it to real life situations. For our purposes we will concentrate on the gene for breast cancer-BRCA2-for which there exists a test that many women have taken.

Students will meet normal people grappling with the dilemma of what to do about the fact that they carry an errant gene that could one day hurt them or their unborn children. They will communicate with genetic counselors who are faced with having to recommend testing, conduct those tests, and then convey the potentially devastating news. They will hear from scientists who work with these genes and doctors who treat

the patients who are their victims. They will research the statistics compiled regarding these genetic abnormalities to know just how many people are dealing with this dilemma nation or worldwide. They will take notes throughout and with their grounding in genetics, will produce their own piece of science journalism that will convey the science and drama of it all.

Simply put, the goal is for students to become scientifically informed, opinionated citizens, while they practice the skills of collecting, reading, summarizing and organizing information and writing complex topics in a format that most can digesta newspaper article.

Objectives

This unit will introduce students to the science of genetics and the issues that have arisen as scientists learn new uses for DNA. It will deal with genetic diseases and testing and the dilemmas it presents. Students will learn the mechanics of a newspaper story, understand the difference between primary and secondary sources, learn how to find and incorporate statistics into that story and be able to apply the basic structure of a news story to their science writing.

This unit is designed for high schools students in grades 9-12 who have an interest in science above and beyond the need to satisfy the science graduation requirement. They enjoy learning scientific concepts that are the basis for controversial medical procedures and discussing them at length with their peers. While they may have a keen interest in science, their skill levels are not considered advanced.

The unit is in line with the district writing policy, with the aim of having students write across the curriculum, essay writing not only in English and Social Studies, but Math and Science as well.

This is a collaborative unit between the library media specialist and the biology teacher. The biology teacher should note that the unit affords the opportunity to address the district's high school science standards of:

Biology content standard 3.0:

Students will:

Demonstrate a basic understanding of the molecular basis of heredity.

Discuss the chemical and structural properties of DNA.

Explain how genetic information is encoded in genes, replicated, transcribed and translated into proteins.

Describe the make-up of the chromosomes of which each species has a characteristic number.

Explain how changes in DNA, called mutations, can occur spontaneously or can be caused by environmental factors.

Performance standard 1.1 f:

Students will communicate and defend scientific argument. Students in school science programs will develop

the abilities associated with accurate and effective communication. These include writing and following procedures, expressing concepts, reviewing information, summarizing data, using language appropriately, developing diagrams and charts, explaining statistical analysis, speaking clearly and logically, constructing a reasoned argument, and responding appropriately to critical comments.

The unit incorporates all of the district's information technology standards, which follow the Big6 research method:

Big6™

1. Task Definition
    1.1 Define the information problem
    1.2 Identify information needed in order to complete the task (to solve the information problem)
2. Information Seeking Strategies
    2.1 Determine the range of possible sources (brainstorm)
    2.2 Evaluate the different possible sources to determine priorities (select the best sources)
3. Location and Access
    3.1 Locate sources (intellectually and physically)
    3.2 Find information within sources
4. Use of Information
    4.1 Engage (e.g.) read, hear, view, touch) the information in a source
    4.2 Extract relevant information from a source
5. Synthesis
    5.1 Organize information from multiple sources
    5.2 Present the information
6. Evaluation
    6.1 Judge the product (effectiveness)
    6.2 Judge the information problem-solving process (efficiency)

The unit exercises many of the skills needed for CAPT-critical reading and research, analyzing information and drawing conclusions, analysis of data and drawing conclusions, outline processes in writing.

The students' jobs as science writers will be to thoroughly air the issue. They will interview subjects about their experiences. They will interview experts on the subject. They will research (take notes) on the subject using the resources of the library media center. They will organize their research into a feature story that incorporates all points of view on the subject. They will learn basic properties of newspaper layout so that they may create graphics that add multiple points of entry to the story. The final product will be a newspaper story to be published in a special science edition of the school newspaper.

It is important to note that this unit can be applied to any aspect of science, any science unit that impacts the population in some way.

I might add that I am drawing on my decade long career as a journalist, much of which included science writing. I worked as an environment reporter for the Houston Post and a military writer for the San Antonio Light, which included coverage from Saudi Arabia of Desert Shield and Desert Storm. My freelance work included three years as a correspondent for Reuters news service in Connecticut and reporting for the New Haven Register. I wrote business features for the Hartford Courant. I have a master's degree in Journalism from the Graduate School of Journalism at Columbia University. Thus, after many years of writing news and feature stories, I have come up with a body of knowledge from which I will draw to write much of this unit.

What is a feature?

A feature is a story that is more in depth than a hard news story, which consists of just a direct, one sentence lead paragraph and all the particulars in descending order of importance. The feature writer has more time and space to go into more depth. Written well, a good feature will move, entertain and teach the reader all at the same time.

The most popular type of feature is the human-interest story. Whereas a news story doesn't usually feature people affected by the news, feature stories have real people and real lives at the heart of them. Features are not features without the people whose lives are affected by the subject matter. They appeal to the reader on a visceral level, which makes the reader more likely to keep reading and absorb the information.

Features are comprehensive. Once the reader has read the feature story from beginning to end, he should feel very educated or at least grounded in the subject matter. The feature format lends itself particularly well to science journalism for several reasons, most important being that scientific concepts can be complex and therefore difficult for the layperson to understand. Features allow science journalists room to offer human examples, statistics, definitions, background and more to make the subject matter accessible to the reader.

While features have more entertainment value than news stories, science features must be just as accurate and fact filled as straight news stories. They also need to be well organized so the reader does not get lost, with the information well paced and spaced to keep the reader's attention.

What is the structure of a feature story?

There are many ways to structure a feature story. For our purposes, however, we will stick to the following format for our human-interest feature (this feature is widely employed in Science Times articles):

Anecdotal open
Nut graph themes or issues a, b, c
Terms defined including background and statistics to demonstrate scope
Development of a, b, c
Anecdotal close

This may seem scary, but it is easier than it looks. Read on for details about how each part of the feature is structured.

The Anecdotal Open and Close

First, what is an anecdotal open? Assuming you have chosen an interview subject, or a person who is directly affected by what you are writing about, you will begin your science feature with a little snippet of or scene from their life that illustrates the problem.

Using a story from the Science Times section for Tuesday, May 1, 2001, headlined, "Hepatitis C Poses New Threat to Many with AIDS" by David Tuller, here is an example of an anecdotal open:

Gerald Moreno was thrilled when his doctor told him he was responding wonderfully to his H.I.V. drug cocktail, which included a powerful new protease inhibitor.

Then the physician delivered the other news. Despite Mr. Moreno's apparent improvement, tests revealed that he had a second major illness, hepatitis C, which can lead to liver cancer, cirrhosis and, in some cases, death.

"After surviving the H.I.V. epidemic all through the 80's, I was finally feeling, 'My God, now there's hope I can actually grab onto,'" said Mr. Moreno, a recovering drug user, who now is a health educator at the University of California at San Diego Treatment Center, a clinical and research facility. "So when my doctor told me I had another potentially fatal disease, I left his office devastated."

The writer has used Gerald Moreno's situation to illustrate the news story he is writing about. The anecdotal open is simply that: a story or anecdote to draw the reader right into the piece by allowing him a voyeuristic peak into someone's life and troubles.

The Nut Graph

The anecdotal open is usually closely followed by the nut graph, graph being short for paragraph. Nut is a slang term journalists like to use because it symbolizes the paragraph's function as the purpose of the feature story in a nutshell. This paragraph must tell the reader what the story is about and why it matters. In addition, the nut should preview all the issues, problems, themes you are about to develop in the feature story. Those issues will be aired in greater depth later in the story, but for now, the reader must be able to get the gist of the story just by reading the nut graph. If it is written well, the reader will continue on.

Continuing to use the story by David Tuller, here is his nut graph:

> "When the Food and Drug Administration approved the first protease inhibitors in 1996, many people with H.I.V. believed they had been granted an open-ended reprieve from death. Yet thousands of them are now confronting the reality that their hard-won longevity has left them with a possible life-threatening complication."

The Statistics

Next come the statistics and the scope of the problem.

Numbers rule in journalism, because they give a story weight and importance. If only three people are affected by what you're writing about, why are you writing it? But if 30,000 people in a three-town area are affected, then you've got a story.

In Tuller's story, he immediately gives numbers to back it up.

"Up to 40 percent of Americans with H.I.V. 300,000 to 400,000 peopleare believed to be infected with the hepatitis C virus, or H.C.V."

In a feature story, statistics come write after the anecdotal open and the nut graph. Once you have introduced the reader to a person affected by the subject, and you have stated definitively that a problem exists, you have to prove that it affects more than that one person.

There are numerous sites on the World Wide Web that offer statistics on the extent of breast cancer:

One example is the website posted by the National Alliance of Breast Cancer Organizations:

> "In 2001, 192,000 new cases of female invasive breast cancer will be diagnosed, and 40,200 women will die from the disease. Nearly 46,400 cases of female in situ (preinvasive) breast cancer will be diagnosed in 2001. Of these, approximately 88% will be ductal carcinoma in situ (DCIS). Breast cancer is the second leading cause of cancer death for all women (after lung cancer), and the leading overall cause of death in women between the ages of 40 and 55."

Background information and how it is incorporated into the feature

It is almost impossible to write a science feature without appropriate background. Science writers are in no way experts on anything they write; they rely on experts for expert advice. But that does not mean they don't know anything about the subject. In this section I will talk about just how much science journalists need to know about their subjects and how to get quick and dirty background information to provide a foundation for your piece.

Using Tuller's story as an example, the writer includes the symptoms of the Hepatitis C virus: "…fatigue, joint and abdominal pain, nausea and lapses in concentration."

Where did he get this information? For background information he turned to experts and government agencies involved in research: the director or the Hepatitis C Support Project in San Francisco, the National Hemophilia Foundation, a chief of Gastroenterology, the Centers for Disease Control and Prevention, a nurse practitioner at the U.C. San Diego Treatment Center, the San Francisco AIDS Foundation, the Hepatitis Resource Network, and another person infected with both viruses. All of these people and organizations are mentioned in the story.

It doesn't take much to ground the lay reader so that they have the background to understand what your subject is going through.

Primary sources are the best places to look for background. Primary sources are first hand sources, as opposed to second hand where someone else has the first hand source and writes about it. They are critical to science feature writing. Interviews with people affected by the subject are primary, and they are what give features life. News happens to people so an interview with someone who is directly affected by the subject is crucial.

Using as an example an article written by Richard Willing for USA Today the story has several significant interviews. First, there is Liz Stierman, a woman almost 40 who on her doctor's advice gets tested for the breast cancer gene. Her insurer pays, at a cost of $2,500. In an interview with her, Stierman reveals it was her 12-year-old daughter who objected to the test because if Stierman tested positive for it, there was a 50 percent chance she would have the gene as well.

Also interviewed was Nathaniel Robin, a doctor and geneticist, who put it best when he said that so much about genetics is space age stuff when the real drama is playing out right among us. "…in the real world (gene testing) is where the nitty gritty issues are being worked out. And so far, the technology is running miles ahead of the answers."

Other primary sources are data released by researchers or institutes. You can either comb through reams of raw data and draw your own conclusions or write your own summaries. This is what science journalists do. Students researching papers, however, usually get their information from the stories that those journalists write. The raw data is the primary source, the stories that summarize and interpret the data and are published in magazines, newspapers and journals are secondary sources.

For the purposes of the gene story, students can contact labs to find out the state of genetic testing for breast cancer: Willing uses GeneTests, in Seattle, which tracks testing. Genzyme Genetics, in Cambridge, Mass., Myriad Genetics of Salt Lake City. A secondary source would be the numbers Willing uses in his story as to the number of tests performed each year. A primary source would be a spokesman for the company updating you directly.

In the course of the interviews with the patient, the doctor, the genetic counselor, the insurance company, or the gene test manufacturer, students will want to pose some of the same questions to each. For instance, what will be the impact of widely available genetic testing in the future? What are some of the ways that patients who look and feel healthy today but have just found they carry a destructive gene can react? What resources are available to them? What about family members at risk who refuse to be tested? How effective and available is genetic counseling? Do the test results go to the insurance company? Do you see the possibility of genetic testing used for evil rather than good (similar to the Nazi-type experiments of the past)? Who should make these choices?

Interesting answers then lead to more questions. Students then choose from the interviews at least three themes that they will introduce in the nut graph and develop in subsequent paragraphs.

I am not a scientist. But for social intervention of genetic screening you might look at the following articles which raise the following questions:

As they ask these questions of the various sourcesthe doctors, patients, counselors, gene test

manufacturersstudents will invariably get different answers, some that may surprise them and introduce a side to the issue that they never thought of. These questions become the themes within their feature referred to earlier in the structure of the feature as a, b, and c. Of course there may be more than just three. Each of these facets of the story are mentioned briefly in the nut graph, then restated one by one in the body of the piece followed by evidence in the form of quotes, statistics, studies, etc. Students should understand this format from have written term papers in which the body of the paper is structured with a topic sentence followed by evidence derived from their research. This is Step 4 of the Big 6 method: extraction of information from sources. The main difference is that the in writing a science feature, the sources are mainly primary, rather than secondary sources from the school library.

Putting it all Together

So in putting it all together, the student selects a particularly poignant comment or moment from the interview with the carrier of the gene, describes it and follows it with a quote. After that, comes the nut graph which explains why the story is being written in the first place. It will contain the three issues the student plans to cover in the story.

Following the nut graph come the statistics that prove the story is a story. If the statistics are particularly startling, they will be followed by an interpretive comment by an expert. Then comes the background, explaining the complex science behind the story. After that, the three issues become topic sentences followed by supporting data which can be in the form of quotes from the interviews.

The story wraps up nicely with a closing quote from the patient that either shows some emotion or advances the story: the patient expressing concern for her children, the patient talking about what she plans to do next, the patient looking back on her decision to test, etc. This should be selected from the interview in advance, and saved to close the story.

What should teachers think about when teaching the structure of a feature?

Any time a student receives lengthy instruction on how to structure a piece of writing, that student benefits enormously. Whether it is a simple essay with an introduction, three main ideas and a conclusion, just the act of collecting data to back up those three main ideas helps the student deal with the overwhelming amount of information available to them.

As a graduate student, I took a course in political science that required a term paper. While the paper needed to be longer than anything I had written previously, I used my training as a journalist in organizing my information, writing clearly and concisely (something I can't say for many academics) and bringing the subject matter to life. While the approach may have differed from the professor's other students, she admired the work and graded accordingly.

How will students choose subjects for a feature?

Essentially, there are several steps the class must do to make this feature work. They must find someone who has a history of a genetically transmitted fatal illness in his or her family. Interview that person about the choice to be tested or not. Find an expert (doctor? Genetic counselor?) and interview him or her on implications of both decisions. Research background on the disease and possible causes of genetic defect. Find statistics on number of people who suffer from disease and/or die from it. This all works best when there is plenty of material.

Students will choose subjects for their feature stories based on the following:

- Availability of interview subjects
- Availability of research material
- Their interest in the subject

First and foremost, if you or they manage to find good subjects, they've got a story. Students have an invaluable source of interview subjects from nearby Yale University, starting with Jerry Mahoney, Professor of Genetics. Yale-New Haven Hospital's high-risk obstetrics practice has genetic counselors who may be willing to make a classroom visit. Physicians or counselors can refer breast cancer patients willing to speak of their experiences. Students themselves very likely know or are related to someone who has had breast cancer or may have had the gene test for it. While not as reliable, there may be cancer survivor chat rooms where students can read up on personal experiences and even post their own questions to see what responses follow.

If they've chosen something so obscure there is nothing available on the subject, they should drop that idea. And you wouldn't want your student slogging through a topic they couldn't care less about. Lord knows that in the area of genetic testing there are plenty of fascinating issues to go around.

Topics to cover for background:

I am not a science teacher, and only got by with B's in it in high school. I can understand the problems that some students have in grasping complex scientific concepts. It is important then to make sure that you can convey clearly the concepts students will need to know about the write about the people they will interview.

I turned to the book Genetics and Human Health: A Journey Within by Faith Hickman Brynie for a nice, simple explanation of how genes work. For science teachers, explaining genes and genetics should not be a problem. But a good science teacher is always looking for better ways of communication scientific concepts.

Following the science curriculum, and keeping in mind that we are dealing with students with average or below average skills, we must be able to clearly convey the parts of a cell and how the parts function as it relates to the science of genetics.

Brynie writes: "DNA is the blueprint for making proteins. DNA tells the cell what proteins to make and when to make them. Proteins, in turn, do the work of the cell. When proteins are missing or incorrectly constructed, they don't do their jobs properly. That's a genetic disease."

OK, but how? We need to break this way down.

My feeling is this is nice and easy to understand on a very general level. But if this unit is going to fly with students with average to low skills, the teacher must use several methods to explain the process of how DNA works to make the cell do what it is supposed to do. I recommend purchasing a model of the DNA Helix and a cell with movable parts for kinesthetic learners. I would also recommend the use of a video to show the process. I am using the Discovery Channels video on Genetics. The more you can ground the students in the

science behind the genetic diseases, the better they will be able to write about them. I remember from my days as a reporter that when I sat down to write with incomplete information, it would take forever to choke out a story. The better I understood my subject, the quicker the words flowed from my fingers.

DNA sits in the chromosomes in the nucleus, which we talked about earlier. But it is the ribosomes sitting in the cytoplasm on the outside that make the proteins that do all the work. DNA does not move, so how do the ribosomes get the instructions from the DNA?

It is a 3-step process: code, send, translate.

Brynie uses the analogy of someone trying to send a message in the days before the telephone. Say they speak English, and need to send a message in French. They are using a telegraph machine. So first, the message is put in Morse code and the telegraph operator receives it in English. He then finds a translator who translates it to French. Then the receiver can understand it.

DNA is the English speaker who wants to send a message, messenger RNA is the Morse code, transfer RNA is the French translator, and ribosomes are the French speaker who receives the message. Code, Send, Translate.

As I said before, journalists are frequently charged with delving into very complex subjects and having to write about them soon after. If science is not a strong point, always look for the person who could explain the concept in the terms easiest to understand. In the Encarta Encyclopedia, there was a link to a website called, "What the heck is a gene?" which immediately caught my eye for obvious reasons. What endeared me to this source even more was the library analogy:

> "...the local library is the DNA (all of the chromosomes). You go inside, show your card, and you are allowed to open a book (one of the chromosomes). You look at a sentence (gene), however, the sentence is written in French (DNA you can recognize individual letters, but you do not understand the words). Luckily for you, there is a copy machine which miraculously converts the letters (DNA nucleotides) in the sentence to English (RNA) when the sentence is copied. Now, you (the ribosome and tRNA) can read and understand the text. The copy machine of the cell (RNA polymerase enzyme) reads the text (DNA), and generates a copy (mRNA) both readable and understandable by the ribosome, and the tRNA."

Of course, in a regular feature, there simply is not the space to explain the whole process. The science journalists, who, in the interest of space must trim, trim, trim. Here is Richard Willing from the aforementioned USA Today article on mutations: "DNA, a cell acid that a person inherits from both parents, is carried on microscopic packets called genes. The DNA forms body proteins that create most of a person's unique characteristics. Occasionally, DNA sequences mutate. That fouls up the genetic code and creates diseases. These diseases can be passed from parent to child. Both parents have to pass on a copy of a bad gene to cause some diseases. Others only take one."

For the purposes of this unit, students should be introduced to certain genetic concepts and be able to answer the following:

Define the human genome.

What is the Human Genome Project?

What is mutation?

What is genetic testing? When and how is it done? Examples.

What is genetic linkage?

What is genetic counseling and when and why does it occur?

What training do counselors need?

What is genetic expression and determinism?

What causes gene damage? How does it occur?

What is your genetic profile and how can you find out about it?

What is a DNA marker?

Note: As a research exercise the teacher may want to devise a one-day library-based activity where students find the answers to the questions above.

Classroom Activities

It will be up to the science teacher as part of this collaborative unit to plan the activities to make students familiar with the science behind the story. The library media specialist should be there to teach the story structure. The following are ideas for conducting the lessons that go with writing up the story:

Sample Lesson Plans

Lesson Plan 1 Becoming Familiar with the Format

Lesson Plan Purpose

The purpose of this lesson is simply to show the students examples of the science writing format that the library media specialist has introduced them to.

Lesson Plan Objective

Students should be able to recognize and point out the elements of the feature story.

Lesson Plan Procedure

Step One: Students are briefed in a 20-minute PowerPoint presentation on the format of the feature.

Step Two: Students receive back issues of the Science Times section of The New York Times as well as three or four examples of science features that fit the format printed out from a full-text periodical database such as Newsbank, EbscoHost or Infotrac. If your high school library does not have a private service, your library media specialist can access a database through the public library website or the Connecticut State Library.

Step Three: Students mark up the stories, labeling each part of the feature.

Lesson Plan Assessment

Students will be asked to answer the following questions:

1. Who was interviewed for the story?

2. What statistics were used?

3. Where did the reporter get background information?

4. Where is the science summarized?

5. Which unanswered questions does the story leave in your mind?

What issues are raised and developed?

Lesson Plan 2 Interviewing for Feature Writing

Lesson Plan Purpose

The purpose of this lesson is to introduce students to the art of interviewing.

Lesson Plan Objective

The objective of this lesson is to teach students how to ask in-depth, probing questions and be able to listen to the answers to make sure the questions have been addressed and see if any follow-up is needed.

Lesson Plan Procedure

Step One: Choose a student in the class who is involved in an extra-curricular activity such as Debate Club or a sport.

Step Two: Stage a mock press conference around an upcoming event or a recent event in which that person participated.

Students are to take notes on a specially designed handout.

Step Three: As a group, students discuss which quotes are good to use directly, which are for paraphrase (informational).

Step Four: Using their notes, students write a news story on the event.

Resources/Materials

Portable tape recorders and blank tapes to check for accuracy

Lesson Plan Assessment

Students will read their stories in class and get reaction from other students who may have tried a different

approach

Lesson Plan 3 Picking Quotes

Lesson Plan Purpose

The purpose of this lesson is to help students pick out appropriate quotes for their stories.

Lesson Plan Objective

Students will be able to pick at least three themes to develop for their stories after combing through all interviews. They will have at least one quote to back up each theme.

Lesson Plan Procedure

This lesson is done after students have done all interviews. Teachers should note that all interviews should be audio taped so students can make transcripts as part of this lesson.

Step One: Students transcribe their taped interviews. As part of the transcription, they will include the questions that they asked the subjects as well as the answers.

Step Two: Students will read over the interviews, starring quotes that they feel raise a significant point about the subject of genetic testing. Students must be sure that all voices are represented and all viewpoints aired.

Step Three: Students will formulate "topic sentences" for each of the three issues that are raised, and make note of which quotes will be used in the development of the issue, being careful to see that there are at least two points of view for each.

Lesson Plan Assessment

This is a graded assignment, which will include a rubric. Points will be assessed for the three themes and the quotes selected.

Materials for Classroom Use

For the kinesthetic learners I recommend realia in the form of a large-scale model of the DNA Helix for the explanation of the scientific background.

For the visual and auditory learners I recommend such videos as the following:

Discovery Magazine: Genetics . Videotape. Discovery Communications, Inc., 1997. 26 minutes.

Double Helix . Videotape. Films for the Humanities and the Sciences, 1998. 107 minutes.

Several past issues of the Science Times section of *The New York Times* should also be available for perusal.

Bibliography for Teachers

Blum, Deborah, and Knudson, Mary eds. *Official Guide of the National Association of Science Writers: Field Guide for Science Writers* . Cambridge: Oxford University Press, 1997.

Greenman, Robert. *Using The New York Times as Your Journalism Textbook* . New York: The New York Times Company, 1998. This book gives great insight into the best newspaper for young journalists to read. It also uses Science Times examples and talks about the elements of feature stories including the anecdotal opening, which it refers to as a "vignette."

Osborn, Patricia. *School Newspaper Adviser's Survival Guide* . West Nyack, New York: The Center for Applied Research in Education, 1998. This book contains loads of tips for getting students comfortable with the newspaper writing style.

This and the following recommendation will help students draw from the tool they like to use the most: the computer.

Paul, Nora M. *Computer-Assisted Research: A Guide to Tapping Online Information* . 4th ed. Chicago: Bonus Books, Inc., 1999.

Berinstein, Paula, et al. *Finding Statistics Online: How to Locate the Elusive Numbers You Need* . Medford, NJ: Information Today, Inc., 1998.

Student Resources

Again, it will be up to the science teacher to introduce the genetics, but I benefited from the following two books from my library:

Brynie, Faith Hickman. *Genetics and Human Health* . Brookfield, Conn.: Millbrook Press, 1995. Very helpful with the basic understanding of how DNA controls cell production and how genes function and can become damaged, causing medical problems.

Rodgers, Joann Ellison. *Cancer* . New York: Chelsea House, 1990. Provides history, genes, viruses, statistics and new approaches to treating cancer.

Jones, Steve. *The Language of Genes: Solving the Mysteries of Our Genetic Past, Present and Future* . New York: Anchor Books, 1995.

Students will benefit from reading mainstream media articles on the experiences of science writers. Examples:

Barnes-Svarney, Patricia. "Science Writing: Today and Tomorrow." *The Writer* . Nov. 1994: 15-17.

Bigelow, Bruce V. "Writer Strives to Humanize Science Journalism." *San Diego Union-Tribune* . 16 Aug. 1995. E-2.

McKenzie, Aline. "An Inexact Science: Coverage of Subjects Like Cloning and Cancer Sometimes Suffers Because of Nature of News Business." *Dallas Morning News* . 07 June 1998: 11.