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**Title:** *Let Me Count the Ways: Teaching Math in the Library May Seem Like a Stretch. But It's Easier Than You Think*, By: Fleming, Dan, School Library Journal, 0362-8930, 20040801, Vol. 50, Issue 8

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### Let Me Count The Ways

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#### Teaching math in the library may seem like a stretch. But it's easier than you think.

Is it possible for librarians to strengthen math skills? The answer "yes" became apparent to me a few years ago while teaching a routine library lesson to a roomful of eighth graders. During an introductory lecture on *The Hobbit* to a language arts class, I placed a biography of J. R. R. Tolkien on an overhead projector and started to ask a few background questions.

"Can anyone tell me if they've read Tolkien?" A dozen hands shot straight up in the air.

"Who are some of your favorite characters?" The kids shouted names ranging from Gandalf to Bilbo Baggins.

I eventually shifted gears by inquiring how old Tolkien was when he published *The Hobbit*. "That's not up there," someone said.

"It doesn't say," called out another.

"Yes it does," one child suddenly yelled after making some quick tabulations. "He was 45."

"How many years passed between the writing of *The Hobbit* and *The Fellowship of the Ring*?" I continued. "And what percent of his life did he spend as a college professor?"

It took a little longer, but another student eventually came up with the correct answers.

As vice principal of Fuller Middle School and a former school librarian, I've been involved with our schoolwide initiative that focuses on strengthening students' math skills. The effort highlights the importance of math in all subject areas and emphasizes the library's role in helping to boost those skills through research projects and other lessons. Math is probably the last thing that comes to mind when you think of the library, but information literacy doesn't just apply to the written word. Media specialists have access to a variety of resources and can serve as an important link between math and other subjects.

There's no reason to feel intimidated about adding math to your library lessons. Stepping outside the familiar world of literature is not as hard as it sounds. As an adjunct professor at the Simmons College Graduate School of Library and Information Science, in Boston, I've asked my students to begin by studying the Massachusetts Curriculum Frameworks, starting with the statewide math standards, to devise math lessons in a library setting. Part of the focus of my class, "Curriculum Frameworks and Instructional Strategies for Library Teachers," is to train future librarians to reach beyond traditional librarian roles-and demonstrate how all subject areas, even math, can be presented in the library.

Just as information-literacy skills lead to higher reading scores, practicing math skills in the library

strengthens students' abilities to apply and understand math, which likely leads to higher math scores.

School librarian and former Simmons College student Suzanne McHugh says that the class taught her how to examine all of the Curriculum Frameworks and to integrate them into library instruction, an essential skill as she prepares future students for the mandatory statewide math tests called the Massachusetts Comprehensive Assessment System (MCAS).

"After taking the class, I no longer see our role as building individual skills but as part of a larger context in which we teach students how to think creatively, independently, and critically in all subjects," McHugh says. "It will help me create more thoughtful, effective lessons in the library."

Like most statewide standards, the Massachusetts Curriculum Frameworks includes many literacy and critical-thinking skills such as reading, researching, problem solving, making connections, evaluating, and reasoning. And since many math questions on the MCAS exams read like passages from the nonfiction books on our library shelves, what better way to practice for the exam than by bringing students to a "library-classroom" filled with multiple and varied resources that can help them fine-tune their math skills.

Before you begin, read your state's math standards to help you identify the "library in the math." You'll also need to reexamine your nonfiction collection with an eye toward strengthening math skills. When I was a media specialist, I ordered the entire Country Fact Files series (Raintree) and numerous other nonfiction books in various subjects that contained lots of charts, tables, graphs, and numbers. It's much easier to develop library projects with math-related questions if your media center is equipped with these resources.

I continue to encourage our students to spend time out of their math classes by digging into the undiscovered math in the school library's vast nonfiction books. Mathematical relationships are everywhere-in encyclopedias, almanacs, yearbooks, country books, animal titles, and even art books.

To help get you started, here are some simple steps to incorporate math into your library projects:

Know the underlying math priorities that are in your state standards. In Massachusetts these priorities are Number Sense and Operations; Patterns, Relations and Algebra; Geometry; Measurement; and Data Analysis, Statistics, and Probability. These math themes appear in all K12 courses. Here's how they can serve as the basis for introducing math into your library lessons, projects, and activities:

#### Number Sense and Operations

Explore nonfiction books and topics that include "real" number concepts, graphs, and charts to reinforce math skills and ideas. Locate and calculate "real" information that incorporates number sequences and other operations.

#### Patterns, Relations, and Algebra

Recognize and predict patterns in familiar stories and rhymes. Use reference books and other resources to create real-world problems with actual data.

#### Geometry

Ask students to find basic shapes in their environment and in books.

#### Measurement

Locate, observe, and compare the lengths of objects to each other and use appropriate vocabulary to describe them. This exercise works well in lessons on map skills.

#### Data Analysis, Statistics, and Probability

Collect, sort, organize, and draw conclusions about data using concrete objects, pictures, numbers, and graphs.

Focus on math when collaborating with any subject teacher on a research project. If you're assisting

with a biography project in any subject, have your students collect and analyze important mathematical statistics about their subject and ask them to present the data in the form of tables, ratios, percentages, and fractions.

Here are some sample questions to help get you started with your projects:

Calculate how many years your subject lived.

Illustrate in the form of a pie chart the percentage of your subject's life (in actual years) that he devoted to the activity for which he is noted. Show in the form of a table whether he accomplished most of his work in his early or later years.

If your subject is a woman or a minority, figure out the ratio of women or minorities who are working in his or her field.

If the person has made an important contribution to society, express it in mathematical terms. For instance, if the subject is an inventor, figure out what percentage of the population uses that invention. How many have been sold? Using a time-line graph, show how quickly the invention was adopted. If your subject discovered a new drug, how many lives has it saved? What percent of the world has access to the drug?

Be creative. Without giving them any guidance, ask students to use their imagination while incorporating math into their research projects. You'll be surprised by the ways they apply math concepts they've already learned. Invite classes to the library for mini-math activities so they can get into the habit of applying the concepts they're learning. We invited math classes to the library for one period and asked students to apply the concept of mean and positive and negative numbers by researching, comparing, and presenting information about mountains found in various country books. We asked students to identify the elevation of the highest mountain in each country, to create bar graphs that describe how the countries and their highest mountains compare, and to calculate the average height of the mountains in all the countries studied.

Have students develop a word problem based on mathematical information that they've read in their research. As students dig for information on any subject, they're sure to come across information expressed in mathematical terms.

My hope is that librarians will eventually say, "Adding math to my library lesson makes perfect sense" or "I can do that." As Theresa Conroy, another media specialist and former Simmons student put it, "The school library provides a setting for students to take a second and third look at ideas presented in the classroom." Let's try to reverse some of those old stereotypes about math and create a learning environment that'll help boost our kids' skills in math, as well as reading.

PHOTO (COLOR)

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By Dan Fleming

Dan Fleming is vice principal at the Fuller Middle School in Framingham, MA.

#### **Links Between Information Literacy and Math Skills**

- Students who use the library must use information accurately. Accuracy is key when engaging in math operations and calculations.
- Students who use the library must have good number sense and interpret numbers to locate information.
- Students who use the library use logic. Navigating your way through a library requires sequential and organized thinking, which is essential to being successful in mathematics.
- In a library, students must be able to sort information, a key math skill.
- The library has an endless supply of online and print data, resources, charts, graphs, and other statistics. Teachers can use these resources to develop lessons, and students can use them to demonstrate proficiency.

- Researching in a library is equivalent to problem solving. The Massachusetts Mathematics Framework says, "To become good problem solvers, students need many opportunities to formulate questions, model problem situations in a variety of ways, generalize mathematical relationships, and solve problems in both mathematical and everyday contexts."
- The library's multiple resources are ideal for presenting math skills and principles in combination with real-life situations. For example, students studying natural disasters might use almanacs or encyclopedias to analyze or read tables and charts about natural disasters or the impact of them.
- Information-literacy skills progress from the simple to the complex. Solving math problems is cumulative, building from the simple to the complex.
- Learning math is more than learning a rote set of rules. Using the library means following routines and applying them. This means using critical thinking and information literacy skills-analyzing, evaluating, synthesizing, connecting, integrating, and evaluating information.
- As students sift through library data doing research projects that involve both problem solving and performing math operations, teachers can observe, assess, and make immediate interventions to help them improve these skills.

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