

# **Chattanooga Math Trail: Community Mathematics Modules, Volume 1**

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## Introduction

This collection of community mathematics modules, or “math trail,” is appropriate for middle grades and high school students (grades 5-12). The modules were developed during the fall semesters of 2001 and 2002 by students enrolled in the Education 451 Teaching Strategies and Materials in Secondary and Middle Grades Mathematics course at The University of Tennessee at Chattanooga. Community sites are featured from the perspective of mathematics. Each module includes the mathematics of a particular location within the community, organized around one or more of the National Council of Teachers of Mathematics (NCTM, 2000) standards. Collectively, the modules provide attention to all 10 of the NCTM standards, which include 5 content standards (Number and Operations, Algebra, Geometry, Measurement, Data Analysis and Probability), and 5 process standards (Problem Solving, Reasoning and Proof, Communication, Connections, and Representation).

The community mathematics module is a new type of project for the Education 451 course, which is completed by university-level teacher education students (pre-service teachers) who will teach high school or middle school mathematics. The project has been met with student enthusiasm. It is not an off-the-shelf replication, from a lab manual, or a collection of documents. It takes place outside of a dorm room or home, and includes more than interaction with word processing and spreadsheet software, as in other projects. The students work individually or in small groups, and are responsible for designing a complete, stand-alone module through the process of selecting a site, having the site approved, collecting and analyzing data, and writing a problem set with solutions.

The prototype site module is *The Carousel at Coolidge Park*, developed during summer 2001. Critical mathematics facts, such as time for one rotation of the carousel, radius or diameter of the carousel, radius of each animal’s concentric circle for a given row, dimensions of the animal, etc., were gathered through direct measurement. Problems are posed, such as finding the rider’s velocity on a given animal, finding the scale factor of the carousel animal as compared to a live animal, etc. Technology connections are provided in the form of Web sites for further exploration of both the mathematics content and the community site. For example, the Annenberg/CPB Exhibits Collection (2003) Web site features information and interactive activities for several amusement park rides.

Given the results of international studies, such as TIMSS (Michigan State University, n.d.), and various media reports, it is known that mathematics is an academic stumbling block for many children and adults. Academic student performance data (Tennessee Department of Education, 2002a, 2002b) for middle grades mathematics suggests there is ample room for growth in teaching and learning experiences at the university pre-service level as a means to improve student academic performance in the K-12 setting. Improved performance in mathematics for the K-12 student may reduce the barrier to career choice, especially in the natural sciences, engineering, and technology.

Making mathematics “relevant to the student” was a phrase echoed many times by session presenters at the 2001 National Council of Teachers of Mathematics national conference, especially those who teach in urban settings. Conference participants are sometimes able to attend a conference session to take a mathematical walking tour of the host city. Chattanooga has many attractions and sites that are rich in mathematics, but not necessarily within walking distance of a central location. The modules pose problems for mathematical solution that are based upon area sites, are relevant to middle grades and high school mathematics, and involve multi-step solutions. Concurrently, this project increases the problem posing flexibility and problem solving fluency of the problem posers themselves, the pre-service teachers, who will soon be mathematics teachers.

Kay Toliver, an educator in New York City, and a speaker at the NCTM national conference, used the writing of a math trail as a class project with middle grades students (Toliver, 1993, 1996; FASE Productions, 2002). At the Alabama Council of Teachers of Mathematics conference, a session was presented for the writing of math trails (Clopton, 2001). After learning about the presenter’s work in designing math trails for her students, the group set out on a math trail around the Auburn University-Montgomery campus. Tasks included estimating the height of a building, viewing geometric patterns and angles in the concrete walkways, finding number and letter combinations on automobile license plates, calculating the area beneath the lunch tent, etc., capturing digital photographs as the math trail progressed.

In a session at the NCTM national conference during spring 2001, teaching and learning strategies supported by the NCTM standards were discussed that are important to use when teaching mathematics to inner-city, African American students. Among the nine strategies are (a) reinforcing skills in a variety of ways, including field trips, games, etc., to show mathematical connections; and (b) using mathematical enrichment activities as the norm and not as the exception (Smalley & Moch, 2001).

The students in Education 451 complete an urban field placement for the course, and one 8-week urban placement during the 16-week student teaching field experience. The modules complement the work done in Connected Mathematics (Lappin, Fey, Fitzgerald, Friel, & Phillips, 1998), the textbook series adopted for middle grades mathematics in Hamilton County, TN, as well as in other school districts in the U.S. It is important to design and have relevant resources available for the student to use in pre-service teaching experiences, and for the student to carry forward methods and materials that will lead to a successful classroom teaching career.

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