Enhancing Mathematics Learning Through Informal Summer Math Camp Experiences

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EXECUTIVE SUMMARY

This chapter focuses on Montana Math Summer Circle, an informal mathematics learning program designed to support and meet the needs of rural students who are passionate about mathematics. The main goal of the summer math camp program is to provide students with the necessary knowledge and skills to excel in advanced mathematics and mathematics competitions, such as the American Mathematics Competition, in a setting away from the formal school environment. The math camp's curriculum encompasses both pure and applied mathematics. It offers a blend of formal academic and technical mathematics problems, as well as informal recreational and everyday mathematics activities. This thoughtful combination of mathematical rigor and joy in the summer camp program supports and improves both the intellectual and socio-economic development of students.

BACKGROUND OF THE MONTANA
MATH CIRCLE SUMMER CAMP

A summer camp program provides an informal learning environment where the curriculum and activities occur outside the traditional school setting, with participation being voluntary rather than mandatory. In this chapter, we showcase the math curriculum and activities of the Montana Math Circle Summer Camp program, highlighting its informal learning approach. The primary goal of the Montana Math Circle Summer Camp is to help students succeed in advanced mathematics and competitions through informal learning experiences in a summer camp setting. This goal holds particular significance for rural school students, who often face unique challenges in accessing STEM educational opportunities (Harris & Hodges, 2018; Shang et al., 2023).

The Montana Math Circle Summer Camp promotes equitable access to mathematics problem-solving for rural middle and high school students. Rural students account for almost 20% of U.S. K-12 students, but rural context varies from state to state. Montana, a large geographic, low populous state, has the highest percentage of rural students in all the United States. Most schools in Montana are classified as rural schools (74% as compared to a nationwide average of 28.5%), and 90% of Montana's rural districts are smaller than the national median of 484.5 students (Schowalter et al., 2017). Rural schools in Montana face challenges when it comes to serving the needs of their gifted learners. Perhaps the most obvious challenge stems from rural districts' smaller student body size. Because of their size, rural systems often have a small number of gifted learners who are spread across grade levels and even schools. As such, Montana's mathematically talented students have little to no access to challenging math programs and thus are underrepresented in well-known national math enrichment programs. This also means interaction with intellectual peers—which is vital to both the academic and social-emotional growth of gifted learners—is severely limited in rural schools. Additionally, the sparse gifted population in rural areas often results in districts allocating fewer resources and time to these students; consequently, gifted students report less challenge in their courses than their urban and suburban counterparts.

The Montana Math Circle Summer Camp is housed in the Science Math Resource Center (SMRC) at Montana State University in Bozeman. It is part of Montana State University's ongoing commitment to science, technology, engineering, and mathematics (STEM) education. Over the past half-century, SMRC has partnered with local education agencies (LEAs) and government agencies at various levels to offer informal STEM enrichment programs or projects, such as the Montana Science Olympiad, the American Mathematics Competition (AMC) series, the Montana Girls STEM Collaborative, QuantumGirls, and Citizen Science, for youth. Over the past

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