

# Creativity, Giftedness, and Talent Development in Mathematics



edited by  
**Bharath Sriraman**

MONOGRAPH 4 IN  
THE MONTANA MATHEMATICS ENTHUSIAST  
MONOGRAPH SERIES IN MATHEMATICS EDUCATION



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# **The Montana Mathematics Enthusiast**

## **Monograph 4**

*Creativity, Giftedness, and  
Talent Development in Mathematics*

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*The University of Montana*



INFORMATION AGE PUBLISHING, INC.  
Charlotte, NC • [www.infoagepub.com](http://www.infoagepub.com)

**Library of Congress Cataloging-in-Publication Data**

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of Teachers of Mathematics

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Printed in the United States of America

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## PREFACE

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# **CREATIVITY, GIFTEDNESS, AND TALENT DEVELOPMENT IN MATHEMATICS**

**Bharath Sriraman**  
*The University of Montana*

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Our innovative spirit and creativity lies beneath the comforts and security of today's technologically evolved society. Scientists, inventors, investors, artists and leaders play a vital role in the advancement and transmission of knowledge. Mathematics, in particular, plays a central role in numerous professions and has historically served as the gatekeeper to numerous other areas of study, particularly the hard sciences, engineering and business. Mathematics is also a major component in standardized tests in the United States, and in university entrance exams in numerous parts of world.

Creativity and imagination is often evident when young children begin to develop numeric and spatial concepts, and explore mathematical tasks that capture their interest. Creativity is also an essential ingredient in the work of professional mathematicians. Yet, the bulk of mathematical thinking encouraged in the institutionalized setting of schools is focused on rote learning, memorization, and the mastery of numerous skills to solve specific problems prescribed by the curricula or aimed at standardized testing.

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My foray into creativity and giftedness began as a school district coordinator of the gifted program in a public school district in Illinois. During this time I was mentored by Professor Robert Wheeler at Northern Illinois University, who shared my interest in the construct of creativity. Several seminars led us into the considerable body of literature on creativity and I naturally wanted to empirically test things out in the classroom. In the public school setting, I tried out many innovative things like integrating science, philosophy and literature with mathematics; conducting teaching experiments with problems that were isomorphic in structure and studying whether students were able to discover generalizations via this process, as well as studies aimed at the insights of mathematicians and gifted students on proof and the nature of creativity in mathematics. Several of the chapters in this book are based on critically peer-reviewed published articles arising from these studies. I also had the good fortune of having the support of Harry Adrian, a teacher of philosophy and great ideas who helped me learn the logistical and practical aspects of operating a functional and equitable gifted program in a public school district. My scholarly interest in the field also grew as a result of serendipity—i.e., meeting Paula Olszweski-Kubilius at the State of Illinois gifted conference at Pheasant Run, St. Charles, Illinois in 2000. Paula encouraged me to read the research literature in journals and to start writing and publishing the findings of my research in gifted education journals.

It is difficult to believe that eight years later, many of the research studies that I initiated and published on are receiving wide citations and are also being extended and carried out by scholars in other countries. The chapter by Supattra Pativisan which examines the problem solving abilities of Thai gifted students (Chapter 8) is an extension and a more detailed examination of the ideas found in the chapter entitled *Mathematical giftedness, problem-solving and the ability to formulate generalizations* (Chapter 2). Similarly Chapter 11 by Yim, Song, and Kim on *Mathematically gifted Korean elementary students' revisiting of Euler's polyhedron theorem*, is a practical study inspired by my (audacious) theorization of the possibilities of implementing Lakatosian methods in the classroom (in Chapter 10) based on my results of classroom based studies.

The monograph also contains chapters from Viktor Freiman and Alexander Karp, scholars who have an insiders perspective on the models of talent development used in the former Soviet Union. In addition the chapters by Sylvia Bulgar, Alan Zollman and Linda Sheffield present a complementary discussion of the issues surrounding mathematics gifted education in the United States. The sheer range of perspectives presented in the chapters and the geographic diversity of the author's backgrounds makes the monograph truly international in its scope.

Given the lack of research based perspectives on talent development in mathematics education, this monograph is specifically focused on contributions towards the constructs of creativity and giftedness in mathematics. This monograph presents new perspectives for talent development in the mathematics classroom and gives insights into the psychology of creativity and giftedness. The book is aimed at classroom teachers, coordinators of gifted programs, math contest coaches, graduate students and researchers interested in creativity, giftedness, and talent development in mathematics.

