

Mind Builders: Multidisciplinary Challenges for Cooperative Team-building and Competition

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Teacher Ideas Press

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Teacher Ideas Press, an imprint of Libraries Unlimited
Westport, Connecticut • London

Library of Congress Cataloging-in-Publication Data

Fleisher, Paul.

Mind builders : multidisciplinary challenges for cooperative team-building and competition /
by Paul Fleisher and Donald M. Ziegler.

p. cm.

Includes bibliographical references and index.

ISBN 1-59158-376-4 (pbk. : alk. paper)

1. Gifted children—Education—Handbooks, manuals, etc. 2. Student activities—Handbooks,
manuals, etc. 3. Problem-based learning—Handbooks, manuals, etc. 4. School contests. I. Ziegler,
Donald M. II. Title.

LC3993.2.F58 2006

371.95'6—dc22

2006023744

British Library Cataloguing in Publication Data is available.

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Library of Congress Catalog Card Number: 2006023744

ISBN: 1-59158-376-4

First published in 2006

Libraries Unlimited/Teacher Ideas Press, 88 Post Road West, Westport, CT 06881

A Member of the Greenwood Publishing Group, Inc.

www.lu.com

Printed in the United States of America



The paper used in this book complies with the
Permanent Paper Standard issued by the National
Information Standards Organization (Z39.48-1984).

10 9 8 7 6 5 4 3 2 1

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Acknowledgments

The authors would like to express their appreciation to the Richmond, Virginia, Public Schools, and its superintendent, Dr. Deborah Jewell-Sherman, for their long-standing support of the Mind Games interscholastic competition, from which the ideas in this book grew.

We'd also like to thank our fellow teachers in the RPS Programs for the Gifted, who worked with us through many years of cooperative planning, collegial problem solving, and educational fun. Our supervisors, Anna Lou Schaberg and Rodney Fout, each deserve special, heartfelt thanks for their unflagging support over the years. We couldn't have asked for a stronger pair of advocates for gifted students and for the teachers who serve them.

Thanks to David Odehnal, Mary Ann Ready, and John Hunter for their assistance with the problems in the book and to Elontae Terry who posed for photographs. And thanks to the many educators we've met over the years who have generously shared their ideas with colleagues in classrooms, faculty lounges and workshops. Some of those ideas have undoubtedly found their way into this book, although our faulty memories make it impossible to give proper credit to the people from whom we garnered them.

Most of all, our undying gratitude to Debra Fleisher and Beverly Ziegler, to whom this book is dedicated. They have given us daily support and love, as well as a number of helpful suggestions for this book, taught us virtually everything we know about education, and enriched our lives beyond measure.

Introduction

Every educator wants his or her students to develop skills that allow them to work together cooperatively. We want young people to apply what they've learned as they solve new problems. We want them to be flexible enough to consider a variety of possible answers to open-ended questions. We want them to test and evaluate solutions to a problem rather than jumping on the first "right" answer they come up with. We want students to be willing to tackle difficult problems and to be persistent in their quest to solve them. Most of all, we want them to be excited and enthusiastic about learning.

Skills like these enable students to succeed in real-world situations. But teamwork or enthusiasm can't be taught with drill and practice. You can't promote flexibility by training students to give the "right" answers to standardized multiple-choice tests.

Fortunately, there are other ways to help students develop these skills and attitudes. For more than twenty years, Richmond, Virginia, Public Schools has conducted an annual interscholastic, intellectual competition called Mind Games. This program was instituted by educators in the school system's program for gifted education. On the day of the competition, teams of five students measure themselves against a variety of problem-solving challenges.

We try to involve as many students as possible in the competition. Buses bring students from schools across the city to a central athletic facility. The teams—along with parents, teachers and student cheering sections—dress in their school colors. Each school fields two teams of seven members, five of whom may compete in any one event. Each team is also allowed two additional student "coaches," who help the competitors prepare for the events but will not compete. Some schools even hold intramural competitions several months in advance to determine who will represent their school in the citywide competition.

Teams gather on the bleachers, eager to begin the first of four events. As a team, they answer questions about math, science, language, social studies and current events. They brainstorm multiple answers to open-ended questions. They solve logic puzzles. And in the featured contest of this event, teams present solutions to engineering problems they have worked on for several weeks or more. Finally, as the competition's administrators tally the scores, students lunch on pizza and wait eagerly for the final results. Because we award first through fifth place in each event as well as in overall score, most teams come away with at least one ribbon. But most of all, students all have a huge amount of fun putting their intelligence and creativity to the test.

The problems in this book are based on engineering challenges our students have tackled over the years. The problems are multidisciplinary and open to many possible solutions. They are written to include basic skills from the core curriculum. With the exception of the simplified first challenge, Estimeasurement, they include elements of research and writing, mathematics and science, as well as some sort of artistic presentation such as a skit, a song, or a poem. Each problem requires just a few inexpensive materials and a minimum of equipment.

Although these problems were originally designed for a gifted program, the competition itself should not be limited to students identified as gifted. In fact, the problems give all students the opportunity to display their unique skills and talents. A number of students who later achieved success in the Richmond program for the gifted first “identified themselves” through participation in these competitions. These problems make excellent challenges for intramural as well as interscholastic competitions or for organized gatherings of home-schoolers. They are just as suitable for after-school programs or recreational organizations such as scouts or Boys and Girls Clubs.

Students are often motivated by competition. Nevertheless, we believe cooperation is an equally important human process. It is an essential skill for the modern workplace, where virtually no one tackles a problem individually. Beyond that, if human beings are to continue living together on our little planet, cooperation is a skill we all must learn. We have designed each problem to require cooperative problem solving. To succeed, teams must collaborate, dividing and sharing tasks to work as efficiently as possible. The teams that achieve the greatest success in these problems will be those who learn to work together most effectively.

Mind Builders begins with a few simple exercises that will help students learn to work more effectively in teams. Following that is a selection of ten warm-up problems—short engineering challenges that can be completed within an hour or less, with little advanced preparation. These activities will allow students to practice working together in teams while they solve relatively simple engineering problems.

Finally, the book contains a dozen complete Mind Builders, long-term challenges. These are designed for teams of students to work on for an extended period—as much as a month or two. Much of this work can be done either during after-school activity time, or even during class if the curriculum permits. Individual team members can do some parts of the preparatory work for these challenges at home. The final practices will have to be done as a team. And of course, the competition itself is best conducted in a festive, large-group setting in which each team gets to see the efforts of the others and learn from them.

Each Mind Builder problem includes detailed specifications of the problem’s requirements and a scoring rubric. Each team should receive a copy of the rubric when they start work on the challenge. This is very important! Teams should know exactly how they will be scored *before* they begin generating solutions to a problem. Each challenge is also accompanied by suggestions for teachers and coaches and a checklist for administering each competition.

Teams have a spending limit for each problem. This is intended to encourage students to work creatively with simple materials rather than finding a quick solution purchased at an electronics or hardware store. If you find that the \$25 limit for these

problems is either too limiting or too extravagant, we again encourage you to make appropriate adjustments.

You should expect queries about whether certain techniques are acceptable in solving these problems. Use your best judgment as you consider whether each question meets the spirit as well as the letter of the problem as stated. It is probably wise to keep a written record of these queries and your responses in case other students or coaches have similar inquiries or question your decisions later.

A word about the role of the coach. Coaches and teachers should work as facilitators. Their job is to help students obtain materials, steer them toward the information they need, and supervise teams as they solve the Mind Builders problem. They should make sure the students work safely. Coaches should encourage teams to test their solutions and practice presentations thoroughly before the day of the competition.

It's very important, however, that the solutions belong to the students themselves. Coaches should not solve the problems for the students nor build any devices they might need. That defeats the purpose of these challenges. Good coaching calls for the patience to allow students to learn through their errors, false starts, and interpersonal disputes.

Finally, we encourage anyone using this manual to use it creatively. If you see ways to improve a problem or change it to better fit your needs, please do.