

Rediscovering Mathematics: You Do the Math

by Shai Simonson, Classroom Resource Materials, Mathematical Association of America, 2011

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How can we encourage students to get beyond a mindless approach to mathematics and become active learners who will strive for insight, understanding and creativity? This book, whose author teaches computer science at Stonehill College in Easton, MA, addresses this question explicitly. He directs his book to teachers who he hopes will be able to “reshape the popular perception of mathematics – one child at a time” as well as anyone “looking for a guide to revisit and reconsider mathematics”. The background required is arithmetic, basic algebra and some geometry; the reader is assumed to have little experience of mathematics beyond the traditional school classroom.

He begins with advice: don't miss the big picture; don't be passive; slow down; own the mathematics. This is illustrated by an imaginary (and somewhat artificial) exchange between a professional and reader of a mathematical passage. Then the mathematics, a mixed bag of topics, is developed through a sequence of questions, exercises and problems designed to encourage participation. Most of the material will be familiar to readers of this journal: repeating and terminating decimals, averages, mental computation, checking, pythagorean triples, fractions, convergent and divergent series, numerical patterns, rates, variation, percentages, algorithms, Pythagoras' theorem, quadratic equations, probability, three-dimensional solids and area. There are a few snippets of greater interest, such as near misses to Fermat's theorem (e.g. $13^5 + 16^5 = 17^5 + 12$), caroms, the RSA encryption method and solids whose faces are all pentagons and hexagons. Although the treatment is salted with some anecdotes and points of information, it mainly consists of a graded sequence of exercises, each immediately followed by the solution. Although the reader is strongly encouraged to stop and consider the question before looking at the solution, I wonder whether this will in fact occur.

The difficulty with this approach is that a book is a one-way communication from author to reader. Any learning situation requires the teacher and learner to find common ground from which to proceed; each comes with his own worldview. The danger is that,

without an opportunity for negotiation, the teacher can proceed to develop a topic without being aware that the reader has hit a stumbling block because of a fundamental difference in outlook. In the present book, I can see this occurring in the discussions on averages and probabilistic expectation. On the other hand, a two-jug liquid pouring problem makes a nice entrée to the Euclidean algorithm. A highly disciplined reader who is willing to struggle with difficulties will gain from this book, but much of the book reads like a regular textbook.

It might have been a better strategy to defer discussion and solutions to the end of the chapter. Sometimes we come to understand gradually or haphazardly, by going ahead, getting stuck and backtracking. Thus, the reader should be discouraged from looking for outside help too soon. Where feasible, students should be helped to construct their own examples. Perhaps the presentation can be punctuated by blanks for the student to fill in or the occasional "why?" inserted into an argument. One author who has done this with greater success is A.D. Gardiner (**1**, **2**).

This book would be suitable for secondary teachers looking for advice and material to encourage more independence among their students, as well as college teachers who have to teach an appreciation course to a general audience.

References

1. A.D. Gardiner, *Discovering Mathematics: The Art of Investigation*, Oxford, 1987. ISBN 0-19-853265-2 (paper)
2. A.D. Gardiner, *Mathematical Puzzling*, Oxford, 1987. ISBN 0-19-914258-0