

New analysis of US elementary school mathematics finds half-century of problematic 'strands' structure

October 15 2013

During the "New Math" movement of the 1960s, a team of mathematicians developed a new structure for elementary mathematics. Instead of having a single subject, namely, school arithmetic, as its central core, this new structure instead had eight "strands" that were supposed to tie together elementary mathematics content. The strands structure has persisted to this day. In an article in the November 2013 issue of the *Notices of the American Mathematical Society*, Liping Ma argues that the strands structure has significantly weakened U.S. school mathematics.

In her article, Ma notes that, in many countries where students do well in mathematics, [elementary mathematics](#) has school arithmetic as its main organizing structure. School arithmetic is developed as a self-contained subject consisting of whole numbers and fractions, with the whole numbers forming the basis for understanding of fractions. Other components of elementary mathematics, such as measurement or geometry, are not presented as self-contained subjects but are taught in relation to the main subject of school arithmetic.

In the U.S., by contrast, the organizing structure for elementary mathematics has no self-contained structure at its core but rather consists of several strands that are juxtaposed but not explicitly connected. Over the decades, the strands have been given different names—such as "strands", "content areas", or "standards"—and their number, form, and

content have varied many times.

Examining developments in U.S. mathematics education going back to the 19th century, Ma notes that although U.S. scholars made significant contributions to school arithmetic, the U.S. never had, as some other countries do, a well-developed school arithmetic. Nevertheless, arithmetic was the core of elementary mathematics in the U.S. for almost one hundred years. Ma describes how this began to change during the 20th century with the advent of the "New Math" of the 1960s and the NCTM Standards of the 1990s. Among the effects of the strands structure are instability of curricular content, discontinuity in instruction, and incoherence in concepts.

In the United States, "the potential of school arithmetic to unify elementary mathematics is not sufficiently known," Ma argues. "This is a blind spot for current U.S. elementary mathematics." Too often school arithmetic is equated with basic computational skills that require only inferior cognitive activity such as rote learning. Although many people in [mathematics education](#) view arithmetic as an ugly duckling—that is, a collection of algorithms to be learned by rote—Ma notes that "in the eyes of mathematicians it is often a swan" because of the mathematical structure mathematicians see in arithmetic.

Liping Ma became well known among mathematicians for her 1999 book "Knowing and Teaching Elementary Mathematics" (the book was reviewed by Roger Howe in the *Notices*; see <http://www.ams.org/notices/199908/rev-howe.pdf>). In this book, Ma studied the understanding of mathematics possessed by school teachers and described a quality called "profound understanding of fundamental mathematics". Ma found that about 10 percent of very experienced teachers in China have this quality. Their profound understanding was acquired not by studying advanced mathematics, but by studying and teaching school mathematics with arithmetic as its core. In an ironic

twist, she finds that today China seems to be moving toward adopting a more strand-like structure for its school mathematics standards.

More information: Ma's article, "A Critique of the Structure of U.S.Elementary School Mathematics", is freely available on the Notices web site at www.ams.org/notices

Provided by American Mathematical Society

Citation: New analysis of US elementary school mathematics finds half-century of problematic 'strands' structure (2013, October 15) retrieved 20 March 2024 from <https://phys.org/news/2013-10-analysis-elementary-school-mathematics-half-century.html>

<p>This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.</p>
