

A JOINT RESEARCH PROJECT WITH

Education Connection of Texas

9323 Bowen Drive
San Antonio, TX 78250
(210) 682-2343

January 1999
Request For Immediate Distribution of Important Information

<p style="text-align: center;">SCHOOL DISTRICT ALERT FOR MATHEMATICS TEXTBOOK SELECTION ~~~~~ INDEPENDENT ANALYSIS OF MATHEMATICS TEXTBOOKS</p>

I. Introduction

The following is a special, independent analysis of several of the mathematics textbooks being considered for adoption by local school districts. This summary report compliments a comprehensive analysis available to the public on the worldwide web at <http://www.mathematicallycorrect.com/books.htm>

This report is being sent to school districts throughout Texas for distribution to the teachers on mathematics textbook selection teams, curriculum directors, school board members and district superintendents. It was developed to provide information needed to make informed decisions about the selection of elementary and middle school math textbooks.

Never before in Texas have schools experienced a more complicated textbook selection. Nor have schools ever faced a selection that will introduce such significant and long-lasting impacts on student learning. In early 1999, teachers will choose textbooks that determine not only how math will be taught, but also what type of math will be learned by the next generation of students in Texas.

"What are the most important math proficiencies a student should acquire?" "What is the best way for students to acquire these proficiencies?" "Which textbooks are based on these instructional goals and methodologies?" "Which textbooks best prepare students to study algebra in grade 8?" "What factors should influence textbook selection - cost, funding, grants, state policies, federal initiatives, and public interest?" These important questions are now being investigated by schools.

To help determine the answers, this report provides information based on public policy research and a textbook analysis, sponsored by Education Connection of Texas, and conducted by founders of Mathematically Correct that can be accessed at <http://www.mathematicallycorrect.com/books.htm>. Using this report as a resource, schools can feel confident that their selections serve the needs of their students and reflect community values.

Information about the Sponsors of this Report

This report has been developed by the **Texas Public Policy Foundation** and **Education Connection of Texas**. The **Texas Public Policy Foundation** is a non-profit, non-partisan research institute headquartered in San Antonio, Texas dedicated to upholding the principles of limited government, free and competitive markets, private property rights and individual responsibility. TPPF conducts research on public policy issues and disseminates the findings to the public, the media, and elected officials at all levels of

government.

Education Connection of Texas is a non-profit organization established to provide information to the public about primary and secondary education. Based in San Antonio, Education Connection conducts and publishes the research on textbooks, curricula, instructional practices, testing and governance needed for the public to make informed decisions in education.

Both the Texas Public Policy Foundation and Education Connection of Texas are independent of any textbook publisher and conduct no contract research.

The math textbook analysis described by this report was conducted by founders of **Mathematically Correct**. **Mathematically Correct** is a national organization of mathematicians, scientists, engineers, and concerned individuals who volunteer to improve the academic integrity of elementary and secondary math education. Members of **Mathematically Correct** have provided expertise throughout the nation to state education agencies, school board members, state legislatures, parents, the U.S. Congress, and the Secretary of Education. In California, members of **Mathematically Correct** have participated in developing the state mathematics framework, math curriculum standards, and the state science standards, as well as the San Diego Language Arts and Mathematics Standards. Mathematically Correct's web site at <http://www.mathematicallycorrect.com> is considered a primary resource for mathematics information in the nation.

II. CHOOSING BETWEEN TWO DIFFERENT TYPES OF MATH INSTRUCTION

Math Instruction is Controversial

The 1999 adoption of math textbooks in Texas highlights the two very different forms of math instruction that now compete throughout the nation for dominance in math education. On both the Conforming and Non-conforming Lists published by the Texas Education Agency are textbooks considered to represent "Standards-based" (or "reform") math and "classical" (or "traditional") math.

As indicated by newspaper headlines in Texas and throughout the nation, this competition has provoked many concerns about math instruction. Headlines such as "This is Math?" (Time), "'Critics say new math is creating dummies" (Waco Tribune Herald), "Math movement robs generation of basic skills" (San Diego Union Tribune), "Standards Math is Creating a Big Division in Education Circles" (The Wall Street Journal), and "The Second Great Math Rebellion" (Education Week) indicate the significant public controversy engendered by the debate on math instruction.

Defining "Standards" and "Classical" Math

"Standards" math is based on guidelines developed by the National Council of Teachers of Mathematics in 1989. NCTM standards establish broad social expectations for math learning. Becoming a person who feels confident about math, values math, solves problems, and reasons, as well as communicates mathematically are the NCTM goals. These standards also identify how math should be taught. Math should: (1) focus on applied, not theoretical, learning; (2) utilize calculators for computation; (3) develop process skills before computational skills; and, (4) be constructed by the student with the teacher serving as a guide.

"Standards" or NCTM-based math instruction are based on the following tenets for learning:

- The highest form of learning is the development of an abstract ability to think independently and solve problems that transfers across all fields of knowledge (but is not specific to math, science, history, and the arts);
- It is more valuable for students to learn how to acquire and analyze information than to learn a specific body of knowledge because technology renders specific information readily accessible and rapidly obsolete; and,

- Learning is most effective in the context of complex, "real world" problems and least effective when it is focused on the acquisition and practice of basic component skills.

Through teaching methods and textbooks, these principles of "standards" math have passed through the door of every classroom in our state and nation.

"Standards" math poses a dramatic challenge to "classical" math learning. The instructional objectives and methodologies used with "classical" math generally represent the polar opposite of "standards" math. In "classical" math studies, students are expected to learn the specific facts and skills that comprise the established body of math knowledge and skills developed by mathematicians through centuries of western civilization. Teachers are responsible for directing and correcting learning. "Classical" math is taught as a specifically organized sequence of building math language, symbols, and manipulations. "Classical" instruction is based on the premise that learning complex math is predicated on mastery of basic components; When repeated practice enables the use of basic skills to become automatic, learning can be most effectively focused on developing abstract and sophisticated problem-solving. Advocates of "classical" math believe that knowledge, unlike technology, never grows obsolete.

An Example of "Standards" Math Instruction

What and how students learn is significantly different between classrooms where "standards" and "classical" math are employed. The following example was published by Lynne Cheney in an Op-Ed for the New York Times (Aug. 11, 1997).

In a traditional math classroom students might be introduced to the Pythagorean theorem by the teacher who draws a right triangle on the blackboard, adding squares on its sides, and explaining and then proving that the area of the largest square exactly equals the combined areas of the two smaller squares. The students are given the formula $a^2+b^2=c^2$ and asked to solve several problems requiring solutions for the area of right triangles of varying sizes.

In a "standards" math lesson, students might be asked to play a game. Students are given graph paper and instructed to cut squares with sides ranging from two to fifteen units. Using edges of the squares, they form triangles of various shapes. The winner is the first to discover if the area of one square exactly equals the combined areas of the other two squares, the triangle must have a right angle with the largest square on its hypotenuse. By this activity, students discover that with right triangles, the square of one side added to the square of another side are equal to the square of the third side.

Examples of "Standards" Math Textbooks

"Standards" math textbooks to date have been funded and developed by the National Science Foundation. The three elementary "standards" textbooks sponsored by the NSF for math are: *Everyday Mathematics*; *Investigations in Number, Data and Space*; and *Math Trailblazers*. The two middle school "standards" textbooks sponsored by the NSF for math are: *Connected Mathematics*; and *Math Thematics*.

Only Everyday Mathematics and Math Thematics were approved for the State Textbook Conforming List, meeting all of the state instructional objectives (TEKS). Both Investigations in Number, Data and Space and Connected Mathematics were approved for the Non-conforming List, meeting at least half of the state instructional objectives.

"Standards" Math Provokes Significant Criticism

Never lacking for critics even from its inception, "standards" math has generated an increasing number of opponents over the past decade. As the prevailing form of instruction in classrooms throughout the nation, "standards" math is blamed for the embarrassing scores attained by American students on the Third International Math and Science Test. California, now at the bottom of the nation's math scores, attributes "standards" instruction for the precipitous decline of math learning.

In Texas and other states, "standards" math has collected a slew of derisive names including "fuzzy math,"

"whole math," "rain forest math," and "new, new math." Rampant and loud public disbelief is voiced that meaningful math learning can occur when students:

- direct their own learning as interest leads (or doesn't as the case may be);
- work in groups to teach one another;
- construct their own math language, facts and computations;
- are not taught or required to memorize facts or formulas;
- are taught to use calculators as the first and primary form of computation; and,
- are taught that deriving correct solutions lacks importance.

An expanding group of academicians and mathematicians express concern that "standards" math sacrifices math content for process. These individuals assert that NCTM standards do not identify expectations for math learning, but instead represent a list of instructional methods. And these instructional methods are not supported by research, many claim. Decades of research conducted within the field of mathematics and educational psychology indicate that methods employed by "standards" programs fail to demonstrate improved learning, and in fact demonstrate diminished academic achievement, especially for disadvantaged students.

III. WHAT DOES RESEARCH SAY ABOUT MATH INSTRUCTION?

Research Conducted by Mathematicians and Educational Psychologists

Since 1960, research has been conducted both nationally and internationally to compare the academic effectiveness of direct instruction (characteristic of "classical" math instruction) and student-constructed or "discovery" learning (characteristic of "standards" math). Much of this research also compared the academic effectiveness of academic content-based instruction (characteristic of "classical" math instruction) with process or outcome-based instruction (characteristic of "standards" math).

Consequently, a large body of empirical research now documents the superiority of academic content-based curricula and direct instruction over the approaches employed by "standards" programs. This research finds that students become most academically proficient at math and all subject domains when:

- Curricula is taught directly, systematically and incrementally in small, structured and guided steps that progress from basic to more complex learning;
- Instruction is focused on specific academic content not process or outcomes;
- Repetition, practice and memorization is used to derive automaticity; and,
- Students receive immediate feedback and correction.

The findings of *Project Follow Through*, the Brophy-Evertson Studies, the University of Canterbury, New Zealand studies, and the Gage studies are summarized by Dr. E.D. Hirsch, Jr. in the American Federation of Teacher's American Educator (Fall, 1996), and *The Schools We Need-Why We Don't Have Them* (Doubleday, 1996).

Research by Drs. Harold Stevenson and James Stigler comparing math instruction in the United States with China, Japan and Taiwan confirms these findings (The Learning Gap, Touchstone, 1992).

A new study from Carnegie Mellon University indicates that the instructional methods employed by "standards" math conflict with research on learning developed by cognitive research. This study finds that the central principles of "standards" math instruction (constructed learning, focus on applications, learning by whole instead of component skills) are not grounded in empirical, validated research. The researchers find evidence that "standards" math instruction is costly in time, injurious to student motivation, and academically inferior to "classical" math instruction. *Applications and Misapplications of Cognitive Psychology to Mathematics Education* is published on the Internet at <http://act.psy.cmu.edu/personal/ja/misapplied.html#fn0>.

A Study Conducted by the U.S. Department of Defense

In 1995 the Department of Defense introduced two "standards" math programs to grades 3 through 8 in military schools. In 1996 the Department of Defense conducted standardized testing of the 81,140 students enrolled in "Mathland" (elementary school) and "Interactive Math" (middle school). The CTBS indicated that scores in computation had significantly dropped (9 points for grade 3, 12 points for grade 4, 11 points for grade 5, 10 points for grades 6 and 7, and 4 points for grade 8). Data generated by this study can be accessed on the Internet at <http://206.86.183.194/math/McArthurText.htm>.

Replicating findings from *Project Follow Through*, the CTBS scores indicated that "standards" instruction had a greater negative impact on minority student learning. CTBS scores revealed a significant increase in the achievement gap between all racial/ethnic groups following introduction of math programs sponsored by the National Science Foundation into military classrooms.

An Evaluation of National Science Foundation Programs

A study of "standards" programs sponsored by the National Science Foundation and introduced to twenty five states (including Texas) by the Statewide Systemic Initiative indicates that only "modest" improvements in student achievement could be demonstrated. And this statement was qualified by the following statement: "However, there are also serious limitations in the data that underlie these findings, even in the best case: (1) the quantity of the data is extremely limited, both within and across states; (2) the data within states are contradictory in some cases; and (3) effect sizes are small."

Sponsored and published in 1998 by the National Science Foundation, the five year study entitled *A Report on the Evaluation of the National Science Foundation's Statewide Systemic Initiative Program* documents that "standards-based reform" has achieved significantly more success in affecting change than in raising standardized test scores. This report can be accessed on the Internet at <http://www.nsf.gov/cgi-bin/getpub?nsf98147>.

A Report from the Connected Mathematics Program

The teacher's manual for *Connected Math*, one of the middle school programs developed by the National Science Foundation (and listed on Texas' Non-conforming List), indicates that standardized achievement scores could be diminished by this "standards" approach to learning. *Getting to Know CMP* states "Some students may not do as well on parts of standardized tests assessing computational skills as students in classes that spend most of their time on practicing such skills."

IV. WHAT DO COMMUNITIES WANT FROM MATH INSTRUCTION

Opinion Polls Conducted by Public Agenda

Studies of public opinion conducted by the New York-based research firm, Public Agenda, indicate that the American public holds very specific ideas about how math should be taught in primary and secondary schools. National surveys conducted by Public Agenda document that an overwhelming majority of Americans want:

- Schools to increase the time devoted to math;

- Students to memorize traditional math facts and skills;
- Teacher-directed, structured math learning;
- Students to produce correct answers to math problems;
- Pencil and paper (mental) computation to precede use of calculators;
- Standardized testing and individual accountability for students.

These public perspectives on education were published in *The Basics: Parents Talk about Reading, Writing, Arithmetic and the Schools*; *First Things First: What Americans Expect from the Public Schools*; and, *Americans' Views on Standards*.

The results of these surveys conducted by Public Agenda were confirmed by a 1996 study conducted by the Education Commission of the States. Listen, *Discuss and Act: Parents' and Teachers' Views on Education Reform* documents over 75% of Americans reject "new" educational reforms and want schools to use more traditional curricula and instruction.

Accusations of Racism Sully "Standards" Instruction

The implementation of "standards-based" programs has been primarily stimulated by federal initiatives (including Goals 2000, School-to-Work, and the Statewide Systemic Initiatives sponsored by the National Science Foundation). These initiatives have specifically targeted schools with large minority and at-risk populations.

Given the failure of "standards" programs to improve academic achievement, it is not surprising that some interpret the adverse impact of "standards" instruction, especially "whole language," and the "new new math" developed by the National Council of Teachers of Mathematics, as racist.

Several national periodicals have recently published articles describing the harm experienced by minorities and at-risk-students by the educational practices introduced by "standards" or outcome-based education reform. Both the *Harvard Educational Review* and *The National Review* decry the replacement of traditional academic learning with "constructivism," and "active learning," emphasizing "critical thinking" over acquisition of knowledge and student discovery over teacher-directed instruction. An article entitled "*How progressive education hurts the poor and minorities*" in the *National Review* (December 21, 1998) cites evidence from "extensive studies of children from both English working-class and American inner-city neighborhoods." This article also quotes "liberal black educators" published in the *Harvard Educational Review* that condemn "standards-based" progressive reforms as "liberal nonsense."

Between 1990 and 1996, the scores of minority students on the National Assessment of Educational Progress have fallen, both in absolute terms and relative to white student scores. Minority scores on the math section of NAEP were most significantly decreased. Math scores of white students rose while scores of minority students plunged.

As public recognition of the negative impact of "standards-based" instruction on minorities grows, voices mount against the racism believed engendered by this curricula. Charges of educational "red-lining" began to appear in newspapers throughout the nation this past summer when a syndicated column written by Robert Holland of the *Richmond Times Dispatch* quoted a Milwaukee school board member who demanded the restoration of traditional instruction.

Public Sentiment Favors Traditional Math in Texas

There are many indications that Texans strongly support traditional or "classic" math instruction, as well as indications that Texans reject reforms introduced by "standards" math programs.

The first signs of public sentiment opposing "standards" math surfaced during the 1997 adoption of new state curricula, the Texas Essential Knowledge and Skills (TEKS). Newspapers throughout Texas were filled with headlines protesting "feel good and know nothing math" or "mushy" math, as articulated by Governor Bush. The 1998 adoption of algebra textbooks evoked a similar response from the public and various state newspapers again published articles about "fuzzy" math. Members of the State Board of Education made an unsuccessful attempt to remove the "standards" algebra textbook from the state list of conforming books.

Fears that "standards" math programs fail to teach necessary skills have recently generated newspaper articles in several parts of the state. *Everyday Math* and *Connected Mathematics* (both National Science Foundation programs included in the 1999 state textbook lists) have stimulated concerns from both parents and teachers in San Antonio and Plano. In Plano, a parent group formed to seek legal assistance with their request to their school district for a traditional course alternative to *Connected Mathematics*.

Representing public concern that "standards" math textbooks fail to provide students with necessary skills, in November members of the State Board of Education made, yet once again, another unsuccessful motion to remove the four "standards" math textbooks from both the state Conforming and Non-conforming Lists.

V. STATE AND FEDERAL PROMOTION OF "STANDARDS" TEXTBOOKS

Texas Statewide Systemic Initiative

The Texas Statewide Systemic Initiative (SSI) exerts a strong influence in the selection of math textbooks by school districts. The SSI works to introduce "standards-based" math education to all students by influencing district level policy and assisting district-level personnel to support reforms. The Texas SSI achieves this objective through involvement in all key state agencies and activities related to education. Information about activities and goals of the Texas SSI can be obtained from The *Texas Statewide Systemic Initiative Annual Report and Strategic Plan, 1998* located on the Internet at <http://www.tenet.cc.utexas.edu/ssi>.

The Texas SSI disseminates information about National Science Foundation "standards" math programs, publishes a textbook selection manual, and trains school district textbook selection leaders to use the SSI selections materials "so that new textbooks adopted for the next decade will be standards-based." The Texas SSI is also implementing a model "standards" math program for middle schools and working to expand *Connected Mathematics* throughout the state. In preparation for the 1999 statewide selection of math textbooks, the Texas SSI invited school districts to participate in a curriculum conference (Austin, November 1998) exclusively showcasing the National Science Foundation-sponsored math textbooks.

The dual activities of serving both the National Science Foundation and the State of Texas (as contractor for the state math curriculum standards and Center for Math Educator Development) have raised grave questions about conflicting interests. Concerned schools might misinterpret the support of specific "standards-based" math textbooks by the Texas SSI as state support, the Commissioner of Education asked the Director of the SSI to ensure schools "are very clear about the [Dana] center's neutrality on state-adopted instructional materials." The October 28, 1998 letter from Dr. Mike Moses, Texas Education Agency, to Dr. Uri Treisman of the Charles A. Dana Center further expresses concern that the promotion of *Connected Mathematics* poses "potential for a conflict of interest."

Comprehensive School Reform Funding

A new federal education program is also introducing strong pressures to adopt "standards" math programs. In March of this year, the Texas Education Agency notified school districts that approximately \$12 million dollars of supplemental funding is available through the new federal Comprehensive School Reform Demonstration Program. Award of CSRD funds are based on federal requirements for school-wide change, including reform of instructional methods. The models identified by the federal statute for math instruction are the "standards-based" programs sponsored by the National Science Foundation (including *Connected Mathematics*, *Interactive Mathematics*, *Core Plus Mathematics*, *Math Connections*, *Comprehensive School Mathematics*, and *University of Chicago School Mathematics Project* also known as *Everyday Mathematics*).

Like other federal education initiatives, CSRD is intended for the primary use of schools with high populations of minority and at-risk students.

VI. TEXTBOOK ANALYSIS CONDUCTED BY MATHEMATICALLY CORRECT

Framework for Analyzing Math Textbooks

"What goals should be established for elementary and middle school math?" "What should students be expected to learn in each grade?" Answers to these questions frame the analysis of math textbooks conducted by four of the founders of Mathematically Correct and now published on the Internet at <http://www.mathematicallycorrect.com/books.htm>. The authors based their analysis on the following principles:

- Students should be prepared to study algebra in eighth grade. The U.S. Secretary of Education and President have called for states to aim to have their students ready to study algebra in and geometry as they enter eighth grade to reflect the practice of nations scoring high on the Third International Math and Science Study;
- Instruction should be thorough and clear, with both exposition and examples that will enable students to acquire explicit math concepts and skills;
- The model for learning expectations draws upon the Mathematically Correct Standards and the San Diego Standards. The standards in San Diego were designed to be in line with both the California State Standards and the achievement goals in Singapore and Japan. A subset of key points was chosen for evaluation. These points include: Grade 2 Students should: (1) be able to add and subtract whole numbers; (2) be introduced to multiplication and learn a subset of the multiplication facts; (3) tell time and manipulate money; and (4) measure length, weight, volume and temperature. Grade 5 Students should: (1) be able to multiply and divide whole numbers and decimals; (2) determine the area of triangles; and, (3) be introduced to negative numbers, powers, exponents and scientific notation. Grade 7 Students should be able to: (1) apply rules of order of operations and properties of numbers; (2) calculate with exponents, squares, roots, fractions, decimals, percents, and proportions; (3) write, simplify, and solve expressions and equations; (4) graph ordered pairs and linear equations; (5) identify, construct and measure shapes, objects, angles, similarities, and congruence; and, (6) know and use formulas for finding area, volume, perimeter, and distance.

Textbooks Selected for Analysis

Some of the major textbook series available for use in public schools were identified. Most of the textbooks are listed by on the Texas State Conforming list. Several of the textbooks are listed on the State Non-conforming List. Evaluations were made for grades two, five and seven as markers for the progression through the material leading to algebra readiness.

The textbooks that were selected for analysis are listed in the chart attached at the end of this report.

Results of the Analysis

Grade 2

The analysis of grade 2 textbooks identified three broad clusters of instructional quality.

- Cluster I- Instruction meets most of the high level expectations for student learning.
SRA Math Explorations and Applications, SRA/McGraw-Hill
- Cluster II- Instruction meets many, but falls short of high level expectations for learning.
Supplementation of these textbooks would be required to provide students the opportunity to attain high level expectations for student learning.
Math in My World, McGraw-Hill School Division

Math Grade 2, Scott Foresman-Addison Wesley
Math 2: An Incremental Approach, Saxon Publishers (Listed as Non-conforming)
Math Advantage, Harcourt Brace
Mathematics: The Path to Math Success, Silver Burdett Ginn

- Cluster III- Instruction does not meet minimal expectations for student learning. Programs are not recommended for use.
 - * *Everyday Mathematics*, Everyday Learning
 - * *Investigations in Number, Data and Space*, Dale Seymour Publications (Listed as Non-conforming)

Grade 5

Analysis of grade 5 textbooks identified four broad clusters of instructional quality

- Cluster I - Instruction comes close to high level expectations, although an experienced teacher would be necessary for students to attain such a high level of learning.
SRA Math: Explorations and Applications, SRA/McGraw-Hill
- Cluster II- Instruction, although moderately effective, fall short of preparing students to attain high levels of achievement. Acquiring the level of achievement targeted by this analysis would require supplementation.
Math 65: An Incremental Development, Saxon Publishers (Listed as Non-conforming)
Mathematics-Texas Edition, Silver Burdett Ginn
- Cluster III- Instruction falls below expectations for learning established by this analysis. Achievement with these programs would be limited to modest mastery without substantial supplementation.
Math-Texas Edition, Scott Foresman Addison Wesley
Math Advantage, Harcourt Brace
Math in My World, McGraw-Hill
- Cluster IV - Not recommended for use in fifth or higher grades.
 - * *Everyday Mathematics*, Everyday Learning
 - * *Investigations in Number, Data and Space*, Dale Seymour Publications (Listed as Non-conforming)

Grade 7

Analysis of grade 7 textbooks identified four broad clusters of instructional quality.

- Cluster I - Instruction that prepares students well to sequence next into algebra.
Pre-Algebra, an Integrated Transition to Algebra and Geometry, Glencoe/McGraw-Hill
Passport to Algebra and Geometry, McDougal Littell (Listed as Conforming for Grade 8)
Algebra ½, Saxon Publishers (Listed as Non-conforming for Grade 8)
- Cluster II - Instruction that prepares students at a lower level of learning to sequence next into algebra but might be effective with an experienced teacher.
Middle School Math Course 2, Scott Foresman Addison Wesley
Mathematics: Applications and Connections, Course 2, Glencoe/McGraw-Hill
Math Advantage Middle School Preparation for Algebra, Harcourt Brace
Middle Grades Math: Tools for Success Course 2, Prentice Hall
- Cluster III - Instruction not suitable for transitioning students directly into algebra but might be suitable as pre-pre-algebra.
Math 87, Saxon Publishers (Listed as Non-conforming)
Passport to Mathematics Book 2, McDougal Littel

- Cluster IV - Instruction that fails to meet criteria for pre-pre-algebra (5th) grade.
**Math Thematics*, McDougal Littell
**Connected Mathematics*, Addison Wesley Longman (Listed as Non-conforming)

* Asterisks denote National Science Foundation-sponsored math programs promoted by the Texas Statewide Systemic Initiative.

At the conclusion of this report, charts are furnished to provide more details of the textbook analysis. The complete analysis can be read on the Internet at- <http://mathematicallycorrect.com/books.htm>.

Key Observations Derived from the Analysis

- For the purpose of preparing students to successfully engage in algebra during grade 8, only one textbook for each grade level is identified that can be selected from the State Conforming List and will assure the highest degree of preparation;
- Several textbooks identified as good mathematical instruction were not judged worthy to be placed on the State Conforming List for the grade level while several textbooks identified as inferior instruction were placed on the State Conforming List;
- Textbooks sponsored by the National Science Foundation and promoted for use in Texas by the Texas SSI furnish inferior math instruction and fail to establish high expectations for math learning; and,
- As grade levels progress, the capability of textbooks to promote high level mathematical achievement progressively declines. In grade 2 most textbooks furnish satisfactory preparation for the study of algebra in grade 8, whereas; by grade 7 most textbooks fail to adequately prepare students for 8th grade algebra.

Significance of the Analysis

- Good, as well as inferior, instructional materials are screened out by the state process for placing textbooks on the Conforming List, although based on the Texas Essential Knowledge and Skills (TEKS);
- Neither the state textbook review procedure nor the TEKS are designed to enable students in Texas to engage in Algebra at grade 8;
- Expectations for math learning in Texas are appropriate for grade 2 but expectations diminish as grade levels increase. By grade 8, students in Texas have fallen behind their peers in other states who are studying algebra; and,
- The elementary and middle school textbooks promoted by the National Science Foundation and Texas SSI do not teach the full range of skills necessary to prepare students for algebra.

VII. ADOPTION AND SELECTION OF TEXTBOOKS IN TEXAS

State Conforming and Non-conforming Textbook Lists

In November 1998 the State Board of Education voted to adopt the Commissioner's recommendations for the listing of Conforming and Non-conforming kindergarten through grade 8 Math textbooks. To be placed on either the State Conforming or Non-conforming List, publishers submitted textbooks to be reviewed for use by specific grade levels. Textbooks that fully met 100 % of the standards for the specified grade level learning established by the Texas Essential Knowledge and Skills (TEKS) are placed on the state list as

Conforming for that grade level. Textbooks that meet at least 50% of the TEKS, but less than 100 % for that grade level are placed on the Non-conforming List for use at that specified grade level.

The Texas Education Agency (TEA) distributes the Conforming and Non-conforming Textbook Lists to school districts. School districts are responsible for determining textbook selection processes, submitting the selection to local school boards for adoption, and remitting a list of textbook selections to the TEA prior to April 1, 1999. The TEA orders and pays the full cost of textbooks listed on both the Conforming and Non-conforming Lists. School districts are only financially responsible for textbook costs if a textbook is selected that is not listed on either of the lists for specific grade level use.

School Districts are not penalized, financially or otherwise, for selecting a math textbook from the Non-conforming List. School districts may additionally select textbooks that are not listed on either of the lists or are not listed for the specific grade level for which the district intends to use the textbook as long as the district assumes the financial burden of purchasing the textbook.

Textbook Selection Directly Impacts Type and Degree of Student Learning

As previously described in Section III of this report, research indicates that student achievement is directly related to textbooks, as well as instructional methodology. Additional support for this causal relationship was furnished to the Texas State Board of Education in 1997.

The TEA correlated the passing percent on the 1996-97 end-of-course algebra scores with the algebra textbook used by the students. One textbook, Forester's Algebra I 2 E, showed statistically significantly higher test scores (by 17%) than the other seven primary textbooks used for teaching algebra in Texas.

VIII. RECOMMENDATIONS

The findings of the mathematics textbook analysis conducted by Mathematically Correct support the following recommendations:

- Schools should use the Texas Conforming and Non-conforming Lists as guidelines, not the sole criteria, for selecting textbooks;
- Schools should advise students and parents that the selection of a "standards" textbook may interfere with students achieving traditional expectations for mathematics learning, and may result in decreased scores on standardized tests;
- Schools should develop supplemental instructional support for math in each grade level from grade 2 through grade 7 to enable all students the opportunity to study algebra in grade 8;
- The State Board of Education should revise the State Textbook Review Procedures to ensure meritorious instructional materials are placed on the State Conforming List and academically inferior materials are excluded;
- The State Board of Education should review the state math standards for elementary and middle school to consider accelerating expectations for learning so that all students can be given the opportunity to study algebra in grade 8 like their peers in other states; and,
- The Legislature should review the Texas SSI and develop statutory recommendations for the protection of academic integrity and local school governance.

IX. GRAPHICAL REPRESENTATIONS (found on following pages)

Tables:

- [Table 1](#), Grading Textbooks - Grade 2 Mathematics
- [Table 2](#), Grading Textbooks - Grade 5 Mathematics
- [Table 3](#), Grading Textbooks - Grade 7 Pre-Algebra

Charts:

- [Chart 1](#), Grading Textbooks - Middle School Mathematics
- [Chart 2](#), Grading Textbooks - Elementary School Mathematics

X. RESOURCES FOR ADDITIONAL INFORMATION

For Information about this Report, Please Contact:

Texas Public Policy Foundation	Education Connection of Texas
8122 Data Point Dr., Suite 816	9323 Bowen Dr.
San Antonio, TX 78229	San Antonio, TX 78250
(210) 614-0080 Phone	(210) 682-2343
(210) 614-2649 Fax	
E-mail: tppf@tppf.org	
website: www.tppf.org	

For Information about the Math Textbook Analysis, Please Contact:

Textbooks Division	or	books@mathematicallycorrect.com
Mathematically Correct		
P.O. Box 22083		
San Diego, CA 92192-2083		

For Information about the State Textbook Review and Adoption Process, Please Contact:

The Texas Education Agency, Textbook Administration
 1701 N. Congress
 Austin, TX 78701
 (512) 463-9601

For Information about the Texas Statewide Systemic Initiative, Please Contact:

Texas Statewide Systemic Initiative
 Charles A. Dana Center
 2901 N. I.H.-35, Ste. 2.200
 Austin, TX 78722
 (512) 471-6190

This report was written by Chris Patterson, Director of Education Connection of Texas.

Texas Public Policy Foundation/Education Connection of Texas

Independent Analysis of Mathematics Textbooks.

**TABLE 1
GRADING TEXTBOOKS - GRADE 2 MATHEMATICS**

Textbook	Publisher	Rating			Score (Out of 5)	Conforms with TEKS Grade 2	Cost
		Good	Fair	Poor			
SRA Math: Explorations and Applications	SRA/McGraw- Hill	X			4.4	Y	18.75
Math in My World	McGraw-Hill School Division		X		3.94	Y	19.00
Math Grade Two	Scott Foresman Addison Wesley		X		3.8	Y	18.99
Math Advantage	Harcourt Brace		X		3.5	Y	18.99
Math 2: An Incremental Development	Saxon Publishers		X		3.5	N	36.87
Mathematics: Path to Math Success	Silver Burdett Ginn		X		3.4	Y	19.00
Everyday Mathematics*	Everyday Learning Corporation			X	2.6	Y	19.00
Investigations in Number, Data and Space*	Addison Wesley Longman			X	1.1	N	33.80

* National Science Foundation Statewide Systemic Initiative-supported Textbooks

Texas Public Policy Foundation/Education Connection of Texas

Independent Analysis of Mathematics Textbooks.

TABLE 2 GRADING TEXTBOOKS - GRADE 5 MATHEMATICS							
Textbook	Publisher	Rating			Score (Out of 5)	Conforms with TEKS Grade 5	Cost
		Good	Fair	Poor			
SRA Math: Explorations and Applications	SRA/McGraw- Hill	X			4.1	Y	37.00
Math 65: An Incremental Development	Saxon Publishers		X		3.8	N	36.68
Mathematics - Texas Edition	Silver Burdett Ginn		X		3.5	Y	37.00
Math- Texas Edition	Scott Foresman Addison Wesley		X		3.2	Y	36.99
Math Advantage	Harcourt Brace		X		3.1	Y	37.00
Math in My World	McGraw-Hill		X		3.0	Y	37.00
Everyday Mathematics*	Everyday Learning Corporation			X	2.3	Y	37.00
Investigations in Number, Data and Space*	Addison Wesley Longman			X	1.3	N	36.43

* National Science Foundation Statewide Systemic Initiative-supported Textbooks

Texas Public Policy Foundation/Education Connection of Texas

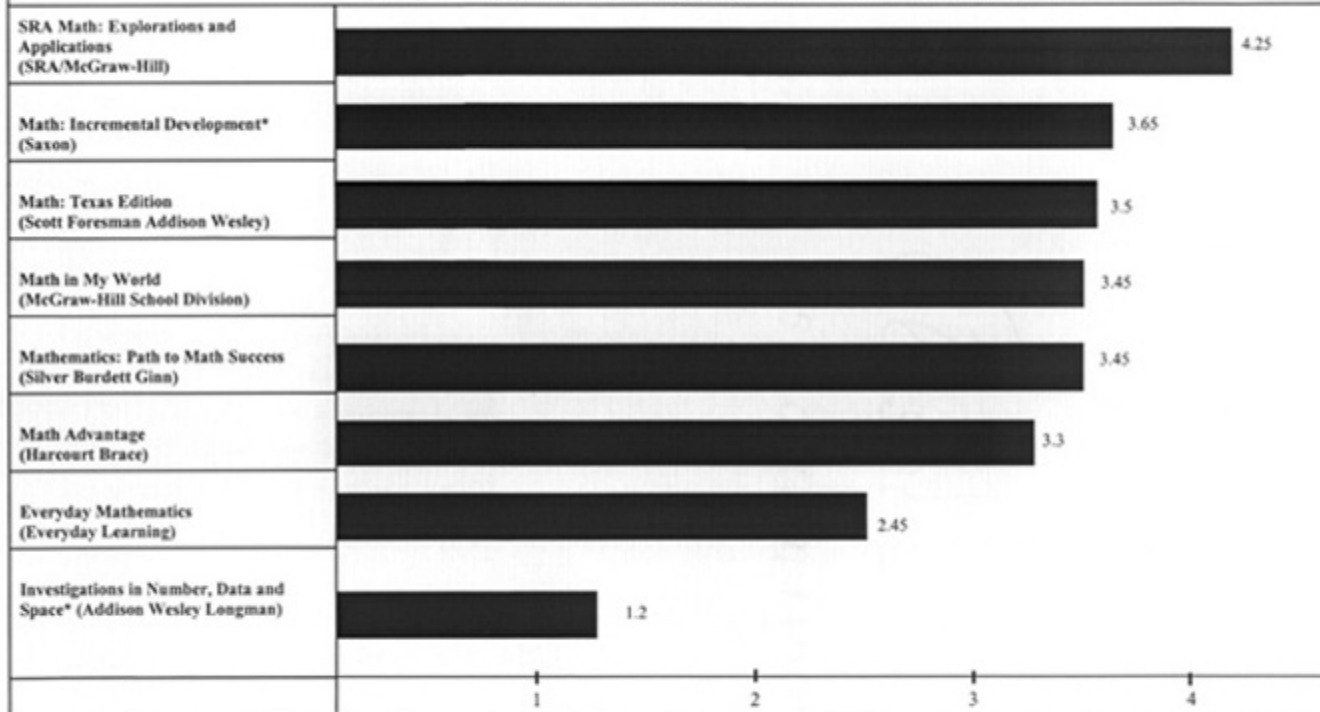
Independent Analysis of Mathematics Textbooks.

TABLE 3 GRADING TEXTBOOKS - GRADE 7 PRE-ALGEBRA							
Textbook	Publisher	Rating					
		Good	Fair	Poor	Score (Out of 5)	Conforms with TEKS Grade 5	Cost
Pre-Algebra, Integrated Transition to Algebra and Geometry	Glencoe/McGraw- Hill	X			4.8	Y	40.50
Passport to Algebra and Geometry	McDougal Littell	X			4.6	N	40.50
Algebra 1/2	Saxon Publishers	X			4.3	N	38.43
Middle School Math Course 2	Scott Foresman Addison Wesley		X		3.8	Y	40.50
Mathematics: Applications and Connections Course 2	Glencoe/McGraw- Hill		X		3.6	Y	40.50
Math Advantage - Middle School II Preparation for Algebra	Harcourt Brace		X		3.5	Y	40.50
Middle Grades Math	Prentice Hall		X		3.5	Y	40.50
Math 87	Saxon Publishers			X	2.8	N	38.43
Passport to Mathematics Book 2	McDougal Littell			X	2.7	Y	40.50

Math Thematics*	McDougal Littell			X	2.2	Y	40.50
Connected Mathematics*	Addison Wesley Longman			X	1.7	N	**40.50
<p>* National Science Foundation Statewide Systemic Initiative-supported Textbooks ** Must be purchased annually, consumable book</p>							

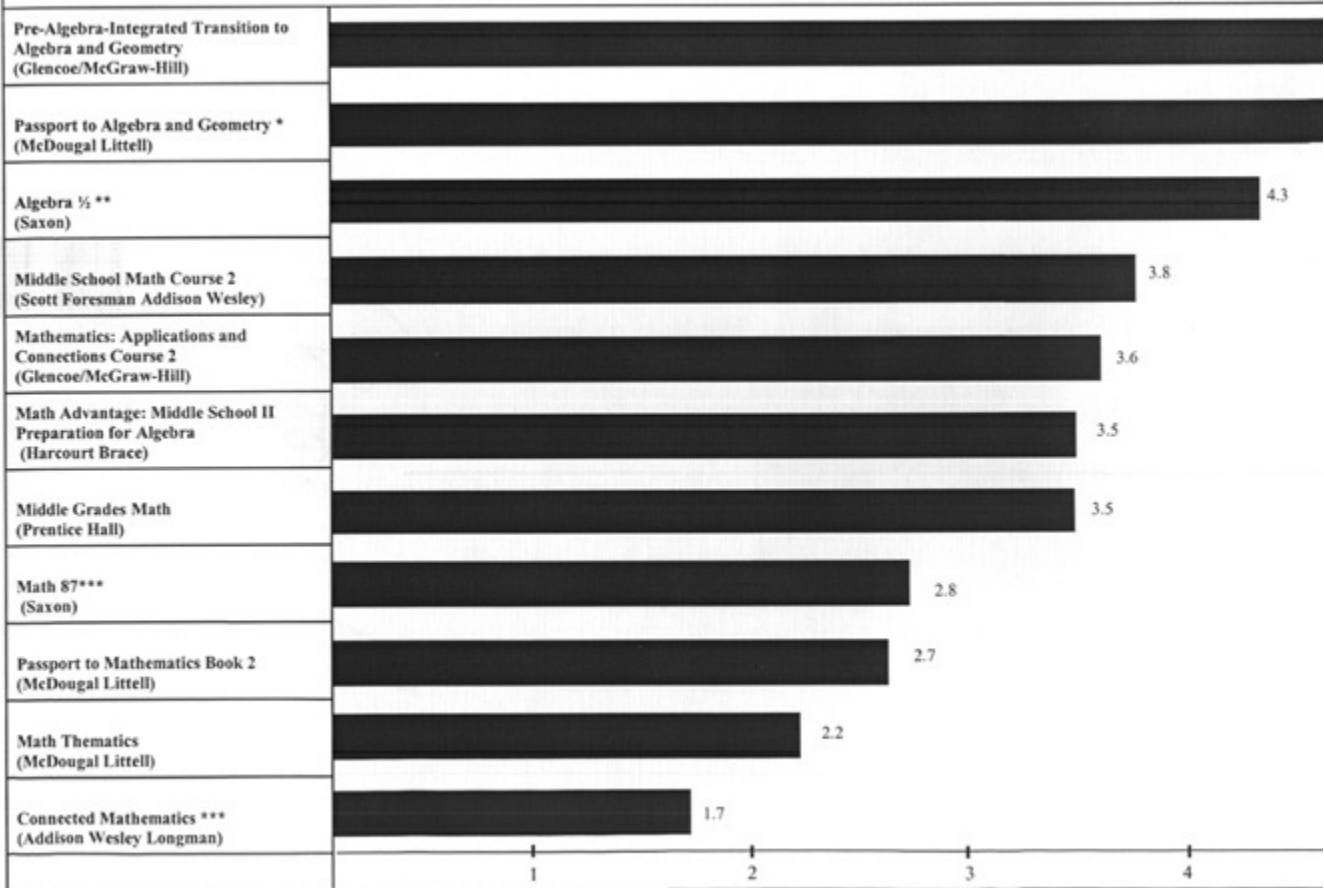
**GRADING TEXTBOOKS - ELEMENTARY SCHOOL MATHEMATICS
PREPARING STUDENTS FOR ALGEBRA IN GRADE 8**

(Ratings derived from averaging scores of analysis conducted by Mathematically Correct)



* Texas non-conforming list

**GRADING TEXTBOOKS - MIDDLE SCHOOL MATHEMATICS
TEACHING STUDENTS PRE-ALGEBRA IN GRADE 7**



* Neither conforming nor non-conforming for Grade 7 (conforming for Grade 8)
 ** Neither conforming nor non-conforming for Grade 7 (non-conforming for Grade 8)
 *** Non-conforming for Grade 7