The research evidence about *Everyday Mathematics*® almost all points in the same direction: Children who use *Everyday Mathematics* tend to learn more mathematics and like it better than children who use other programs. This finding has been supported by research carried out by the University of Chicago School Mathematics Project (UCSMP), by independent researchers at other universities, and by hundreds of school districts. The absolute amount of this research is large. When compared to what is available for other curricula, it is enormous. As a recent report from the National Academy of Sciences (NRC, 2004) makes clear, no other currently available elementary school mathematics program has been subjected to so much scrutiny by so many researchers. The agreement about the curriculum across so many research studies is, itself, perhaps the strongest evidence that *Everyday Mathematics* is effective.

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Everyday Mathematics was developed by the University of Chicago School Mathematics Project (UCSMP) in order to enable children in elementary grades to learn more mathematical content and become life-long mathematical thinkers. Development of Everyday Mathematics began with a research phase in 1983. During this phase, the authors of the curriculum reviewed a rich body of existing research on children’s mathematical thinking and on curriculum and instruction. They also interviewed hundreds of K-3 children and surveyed instructional practices in other countries. Based on their findings, the authors established several basic principles that have guided the development of Everyday Mathematics. These principles are:

- Students acquire knowledge and skills, and develop an understanding of mathematics from their own experiences. Mathematics is more meaningful when it is rooted in real-life contexts and situations, and when children are given the opportunity to become actively involved in learning.
- Children begin school with more mathematical knowledge and intuition than previously believed. A K-6 curriculum should build on this intuitive and concrete foundation, gradually helping children gain an understanding of the abstract and symbolic.
- Teachers, and their ability to provide excellent instruction, are the key factors in the success of any program. Previous efforts to reform mathematics instruction failed because they did not adequately consider the working lives of teachers.

The authors of the curriculum reviewed a rich body of existing research on children’s mathematical thinking and on curriculum and instruction. They also interviewed hundreds of K-3 children and surveyed instructional practices in other countries.

Extensive Field Testing Prior to Publication
Starting with kindergarten, Everyday Mathematics was developed one grade level at a time. Each grade level went through a three-year development cycle that included one year of writing, a year of extensive field testing, and a year of revising before final publication. More information on field testing can be found on pages 8–9.

All three editions of Everyday Mathematics have been written by the same core team of authors, in collaboration with a team of mathematicians, education specialists and classroom teachers. This unique development process has resulted in a comprehensive Pre-K–6 curriculum that provides consistent high quality, and a sequence of instruction that carefully builds upon and extends knowledge and skills from year to year.

UCSMP is an ongoing research project in continuing partnership with Everyday Mathematics users. Over the years, the Everyday Mathematics author team has listened to feedback from classroom teachers who are implementing the program. Based on the continuing dialogue with these users and reviews from other educators, refinements, changes and additions have been made to the program in order to support implementation and to facilitate teachers’ professional decision making.

The Research Basis for Everyday Mathematics
Everyday Mathematics is based on an extensive body of mathematics education research. This includes the authors own research into children’s mathematical thinking, as well as systematic studies of the mathematics education research literature for curriculum content and effective classroom practices.

A research-based program should furnish instruction that reflects current and validated pedagogical elements, identified through studies and evaluations of instructional methods. The authors continue to update the program as new studies and research on instructional methods become available.

Field Testing Studies for Everyday Mathematics
Everyday Mathematics was originally created in a process of systematic field testing and revision that lasted from 1986 to 1996. Each grade level (K-6) was written and then field tested in its entirety in diverse classrooms nationwide for a full academic year. During each field test, UCSMP authors interviewed teachers and students about Everyday Mathematics to determine what worked and what needed improvement. Finally, the UCSMP authors re-wrote each grade level curriculum to reflect research and experiences prior to publication. These original field tests would also guide future revisions of the materials.

The subsequent editions of Everyday Mathematics build on the tradition of research, teacher feedback, and student success. UCSMP continued field testing and revising the curriculum throughout the Second and Third Editions. Field testing for the new Pre-K program, introduced in the Third Edition, began in 2002, and was as intensive as the original rounds of field testing.

Learner Verification and Evaluation Studies for Everyday Mathematics
Numerous learner verification studies and evidence of effectiveness studies have been carried out by researchers at UCSMP, by independent researchers, and by schools and districts using the program. A five-year longitudinal study of the Everyday Mathematics curriculum was designed and conducted by researchers at Northwestern University.

In 2003, the National Science Foundation (NSF) sponsored the Tri-State Student Achievement Study that evaluated the effectiveness of Everyday Mathematics. The study compared the performance of nearly 40,000 students who used the program with an equal number of students from non-using comparison schools carefully matched by reading level, socioeconomic status, and other variables. More information on this study can be found on pages 12–13.

Everyday Mathematics is based on research and has been validated by research. Across this research, a wide range of instruments and methodologies have been employed to measure students’ progress and understanding, providing a broad perspective on which to evaluate the effects of the curriculum. Many of these studies have appeared in the peer-reviewed mathematics education literature, which means that these studies have been found to meet the criteria of even the most prestigious journals in the field.
Research Foundations of the Everyday Mathematics Curriculum

Everyday Mathematics is based on an extensive body of mathematics education research into children’s mathematical thinking, and on curriculum and instruction. In addition, the authors have drawn upon their own research, and upon studies of instructional practices in other countries such as Russia and Japan, to guide the development of Everyday Mathematics.


Discusses thirteen topics the author believes to be the minimum objectives of a person’s mathematics experience. Argues for increased use of mathematics in everyday life and a focus on broad understanding and higher-learning skills as opposed to behavioral objectives. Asserts that necessary components of mathematics education are: (1) the uses of numbers, algorithms, estimates, variables and computers; (2) the concepts of relations, measures, functions, probability, logic and geometry; (3) the interpretation of graphs; and (4) the links between mathematics and life.


During the 1980’s, a consensus emerged among mathematics educators about how best to teach mathematics to children in school. The NCTM Standards expressed that consensus and communicated it to a broader audience. Everyday Mathematics is based largely on the same body of research that led to the standards consensus. This paper describes the research findings that were most influential in the original development of Everyday Mathematics.


Presents a comprehensive collection of mathematical problems that highlight the applications of mathematics in real-life situations including the physical world, the social structure and industry that are useful to students by the time they reach the middle school years. Organized around basic mathematical ideas that are essential for everyman yet neglected in most schools’ materials which offer few genuine applications. Provides a sourcebook for teachers to develop honest applied mathematics for earlier levels of education.


Recognizes that the calculator will change the emphasis in mathematics education from how to work answers to when to apply particular arithmetic processes. Addresses the need to incorporate realistic applications of arithmetic in the classroom. Attempts to provide a rather complete categorization of the simpler applications of arithmetic using a large number of examples, as well as ideas to facilitate classroom use.

Other research informing Everyday Mathematics curriculum design:


UCSMP TEXTBOOK TRANSLATIONS SERIES

Among its first projects, the University of Chicago School Mathematics Project (UCSMP) began examining the curricula of other countries for proven ideas and methods. A series of foreign mathematics texts were translated by the Resource Development Component of UCSMP. The resource component’s translations include the entire former Soviet Union curriculum (Grades 1-10), standard Japanese texts for Grades 7-11, and innovative textbooks from Hungary and Bulgaria.

The textbooks were originally translated to give US educators and researchers a first-hand look at the content of mathematics instruction in educationally advanced countries. More specifically, they provided input for UCSMP as it developed new instructional strategies, textbooks, and materials of its own. The translation series texts were critical materials in the foundational planning for Everyday Mathematics.

For more information on the Resource Development Component at the UCSMP: http://socialsciences.uchicago.edu/ucsmp/Res_Dev.html (Link is case sensitive).
Effective Classroom Practices – A Selected Annotated Bibliography

A research-based program should furnish instruction that reflects current and validated pedagogical elements, identified though studies and evaluations of instructional methods. The studies listed below are representative and serve as the cornerstones of instruction found in Everyday Mathematics. The authors continue to update the program as new studies and research on instructional methods become available.


Reports on a study based on the assumption that mathematics is a way of thinking that includes higher mental processes. Through case studies, concludes (1) that mathematics is a thinking process, not skills mastery; (2) that children possess a greater knowledge of mathematics than was previously accepted; and (3) that if teachers realize that children are capable of more challenging mathematics, the focus will change from the end result to the thought process.


Reports on a study of problem solving techniques in first, second, and third grade children. Suggests that teaching addition and subtraction concepts should allow for the natural progression of problem solving skills, rather than moving directly from modeling to memorization. Argues that instruction should be arranged to allow for a child’s informal mathematical knowledge.


Recommends the following modifications in mathematics education: (1) introduce calculators and computers as early as possible; (2) emphasize mental arithmetic, estimation, and approximation instead of physical execution of arithmetic operations; (3) include experience with collection and analysis of data; (4) include new topics in secondary school curriculum; and (5) regard discrete mathematics, statistics and probability, and computer science as fundamental to the curriculum.


Reports on a study of students with learning disabilities and at-risk students using the Everyday Mathematics curricula. Proposes a reassessment of previously used special education techniques. Demonstrates that the Everyday Mathematics curriculum has many benefits for special needs students in general education classes, including long-term educational success in mathematics and inclusion in a general education classroom.

Other research informing Everyday Mathematics curriculum design:


Field Testing Studies – A Selected Annotated Bibliography

The procedures used to create research-based programs should ensure that every lesson works in actual classrooms. Everyday Mathematics was created in a process of systematic field-testing and revision that lasted from 1986 to 1996. Each grade of the program was first drafted, then field tested under controlled conditions with rigorous and systematic procedures for gathering and analyzing implementation and achievement data, and then revised on the basis of empirical findings from the field test.

The University of Chicago School Mathematics Project (UCSMP), which created the Everyday Mathematics curriculum, produced a series of reports based on these field test studies. Reports from these formative evaluation studies were used to inform the revision of the draft materials.

In addition to formative evaluation studies carried out during field testing, summative evaluation studies of Everyday Mathematics were carried out by UCSMP as each grade was completed. These summative evaluation studies relied largely on matched comparison groups in a quasi-experimental design using instruments of proven validity and reliability. Many of these summative evaluation studies have been published in the peer-reviewed literature.


Reports on a study involving fourth-graders who, since kindergarten, had been in a standards-based curriculum emphasizing student-invented procedures and discussions of problem-solving methods. Demonstrates (1) that students’ computations used both invented and standard algorithms, and (2) that students’ scores were above normative levels.


Reports on a study to measure the performance of third-graders in Everyday Mathematics classrooms on Illinois standardized tests. Notes that 23 of 26 schools tested scored above the state mean scores. Concludes that a reform-based curriculum may translate well to traditional assessment measures.


Reports on a study comparing mental computations of fifth-graders in reform-based and traditional curricula. Results demonstrate that students in the reform-based curriculum performed much higher than those in the traditional curriculum, indicating that a reform-based curriculum leads to a better ability to compute mentally.


Reports on a study of how instruction influences the use of invented algorithms and mental math. Results suggest that, while all second-grade students tested used mental procedures and standard algorithms, students whose teachers emphasized the use of standard algorithms (1) used standard algorithms more than mental procedures, and (2) were less accurate than students who were encouraged to explore many problem-solving options.

Other field testing studies informing Everyday Mathematics curriculum design:


Learner Verification and Evaluation Studies

Rigorous research has been conducted to study the effectiveness of Everyday Mathematics. These evaluations have been consistently positive and guarantee that Everyday Mathematics has been proven effective in real classrooms with real students.

The Northwestern Longitudinal Study – A Selected Annotated Bibliography

Everyday Mathematics was the focus of a five-year longitudinal study of the curriculum designed and conducted by researchers at Northwestern University. This longitudinal study used a variety of instruments and observational methods. Items on written tests were drawn from the National Assessment of Educational Progress (NAEP), from international studies of mathematics achievement, and from the research literature; some items were also specially designed for the longitudinal study. Student and teacher interviews, classroom observations, written tests and surveys, and collected artifacts were used in the longitudinal study.


Carroll, W.M., Fuson, K.C., & Diamond, A. (2000). Use of student-constructed number stories in a reform-based curriculum. Journal of Mathematical Behavior, 19, 49-62. Reports on a study of first-grade students generating and solving addition and subtraction number stories. Finds (1) that students were successful in generating and solving the number stories using many solution methods; (2) that teachers in one quarter of the classrooms failed to link the stories to mathematical representations; and (3) that only half of the teachers discussed solution methods. Implies that teacher instruction and goals are vital to reform-curricula success.


Posits use of the Advanced Children’s Thinking framework, a framework for teachers comprised of (1) eliciting solution methods; (2) supporting conceptual understanding; and (3) extending mathematical thinking. Reports on a study of five Everyday Mathematics teachers which finds that teachers often support children’s thinking but less often elicit or extend children’s mathematical thinking.


Posits use of the Advanced Children’s Thinking framework, a framework for teachers comprised of (1) eliciting solution methods; (2) supporting conceptual understanding; and (3) extending mathematical thinking. Reports on a study of five Everyday Mathematics teachers which finds that teachers often support children’s thinking but less often elicit or extend children’s mathematical thinking.


Reports on a study of second and third grade students using Everyday Mathematics. Finds that Everyday Mathematics students (1) are performing at normative levels for multi-digit addition and subtraction on traditional, reform-based, and Everyday Mathematics specific test items, and (2) outperform traditionally taught U.S. students.

Achievement of Students Using Everyday Mathematics

The project found that Everyday Mathematics students outperformed comparison students in the United States across all grades and raised achievement to levels approaching that of high-performing Asian countries.

Carroll, W.M., Fuson, K.C., & Diamond, A. (2000). Use of student-constructed number stories in a reform-based curriculum. Journal of Mathematical Behavior, 19, 49-62. Reports on a study of first-grade students generating and solving addition and subtraction number stories. Finds (1) that students were successful in generating and solving the number stories using many solution methods; (2) that teachers in one quarter of the classrooms failed to link the stories to mathematical representations; and (3) that only half of the teachers discussed solution methods. Implies that teacher instruction and goals are vital to reform-curricula success.

Percent Exceeding Goals
Percent Meeting Goals
Percent Not Meeting Goals

At the 14 schools where students had used the curriculum since kindergarten, more than half of the students exceeded the state goals, and only 2% failed to meet the goals. A much higher percentage of Everyday Mathematics students exceeded the state goals, and a lower percentage failed to meet the state goals, as compared to the state and Cook County data.

Percent at each level of competence on the 1993 Illinois mathematics test - Grade 3

Percent Exceeding Goals
Percent Meeting Goals
Percent Not Meeting Goals

* Represents 14 schools that had implemented Everyday Mathematics since Kindergarten
** Represents all 26 schools using Everyday Mathematics including 12 that had adopted the program in either second or third grade.
Other Northwestern longitudinal studies informing Everyday Mathematics curriculum design:


Independent Studies – A Selected Annotated Bibliography

Other evaluations of Everyday Mathematics have been carried out. The most important of these are NSF-sponsored Tri-State Achievement Study (2003), Riordan and Noyce (2001), Briars and Resnick (2000), and Baxter, Woodward, and Olson (2001).


Extends an earlier study of learning disabled children using the first edition of third grade Everyday Mathematics (Woodward & Baxter, 1997). The current study employed surveys, interviews, and classroom observations to examine the difficulties low-achieving student face when working with reform-based mathematics curricula, and identified the formation of a community of learners and the cognitive load as key features of the curriculum that need to be considered in relation to low achievers. Concludes that reform-based mathematics should not be abandoned when teaching low achievers.


The What Works Clearinghouse review of elementary school mathematics curriculum-based programs addresses student outcomes in mathematics achievement. Everyday Mathematics was found to have potentially positive effects on students' mathematics achievement. Available online at: http://ies.ed.gov/ncee/wwc/reports/elementary_math/eday_math/


Reports on a study comparing statewide standardized test scores of fourth-grade students using Everyday Mathematics and eighth-grade students using Connected Mathematics to scores of similar students using traditional curricula. Finds that students using a standards-based curriculum performed significantly better than those using a traditional-based curriculum. Finds apparent improvements across mathematical strands, question styles, and student populations.

Other independent research studies informing the Everyday Mathematics curriculum:


TRI-STATE STUDENT ACHIEVEMENT STUDY

In 2003, the ARC Center, located at the Consortium for Mathematics and its Applications (COMAP), completed a study of the effects of standards-based mathematics programs on student performance on state-mandated standardized tests in Massachusetts, Illinois, and Washington. The National Science Foundation funded this study and its report.

The findings in this report are based on the records of over 78,000 students: 39,701 who had used the Everyday Mathematics curriculum for at least two years, and 38,481 students from comparison schools. The students were carefully matched by reading level, socioeconomic status, and other variables.

Results showed that the average scores of students in the Everyday Mathematics schools were consistently higher than the average scores of students in the comparison schools. The results hold across different state-mandated tests and across topics ranging from computation, measurement, and geometry to algebra, problem-solving, and making connections. (A complete report is available from COMAP or Wright Group/McGraw-Hill.)

Available online at: http://www.comap.com/elementary/projects/arc/
Evidence of Effectiveness in User Schools and Districts

Since Everyday Mathematics is so widely used—over four million students use the program nationwide—many school districts have studied its effects on student achievement. Such school district studies typically report the results of paper-and-pencil tests, usually commercial norm-referenced tests or mandated state assessments. Surveys of teachers, parents, and students are also often included in district program evaluations.


Numerous districts have shared test data and have offered their insights into implementation and professional development through Everyday Mathematics Success Stories. A few of the districts that have shared their evidence of increased achievement are listed below.

- Anchorage, Alaska
- Burnsville, Minnesota
- Citrus County, Florida
- Daviess County, Kentucky
- Fayetteville, Arkansas
- Glendale, California
- Horry County, South Carolina
- Ka’ala, Hawaii
- Lapwai, Idaho
- Michigan City, Indiana
- Montgomery Area SD, Pennsylvania
- Montgomery County, Virginia
- New York City, New York
- Norman, Oklahoma
- Orange County, Florida
- Philadelphia, Pennsylvania
- Plainfield, Illinois
- Union County, Oklahoma
- Virginia Beach, Virginia
- Winchester, Massachusetts

Summary reports detailing the most recent student achievement results on state mathematics tests in six nationally representative districts are presented on the next two pages.

For more information on a variety of Everyday Mathematics Success Stories and Evidence of Student Achievement, please visit http://www.EverydayMathSuccess.com.
On more traditional topics, such as fact knowledge and computation, Everyday Mathematics students perform as well as or better than students in more traditional programs. On topics that have been underrepresented at the elementary level—geometry, measurement, algebra—Everyday Mathematics students score substantially higher.

Additionally, Everyday Mathematics received an effectiveness rating from the WWC of “potentially positive effects” on students’ math achievement. All of the other elementary school mathematics programs reviewed by the WWC received effectiveness ratings of “no discernible effects.” The Everyday Mathematics development team at UCSMP currently includes a full-time statistician who directs the analysis of data from student testing, teacher surveys, and classroom observations. The scientific research basis for Everyday Mathematics is solid.

Conclusion

Everyday Mathematics is based on research and has been validated by research. Across this research, a wide range of instruments and methodologies have been employed to measure students’ progress and understanding, providing a broad perspective on which to evaluate the effects of the curriculum. Methods used include a variety of effective research designs, including pre-post comparisons, quasi-experimental designs, longitudinal studies, and observational studies, all with appropriate controls and statistical analyses. Studies range from intensive observations in a small number of classrooms to large-scale studies of tens of thousands of children. These studies began in the late 1980s and continue to this day.

The results of these many studies indicate the following:

- On more traditional topics, such as fact knowledge and paper-and-pencil computation, Everyday Mathematics students perform as well or better than students in more traditional basal programs. In addition, Everyday Mathematics students use a greater variety of computation solution methods. Students are especially strong on mental computation.

- On topics that have been underrepresented in the elementary curriculum—geometry, data, measurement, and algebra—Everyday Mathematics students score substantially higher that do students in more traditional programs. Everyday Mathematics students also generally perform better on questions that assess problem solving, reasoning, and communication.

- Improvements in performance for students using the Everyday Mathematics curriculum cut across racial, ethnic, and income-level categories. The What Works Clearinghouse (WWC), within the US Department of Education, reported in 2006 on the effects of elementary school mathematics programs on student outcomes in math achievement. In rating the effectiveness of any curriculum, the What Works Clearinghouse considers only those research studies that meet a “gold standard” for scientifically based research. The elementary mathematics review included Everyday Mathematics as well as traditional basal textbook series and a skills-based alternative basal.

The WWC considered for evidence of effectiveness four studies of Everyday Mathematics that included a total of approximately 12,600 students in grades 3-5 from a range of socioeconomic backgrounds and attending schools in urban, suburban, and rural communities in multiple states. The WWC considered the extent of evidence for Everyday Mathematics to be moderate to large.
For more information about *Everyday Mathematics*, call 1-800-648-2970 or visit EverydayMath.com.