A Comprehensive Summary of the
Scientific Research & Evidence of Effectiveness
for the Everyday Mathematics program
The mathematics students need to learn today is not the same mathematics that their parents and grandparents needed to learn. When today’s students become adults, they will face demands for mathematical proficiency that school mathematics should attempt to anticipate. Moreover, mathematics is a realm no longer restricted to a select few.

All young Americans must learn to think mathematically, and they must think mathematically to learn.

No Child Left Behind

The US Department of Education through the No Child Left Behind Act has outlined the following to help increase achievement in mathematics:

Our nation must research the best way to teach math and science and measure students’ progress in math.

- *No Child Left Behind* requires that federal funding go only to those programs that are backed by evidence.
- Over the last decade, researchers have scientifically proven the best ways to teach reading. We must do the same in math. That means using only research-based teaching methods and rejecting unproven fads.
- The new law also requires states to measure students’ progress in math annually in grades 3-8 beginning in 2005.

*No Child Left Behind* creates Math and Science Partnerships to rally every sector of society to work with schools to increase math and science excellence.

- The National Science Foundation and the U.S. Department of Education will provide an estimated $1 billion over five years for results-oriented partnerships between local districts and universities to bring urgency, tested method and high level expertise to rebuilding math excellence.
- Partnerships will invite businesses, science centers, museums and community organizations to unite with schools to improve achievement.
- The program rewards states for increasing participation of students in advanced courses in math and science and passing advanced placement exams.
- To ensure accountability, the Partnerships must report annually to the U.S. Secretary of Education on progress in meeting their set objectives, aligned to state standards.

[taken from the US DOE website
Research & Development

Everyday Mathematics is a research-based curriculum developed by the University of Chicago School Mathematics Project. UCSMP was founded in 1983 during a time of growing consensus that our nation was failing to provide its students with an adequate mathematical education. The goal of this on-going project is to significantly improve the mathematics curriculum and instruction for all school children in the U.S.

Development of Everyday Mathematics began with a research phase. 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. Teachers and other adults play a very important role in providing children with rich and meaningful mathematical experiences.

- 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.

With these principles in mind, the Everyday Mathematics author team began developing the curriculum. 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 in a cross section of actual classrooms, and a year of revising before final publication. All seven grade levels were written by the same core of authors, in collaboration with a team of mathematicians, education specialists and classroom teachers. This unique development process has resulted in a comprehensive K-6 curriculum that provides a consistent high quality, and a sequence of instruction that carefully builds upon and extends the knowledge and skills of the previous year.
Scientific Research Basis

Scientifically Based Research

The term, “scientifically based research” means research that involves the application of rigorous, systematic and objective procedures to obtain reliable and valid knowledge relevant to educational activities and programs. There are four types of research:

- **Academic Research** is research that is evaluated using experimental or quasi-experimental designs in which individuals, entities, programs, or activities are assigned to different conditions and with appropriate controls to evaluate the effects of the condition of interest, with a preference for random-assignment experiments, or other designs to the extent that those designs contain within-condition and across-condition controls.

- **Research Concerning Effective Classroom Practice** employs systematic, empirical methods that draw on observation or experiment, and involves rigorous data analyses that are adequate to test the stated hypotheses and justify the general conclusions drawn.

- **Field Testing Research** that relies on measurement or observational methods that draw on experiment, and involves valid data across evaluators and observers and across multiple measurements and observations.

- **Learner Verification Research** conducted on the success of those using the program. Findings have been accepted by a peer-reviewed journal or approved by a panel of independent experts through a comparably rigorous, objective and scientific review.

Research Basis for Everyday Mathematics

*Everyday Mathematics* combines all four types of research. *Everyday Mathematics* was developed by the University of Chicago School Mathematics project (UCSMP). *Everyday Mathematics* is based on the authors’ own academic research into young children’s mathematical abilities, as well as on systematic surveys of the mathematics education research literature for effective classroom practices.

Furthermore, *Everyday Mathematics* was originally created in a process of systematic field-testing and revision that lasted from 1986 to 1996. Numerous learner verification 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.
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.

**Academic Research**

Academic research is research that is provided by educational researchers. It is critical that the authors of a scientifically research-based mathematics program be educational researchers in their own right. Everyday Mathematics is based on a wide variety of scientific research, including the extensive body of mathematics education research carried out by the authors and others over the past 30 years.


Effective Classroom Practices

A research-based program means that the instruction in a given program reflects the most current pedagogical elements identified through scientific research. *Everyday Mathematics* is a research-based program based on educational philosophies and rooted in scientific research and practical classroom experience.

These studies listed below and many others serve as the cornerstone of the instruction found in *Everyday Mathematics*. The authors of *Everyday Mathematics* continue to update the program as new studies are published and new research on instructional methods becomes available. Several of these studies used portions of *Everyday Mathematics* in their investigations, while others used instructional methods incorporated in *Everyday Mathematics*. The sum of the knowledge revealed by these studies continues to support and enhance the philosophy of this program.


The coordination of curriculum, instructional materials, assessment, instruction, professional development and school organization around the development of mathematical proficiency should drive school improvement efforts.

Field Testing

The procedures used to create research-based programs ensure that every lesson has worked in actual classrooms. *Everyday Mathematics* was originally 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 finally 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.


**Learner Verification**

Rigorous research has been conducted to prove the effectiveness of *Everyday Mathematics*. When a program is not only research-based, but also researched, there is a guarantee that it has been proven effective in real classrooms with real students.

**Northwestern Longitudinal Study**

*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.


### Independent Studies

Several empirical studies of *Everyday Mathematics* have also been carried out by scientific groups other than UCSMP and the Northwestern team. The most important of these are Briars and Resnick (2000), Noyce and Riordan (2001), and Woodward, Baxter, and Olson (2001). These external studies have informed both the initial creation and the revision of the curriculum.

Since *Everyday Mathematics* is so widely used—approximately 2.8 million students are using it during the 2003-2004 school year—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.


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**Efforts to improve students’ mathematics learning should be informed by scientific evidence, and their effectiveness should be evaluated systematically. Such efforts should be coordinated, continual, and cumulative.**


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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.

These studies have been carried out by three principal groups: 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 also designed and conducted by researchers at Northwestern University. 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. 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 as 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, measurement, and algebra—*Everyday Mathematics* students score substantially higher than do students in more traditional programs. *Everyday Mathematics* students also generally perform better on questions that assess problem solving, reasoning and communication.

- Evidence for the curriculum is apparent in the “invented algorithms” used by students in mental computation and during problem solving.

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 firm.
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