



Because learning changes everything.®



Evidence for K–5 Mathematics Solutions

The purpose of this document is to demonstrate clearly and explicitly the scientific research evidence for *McGraw-Hill My Math*—a complete program built around effective instruction to meet the needs of all learners.

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Dear Educators,

At McGraw-Hill Education, research fuels all that we do to improve the learning experience. We believe our biggest contribution in building a brighter future lies within our deep understanding of how learning happens and how the mind develops. We do this by supporting and funding a wide range of research on the effectiveness of our educational solutions.

As part of the development of *McGraw-Hill My Math*, McGraw-Hill Education worked with world-class researchers, academics, and practitioners in education to build an authorship team for our programs that helped design, develop, and validate instructional models that are based on current scholarship and research and that support effective teaching and learning.

Our approach to evidence-based research and efficacy recognizes the value of smaller studies piloting first-year implementations as well as large-scale experimental studies, with both approaches designed to propel learners toward higher levels of achievement. We are actively incorporating rigorous research design and methodologies to our iterative product development process. We are also gaining a wide range of educational insights through a variety of research efforts, including studies that focus on the impact on learning of non-cognitive factors, such as social-emotional skills, equity, and fidelity of implementation for educators. All studies—no matter the size or the outcome—help to inform future product development.

McGraw-Hill Education will continue to invest in a range of research efforts, including experimental, quasi-experimental, correlational, and qualitative research, because the findings of these research efforts are foundational to our mission and our educational equity philosophy. Our most recent instructional solutions are grounded in time-tested research of the highest level of rigor possible.

We invite you to review the attached portfolio, where we have included the most compelling indicators of success of the *McGraw-Hill My Math* program. Included in the supporting documents you will find:

- Independent efficacy studies in which students using *McGraw-Hill My Math* products showed statistically significant improvement in test scores and achievement from beginning-of-year to end-of-year exams.
- References to whitepapers detailing the benefits of specific program elements and the research conducted to develop *McGraw-Hill My Math*

At McGraw-Hill Education, we are committed to continuously improving the instructional quality and academic integrity of our materials, and we welcome the opportunity to meet with you and your colleagues to discuss our *McGraw-Hill My Math* series in more depth.

Thank you for both your dedication to the success of your learners, as well as your efforts to support our joint commitment to helping empower great teaching.

The McGraw-Hill Education Team

Core Comprehensive Mathematics for Grades K–5

Customizable to fit your teaching style, *McGraw-Hill My Math* challenges and engages students as they build their skills to communicate mathematically.

McGraw-Hill My Math Offers:

- Rigorous material that challenges and engages students through real-world applications and experience.
 - Customizable instruction with interactive eTools, lesson presentations, and support for differentiated instruction.
 - Meaningful opportunities for students to communicate mathematically through robust vocabulary resources and language development support.
 - On-demand professional development resources that enable continuous learning.
- McGraw-Hill My Math* makes math relevant, rigorous, and possible for every student. With solutions to support lesson planning, state standards, differentiated instruction, and next generation assessments, McGraw-Hill My Math supports the needs of both students and teachers.

McGraw-Hill My Math Correlational Study

McGraw-Hill My Math is an elementary mathematics curriculum built to meet the Standards for Mathematical Practices focusing on mathematical rigor while also providing differentiated instruction to meet the needs of a wide variety of learners. The focus on building mathematical knowledge is a key component both for setting students up for future success in math as well as for creating more immediate impacts on mathematics assessment outcomes.

Evidence of *McGraw-Hill My Math*'s impact on student outcomes is necessary to ensure that the program is meeting the needs of students. Under the Every Student Succeeds Act (ESSA), research evidence is divided into four categories based on the research design used. A promising (Tier III) intervention should have at least one correlational study that controls for selection bias. To meet this level of evidence, McGraw-Hill Education conducted a research study for *McGraw-Hill My Math* using data from the state of Arizona. In grades 3, 4, and 5, statistically significant higher gains were found for the *McGraw-Hill My Math* users.

Key Findings

- Passage rates on the 2016, 2017, and 2018 AzMERIT Math assessment were statistically significantly higher for schools in districts using *McGraw-Hill My Math* than schools in districts not using *McGraw-Hill My Math* for grades 3 and 4.
- Grade 5 passage rates for *McGraw-Hill My Math* users were statistically significantly higher than their non-*McGraw-Hill My Math* counterparts in 2017, and higher than their non-*McGraw-Hill My Math* counterparts in 2018 at a marginally significant level.

Procedure

The purpose of this analysis was to compare schools using *McGraw-Hill My Math* with schools not using *McGraw-Hill My Math* during the 2016-2018 school years. *McGraw-Hill My Math* status was determined through the use of sales data (district level) and confirmation from MHE Sales personnel in AZ.

This analysis does not include schools identified as charter schools by the Arizona Department of Education.

All data were retrieved from the Arizona Department of Education Accountability and Research website (<http://www.azed.gov/accountability-research/data/>) between August 16 and August 28, 2018. Enrollment data, including demographics, were drawn from the most recent available data file (2016-2017 school year). In accordance with the guidance for Tier III ESSA studies, all analyses reported below document the differences between *McGraw-Hill My Math* and non-*McGraw-Hill My Math* users beyond the impact of selection bias by including statistical controls for:

- The percent of non-white students in each school
- The percent of students eligible for free or reduced-price lunch in each school
- The percent of students with documented disabilities in each school
- The percent of English language learners in each school

Figure 1. Percent of **3rd Graders** in AZ Public Schools Passing AzMERIT Math Assessment 2016-2018

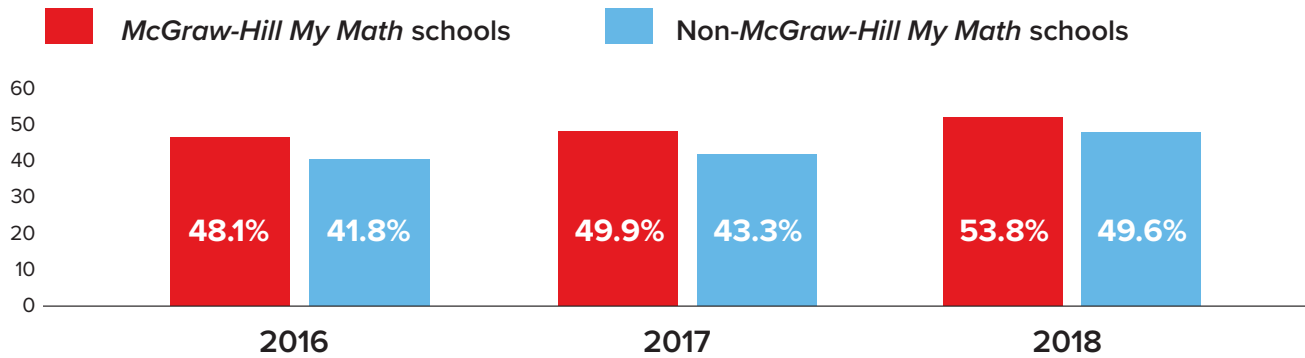


Figure 2. Percent of **4th Graders** in AZ Public Schools Passing AzMERIT Math Assessment 2016-2018

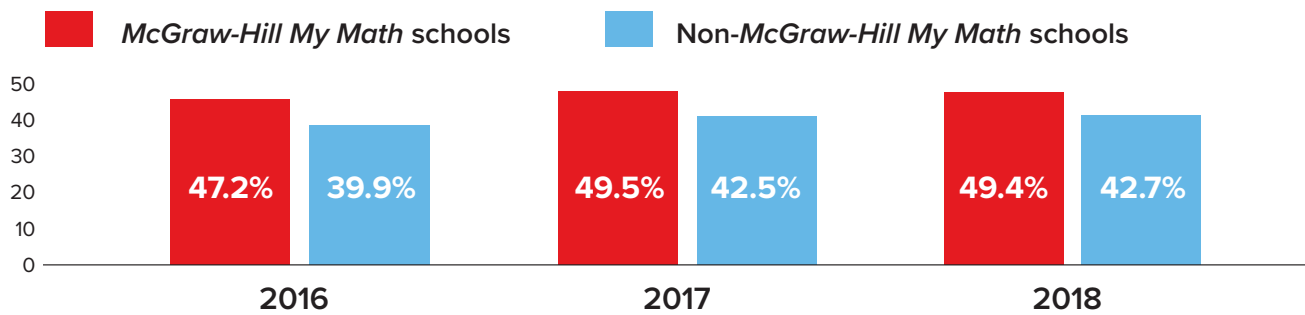


Figure 3. Percent of **5th Graders** in AZ Public Schools Passing AzMERIT Math Assessment 2016-2018

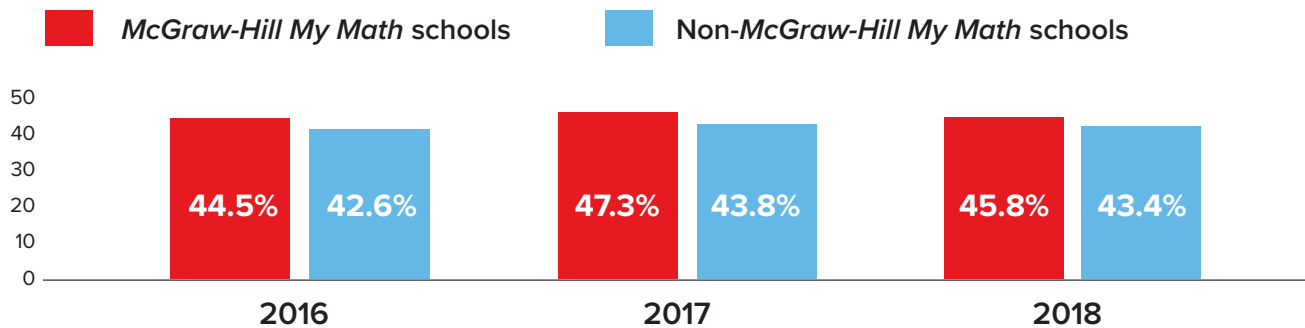


Table 1. Percentage of students passing the AzMERIT Math Assessment

		2016	2017	2018
Grade 3	<i>McGraw-Hill My Math Schools</i>	48.13***	49.93***	53.81***
	<i>Non-McGraw-Hill My Math Schools</i>	41.79	43.34	49.60
Grade 4	<i>McGraw-Hill My Math Schools</i>	47.22***	49.47***	49.43***
	<i>Non-McGraw-Hill My Math Schools</i>	39.87	42.48	42.66
Grade 5	<i>McGraw-Hill My Math Schools</i>	44.45	47.34***	45.79*
	<i>Non-McGraw-Hill My Math Schools</i>	42.57	43.77	43.43

Note: Cell numbers represent the estimated percentage of students passing the AzMERIT Math Assessment after statistically controlling for the percent of non-white students, percent of students eligible for free or reduced-price lunch, percent of students with disabilities, and percent of English language learners.
 *** = $p < .001$, ** = $p < .05$, * = $p < .10$

DISCLAIMER: Class performance can improve due to a number of factors, including the innate ability and prior education of the students participating, as well as differences among teachers and their pedagogies. We believe that, even taking these factors into account, *McGraw-Hill My Math* can contribute to improvements in student outcomes.

McGraw-Hill My Math Efficacy Study Results

Introduction

SKF Educational Services conducted a year-long study investigating the effects of *McGraw-Hill My Math* on student achievement and teacher attitudes. The study utilized a pretest-posttest, randomized control-group design, with assignment at the classroom level. The sample contained 829 students in Kindergarten, second, and fifth-grade; 494 students comprised the *McGraw-Hill My Math* condition, and 335 comprised the control condition. To assess the effect of *McGraw-Hill My Math* on student achievement, students in the *McGraw-Hill My Math* and the control conditions were pretested and post-tested using the math subject test of the Terra Nova.

Descriptive statistics and the results of tests for statistical significance are separately listed for Kindergarten, second-, and fifth-grade students. Below is a synopsis of the data points.

Kindergarten

On average, students in the *McGraw-Hill My Math* group performed about 11 units higher on the SS pretest than did students in the control group. This finding held true for the SS posttest, as students in the *McGraw-Hill My Math* group outperformed students in the control group by 11 units. To control for differences in initial performance on the Terra Nova pretest, linear regression was utilized to determine the program effect on students' posttest scaled scores. After controlling for students' SS pretest score, the effect of program (unstandardized regression coefficient $b = 2.99$) was not found to be statistically significant, $t_{228} = .430$, $p = .668$. This finding remained after incorporating gender, ethnicity, free/reduced lunch status, ESL status, and special education status into the statistical model.

To determine the significance of the difference in Normal Curve Equivalent (NCE) posttest scores, an independent samples t-test was performed. Results indicate that the difference in NCE posttest scores between the *McGraw-Hill My Math* and control group was found to be statistically significant, $t_{228} = 2.138$, $p = .000$. On average, students in the *McGraw-Hill My Math* group outperformed students in the control group by approximately 6 NCE units.

Second Grade

The average Scaled Score (SS) and Normal Curve Equivalent (NCE) scores on the pretest and posttest administration of the Terra Nova were identified. On average, those second grade students in the *McGraw-Hill My Math* group exhibited higher SS and corresponding NCE pretest scores than did second grade students in the control group, by 16 points and 6 points, respectively.

As with the Kindergarten data, linear regression was utilized to determine the program effect on students' posttest SS and NCE score. After controlling for students' pretest SS, program condition was found to be a statistically significant predictor of posttest SS (unstandardized regression coefficient $b = 13.87$, $t_{237} = 3.57$, $p = .000$). After controlling for students' pretest NCE score, the program condition was found to be a statistically significant predictor of posttest NCE scores, (unstandardized regression coefficient $b = 6.19$, $t_{237} = 4.165$, $p = .000$). These findings did not change, in either case, when gender, ethnicity, free/reduced lunch status, ESL/ELL status, or special education status were entered into the statistical model.

Fifth Grade

The average Scaled Score (SS) and Normal Curve Equivalent (NCE) scores on the pretest and post test administration of the Terra Nova were provided. On average, those fifth-grade students in the *McGraw-Hill My Math* group exhibited higher SS and corresponding NCE pretest scores than did students in the control group, by 15 points and 8 points, respectively.

As with the Kindergarten and second-grade data, linear regression was utilized to determine the program effect on fifth grade students “SS and NCE scores. After controlling for students’ pretest scaled score, program condition was not found to be a statistically significant predictor of post test scaled score (unstandardized regression coefficient $b = 3.72$, $t_{239} = .784$, $p = .434$). After controlling for students’ pretest NCE score, the program condition was not found to be a statistically significant predictor of post test NCE scores, (unstandardized regression coefficient $b = 2.59$ $t_{239} = 1.42$, $p = .16$). These findings did not change when gender, ethnicity, free/reduced lunch status, ESL/ELL status, or special education status variables were included in the statistical model.

Figures 1 and 2 provide a summary of findings for all grade levels. Figure 1 compares the average performance of *McGraw-Hill My Math* and control students on the NCE post test. The difference in scores for Kindergarten and second grade students is statistically significant, as indicated by the asterisks. The difference in scores for the fifth grade students was not found to be statistically significant.

Figure 1: Comparison of *McGraw-Hill My Math* and Control Students, NCE posttest

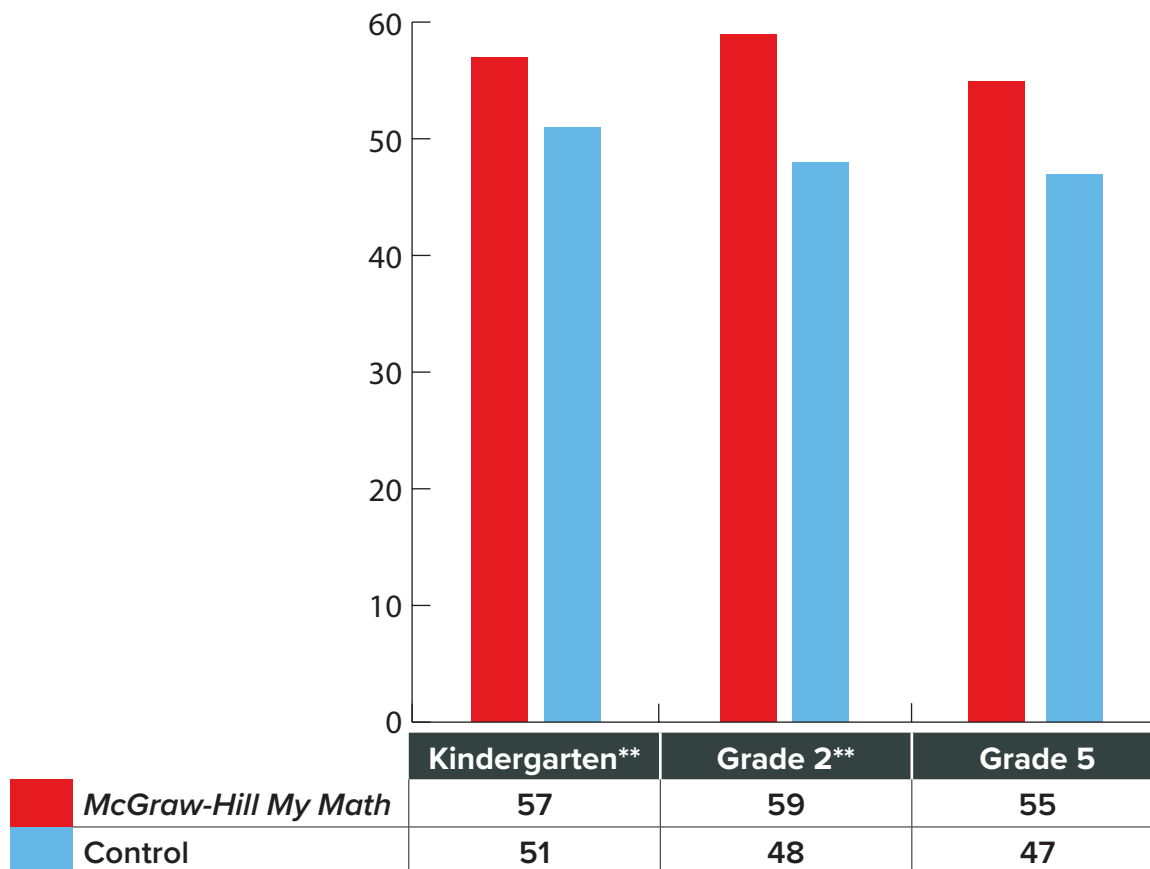
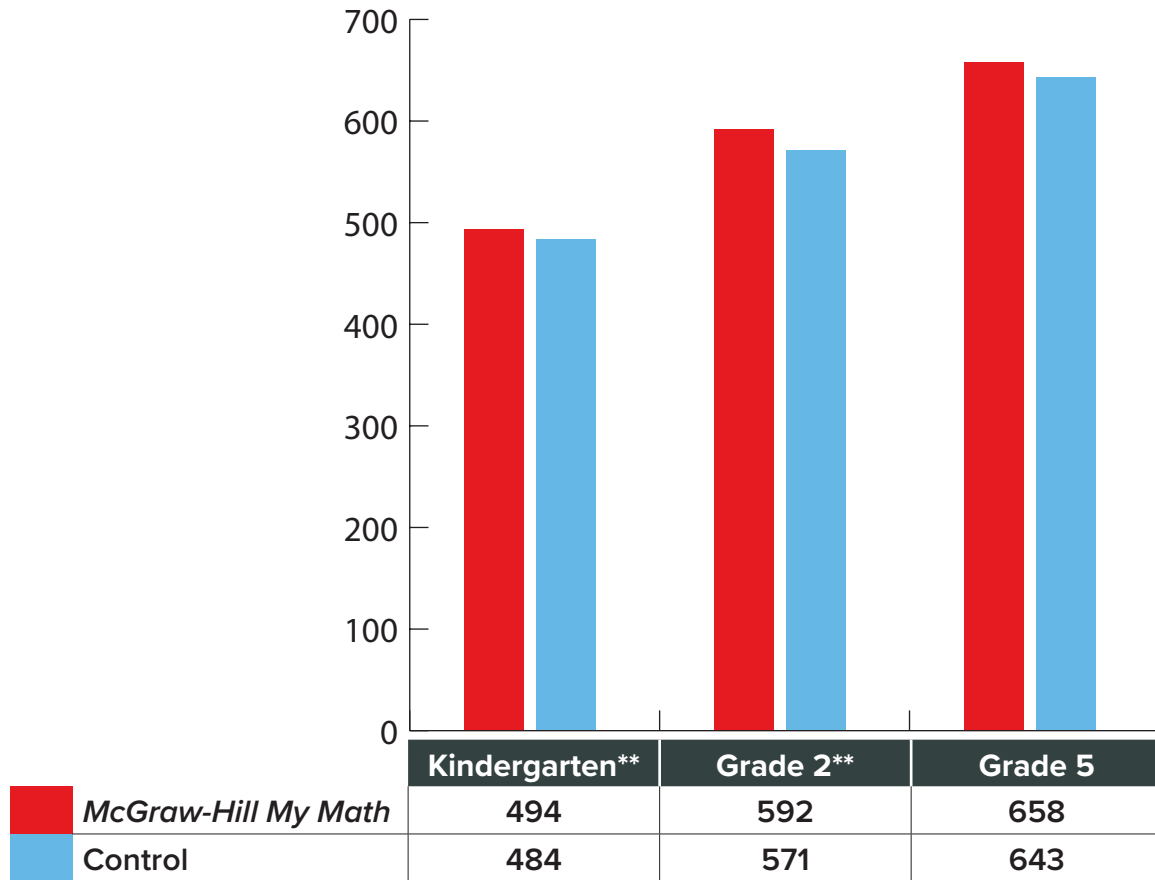


Figure 2 compares the average performance of *McGraw-Hill My Math* and control students on the NCE posttest. The difference in scores for second grade students is statistically significant, as indicated by the asterisks. The difference in scores for the Kindergarten and fifth grade students was not found to be statistically significant.

Figure 2 Comparison of *McGraw Hill My Math* and Control Students, SS posttest



**Results statistically significant, $p < .05$

Conclusion

Kindergarten and second-grade *McGraw-Hill My Math* users performed statistically significantly better than their peers in the comparison groups. While the participants in grade 5 performed better than the control group the results were not statistically significant.

DISCLAIMER Class performance can improve due to a number of factors, including the innate ability and prior education of the students participating, as well as differences among teachers and their pedagogies. We believe that, even taking these factors into account, My Math can contribute to improvements in student outcomes.

Thought Leaders in Mathematics Instruction Comprise Authorship Team

Dr. John A. Carter

Dr. John A. Carter is passionate about teaching mathematics and was happy to return to his passion in 2016 with a teaching position at New Trier High School in Winnetka, Illinois. Prior to this, Dr. Carter was a principal at West Lake High School in Austin, Texas and Adlai E. Stevenson High School before that. Dr. Carter is extremely knowledgeable in using technology to visualize mathematics and creating successful outcomes for English Language Learners in mathematics.

Dr. Gilbert Cuevas

Dr. Gilbert J. Cuevas is a Professor of Mathematics Education at Texas State University - San Marcos where he has taught Math for Elementary Teachers, Current Research in Mathematics Education, and Instructional Techniques and Assessments. Dr. Cuevas taught mathematics in Miami-Dade County Schools and Collier Co. (FL) Schools before getting his PhD in Educational Research in 1975 and becoming an Associate Professor, then Professor, at the University of Miami. Dr. Cuevas is an expert in mathematical representations and applying concepts and skills in mathematically rich contexts.

Dr. Roger Day

Dr. Roger Day has extensive experience in mathematics teachers education and has taught courses like Topics in Algebra and Combinatorics for K-8 Teachers, at his current position of Instructional Assistant Professor at Illinois State University. Dr. Day received his PhD in mathematics Education from the University of Minnesota - Twin Cities after completing a Bachelors in Mathematics, Secondary Education and Teaching from St. Olaf College, and a MS in Mathematics Education from the University of Wisconsin-Madison. His love for mathematics and education brought him to speak at the National Council of Teachers Mathematics (NCTM) Convention and Exhibition in 2017.

In Memoriam, Dr. Carol Malloy

Dr. Carol Malloy was a fervent supporter of mathematics education. She was a professor at the University of North Carolina, Chapel Hill, NCTM Board of Directors member, President of the Benjamin Banneker Association (BBA), and 2013 BBA Lifetime Achievement Award for Mathematics winner. She joined McGraw-Hill in 1996. Her influence significantly improved our programs' focus on real-world problem solving and equity. We will miss her inspiration and passion for education.

Robyn Silbey

With her experience of teaching 11 years in the classroom, being a math coach for 25 years, and serving on several mathematics evaluation and advisory committees, Robyn Silbey has an impressive repertoire of mathematics involvement. Silbey was also a part of the United States Department of Education as a teacher consultant and frequently presents at conferences worldwide to speak about professional development.

Dinah Zike

Dinah Zike is the proud creator of *Foldables*, found exclusively in McGraw-Hill products. Dinah graduated from Texas A&M University before becoming a teacher for 10 years. She has always been passionate about kinesthetic and visual experiences to develop students' math understanding, and she enjoys helping teachers harness the power of graphic organizers in the classroom.

The Role of Research

The following studies have been used to inform the pedagogical foundation for the program:

Research Foundation of McGraw-Hill My Math

This whitepaper describes how *McGraw-Hill My Math* was developed to assist today's teachers with the challenge of helping students in the 21st century acquire a solid mathematical foundation.

Focus, Coherence, and Rigor in McGraw-Hill My Math

This document details the features and components of *McGraw-Hill My Math* that contribute to the program's emphasis on focus, coherence, and rigor and allow students to progress towards a higher level of achievement.

The Benefits of Write-In Textbooks

This report provides research on the benefits of write-in textbooks compared to traditional formats. The advantages to student learning and several different features are highlighted.

Homework Research Gives Insight to Improving Teaching Practice (Richard W. Herrig)

While the effectiveness of homework has been debated for years, this document discusses the key features and actions that help make homework meaningful.

Understanding by Design (Jay McTighe)

The concept of Understanding by Design is based around using Big Ideas to encourage long term retention and genuine student understanding. This document provides a design for curriculum planning that encourages purposeful teaching.

Using Foldables in the Classroom (Rhonda Meyer Vivian, Ph.D., Nancy F. Wisker, M.A.)

Graphic organizers provide robust learning opportunities for students when properly utilized. This report includes guidelines for successful application as well as overarching information on the benefits graphic organizers provide for students.

Future of Research with McGraw-Hill Education

As a learning science company, research and efficacy are at the core of McGraw-Hill Education's vision to unlock the full potential of each learner. To ensure we're accomplishing our goals, we support and fund a wide range of research on the effectiveness of our educational solutions.

Our broad approach to research and efficacy are based in a belief that there is value to have small studies in first-year implementations as well as large-scale experimental studies. While not all of these methodological approaches lend themselves to statistically significant outcomes, the insights we gain help us to inform future product development.

We continue to invest in research because we recognize its importance in creating programs that serve a diverse population of students and teachers across grade levels and content areas.

To learn more about *McGraw-Hill My Math* and our ongoing commitment to research, visit us online at

mhmymath.com



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