



Rounding Up

*A Practitioner's Planning Toolkit for
Assessing Math Curriculum Efficacy*

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Introduction

Selecting the right math curriculum can be a challenging process that requires proactive planning, knowledge of your students and teachers, and a clear idea of desired outcomes. It also requires **research evidence** that can help you make the best decisions for your district and schools.

This toolkit is designed for district leaders and staff exploring new math curricula for their schools and students, and provides information to help leaders consume and conduct research on the effectiveness of math curricula. This toolkit is divided into two sections:

Reviewing Curriculum Effectiveness Research

Are you choosing among different math curriculum options and need to weigh the evidence base?
Find tips for reviewing research in this section.

Planning Your Own Impact Study

Would you like to conduct your own research about the impact of a curriculum that's already being implemented? Visit this section for additional planning tips.

This toolkit is a follow-up to Bellwether's analysis of math curriculum effectiveness research, which examined 61 effectiveness studies to 1) understand how math curriculum effectiveness is typically assessed and 2) identify potential opportunities to better tailor such impact studies to the needs of practitioners.

How to Use the Toolkit

Do any of the scenarios below sound familiar to you? If yes, then this toolkit is for you.

I am a school superintendent who is interested in ...

- Purchasing a new math curriculum for the schools in my district.
- Providing teachers with additional math professional development (PD).
- Learning about what other districts choose for their math curricula.

I am a chief academic or research officer in a district who is interested in ...

- Conducting a pilot study on the effectiveness of a math curriculum.
- Hiring a research firm to conduct a study of a math curriculum.
- Building a system of formative math assessments to improve student learning in my district.

I am a math teacher who is interested in ...

- Learning about the effectiveness of different math curricula to help students at risk of failure.



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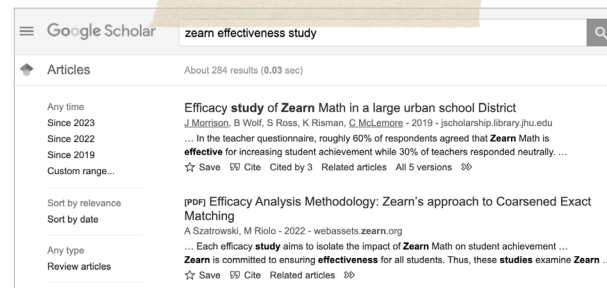
Reviewing Research

The first step in reviewing research is finding studies that investigate the effectiveness of the math curriculum of interest. Search for relevant studies using a variety of sources such as those shown here. For each study you find, you will want to assess its:

1. Research Design
2. Relevance
3. Results

Many publishers include efficacy research on the curriculum website.

Search Results			
33 Results filtered by:			
Product Type	Grade Level	Highest Evidence Tier	Name (Release Date)
Intervention Report	8-PS	TIER 1 STRONG	Cognitive Tutor® Algebra I (Secondary Mathematics) (June 2016) Cognitive Tutor®, published by Carnegie Learning, is a math curricula that combines textbooks and interactive software.
Intervention Report	PK	TIER 1 STRONG	Pre-K Mathematics (Early Childhood Education) (December 2013) Pre-K Mathematics is a supplemental curriculum designed to develop informal mathematical knowledge and skills in preschool children. Mathematical content is organized into seven units. Specific mathematical concepts and skills from each unit are taught in the classroom through teacher-guided, small-group activities with concrete manipulatives. Take...
Intervention Report	4-8	TIER 2 MODERATE	Odyssey® Math (Primary Mathematics) (January 2017) Odyssey® Math is a web-based program developed by Compass Learning® for mathematics instruction in grades K-8. The online program includes a mathematics curriculum and formative assessments designed to support differentiated and data-driven instruction. Based on assessment results, the program generates an individualized sequence of mathematics topics and...



Use [Google Scholar](#) to search for academic research related to the effectiveness of specific math curricula.



The [What Works Clearinghouse](#) provides detailed reviews of the evidence base behind specific curricula.

1. Research Design

Assess how the research approach might shape the kinds of conclusions you can draw.

Does the research design provide the type of evidence that you are looking for?

Do you only need to know if the math curriculum has a demonstrated proven impact on students? In this case you may want studies that are more quantitative. Specifically, you may want to look at studies with an experimental or quasi-experimental research design (page 20). These studies provide the most statistically rigorous and generalizable evidence of a curriculum's impact.

However, you may want research that provides more information about how the program is implemented. These studies often include more qualitative information gathered through observations or interviews. They may also provide more detail about the way teachers are trained in the curriculum or whether there are other specific contexts that might influence the implementation of the program.

Who conducted the evaluation?

Many publishers conduct their own evaluations of the effectiveness of their curricula. While these can be informative, you may also want to look for studies conducted by researchers who are independent of the publisher and can provide an additional, unbiased perspective.

Is the sample size of the study sufficient?

In general, the larger the sample size, the more accurate the average values. Larger sample sizes help researchers identify potential outliers and provide smaller margins of error. However, small sample sizes can be used for a deeper exploration of curriculum implementation in a specific context.

How long is the study?

A study that only examines results after one year or less may not capture the full potential of a curriculum to yield results after several years of implementation.

2. Relevance

Assess the extent to which the study provides findings relevant to your needs and context. The more specific your needs are, the more useful it is to seek out evidence that the curriculum is well suited to your district's circumstances. Many effectiveness studies do not provide detailed information about the study setting, demographics, and other contextual factors. Even if the relevance is unclear or the context is not perfectly aligned to yours, the study can still provide useful information about the potential efficacy of the curriculum.

How closely does the study sample match with your schools and students?

Look for descriptions of the study's:

- Setting (urban, rural, or suburban).
- Student demographics, including race/ethnicity; gender; English learner (EL) status; free and reduced-price meal eligibility; and students with disabilities.
- Grade levels studied.

To what extent does the study focus on issues and outcomes relevant to your district?

Consider whether the report examines:

- Ease of implementation.
- Teacher training requirements.
- Teacher perceptions and practices.
- Student motivation and mindset.
- Student state and/or formative test scores.
- Other contextual factors.

3. Results

Assess what study findings can tell you about how well the curriculum may suit your needs.

What were the study's findings about curriculum impact?

Were the findings positive, negative, or neutral? Note that results may be mixed. For example, students with certain characteristics may have demonstrated growth while others did not, or students may have shown gains on certain math concepts but not others.

What measures did the study use to assess the curriculum?

Many studies use formative or summative test scores to gauge impact on academic performance. However, you might be interested in learning about the curriculum's impact on other areas. Some research includes classroom observations or teacher surveys, which can provide information on teacher practices and attitudes. Similarly, a student survey can yield insight into changes in student mindset and motivation.

How can you use the findings?

This is an important question, and the answer depends on your objectives. For example, if you need to convince a school board or policymaker of the efficacy of the curriculum, you will want to make sure that the study provides strong causal evidence of impact on student performance. If, on the other hand, you are trying to engage your teachers in a conversation about the new curriculum, you will want to make sure that the research references teacher practices and/or perspectives.

In general, efficacy research on its own is usually not sufficient to convince stakeholders that a curriculum is the right match. It is also important to provide information about factors like the quality of the curriculum, ease of implementation, and alignment with instructional values and priorities.



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Planning Your Own

Once you have adopted a curriculum, consider planning your own impact study.

Why plan your own study?

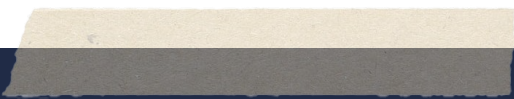
Even if research has been done on your selected curriculum, many studies do not discuss contextual factors or implementation considerations that would help you determine the degree to which the curriculum will work well with your teachers and students.

By planning your own research, you can design a study that will examine issues that are unique to your district's context and focus on outcomes that are most important to you.



To plan a study that will provide actionable information about the curriculum's impact, consider four questions:

1. What is the curriculum's theory of change?
2. What are the key research questions and data sources?
3. Who will conduct the study?
4. What research design should we use?



What is the curriculum's theory of change?

Curricula are designed based on an underlying theory about how to effectively teach the core concepts that are the focus of the program or subject to students.

This theory of change shapes all aspects of the curriculum design, including the sequence and format of the lessons, the types and pacing of formative assessments, the instructional supports and resources, and the knowledge and skills that students are expected to develop as they move through the curriculum.

For example, a technology-based math program might be designed to work best when students log a certain number of minutes per week and move through lessons at their own pace. A curriculum designed for younger children might be structured around hands-on learning opportunities, with a focus on cultivating skills like problem-solving, mathematical reasoning, and perseverance.

By taking the time to thoroughly understand the curriculum before planning a study, you can ensure that the research will **monitor the essential components of implementation and focus on appropriate outcomes**. In essence, this step ensures you are accurately testing that the curriculum does what it is designed to do.

Understanding the Curriculum's Theory of Change

To understand the curriculum's theory of change, consider:

- Who is the curriculum designed for?
- What strategies and activities must take place to ensure the curriculum is implemented as intended?
- What contextual factors (e.g., teacher training, access to materials and/or technology, physical space) are necessary for the curriculum to be successful?
- What are the expectations for how teachers will use the curriculum materials, supplemental resources, and embedded assessments?
- What is the program's intended impact? What specific math skills, concepts, and/or mindsets is it designed to teach? Is it designed to support teachers' development as well as students'?



What are the key research questions and data sources?

Thoughtful research questions ensure that the study yields actionable information about the issues most important to you.

For example, when implementing a particular curriculum, one district might be most interested in understanding its benefits for students who are struggling in math, another district might want to know if it is easy for teachers to learn and implement, and a third district might be most interested in ensuring that students are on track to succeed in ninth-grade algebra. Leaders in each of these districts would ask different research questions.

As you narrow down your questions, consider what **data sources** you could use to answer them. If it is not practical to obtain the data you will need to answer a particular research question (for example, perhaps there are not enough resources to conduct an additional teacher survey during the year), then you may need to revise the question to something that you can more easily measure.

To get a rich picture of a curriculum's effectiveness, consider research questions related to:

- Student Outcomes
- Teacher Outcomes
- Curriculum Implementation

Student Outcomes

Questions to Consider	Potential Data Sources				
	Formative/ Summative Assessments	Teacher Survey/ Interviews	Student Survey	Classroom Observations	Student Demographic Data
How do students using the curriculum perform academically in math at their grade level?	X	X			
How do students who use the curriculum perform on specific math concepts that are targeted by the curriculum or school?	X				
Do students find the curriculum engaging?		X	X	X	
Are students who use the curriculum developing positive math mindsets and attitudes?		X	X		
Do all student subgroups benefit equally from using the curriculum?					X

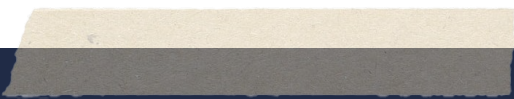
Teacher Outcomes

Questions to Consider	Potential Data Sources		
	Teacher and/or Principal Survey	Teacher and/or Principal Interviews	Classroom Observations
Do teachers find the curriculum engaging?	X	X	
Do teachers find the curriculum easy to use as intended?	X	X	
Do teachers who use the curriculum develop improved math instructional skills and practices?	X	X	X

Curriculum Implementation

Questions to Consider	Potential Data Sources				
	Teacher and/ or Principal Survey	Teacher and/ or Principal Interviews	Teacher Daily or Weekly Logs	Classroom Observations	Coaching Reports
Did the initial training prepare teachers well to use the curriculum?	X	X			
Does the PD offered by the vendor provide sufficient support for teachers to implement the curriculum well?	X	X			
Is the curriculum being implemented as intended? <ul style="list-style-type: none"> • Are teachers using the recommended instructional practices? • Are teachers using the embedded assessments? • Are teachers making use of instructional supports like data reports, resources for differentiation, etc.? 	X	X	X	X	X
Is the curriculum being implemented with fidelity* across grade levels and schools? Why or why not?	X	X	X	X	X

*Fidelity: the curriculum is implemented according to its instructions and theory of change.



Who will conduct the study?

District and school leaders interested in conducting a curriculum effectiveness study have several options for who can lead the research.

Options for who can lead the research include:

Internal District Research Team

Some districts have an internal research department that may be able to design and conduct a study. However, even if a research team exists, it may not have the staff, time, or resources to manage an additional study.

Curriculum Publisher

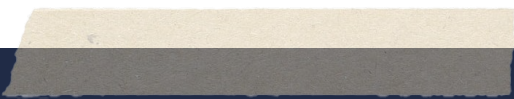
A district can partner with publishers willing to conduct an efficacy study in its schools to build the program's evidence base. In these cases, the publisher may provide the product (or sell it at a discount) and implementation support, and contract with an independent research firm to conduct the study.

University Partner

A district may be able to enlist the help of a local university research team, or establish an ongoing research-practice partnership, to design a study that yields insights to inform both the district and the broader field.

Considerations: Who Will Conduct the Study?

Who Will Conduct the Study?	Potential Pros	Potential Cons
Internal District Research Team	<p>Efficiency: Can save time and money.</p> <p>Security: Safeguards use of private information (i.e., student data).</p> <p>Control: Focus is certain to be on the list of issues of most interest to schools.</p>	<p>Optics: Study may not be seen as independent from the district's interests.</p> <p>Resources: District may not have an internal research team, or the existing team may not have sufficient capacity to manage a study.</p>
Curriculum Publisher	<p>Resources: Publisher may be prepared to invest substantial resources to ensure the program is implemented well.</p> <p>Expertise: Publisher can ensure the study is well aligned with the curriculum's theory of change.</p>	<p>Optics: Study may not be seen as independent from publisher's interests.</p> <p>Security: Proper confidentiality agreements must be in place to ensure student data privacy.</p> <p>Control: Publisher's focus may not be perfectly aligned with practitioner needs.</p>
University Partner	<p>Objectivity: Provides an opportunity for an unbiased lens through which the math curriculum is viewed.</p> <p>Resources: University may have more staff and resources to collect detailed implementation and impact data, over a possible longer period of time.</p>	<p>Security: Proper confidentiality agreements must be in place to ensure student data privacy.</p> <p>Control: Academic focus may not be perfectly aligned with practitioner needs.</p>



What research design should we use?

The design of your impact study will depend on your research questions, resources, timeline, and ultimate purpose.

Although there are benefits and trade-offs to different research designs, each approach can provide valuable information about how the curriculum is working in your schools.


Experimental or Quasi-Experimental Design

These designs provide statistically rigorous evidence that any outcomes you find were caused by the curriculum, rather than being driven by other factors or occurring by chance. However, these types of studies are typically more expensive to mount, require large samples of students, and need a comparison group — students who are similar to the curriculum users but are not exposed to the curriculum at all.

Correlational or Descriptive Designs

These designs do not prove cause and effect, but typically have a lower cost and do not require a comparison group. These studies can be conducted with smaller groups of students and will provide documentation of changes in your outcomes of interest among students who are using the program.

Research Design Overview

Design	Sample Needed	Example of the Type of Finding	Evaluation Budget
Experimental	A large group of students in the target demographic, randomly selected to either use or not use the product.	"Students using this curriculum significantly outperformed similar students in the study who did not use curriculum."	 <p>Higher Cost (~20% of implementation budget)*</p> <p>Moderate Cost (10-20% of implementation budget)</p> <p>Lower Cost (~5-10% of implementation budget)</p>
Quasi-Experimental	A large group of students using the curriculum versus a statistically matched comparison group of similar size and demographics.	"Students using this curriculum significantly outperformed a statistically matched comparison group of students using a different curriculum."	
Correlational	Several groups of students using the curriculum.	"In this sample of students using the curriculum, ELs were statistically more likely to show growth in the targeted math skills than their non-EL peers."	
Descriptive	A small group of students using the curriculum.	"80% of students in this sample demonstrated grade-level or above math proficiency after eight months of using the curriculum."	

*Implementation budget: total cost of rolling out a pilot study, including the implementation of the curriculum and an evaluation.



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About Bellwether

Bellwether is a national nonprofit that exists to transform education to ensure systemically marginalized young people achieve outcomes that lead to fulfilling lives and flourishing communities. Founded in 2010, we work hand in hand with education leaders and organizations to accelerate their impact, inform and influence policy and program design, and share what we learn along the way. For more, visit bellwether.org.

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