All Evidence Is Evidence: What Can We Learn From Studies With Non-Significant Findings?

August 2024

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Acknowledgments

The contents of this document were developed under a contract from the U.S. Department of Education through the Office of Innovation and Early Learning Programs (IELP) within the Office of Elementary and Secondary Education (OESE), by AnLar under Award #GS00F229DA. This contains resources that are provided for the reader's convenience. These materials may contain the views and recommendations of various subject matter experts as well as hypertext links, contact addresses, and websites to information created and maintained by other public and private organizations. The U.S. Department of Education does not control or guarantee the accuracy, relevance, timeliness, or completeness of any outside information included in these materials. The views expressed herein do not necessarily represent the positions or policies of the U.S. Department of Education. No official endorsement by the U.S. Department of Education of any product, commodity, service, enterprise, curriculum, or program of instruction mentioned in this document is intended or should be inferred.

Suggested Citation

Hopkins, Robin and Jones-Mason, Sonji (2024). All Evidence Is Evidence: What Can We Learn From Studies With Non-Significant Findings? Cross-project summary produced by AnLar and the Office of Elementary and Secondary Education, Education Innovation and Research Program (EIR).

The Results Were Not Significant … Now What?

Research studies sometimes return findings that are non-significant but may be relevant in unexpected ways. Non-significant findings can mean that the hypothesis about a program or intervention is wrong or that it doesn't work, or it can mean that there isn't evidence to support its positive effects (Visentin, et al., 2019). Far from suggesting that the study was a failure, non-significant findings are an opportunity to learn more. The challenge is to use these findings to help inform the next project, and to share this knowledge with others in the field. Instead of putting these findings aside, educators, researchers, and policy-makers should uncover and explore what can be learned from these studies to potentially improve student outcomes. This paper highlights why it's important to understand and share studies with non-significant findings and how publishing and disseminating these studies contribute to the body of knowledge at large. Instead of filing these papers away, tapping into these lessons learned can empower educators and improve outcomes for students.

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All programs receiving funding through the U.S. Department of Education's Innovation and Research (EIR) competition are expected to publish and share the findings of their work. EIR awards are issued to institutions that are generating and validating field-based innovations to persistent educational challenges at three different levels of funding—early-phase, mid-phase, and expansion. The purpose of each award is to support identification and testing of solutions that have the potential to increase student achievement and attainment for high-need students. All EIR grantees are required to conduct an evaluation of the project that is designed to meet What Works Clearinghouse standards with or without reservations.

EIR grantees are asked to register their evaluation plans in the Registry of Efficacy and Effectiveness Studies and make their findings publicly available regardless of outcomes. Registering plans and making reports publicly available build cumulative research that includes interventions with a range of findings. This publication requirement can help reduce the publication bias created by selectively publishing only significant findings (Visentin, 2020).

A shared understanding of information produced by research helps avoid basing important policy decisions on misinterpretations of the evidence (Edelsbrunner et al., 2020). Knowing how to interpret research with non-significant findings can help reduce or prevent incorrect assumptions about whether the intervention works (Aczel et al., 2018). Educators, community partners, practitioners, school leaders, policymakers, and seasoned evaluators are all susceptible to misinterpreting non-significant findings, yet it is critical that studies with non-significant findings and their lessons be shared widely in each field.

Why pay attention to studies with non-significant findings?

The education field is an environment of continuous learning for both students and adults. In this type of environment, it can be easy to disregard studies with non-significant findings instead of exploring why the findings were non-significant. The reality is that there are often many factors at play. Box 1 explains some of the potential causes of these types of findings.

Box 1. Why are the findings non-significant?

There are several reasons why a study might return non-significant findings. It's important to explore the reasons why when reviewing study results.

Factor	Frequent Cause
Lack of treatment contrast	What happened in the intervention or study classrooms wasn't different enough from what occurred in the comparison classroom.
Implementation challenges	There were difficulties getting the participants to engage with the innovation as intended.
Poor alignment between the goals of the intervention and the outcome measures	Some studies rely on data that are already collected as the outcome measures (standardized tests, attendance rates, etc.), but those measures are far removed from what the intervention is aiming to change. Measures and tools used to assess student outcomes were not closely aligned enough to capture the anticipated change.
Study was underpowered	Underpowered studies are common when looking for evidence of promise. These challenges may be due to funding, or recruiting or retaining participants, or the sample became too small due to implementation issues.
Misalignment between time of outcome measurement and expected outcomes	Outcomes were measured too early or too late to accurately reflect the anticipated change.
Disruptive events	Major events (e.g., COVID, extreme weather) disrupt the study context, making interpretation of study findings unclear.
Incorrect theory of change or logic model	The inputs and activities assumed to lead to specific outputs and outcomes are not the causal mechanism. There are other inputs or activities that will lead to outputs and outcomes.
Mismatch between intervention and the circumstances	The intervention isn't the right one for the particular circumstances, such as the student population or location.

How can non-significant results lead to positive change?

Recent EIR grantees have experienced success in optimizing use of non-significant findings, discovering valuable lessons that helped them—and others—improve planning for upcoming projects. The Literacy and Academic Success for Dual Language Learners through Science (LASErS)

project and Virginia Ed Strategies' Rural Math Innovation Network (RMIN) Impact Study are two examples. Their process included three key steps for ensuring that implementation teams and evaluators debrief and make sense of all information gathered throughout all phases of a study.

Step 1: Identify potential factors leading to non-significant results

The LASErS project and Virginia Ed Strategies gathered comprehensive information to allow them to fully interpret the study findings. To begin the process of digging into non-significant results, the team gathered qualitative information, and drew conclusions to identify implementation, programmatic, and systemic challenges. The LASErS project received an early-phase EIR award that supported their work from 2014 to 2018. In an evaluation by the Yale Child Study Center, LASErS showed "evidence of promise" and demonstrated significant findings in some measures (Reyes, 2019) but had non-significant findings in others. While the student outcome measures provided one piece of the puzzle, the real value was found when program directors and evaluators chose to look more closely at what else the non-significant data and evidence could be telling them. The team broadened their lens by examining information gathered throughout their professional learning events, including observation logs, interviews, and surveys. Factors identified during this reflective process helped the team categorize issues as related to program design, evaluation design, or professional capacity. For example, regarding evaluation design, the LASErS team was limited to measuring findings based on assessments already used in the classroom, resulting in the use of measures that were not closely tied to the intervention. In this instance, the intervention focused on language and literacy in the context of science. It's not difficult to see that assessments that are specific to only language and literacy skills could miss seeing a positive impact.

Regarding professional capacity, this analysis process helped show the LASErS team that while the project plan included extensive professional learning and ongoing coaching support for both educators and administration, the school lacked the infrastructure necessary to provide planned support. Additionally, the team identified a general lack of engagement, attendance, and participation at events. The non-significant findings prompted the evaluators to examine the broader context of implementation. They discovered that while teachers enjoyed participating in the more hands-on professional development opportunities, many of the science concepts were more challenging to teachers than expected. They also were still struggling to transfer and apply what they learned to their own teaching practices. Overall, the team found that schools themselves were not fully prepared to participate in the activities laid out by the study.

Virginia Ed Strategies also benefited from exploring non-significant results from their RMIN study. In their experience, participating math teachers in rural Virginia had access to a virtual professional network of other math educators to share information and resources and to build their capacity to support student learning in algebra. Student outcomes were measured using Virginia's Standards of Learning (SOL) assessment tool at the end of one year. The evaluation found that the program did not have a significant impact on student algebra or pre-algebra scores on the SOL assessment (Cowley & Uekawa, 2020). While analyzing the study's non-significant findings, the team discovered an example of a mismatch between the time needed to change teacher practices and the timeline of measuring outcomes. Additionally, the SOL measures were not aligned to the intervention. None of these measures could account for any ongoing impact on student outcomes as teachers continue to improve their practices or on future classrooms of new students who might benefit from their

teacher's development. By identifying implementation and systemic challenges, the Virginia Ed Strategies and LASErS teams were able to identify the adjustments needed to modify the design and implementation of future projects.

Step 2: Apply new learning

Teams learn and improve by uncovering the conditions that led to non-significant findings. For example, the LASErS team found that many of the teachers were new to the components of the intervention, including engaging with families and dual language learners around science concepts. Consequently, one important takeaway for the team was the need to look at a teacher's or school's "readiness" for implementing this type of intervention. This insight helped inform implementation and evaluation design changes for current and future projects, including identifying more flexible program components to work with the needs of the people implementing the program. The team also provided coaching and developed an online learning community to help participants share ideas and information and to provide additional support for teachers in the classroom. The LASErS team recognized that they needed to spend much more time intentionally building relationships with school or program administration to gather and maintain support for the program for the duration. By taking the time to identify and explore the conditions that might be associated with non-significant findings, the LASErS team was able to make specific changes to subsequent studies to mitigate some of the issues they had experienced.

Virginia Ed Strategies was similarly able to apply what they learned about the factors that may have contributed to non-significant findings from their study. The grantee team recognized the need to look at additional outcome measures for subsequent projects and to establish timelines that gave practitioners additional time to learn, adopt, and feel confident using new teaching strategies. In addition, although the study returned some non-significant results, the Virginia Ed Strategies team found a lot of value in undertaking this debriefing process as part of their efforts for continued growth.

Step 3: Share your findings

While EIR grantees are required to share findings about their programs, the LASErS team chose to go beyond simply sharing the final research report from their evaluator. Instead, they focused on sharing their learning in several different ways, including developing additional professional learning opportunities for educators in the program, writing and sharing blog posts and other information in science-education related publications, presenting at professional conferences for both practitioners and researchers, and connecting with other school districts to provide them with resources for supporting dual language learners and science education.

"We were pretty straightforward about the non-significant findings while also leveraging the learning we took from the project."

–Cindy Hoisington, Project Director

Virginia Ed Strategies found creative ways to share their evaluation findings and focused on how to describe those results. The RMIN team wanted to identify and share information to help grow both the size and capacity of a network of pre-algebra and algebra teachers and build new community partnerships as part of their efforts. This goal helped the team determine both their dissemination pathways and the messages they shared about the research, including reaching out directly to new partners. They also chose to emphasize what they

learned and what they could take away, including building and expanding a virtual community of practice. The team was able to utilize what they learned about building this professional network to lend their expertise and create new community partnerships.

How to make use of non-significant findings

Educators and partner organizations are increasingly tasked with using evidence-based teaching practices and programs, which means more educators are participating in research, learning how to incorporate findings into their existing practices, and evaluating the quality of research evidence. This is great news, considering how educator participation can lead to a greater understanding of how to turn research findings into action in the classroom (Hemsley-Brown, 2003). As educators develop those skills, the message remains that while it can be tempting to quickly dismiss studies with non-significant findings, there is real value in diving deeper to learn what lessons are reflected in the data and to truly understand what the data mean.

Debriefing projects and exploring the reasons behind non-significant findings helps generate useful takeaways for the future. Certainly, studies with non-significant findings often still demonstrate some clear successes. Identifying what worked and what didn't for whom and in what context provides insight that can help refine future plans, including:

- Implementation changes
- Evaluation considerations
- Instructional/content decisions
- Revisiting the theory of change or logic model

Working with evaluators, teams can develop and answer a set of questions to help uncover the reasons for non-significant findings. Table 1 lists some possible questions.

Table 1. Uncovering Reasons for Non-Significant Findings

Potential Factor	Questions to Ask
Lack of treatment contrast	• What's happening in the control classrooms? • Is there enough of a difference between the treatment and control groups?
Implementation challenges	• What type of professional development/training was provided to ensure the intervention is being implemented as intended or as anticipated? • Are the correct (or enough) resources and support available to implement with fidelity?
Poor alignment of outcomes measures	• What outcomes are being measured? • Will these measures capture the outcomes anticipated?
Study was underpowered	• Are there enough participants in the research? • Did the sample size change?
Wrong timing for measuring outcomes	• When might changes start to be seen? • Should the times when outcomes are measured be adjusted?
Disruptive events	• Have outside influences caused disruptions? • How long did the disruption last? • How might this have affected outcomes?
Theory of change/logic model was not correct	• Did the actions have the anticipated effects?
Intervention is not effective	• Did the intervention do what was expected? • Is this intervention the right one in this context, with this population, or in this location?

Conclusion

Building the body of knowledge around what works in education is a shared responsibility. Studies with non-significant findings can be just as valuable to the field as those that demonstrate positive findings, and the accumulation of that data across projects, disciplines, and interventions is what will help lead to truly innovative and effective educational solutions. By understanding the value of exploring and disseminating non-significant findings, educators can continue to refine their practices, build professional capacity, and ultimately improve student outcomes.

Citations/Links

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Appendix A: Interview Participants and Contributors

Interviewee/ Contributor	Role
Jennifer Stevens	President and CEO, Virginia Ed Strategies Rural Math Innovation Network (RMIN)
Cindy Hoisington	Project Director, Education Development Center Literacy and Academic Success for English Learners through Science (LASErS)
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