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role, and organization
in the chat box.**



Evidence Standards for Evaluating Math and Science Programs

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March 20, 2019



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Objectives for Today's Webinar

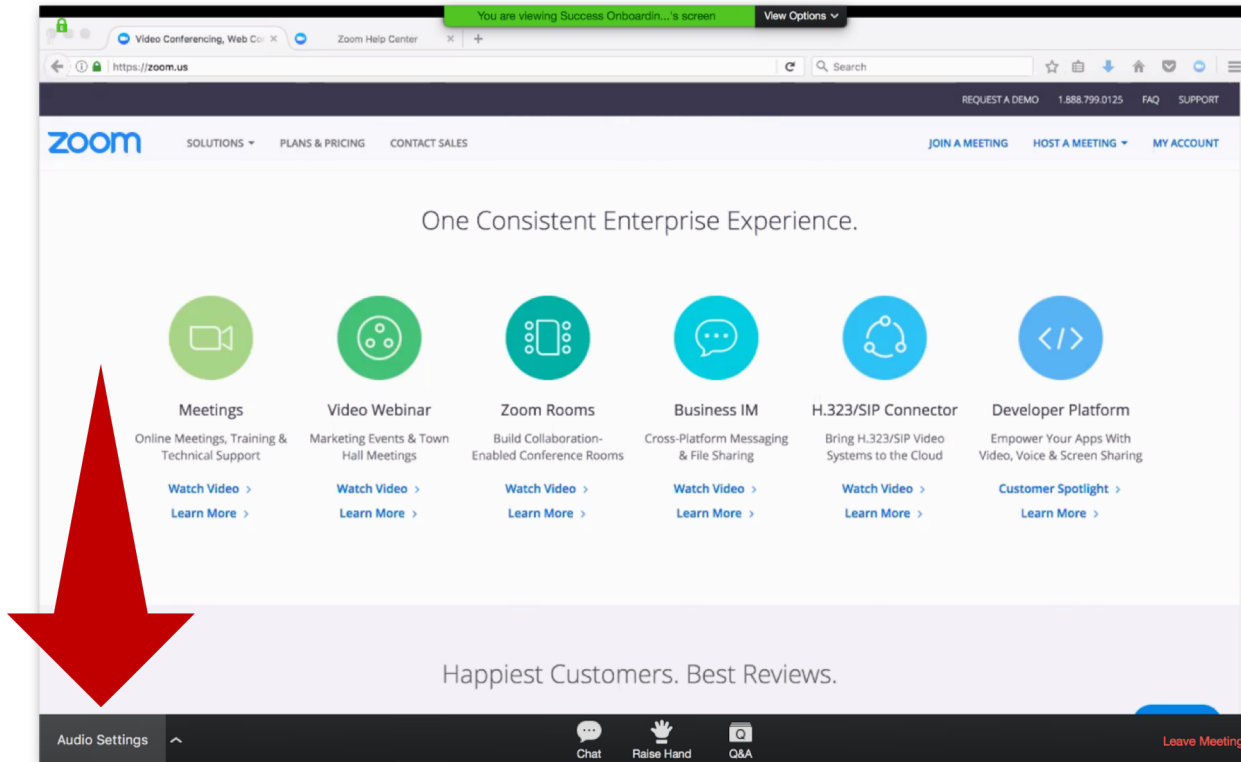
1. Build awareness of evidence standards from U.S. Department of Education and their relevance to science, technology, engineering, and mathematics (STEM) research
2. Learn about the criteria and use of *Every Student Succeeds Act* (ESSA) tiers of evidence
3. Understand the key aspects of What Works Clearinghouse standards

Welcome to

zoom

- Audio settings
- Test audio
- Mute/unmute
- Raise/lower hand
- Q&A
- Submit a question
- Use chat
- View options
- Leave meeting

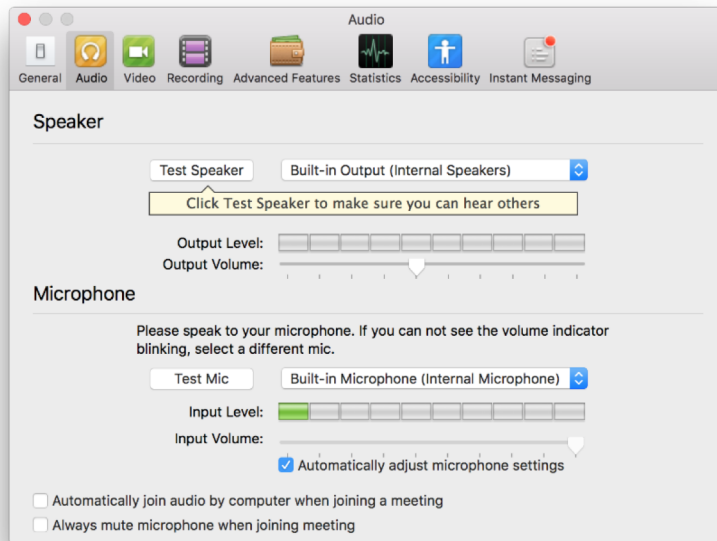
Audio Settings



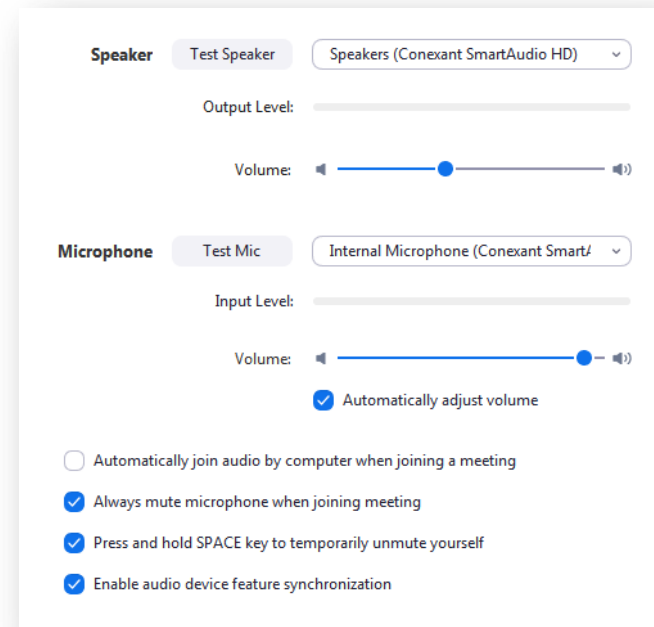
The image shows a screenshot of the Zoom website interface. At the top, there are browser tabs for "Video Conferencing, Web Conferencing", "Zoom Help Center", and "You are viewing Success Onboarding... 's screen". The address bar shows "https://zoom.us". The navigation bar includes the Zoom logo, "SOLUTIONS", "PLANS & PRICING", "CONTACT SALES", "JOIN A MEETING", "HOST A MEETING", and "MY ACCOUNT". The main content area features the headline "One Consistent Enterprise Experience." followed by six feature cards: Meetings, Video Webinar, Zoom Rooms, Business IM, H.323/SIP Connector, and Developer Platform. Each card includes a description and links for "Watch Video" and "Learn More". At the bottom, a dark meeting control bar is visible, containing "Audio Settings", "Chat", "Raise Hand", "Q&A", and "Leave Meeting". A large red arrow points from the "Meetings" card area down to the "Audio Settings" button in the control bar.

Test Audio

On Mac



On PC



Mute/Unmute



Raise/Lower Hand

The image shows a screenshot of the Zoom website. At the top, there is a navigation bar with the Zoom logo and links for SOLUTIONS, PLANS & PRICING, CONTACT SALES, JOIN A MEETING, HOST A MEETING, and MY ACCOUNT. The main content area features the headline "One Consistent Enterprise Experience." followed by six feature cards: Meetings, Video Webinar, Zoom Rooms, Business IM, H.323/SIP Connector, and Developer Platform. Each card includes a brief description and a "Watch Video" or "Learn More" link. At the bottom of the page, there is a dark navigation bar with icons for Chat, Raise Hand, and Q&A. The "Raise Hand" icon is circled in red, and a large red arrow points from it towards the right side of the image.

A dark horizontal bar containing three icons: a speech bubble for "Chat", a green hand for "Lower Hand", and a question mark in a square for "Q&A".

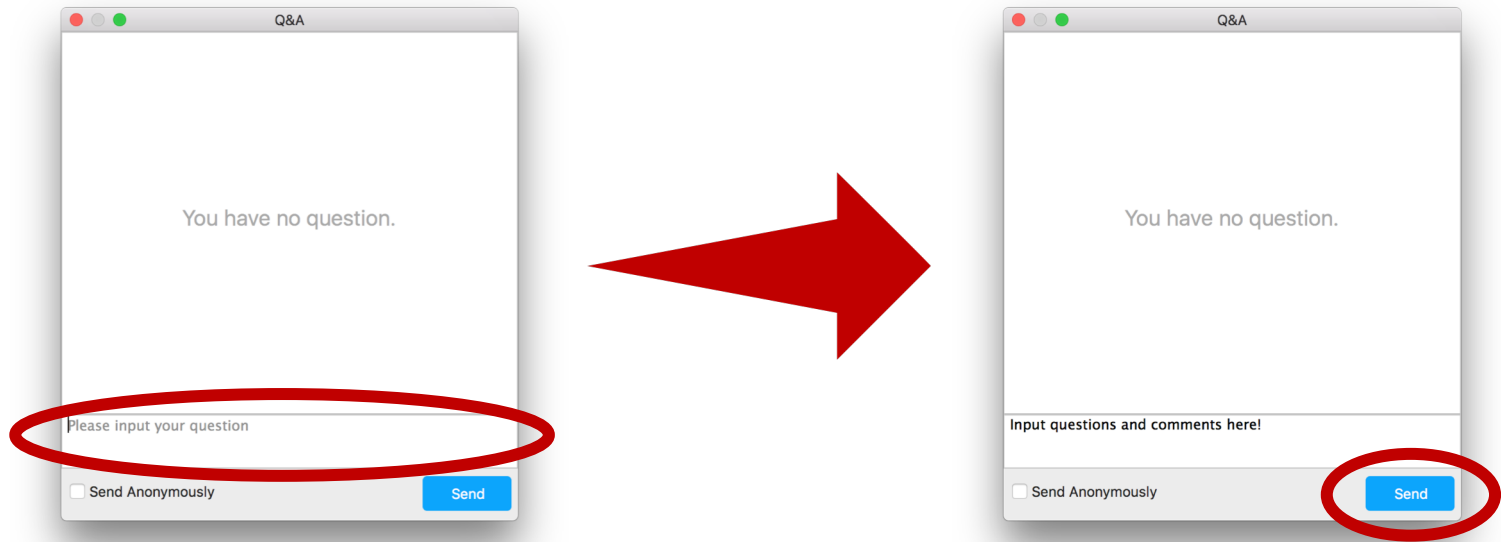
Q&A

The image shows a screenshot of a web browser displaying the Zoom website. The browser's address bar shows "https://zoom.us". The website header includes the Zoom logo, navigation links for "SOLUTIONS", "PLANS & PRICING", and "CONTACT SALES", and buttons for "JOIN A MEETING", "HOST A MEETING", and "MY ACCOUNT". The main content area features the headline "One Consistent Enterprise Experience." followed by six service categories, each with an icon, a title, a brief description, and links for "Watch Video" and "Learn More":

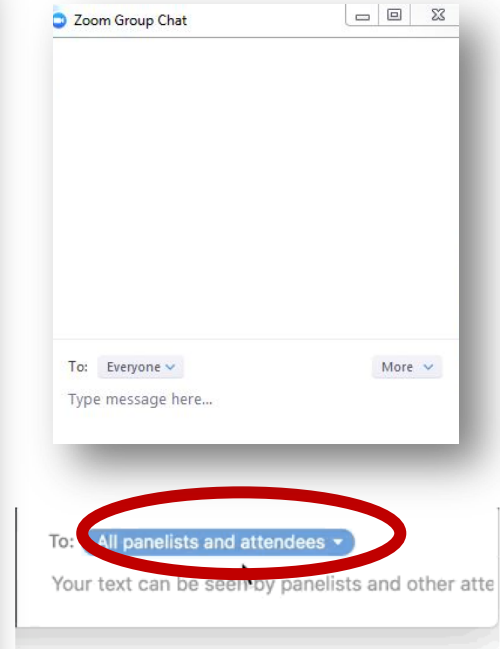
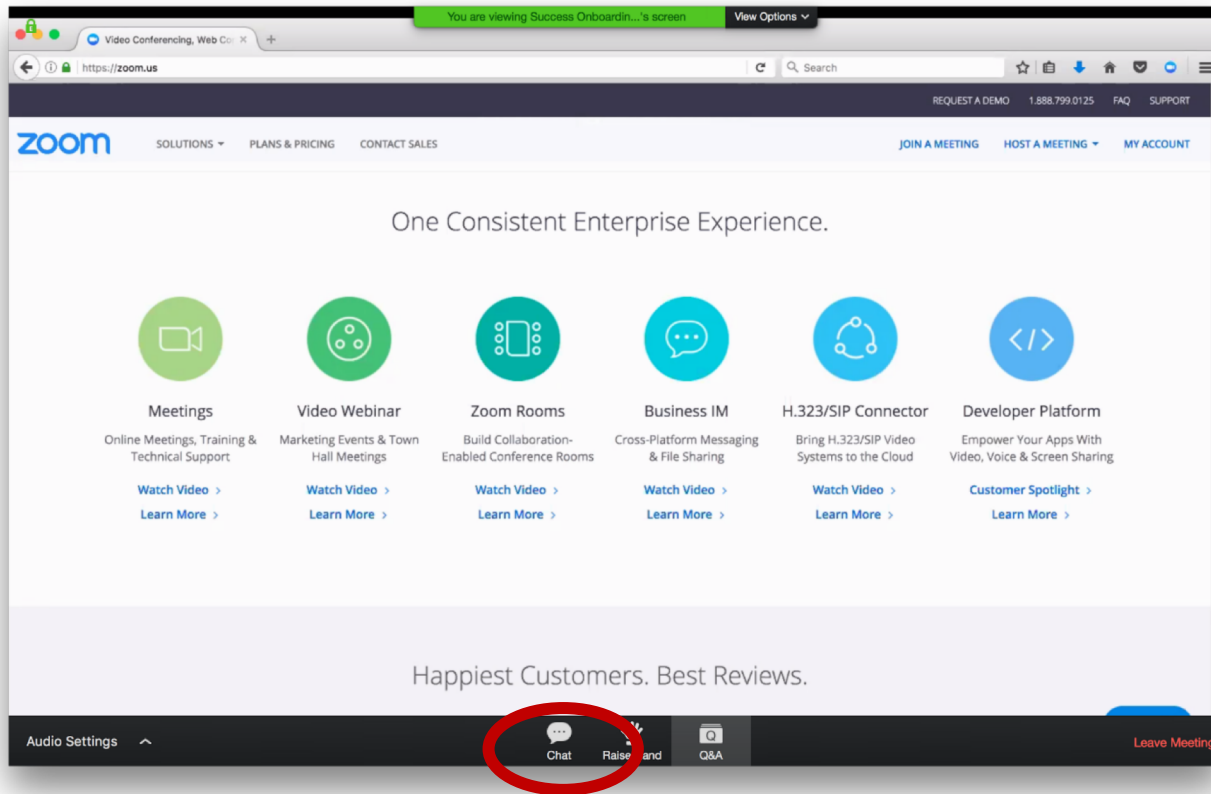
- Meetings**: Online Meetings, Training & Technical Support
- Video Webinar**: Marketing Events & Town Hall Meetings
- Zoom Rooms**: Build Collaboration-Enabled Conference Rooms
- Business IM**: Cross-Platform Messaging & File Sharing
- H.323/SIP Connector**: Bring H.323/SIP Video Systems to the Cloud
- Developer Platform**: Empower Your Apps With Video, Voice & Screen Sharing

At the bottom of the page, there is a section titled "Happiest Customers. Best Reviews." and a "Leave Meeting" button. A meeting toolbar is visible at the very bottom, with icons for "Audio Settings", "Chat", "Raise Hand", and "Q&A". The "Q&A" icon is circled in red.

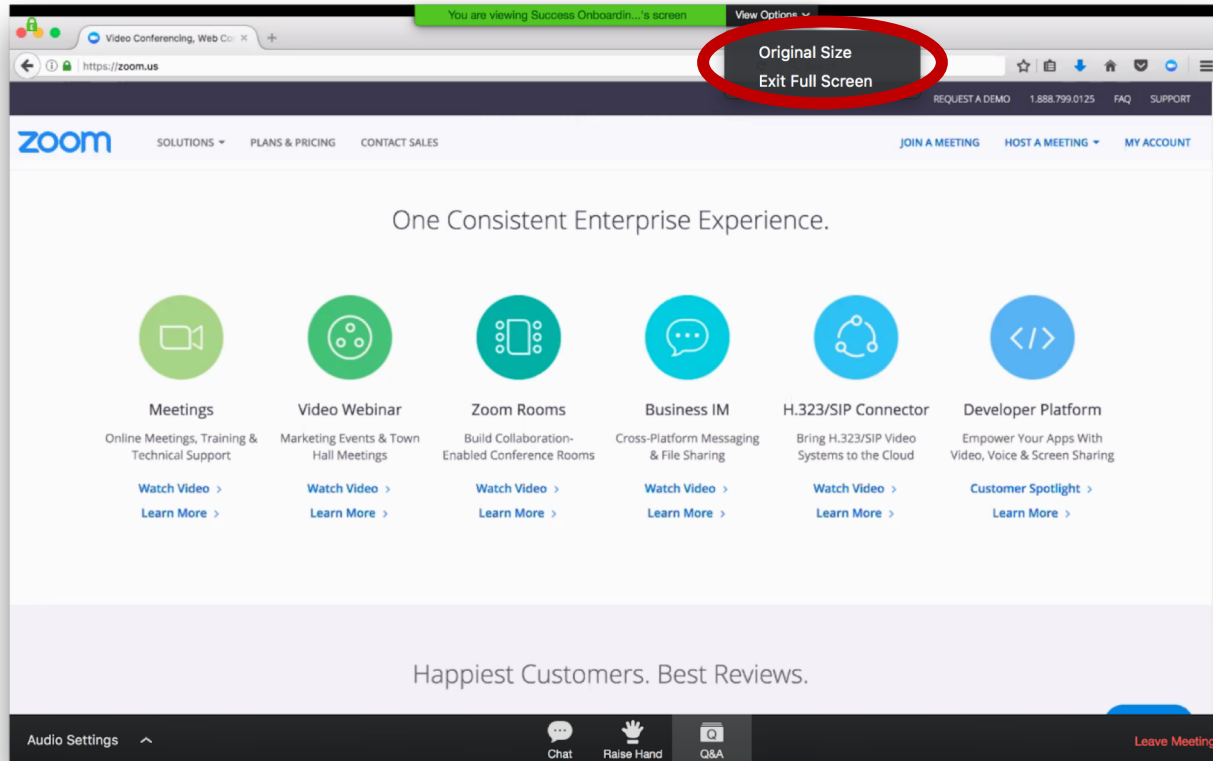
Submit a Question



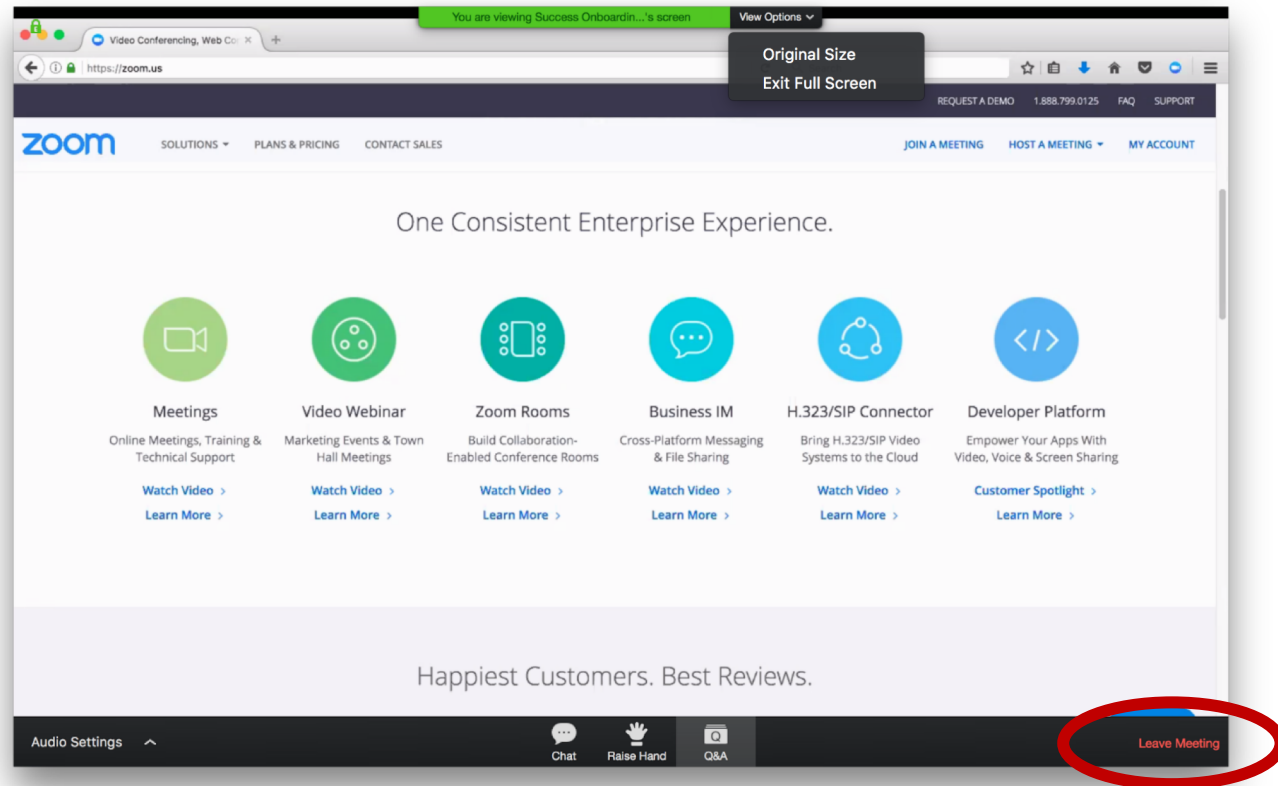
Use Chat



View Options



Leave Meeting



Background on This Webinar Series

- Funded by a Discovery Research PreK–12 (DRK-12) grant from the National Science Foundation
- Goal to help elevate rigorous research methods within the DRK–12 program
- Quarterly webinars in 2019 and 2020
- Hosted by the American Institutes for Research (AIR), and featuring research methodologists



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Meet the Presenters



Lyzz Davis
*Senior
Researcher
AIR*



Joe Taylor
*Principal
Researcher
AIR*

Part 1: What Works Clearinghouse

Broad Research Types

- Foundational research

- Early stage or exploratory

- Design and development

- Impact
 - Efficacy
 - Effectiveness
 - Scale-up

Common Guidelines for Education Research and Development

A Report from the Institute of Education Sciences,
U.S. Department of Education

and the National Science Foundation

August 2013



Poll 1: Study Type

What Is the What Works Clearinghouse (WWC)?



The WWC is an investment of the Institute of Education Sciences (IES) within the U.S. Department of Education.



The WWC is a central and trusted source of scientific evidence on education programs, products, practices, and policies.

The WWC reviews the research, determines which studies meet rigorous standards, and summarizes the findings.

What Does the WWC Provide?

- Information about interventions for both decision makers and researchers
- Centralized location for rigorous evidence of intervention effectiveness
 - Common standards for assessing evidence
 - Common procedures for synthesizing evidence and assessing effectiveness
- Guidance to researchers for designing, conducting and reporting impact studies

Separate Design Standards

Design Type	Description
Single-case design	Uses experiments in which an outcome measure is assessed repeatedly within and across different phases that are defined by the presence or absence of an intervention
Regression discontinuity design	Similar to a randomized trial in that groups are formed by design, but differs in that the assignment is not random
Group design	Randomized controlled trial (RCT)—groups formed randomly
	Quasi-experimental design (QED)—groups not formed randomly

Poll 2: WWC Study Design Ratings

WWC Disqualifiers (study is ineligible for review or does not meet standards)

- Ineligible design
- Confounding factors
- Issues with outcome measures
 - Face validity
 - Reliability
 - Overalignment
 - Inconsistent administration

What Studies Can Meet WWC Group Design Standards?

Rating	Design Type
Meets design standards without reservations	RCT with low attrition
Meets design standards with reservations	RCT that has high attrition but demonstrates baseline equivalence
	QED that demonstrates baseline equivalence
Does not meet standards	RCT with high attrition that cannot demonstrate baseline equivalence
	QED that cannot demonstrate baseline equivalence
	RCT or QED with a confounding factor, or something other than the intervention that could be causing the outcome

Evidence Review Protocols

Subject-specific protocols define outcome domains and establish eligibility criteria such as:

- Student populations
- Interventions
- Outcome measures

Most Relevant Review Protocols to DRK-12

Science

- Science achievement

Math

- Elementary school math
- Middle school math
- High school math
- Mathematical problem solving
- Primary math
- Secondary math
- Teaching strategies for middle/high school algebra

Science Achievement Domains

Science Knowledge

- Life science
- Earth/space science
- Physical science

Science Practice

Skills in:

- Identifying or using science principles
- Using science inquiry
- Using technological design

Science Achievement Eligibility Criteria

Populations	Interventions*	Outcomes
<p>Developed for students in grades K–12 (ages 5–18)</p> <p>Conducted in the U.S. or countries that used English-language science curriculum materials</p>	<p>Which describe:</p> <p>Intervention in general terms</p> <p>Duration of the intervention</p> <p>Characteristics of the individuals who deliver the intervention</p>	<p>Standardized, nationally normed achievement tests</p> <p>Standardized state or local tests of science achievement</p> <p>Research-based or locally developed tests of science concepts or skills</p>

* Includes practices and strategies

Examples of Eligible Science Interventions

- Textbooks
- Software programs
- Hands-on science kits
- University summer programs for young scholars
- Math–science partnership programs
- Museums' scientific programs and activities

Activity: Guess the WWC Study Rating

An RCT of a high school biology intervention has high levels of student attrition. However, for the set of randomly assigned students for whom a post-test score was available, the treatment and control group means on the biology pretest were nearly identical.

Assuming no disqualifying study features, what is the likely WWC study rating?

Activity: Guess the WWC Study Rating

An RCT of a high school biology intervention has high levels of student attrition. However, for the set of randomly assigned students for whom a post-test score was available, the treatment and control group means on the biology pretest were nearly identical.

If all of the treatment group students came from one high school and all of the comparison students came from another, what is the likely WWC study rating?

Other Review Protocols of Potential Interest

- Adolescent Literacy
- English Language Learners
- Students With Specific Learning Disabilities
- Preventing Dropout in Secondary School
- Other

Question-and- Answer Session

Part 2: ESSA Tiers of Evidence

ESSA Tiers of Evidence

Tier 1: Strong evidence

Tier 2: Moderate evidence

Tier 3: Promising evidence

Tier 4: Demonstrates a rationale



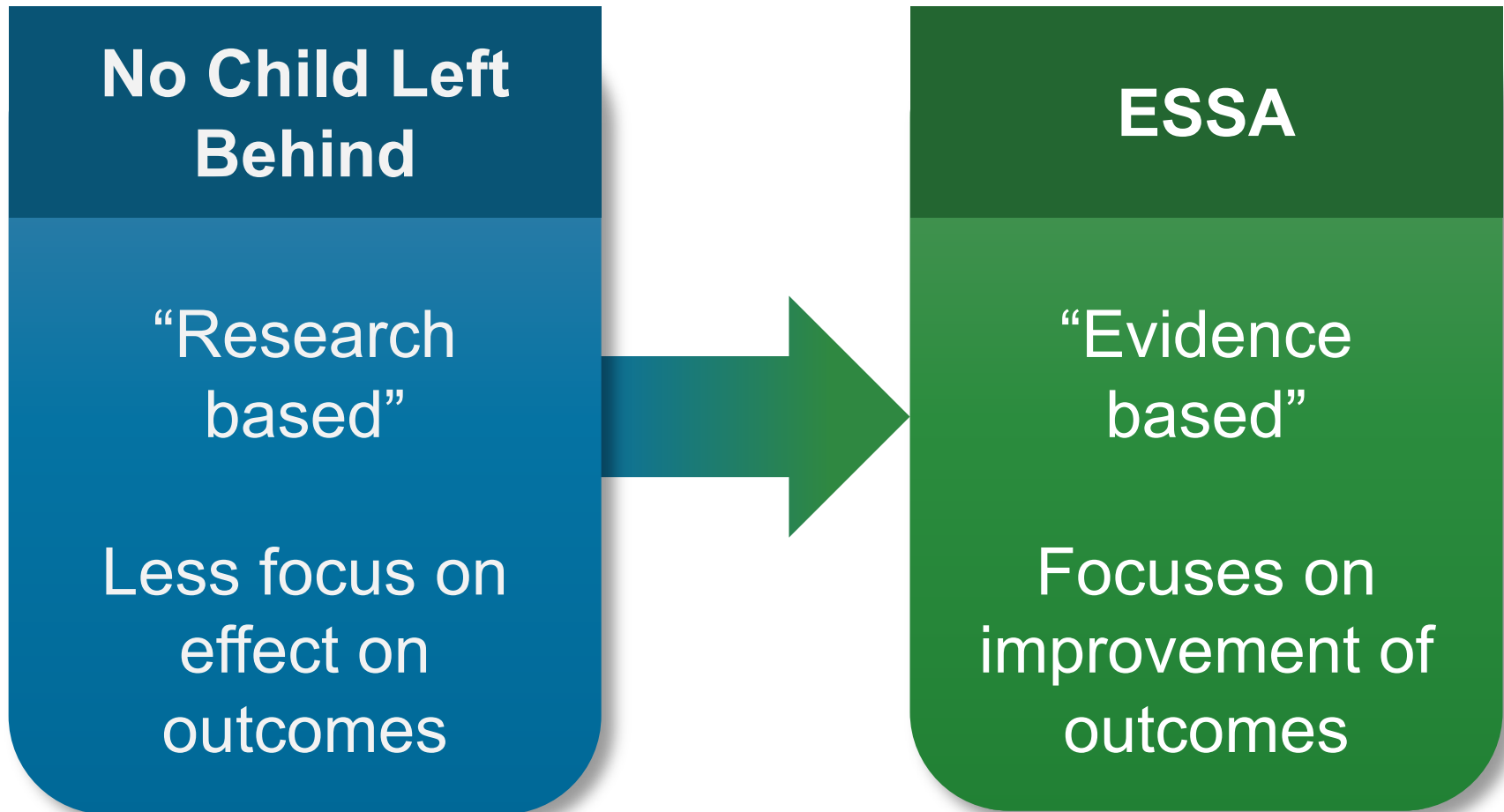
Why Do Districts and School Leaders Care About ESSA Tiers of Evidence?

- Schools identified for targeted supports must implement at least one intervention that is supported by **promising** evidence.
- Some federal grant programs (such as Striving Readers and Promise Neighborhoods) require interventions that meet **strong** or **moderate** evidence.
- Other activities require interventions that at least **demonstrate a rationale**.

Why Should STEM Education Researchers Care About ESSA Tiers of Evidence?

- Education Innovation Research grant requirements
 - Early phase: Demonstrates a rationale (tier 4)
 - Mid-phase: Moderate evidence (tier 2)
 - Expansion: Strong evidence (tier 1)
- Some states have published lists of “preferred practices”
 - Program developers need to generate evidence of their programs’ effectiveness to be eligible for these lists

Why Is It Important to Focus on Evidence?



Criteria	Strong (Tier 1)	Moderate (Tier 2)	Promising (Tier 3)	Demonstrates a Rationale (Tier 4)
Study design				
Significant favorable effect				
No significant unfavorable effects from causal studies				
Large, multisite sample				
Context				

Criteria	Strong (Tier 1)	Moderate (Tier 2)	Promising (Tier 3)	Demonstrates a Rationale (Tier 4)
Study design	Well-designed experimental			
Significant favorable effect	★			
No significant unfavorable effects from causal studies	★			
Large, multisite sample	★			
Context	Population and setting			

Criteria	Strong (Tier 1)	Moderate (Tier 2)	Promising (Tier 3)	Demonstrates a Rationale (Tier 4)
Study design	Well-designed experimental	Well-designed quasi-experimental		
Significant favorable effect	★	★		
No significant unfavorable effects from causal studies	★	★		
Large, multisite sample	★	★		
Context	Population and setting	Population or setting		

Criteria	Strong (Tier 1)	Moderate (Tier 2)	Promising (Tier 3)	Demonstrates a Rationale (Tier 4)
Study design	Well-designed experimental	Well-designed quasi-experimental	Well-designed correlational	
Significant favorable effect	★	★	★	
No significant unfavorable effects from causal studies	★	★	★	
Large, multisite sample	★	★		
Context	Population and setting	Population or setting		

Criteria	Strong (Tier 1)	Moderate (Tier 2)	Promising (Tier 3)	Demonstrates a Rationale (Tier 4)
Study design	Well-designed experimental	Well-designed quasi-experimental	Well-designed correlational	Well-defined logic model
Significant favorable effect	★	★	★	Evaluation is planned or under way
No significant unfavorable effects from causal studies	★	★	★	
Large, multisite sample	★	★		
Context	Population and setting	Population or setting		

Activity: Guess the Tier of Evidence

An **experimental study** that tested the effectiveness of a new math program on state standardized test scores in mathematics **meets WWC standards without reservations**. The researchers found that the math program **significantly increased mathematics test scores**, and a search of the intervention on the WWC shows that **other studies of this intervention have also found significant positive increases**. There were **562 students from 10 high schools** included in the analysis.

What evidence tier would you assign this outcome?

Tier Rating: Strong

Activity: Guess the Tier of Evidence

A **quasi-experimental study** that tested the effectiveness of a science curriculum on science achievement **meets WWC standards with reservations**. The researchers found that the science curriculum **significantly improved science achievement**, and a search of the intervention on the WWC shows that **no other studies of this curriculum have been reviewed**. There were **200 3rd graders** across **3 elementary schools** included in the analysis.

What evidence tier would you assign this outcome?

Tier Rating: Promising

Question-and- Answer Session

Takeaways for DRK–12

Why are evidence standards relevant?

- Evidence quality matters for school systems and funders
- Rigorous evidence is needed, particularly in S,T, E areas
- DRK–12 projects and proposals can advance rigor

How can WWC and ESSA standards be applied to DRK–12?

- Inform designs of comparative studies
- Align designs of impact studies to meet standards
- Set goals for future research



Next Steps

- What are your key takeaways and next steps?
- What questions do you have?

Resources

- Guidance to current and future principal investigators
- Resources for researchers
- Resources for decision makers

Thank You for Joining Us!



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Alignment of the Standards

WWC Rating	Alignment	ESSA rating
Meets standards without reservations	<ul style="list-style-type: none"> Reviewed under WWC standards 2.1 or higher; significant, positive effect, with no negative effects from other studies that meet WWC standards; large, multisite sample 	Tier 1 Strong evidence
	<ul style="list-style-type: none"> Significant, positive effect, with no negative effects from other studies that meet WWC standards; large or multisite sample criteria not met 	Tier 3 Promising evidence
Meets standards with reservations	<ul style="list-style-type: none"> Reviewed under WWC standards 2.1 or higher; significant, positive effect, with no negative effects from other studies that meet WWC standards; large, multisite sample 	Tier 2 Moderate evidence
	<ul style="list-style-type: none"> Significant, positive effect, with no negative effects from other studies that meet WWC standards; large or multisite sample criteria not met 	Tier 3 Promising evidence