An Introduction to Study Design

Office of Continuous Improvement and Support
Objectives

By the end of this webinar, participants will be able to:

- describe the basic principles of study design;
- identify key words related to different study designs; and
- determine the significance of study findings.
Agenda

- Introduction to Study Design
- Alignment
- Experimental Study Design
- Quasi-Experimental Study Design
- Correlational Study Design
- Understanding Significance
Introduction: Why does this matter?

- Every Student Succeeds Act (ESSA)
- ESSA requires school improvement initiatives to be rooted in “evidence-based activities, strategies, or interventions.”
- A key component to understanding ESSA’s evidence provisions is developing an understanding of study design.
Introduction to Study Design

- Study designs provide a framework for the development and implementation of a study.
- Study designs create common language.
- There are many study designs and they have many purposes.
  - Three study designs are mentioned in 34 C.F.R. 77.1:
    - Experimental
    - Quasi-experimental
    - Correlational
Alignment

The study definitions referenced in this webinar are aligned to 34 C.F.R 77.1, “Non-Regulatory Guidance: Using Evidence to Strengthen Education Investments” and the “What Works Clearinghouse Standards Handbook” (Version 4.0 Standards).
Experimental Study Design
Experimental Study Definition

- A study design in which two randomly assigned groups of study participants are compared to determine if an intervention was successful.
  - One study group, the *intervention group*, receives the intervention.
  - The other group, the *control group*, does not receive the intervention.
  - By comparing the two groups, researchers are able to measure the effect of an intervention.
Key Characteristics

- The study design uses *random* assignment.
- Compares an intervention group to a control group.
- Study participants can be treated as individuals or viewed as clusters.
- It is the most rigorous of study designs.
Be on the lookout!

- Compromised random assignment
- High levels of sample attrition

- **Overall Attrition** – the progressive loss of data or subjects during a research study.

- **Differential Attrition** – the absolute value of the attrition of the control group minus the attrition of the intervention group.
Quasi-Experimental Study Design
Quasi-experimental Study Definition

- A study design in which two previously assigned groups of study participants are compared to determine if an intervention was successful
  - One study group, the *intervention group*, receives the intervention.
  - The other group, the *control group*, does not receive the intervention.
  - By comparing the two groups, researchers are able to measure the effect of an intervention.
Key Characteristics

- Compares an intervention group to a control group
- Study participants can be treated as individuals or viewed as clusters
- Uses *previously assigned* groups
- Requires statistical controls to address bias
Be on the lookout!

- Baseline equivalence
- Confounding factors

A confounding factor is a characteristic that is aligned to one group, but not the other.

- This is very common in studies that assign classrooms to different conditions, because schools may group students by characteristics – such as putting lower-performing students with a more experienced teacher or assigning English learners (ELs) with a teacher who holds an extra credential.

- This alignment creates a bias that influences the outcome of the study.
Correlational Study Design
Correlational Study Definition

- A study design that relies on...
  - observational data (collected by the researcher in a natural environment without interference),
  - archival data (publically available data reported by local and state education agencies) OR
  - survey data (collected by the researcher through anonymous surveying) to draw a statistical, or correlational, conclusion.
Key Characteristics

- Relies on observational, archival, or survey data
- Uses statistics to measure the correlation between two variables
- Correlation does not equal causation
Be on the lookout!

- Variable manipulation
- Confirmation and sampling bias
  - Confirmation bias occurs when a researcher designs a study in such a way as to confirm a hypothesis.
    - This is common in surveying, where questions may be worded in such a way as to lead study participants to a certain answer.
  - Sampling bias occurs when a researcher selects certain types of data in hopes of finding certain answers.
- Inaccurate calculations
Understanding Significance
Sampling

- Large Sample
  - 350 or more students
  - 50 or more groups of 10 or more students
- Multi-site Sample
  - More than one site (LEA, locality, or state)
- Setting
- Population
Measurement

- **Performance Measure** – any quantitative indicator, statistic, or metric used to gauge program or project performance
- **Relevant Outcome** – the student outcome(s) (or ultimate outcome if not related to students), the proposed process, product, strategy, or practice is designed to improve; consistent with the specific goals of a program
- **Causal Inference** – the process of drawing a conclusion that an activity or intervention was likely to have affected an outcome
Statistics

- Reliability – the dependability or consistency of an instrument
- Validity – the quality or soundness of an instrument
- Standard deviation – the variability of a measure across the observations of a sample
- p-value – a statistical reporting measure used to describe outcome significance
- Null hypothesis – the hypothesis that there is no statistically significant relationship between two variables
- Effect size – a standardized measure of the magnitude of a difference
Welcome to the What Works Clearinghouse (WWC) group design standards training. The WWC offers this training to inform the public about the key elements of the WWC group design standards, increase transparency of our review process, and promote the use of rigorous, high-quality research.

**ABOUT THE TRAINING**

This training series includes nine modules, each focused on a different aspect of the WWC group design standards and procedures. We recommend viewing the modules in numerical order. Start with the Introduction video, which describes the goals, topics, and organization of this training.

**CERTIFICATE**

If you view the first six modules on WWC standards in this training series, you will earn a certificate of completion. When you complete the Systematic Reviews module, choose the "Print Certificate" menu option on the left to receive your certificate.

**GROUP DESIGN STANDARDS CERTIFICATION**

Becoming certified in the WWC group design standards requires that you view all nine modules on the WWC Standards and Procedures and successfully complete a multiple-choice certification test. You will have four opportunities to take and pass the test, which includes 50 short multiple-choice questions and two multiple-part questions that simulate a review. When you successfully complete the test, you will be able to print a certificate as proof that you are certified in the WWC group design standards.
Resources

- “What Works Clearinghouse Standards Handbook” (Version 4.0)
- WWC Group Design Standards Online Training
- Code of Federal Regulations
- “Non-Regulatory Guidance: Using Evidence to Strengthen Education Investments”
If you have questions regarding evidence-based interventions or study design, please contact the District 180 branch in the Office of Continuous Improvement and Support at (502) 564-2116.