

This product is intended to help State Coordinators (SC)s read and interpret education research. Its content includes how to access and read education research, essential questions to answer when reading research, and tips for sharing helpful research. It concludes with a glossary of commonly used education research terms. Regardless of users' varying levels of familiarity with research methods, interpretation, or terminology, this resource offers information applicable to a range of skill levels.

### State Coordinators as Consumers of Education Research

SCs regularly encounter evidence-based programs and practices within their day-to-day work. Oftentimes, this occurs for SCs when they are reviewing local education agency (LEA) application packets or providing technical assistance (TA) to LEAs. Both responsibilities can be enhanced by a deeper understanding of and ability to apply education research. As LEAs submit grant applications that include plans to fund and implement evidence-based interventions, SCs may find it necessary to examine relevant research and evaluation studies to verify whether the interventions meet any of the ESSA evidence levels. The U.S. Department of Education (ED) defines these levels in [Non-Regulatory Guidance: Using Evidence to Strengthen Education Investments](#).

As either a proactive or a reactive part of TA provision, SCs may also share education research for LEA consumption or help search for available research that is relevant to LEAs' needs. For example, LEAs may ask for recommendations from SCs on best practices or evidence-based programming for their schools.

The Title IV, Part A Technical Assistance Center provides information on selecting evidence-based programs and practices for Title IV-A activities.



### Accessing Education Research

Education research is accessible through various sources such as university and public library systems, nonprofit and for-profit education organizations, open-source journals, and personal networks. Additionally, SCs can perform an independent Web search (using a research-focused search engine) on the topic or intervention of interest; however, this will often return thousands of hits, which can be overwhelming. To avoid this, certain ED sources can be used to help narrow the search focus, such as the [What Works Clearinghouse \(WWC\)](#) (for a curated list of evidence-based programs and their ratings), the [Education Resources Information Center \(ERIC\)](#) (for education-related literature), and the [Regional Educational Laboratory \(REL\) Program](#) (for research and TA products generated from applied research in school systems). When conducting a literature search, try to find a recent compilation of research (a.k.a., a “**meta-analysis**”) or theoretical review paper on your topic of interest, then search for individual studies of the intervention.

## How to Read an Education Research Article

Deciding which education research article to read or which study provides sufficient evidence for an intervention can be overwhelming because of the vast number of publications and articles available. These steps below describe how to review the available literature and identify relevant and credible resources.<sup>1</sup> Useful review questions to ask while reading are included in the next section of this document.

**Bolded** terms, as well as additional commonly used research terminology, appear in the glossary at the end of the document.

1. *Read the title, abstract, and keywords.* The title, abstract, and keywords provide helpful information to determine whether the study fits the area of interest. Also, if the full article is unavailable (i.e., behind a paywall), this may be the only accessible information and will help with the decision to either buy the article or spend time to acquire it (e.g., through a university library).
2. *Skim the research paper.* If the study fits into the area of interest, scan the paper while focusing on the headings, sub-headings, tables, and figures without reading all the detail. This quick-read familiarizes you with the layout, content, and complexity of the document.
3. *Read the introduction.* The introduction provides the background and purpose of the study, which helps you understand contextual information about the topic or intervention. It usually contains the **research question(s)** or **hypotheses**.
4. *Read the full paper.* Thoroughly read the methods, results, discussion, and conclusion sections. Focus on the figures, graphs, and tables, if provided. After reading the full paper, revisit different sections as needed to confirm your understanding and interpretation. Apply the questions outlined in the next section to determine if the paper provides sufficient evidence to support the intervention of interest. If the goal is to be able to discuss the article confidently with colleagues, take notes as you read, with an eye toward deeper comprehension and attention to detail.

## Essential Questions to Ask When Reading Different Types of Education Research

Critical thinking is important when reading any resource to determine accuracy, **reliability**, and relevance. These suggested questions will help you examine the credibility of a study and reflect on whether the intervention is relevant to the LEA or school context. You may not know the answer to every question, but over time you will build your knowledge of and familiarity with how to discern reputable, good-quality research. These questions can be applied to any of the steps mentioned above; however, you may make conclusions based on a limited review (i.e., just a skim of the paper) that are actually contradicted with a deeper dive or more complete read. Consider your evaluation only tentative until you have fully read the paper and applied all the questions.

Research uses different methods to analyze **data** and draw conclusions, depending on the kinds of research questions being asked. Generally, there are three research types: **quantitative**, **qualitative**, or **mixed methods**. The following table displays a set of research concepts, questions, and examples that are applicable to all research types.<sup>2,3</sup>

Research Concept	Question for Consideration	Example
Research topic	Is the research topic clearly defined, with easy-to-identify research questions?	Oftentimes, the author will specifically flag this information by saying something such as, “Three central questions guided this study...”
Reputable researcher(s)	Did a reputable organization or researcher conduct the study?	Government agency; university-affiliated individual; reputable nonprofit organization
<b>Variables</b>	Do the research questions clearly identify what is being measured?	Research questions for a student of student health outcomes might ask about student activity levels or nutrition, as well as availability of school supports such as health or physical education courses.
<b>Validity</b>	Does the study accurately measure the variables?	If a study claimed to be about students’ perceptions of extracurricular activities but asked only school staff about extracurricular activity participation rates, then the measurement of the study is not valid.
Context	Is the focus of the research study applicable to the SEA/LEA setting or <b>population</b> ?	Study of an intervention that addresses literacy achievement for early elementary school may not be a helpful resource if the focus is on literacy for middle school.
Reliability	Are there other similar studies, and are the results from the other studies consistent with the current one?	If two well-designed and well-implemented studies of an intervention are reporting different results — one reports academic gains and one reports no change — these inconsistent results serve as a red flag about the reliability of the intervention.
<b>Sample</b>	Are the participants in the study described with sufficient detail? Are they similar to the SEA/LEA population and setting?	A study examining a largely rural population may not be applicable in urban or suburban contexts.
Conclusions	Are the author’s conclusions consistent with the analytic results?	Ensure that the conclusions and recommendations clearly connect to the findings.
Limitations	What are the limitations of the study?	If the limitations note that the study excluded an area of focus or population, this study/intervention may not be applicable in all settings.

In the next sections, we will look at questions specific to each of the three research types.

### Quantitative Research

Quantitative research questions are answered by collecting and analyzing *numerical* data. Data analysis examines whether an intervention is effective by looking for statistically significant differences among comparisons within the study.<sup>4</sup> Evidence related to improved outcomes can be classified according to the different levels outlined in [Section 8101.21\(A & B\)](#) of the Title IV-A statute. In quantitative research, **statistical significance** determines if the relationship between the variables is meaningful. It is reported as a **p value**, which is usually set at .05 in education research. The value of .05 reflects that there is only a 5 percent possibility (out of 100 percent) that the outcome occurred because of other factors that are unrelated to the intervention. This means that you can be 95 percent confident that the intervention is the reason for the observed changes. With a statistical significance of .05 or less, the relationship or results between the variables in a study are considered statistically significant and reliable.<sup>5</sup>

For example, School A started a behavioral health intervention that is supposed to reduce behavioral disruptions in class. After 6 months of the intervention, the LEA conducted a study comparing School A to School B (similar in size and student demographics, but which did not add any new interventions). When School A analyzed the data on office referrals, the statistical analysis showed a *p* value of .02 (which is less than .05). This value showed a reduction in office referrals for School A. This means that the LEA can be reasonably confident that the change in student behavior at School A is a result of the intervention.

Statistical significance is often paired with the **effect size**, which tells us whether the intervention had a small, medium, or large effect (i.e., the magnitude of the effect).<sup>6</sup> Regardless of whether the outcome is statistically significant or not,

researchers report effect size. The effect size is most often reported as the (*d*) statistic.

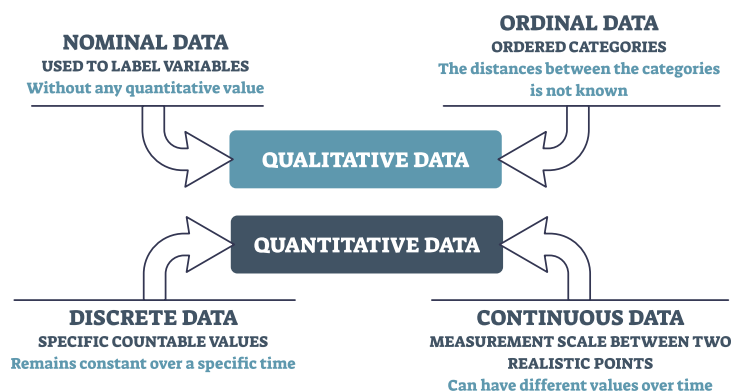
In addition to the general questions outlined above for all research types, consider these questions to confirm that the quantitative research is of high quality:<sup>2,5</sup>

- Do the results include the **statistical significance** and **effect size statistics**?
- Are the **p values** less than or equal to .05 (i.e., statistically significant results)?
- How large is the **effect size**? Is the intervention worth implementing for a smaller effect?

### Qualitative Research

Qualitative research generally uses interviews, focus groups, observations, open-ended survey responses, and documents as *nonnumerical* data sources.<sup>4</sup> Qualitative data require different strategies for analysis, including coding the information for themes and sometimes applying numerical values to those themes. For example, if a researcher analyzes transcripts of listening sessions or focus groups with parents of English language learners (ELLs), they may find themes related to the adequacy of bilingual instructional opportunities, availability of resources for ELLs with disabilities, or concerns about English-only materials sent home to students and families. The analyst may choose to report the frequency with which these themes occur, and the school system can act on the most prevalent issues.

Being able to apply qualitative findings to an educational setting depends on how well the



study context matches a specific LEA's or school's situation. For example, a study of school transportation options in a rural area is not applicable to a city context. Extending the example in the previous paragraph, if this qualitative study is conducted in an LEA that has ELLs as the predominant group (90 percent or more), it may not apply to another LEA with ELLs making up only 5 percent of its student population.

In addition to the general questions outlined above for all types of research, when reading qualitative education research, try to answer the following questions to confirm that the source is of high quality:<sup>4,7</sup>

- Do results represent a variety of viewpoints or experiences reported by participants?
- Does the study do a good job of explaining why and how the intervention works?
- Does the author discuss the specific characteristics of the individuals, settings, or contexts in the study that might have influenced the results (e.g., supports or stressors experienced by students; availability of resources such as qualified personnel, funding, or professional development; influences such as political and socio-economic climate; or support from school or district leadership)?

### **Mixed Methods**

Mixed methods and **action research** designs use both quantitative and qualitative methodologies to address a research problem. While all the questions above apply to these research designs, these additional questions may be considered:<sup>4</sup>

- Do the qualitative results provide additional context to understand and interpret the quantitative findings?
- What is the specific practice-related problem this research is intending to address? What are the recommendations for improvement? Are they applicable for your topic of interest?

## **Sharing Education Research With LEAs and Other SCs**

When sharing research with LEAs or other SCs, it is helpful to accompany your message with a summary of why it is worth reading or knowing about. Be sure to include the title, author(s), and year of the study; what part of the research caught your eye (e.g., background, methods, findings, recommendations); where the information is located in the paper; and how recipients might use the information. For example: "I am sharing with you a research article (authors, year) that highlights findings from a study about the benefits of integrating students' language spoken at home into English as a Second Language (ESL) instructional contexts. I recommend jumping to the Summary on p. X, which lists the specific practices found to be most effective."\*

SCs can also share relevant research with LEAs through TA activities such as Webinars and training sessions, either by explicitly summarizing research study findings or by providing reference lists.

## **Conclusion**

Title IV-A emphasizes that SEAs and LEAs use evidence-based interventions "to the extent a State, in consultation with local educational agencies in the State, determines that such evidence is reasonably available."<sup>1</sup> The purpose of this resource guide is to equip SCs with an understanding of the characteristics of good-quality education research and how to interpret research to identify relevant evidence-based interventions and instructional approaches. The steps of accessing and screening the research for both credibility and applicability are important to determine the level of evidence and usefulness. Sharing research directly or sharing these tips on reviewing research as part of TA can also help guide LEAs in selecting appropriate evidence-based programs.

*\* This example is for illustrative purposes only and is not based on an actual journal article.*

## Glossary of Terms Used in Education Research

Research uses a variety of scientific and technical terminology. This glossary is intended to help you develop a basic understanding of common terminology used in research. The list below contains definitions for all **bolded terms** located within this document, as well as additional commonly used research terminology.<sup>2,4,5,6</sup>

- **Action research** — Research that identifies the challenges within an education system and provides a practical, applied solution to the specific problem.
- **Causation** — The claim that an intervention, activity, or program is responsible for what happened with the outcome (the cause-and-effect relationship). This claim can be made only in experimental studies.
- **Correlation** — A claim indicating a relationship between two or more variables that is *not* known to be causal.
  - **Negative correlation** — An increase in one variable leads to a decrease in the other variable (e.g., an *increase* in student engagement is linked to a *decrease* in feelings of loneliness).
  - **Positive correlation** — An increase in one variable leads to an increase in the other variable (e.g., an *increase* in study time is linked to an *increase* in test scores).
- **Data** — The observations, measurements, or information that are collected, observed, or generated for analysis. A data set is a collection of data.
  - **Primary data** — Data that are collected and analyzed for a specific study by the researcher (e.g., a researcher observes teachers to study the impact of a math intervention program and uses the data for that sole purpose).
  - **Secondary data** — Data that were collected by someone other than the study author, and the author reanalyzes the data for his or her own purpose or to answer unique research questions (e.g., a researcher uses statewide academic achievement test data to study the impact of a new math program).
- **Descriptive statistics** — Information that describes and summarizes the data.
  - **Mean** — The average of the values in the data set, which is calculated as the sum of all the values divided by the number of values in the set.
  - **Median** — The middle value when values are arranged in an ascending or descending order. If the set contains an even number of values, the median is the average of the two middle numbers.
  - **Mode** — The most frequently occurring value in the data set.
  - **Standard deviation** — A measure of the variability of the data set (i.e., how far each score is from the mean).
- **Generalizability** — The extent to which the study applies more broadly beyond the specific study participants or context.
- **Hypothesis** — A specific, testable statement explaining the relation between factors (or variables) and outcomes that can be supported or contradicted by the study.
  - **Alternative hypothesis** — A statement that there is a relationship between variables and outcomes, and there is an expectation of change or effects based on an intervention.
  - **Null hypothesis** — A statement that there is no relationship between variables and outcomes, and there will be no change or effect based on an intervention.
  - **Theory** — An explanation for phenomena that can be repeatedly tested and verified.

- **Limitations** — The flaws or shortcomings of a study (which may or may not be beyond the researcher’s control) that may have affected the results or conclusions.
- **Literature review** — A synthesis of published research in a field of study.
- **Meta-analysis** — A systematic review that involves statistical analysis combining the results of multiple scientific studies on the same topic or program to better understand it.
- **Mixed methods research** — Research using a combination of quantitative and qualitative approaches in one study to address a research question.
- **Population** — An entire group of people with common characteristics to which the researcher wishes to generalize the findings (e.g., students with disabilities; teachers with bachelor’s degrees in a subject area).
  - **Attrition** — A phenomenon that occurs when participants drop out of a study.
  - **Outliers** — Values that are notably higher or lower than the other values in a data set.
  - **Sample** — A set of individuals selected from a larger population to participate in a study.
- **Qualitative research** — Research using nonnumerical data (e.g., analysis of transcripts, written documents, or video observations) to describe and address a research problem. Examples are interviews, focus groups, and document/content analysis.
- **Quantitative research** — Research using numerical data (e.g., surveys, codes, or values assigned to observational data) and statistical analyses to answer research questions and explain relationships between variables.
  - **Descriptive/correlational study** — A nonexperimental study where a relationship between the variables is examined without looking for causation. (e.g., District A is interested in seeing if there is a relationship between a larger offering of extracurricular activities and student engagement. Note that this type of study can be quantitative or qualitative, depending on the type of data collected, such as surveys vs. observations.)
  - **Factor analysis** — An analytic technique that identifies items within measures that have a relationship (e.g., surveys about how students choose what college to go to might include groupings of items [called factors] around preferences for academic rigor, racial-ethnic enrollment characteristics, and social dimensions. Factor analysis can also be used to confirm theories about how the data might best be organized and reported.)
  - **Quasi-experimental (QE) study** — A rigorous study where the participants are not randomly selected. At the baseline, intervention and control groups may not have similar characteristics. A QE study may not be able to demonstrate causal connections (e.g., teachers in District A receive training on Method X; teachers in District B receive no training. The researcher examines student outcomes. There may be no significant differences because results can be influenced by the dissimilarity at baseline, which affected the outcome.)
  - **Randomized control trial (RCT)/experimental study** — A rigorous study where participants are assigned to a treatment or control group randomly. At the baseline, both groups have similar characteristics. RCTs usually lead to claims of a causal relationship (i.e., causation; e.g., teachers in a school district are randomly assigned to take part in training for a new teaching method. The study compares those who received the training with those who did not. Student outcomes are examined and linked to whether teachers had the training or not.)

- **Control group** — The group that does not receive the intervention or receives a different intervention or conducts “business as usual.”
  - **Intervention group** — The group that receives the intervention or treatment that is being studied.
- **Reliability** — The likelihood that similar results will be obtained if a measurement tool is used repeatedly or a study is replicated.
  - **Replicability** — The ability to obtain similar findings in a similar context if the study is repeated.
  - **Research question** — An answerable question that guides the study and its methods.
  - **Statistical significance** — A measure of the likelihood that the result is true and did not occur due to chance. If there is statistical significance, the researcher can reject the **null hypothesis** that states there is no change or relationship between the variables.
    - **Effect size** — Quantifies the size of the effect (i.e., small, medium, large) of the intervention.
    - **p value** — A statistic that tells us whether what was observed is the result of something that changed or a random occurrence. The *p* value is used to denote statistical significance; the lower the *p* value, the stronger the evidence that there is a true effect or a relationship between the variables. *p* = .05 is generally accepted as the minimum threshold. *p* = .01 or .001 represents very solid findings.
  - **Validity** — A term used when a measurement instrument (e.g., a survey) accurately measures what it is intended to measure. Validity tells us whether researchers used tools that accurately measured the issues of importance.

- **Variables** — Measurable characteristics that change within the study.
  - **Control variables** — Characteristics that remain unchanged (e.g., age, gender).
  - **Dependent variable (DV)** — An outcome; the independent variables influence this measure (e.g., student test scores influenced by study time; school dropouts influenced by disciplinary practices).
  - **Independent variable (IV)** — A measure that influences the outcome (dependent variable). The IV is changed or controlled to see its influence on the outcome (e.g., the number of hours of training or courses the study participant is exposed to).

## ENDNOTES

- <sup>1</sup> Huck, S.W. (2012). *Reading statistics and research* (6th ed.). Boston, MA: Pearson Education Inc.
- <sup>2</sup> Colorado Department of Education. (n.d.). *Definitions and characteristics of high quality research*. Retrieved from <https://www.cde.state.co.us/sites/default/files/documents/research/download/pdf/highqualityresearch.pdf>
- <sup>3</sup> Creswell, J.W. (2015). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (5th ed.). Boston, MA: Pearson Education Inc.
- <sup>4</sup> Gravetter F.J., Wallnau, L.B., & Forzano, L.B. (2017). *Essentials of statistics for the behavioral sciences* (9th ed.). Belmont, CA: Wadsworth.
- <sup>5</sup> Lyon, G.R., & Chhabra, V. (2004). The science of reading research. *Educational Leadership*, 61(6), 12-17. Retrieved from <http://www.ascd.org/publications/educational-leadership/mar04/vol61/num06/The-Science-of-Reading-Research.aspx>
- <sup>6</sup> Lavrakas P.J. (2008). *Encyclopedia of survey research methods* (Vol. 2). Thousand Oaks, CA: Sage Publications, Inc. doi: 10.4135/9781412963947
- <sup>7</sup> Title IV, Part A Statute, Every Student Succeeds Act of 2015, §§ 8101. (2015). Retrieved from <https://t4pacenter.ed.gov/T4PAStatutes.aspx?AspxAutoDetectCookieSupport=1#Sec%208101>





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