Understanding the No Child Left Behind Act of 2001

NCREL quick key 7

Scientifically Based Research

LEARNING POINT Associates

The No Child Left Behind Act of 2001

As a reauthorization of the Elementary and Secondary Education Act (ESEA), Congress passed the No Child Left Behind (NCLB) Act of 2001. Signed into law by President Bush in January 2002, the legislation brings many significant changes to schools nationwide.

As a result of the NCLB Act, schools and districts are seeking information to identify, plan, and implement federally funded programs and practices that have been proven to be effective through scientifically based research (SBR). The purpose of this brochure is to help administrators, educators, parents, and community members understand the applicability of SBR and its components as they relate to school improvement efforts under NCLB legislation. It is designed to help you understand how to identify SBR, evaluate evidence of effectiveness, ask key questions about the research you find, and apply SBR to your school improvement efforts.

According to the NCLB Act (2002), a local educational agency or consortium can use federal funds to enact an improvement effort that:

> "Has been found, through scientifically based research to significantly improve the academic achievement of students participating in such program as compared to students in schools who have not participated in such program; or has been found to have strong evidence that such program will significantly improve the academic achievement of participating students" [Section 1606a, 11A-B].

This work was originally produced in whole or in part by the North Central Regional Educational Laboratory with funds from the Institute of Education Sciences (IES), U.S. Department of Education, under contract number ED-01-CO-0011. The content does not necessarily reflect the position or policy of IES or the Department of Education, nor does mention or visual representation of trade names, commercial products, or organizations imply endorsement by the federal government.

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Evidence of Effectiveness—Scientifically Based Research

When school staff members meet to address school improvement efforts, they should first determine their needs and then decide which intervention, program, or model may best address those needs. Under NCLB legislation, funded schools must implement reform strategies informed by "scientifically based research" (SBR), which is defined in Title IX as having six specific components. To make these concepts more readily understood, we are providing more detailed explanations and examples to illustrate the six components. SBR must:

- **Use empirical methods.**

Quality research is conducted in a systematic and consistent manner with great attention to detail. The methods are appropriate, and conclusions are based on systematic observation or experiment.

Practical example: You are the principal of an elementary school serving 500 students. In Grades 1–3, 70 percent of your students are bilingual and not achieving to grade-level standards. You are considering adopting a literacy model that claims to benefit all students, including bilingual students. Before adopting a new program, you should ask some questions about the research: Was this program tested under controlled circumstances in which some schools used the program and some did not? Was the sample size reasonable and relevant to the service provided?

- **Involve rigorous and adequate data analyses.**

Data collected in a high-quality study should be examined with appropriate statistical measurements to test the stated hypothesis and justify the conclusions drawn from the research. Failure to use proper statistical measurements could result in inaccurate or misleading results.

Practical example: You are reviewing a study related to the effectiveness of a K–6 mathematics curriculum that claims significant increases in student achievement over a comparable program. Does the analysis account for students who have not stayed in the program for the length of the study? If yes, does it address how the data change as a result of students dropping out? Was the same measurement (test or assessment tool) used over time, and are comparisons and interpretations really possible given the tools used?

- **Rely on measurements or observational methods that provide reliable and valid data.**

Quality data produce accurate and credible findings. SBR utilizes measurements that provide reliable, valid data across multiple measurements and observations. Reliable instruments allow repeated measurements to produce similar results over time. Valid data will show that the assessment tool measures only what it is designed to measure. There must be a connection between the research question and the observed behavior; the research findings are based on that connection. Repeated measurements should yield identical or similar results from one evaluation to the next.

Practical example: You are an elementary school reading specialist looking to improve reading comprehension. A professional development provider shows evidence that in a particular school that adopted its literacy approach, scores increased on a state assessment of third graders. You may reasonably have some concerns about bias, because the service provider may have selected the success stories. You might also have concerns about validity, because the test measures several aspects of reading performance in addition to comprehension.

- **Use either an experimental or quasi-experimental design.**

Quality studies use experimental research designs in which there is random assignment into at least two equivalent groups. One group participates in the program (receives the treatment), and the other group does not. If random assignment is not an option, quasi-experimental designs allow researchers to match the experimental and control groups as closely as possible.

Practical example: You are a concerned parent and member of the school improvement planning team. An external provider's Web site reports the following: "In 20 schools that have used the MathStar approach, student performance on standardized tests increased by over 15 percent in three years compared to national norms!" Was there a control group? If so, were students assigned randomly? Did similar students in the area also make gains in mathematics performance over the same period?

- **Allow for replicability.**

Quality studies include a clear description of the method, instruments, and data used—a description sufficiently detailed to allow a different researcher to conduct the same study. Findings should be free from jargon to allow an informed lay reader to understand them.

Practical example: A research study in a popular journal looked at the achievement of at-risk students in a computer-mediated environment. Does the study allow the reader to actively "participate" in the research process? Can the research process be recreated in another classroom with the same setting? Does the study provide enough information to carry out the experiment?

- **Undergo expert scrutiny.**

Quality studies have been reviewed and approved by independent expert reviewers. A form of quality control has been executed through expert analysis via rigorous, objective, scientific review of the research.

Practical example: A teacher conducted a detailed case study of her experiences in implementing a new reading curriculum. The editor of a popular magazine that addresses a variety of educational issues decided that the experience was interesting and informative, so it was published. Would you consider this to be a highly scrutinized study?

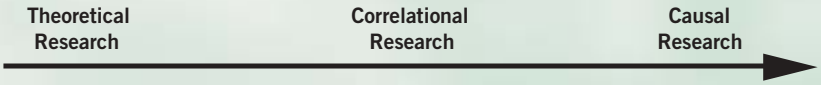
Evidence of Effectiveness—Cumulative Evidence Base

School leaders must make decisions based on the best available evidence, as well as professional judgment, when implementing their programs (U.S. Department of Education, 2002). School reform programs, and the strategies and methods that make up programs, must reflect SBR (as defined above).

It is important to remember that one study, even if it meets all the criteria of SBR, is not enough to be considered sufficient evidence of effectiveness. In most cases, a mix of research exists composed of numerous studies using various methodologies, including but not necessarily limited to experimental or quasi-experimental designs. If an experimental or quasi-experimental design has not been used, however, claims of causality are more tenuous and should be treated with caution. For a thorough but nontechnical guide to assessing the quality of research studies, see *Identifying and Implementing Educational Practices Supported by Rigorous Evidence: A User Friendly Guide* (U.S. Department of Education, 2003).

It might be helpful to note that research exists on a continuum—from research that is purely theoretical in nature, to research that shows a correlation between variables, to research that shows causation. As shown in the diagram, an educational reform program typically starts out as a theoretical relationship between the

variables of interest, is then subjected to correlational studies to understand the relationships of the variables, and finally is subjected to causal studies to examine whether the variables in question are actually causing, for example, changes in student achievement.



Progression from theory to scientifically based practice

While this process does not always happen in the "real world," when you are examining research that purports to make causal claims, look for evidence of this process. Because a program must adapt to meet the specific needs of a particular student population, it is important that clear evidence explains why and how a program works, not just that it does. For answers to the "why" or "how" questions, there must be a theory underlying the program, and evidence that previous research found that the theory successfully predicts certain outcomes.

In order to meet NCLB criteria, school leaders must find ample research evidence for their reform program of choice. Finding SBR and building a cumulative research base are certainly daunting tasks, but resources are available to help. Some are listed in the next section.

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LEARNING POINT ASSOCIATES KEY RESOURCES

Learning Point Associates has resources to assist you in understanding and implementing NCLB in your school and district. Visit our Web site (www.learningpt.org) and *Ahead of the Curve* Web site (www.ncrel.org/policy/curve) containing NCLB information.

NCREL's Learning Point magazine article **"Wake-Up Call"** (www.ncrel.org/info/nlp/lpsp03/wakeup.htm) outlines the challenges of implementing SBR in schools.

NCREL's Learning Point magazine article **"Digging Out"** (www.ncrel.org/info/nlp/lpsp03/dig.htm) focuses on using the best strategies to locate and identify SBR.

Making Good Choices: A Guide for Schools and Districts (www.ncrel.org/csri/tools/makegood/title.htm), a revised publication, provides a process for examining school needs for reform and creating a reform initiative that will address those needs.

Pathways to School Improvement Web site (www.ncrel.org/pathways) is designed primarily to help school improvement teams as they go through the phases within the school improvement process.

ADDITIONAL KEY RESOURCES

Scientifically Based Research and the CSR Program (*Comprehensive School Reform [CSR] Guidance: Appendix C*) (www.ed.gov/programs/compreform/guidance/appendc.pdf) is designed to help school staffs increase their understanding of what SBR is, and use that understanding to assess the quality, relevance, and usefulness of the research they examine.

What Works Clearinghouse (www.w-w-c.org) Web site contains Web-based databases that provide a compendium of high-quality scientific research studies and reviews of scientific evidence of effectiveness of educational programs, practices, products, and policies.

Identifying Research-Based Solutions for School Improvement (www.goodschools.gwu.edu/pubs/sbrsub.php), an online workshop from the National Clearinghouse for Comprehensive School Reform, is designed to provide educators with the skills they need to find, identify, and make good use of the best available educational research.

The Iowa Professional Development Model (www.state.ia.us/educate/ecese/tqt/tc/doc/ipdm02.pdf) provides a framework intended to assist districts, schools, and individuals as they design professional development programs.

Education Commission of the States Web site (www.ecs.org) contains resources and a Web-based summary of state policies and activities related to NCLB requirements and SBR.

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Glossary of Common Research Terms

case study: An extensive study of an individual unit, group, institution, organization, or program. It provides a thorough analysis of the object being studied.

causality: The relationship between the cause and the effect. Causality exists under three conditions: the intervention (e.g., a reform model) must come before the outcome (e.g., increased student achievement); there must be covariance (e.g., if the intervention increases slightly, the outcome will increase slightly); and there must not be extraneous explanations for the observed outcome.

control group: A group of individuals whose characteristics are similar to an experimental group but who do not receive any of the program services or products being evaluated.

correlation: A standardized measure of linear association between two variables. Its values range from -1 (strong negative association) through zero (no association) to +1 (strong positive association).

empirical research: Research conducted for the purpose of collecting measurable data in terms of attitudes, behavior, or performance. Designed to generate projectable, numerical data on a topic.

evidence of effectiveness: A term used in the NCLB legislation, which states that programs must "prove evidence of effectiveness," meaning a program must show—through student achievement data—that it improves achievement.

experimental group: A group in an experimental design that receives the treatment or program.

experimental research: A research design that involves random assignment of study participants to either an experimental or control group. This allows researchers to compare the outcome (e.g., test scores) of the experimental group to that of the control group, and to assess the effect of the treatment. The strongest research design for establishing evidence of effectiveness.

qualitative research: Collection of nonnumerical data using interviews, observations, and open-ended questions to gather meaning from nonquantified narrative information.

quantitative research: Collection of numerical data in order to describe, explain, predict, and/or control phenomena of interest.

quasi-experimental research: A research design that includes some type of intervention or treatment and provides a comparison. Lacks the degree of control over all elements (environment, intervention, subject selection) found in experimental research design, but may provide some evidence of effectiveness. Comparison groups are frequently used, but maximum controls are employed to minimize threats to validity; random selection is typically not possible or practical.

reliability: The degree to which an instrument *consistently* measures in the same way on repeated trials (e.g., a math test given to a student one day would yield roughly the same score if given to the same student the next day).

theory: A comprehensive explanation of a given set of data that has been repeatedly confirmed by observation and experimentation, and has gained general acceptance within the scientific community, but has not yet been decisively proven.

validity of an instrument: The degree to which a measure accurately assesses the specific concept it is designed to measure (e.g., whether a reading-comprehension assessment focuses on students' understanding of a story or their ability to read the story).

validity of a research study: A study has *internal validity* when the possibility is minimal that other (confounding) variables are responsible for the effect in question. *External validity* is the extent to which the results of a study are generalizable and transferable to different populations, settings, and conditions.

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