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Quality Indicators for Research in Special Education and Guidelines for Evidence-Based Practices: Executive Summary

Task Force on Quality Indicators for Special Education Research

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To provide high quality education for students with disabilities, the field of special education must have a foundation of high quality research. Such research provides evidence that practices are effective. High quality research should help teachers, supervisors, parents, policymakers, and researchers "separate the wheat from the chaff," that is, to separate teaching practices that have a strong record of effectiveness from those practices that have little or no evidence. High quality special education research should also provide an understanding of factors in school systems, classrooms, and society that influence how well "evidence-based" practices work in the real world. It should allow us to describe the contexts in which teaching and learning occur, as well as the situations in which individuals live, work, and apply the skills they have learned. In a phrase, special education research should contribute to the quality of life for individuals with disabilities and their families.

To support and promote high quality research in special education, the Division for Research (DR) of the Council for Exceptional Children established a Task Force on Quality Indicators for Research in Special Education.

The goals of the Task Force were to establish a set of quality indicators for research methodologies commonly used in special education and guidelines for identifying practices that are evidence-based. The Task Force intended that the quality indicators be useful for individuals involved in the research process in special education (e.g., journal and grant reviewers, investigators, and students conducting research) and consumers of research such as teachers and policymakers.

Task Force members formed subcommittees, made up of some of the most prominent researchers in special education. The subcommittees established an initial set of indicators, which were shared with other researchers in the field at the Research Project Directors' Meeting hosted by the Office of Special Education Programs (OSEP). The subcommittees incorporated feedback provided by these researchers at the OSEP conference into a revised set of indicators and guidelines and then wrote scholarly papers describing the indicators. These papers will be published in *Exceptional Children*.

Operational Assumptions

Two operating assumptions served as the foundation for quality indicators and evidence-based practice guidelines.

Research Methodology Must Be Matched to Research Questions

A fundamental maxim in applied education research is that the research methodology selected for a study must be appropriate for answering the research question established by the researcher.

The National Research Council's report (Shavelson & Towne, 2002) on scientific research in education proposed that there are three primary types of scientific questions in education.

- Descriptive questions: What is happening?
- Causal questions: Is there a systematic effect?
- Process questions: Why or how is an effect happening?

For each of these types of questions, different methodologies are essential. For example, qualitative and correlational research designs lend themselves to descriptive questions; experimental and quasi-experimental group designs and single subject designs may be more applicable to causal questions; and process questions may be addressed by any of the methodologies described in this summary or a mix of the research methodologies.

The need for multiple research methodologies in special education is perhaps even greater than for other areas of education because of the heterogeneous characteristics of students with disabilities and settings in which special education occurs.

Research Can be Grouped into One of Four Research Methodologies

To develop quality indicators and guidelines for evidence-based practices, Task Force members proposed that research methodologies in special education could be organized into four groups that share common indicators of high quality. These conceptual groups are:

- Experimental and Quasi-experimental Group Designs;
- Single Subject Designs;
- Correlational Designs; and
- Qualitative Designs.

For each of these methodologies, task force subcommittees defined the methodology, identified quality indicators, and proposed guidelines for using results from each methodology to provide evidence for the effectiveness of special education practices.

Experimental and Quasi-Experimental Group Designs

Definition

Experimental and quasi-experimental group designs address causal questions related to special education practice (Gersten et al., in press). In other words, these designs allow researchers to determine whether implementation of a practice results in, or causes, a systematic change in specified outcomes within a defined population of students.

With this methodology, the effects of a special education practice is delivered to a group of participants. The outcomes for that group of participants are compared to the outcomes of participants who did not receive the innovative practice or who received an alternative practice. Experimental group designs are considered randomized trials when the researcher randomly assigns students, classrooms, teachers, interventionists (etc.) to receive the experimental treatment or a comparison condition. Quasi-experimental designs are similar except that groups are not randomly assigned. For quasi-experiments, researchers must demonstrate the groups are equivalent on a set of pretest measures and demographic measures.

Quality Indicators for Experimental and Quasi-Experimental Group Designs

Quality indicators for experimental and quasi-experimental group designs appear in Table 1 (Gersten et al., in press). These indicators specified features of research that include a) conceptualization of the research study, b) participant description, c) implementation of treatment and comparison conditions, d) outcome measures, and e) data analysis. In their paper, Gersten et al. (in press) also provide a checklist that translates these indicators into questions. Separate sets of questions were developed for evaluating research manuscripts (for journal reviewers) or research proposals (for grant reviewers), given that the interpretation of the quality indicators changes slightly depending on how they are used.

Table 1:
Quality Indicators for Experimental and Quasi-Experimental Group Designs

Conceptualization of the Research Study	**1.** The conceptualization of the research study is based on the findings of rigorously designed studies that reflect the current scope of extant knowledge, including the findings of seminal studies. OR If an innovative approach is proposed, it is based on sound conceptualization and is rooted in sound research. **2.** A compelling case for the importance of the research is made. **3.** Valid arguments supporting the proposed intervention as well as the nature of the comparison group are presented. **4.** The research questions are appropriate for the purpose of the study and are stated clearly.
Participant Description	**5.** Sufficient information to determine/ confirm whether the participants demonstrated the disabilities or difficulties addressed is presented. **6.** Appropriate procedures are used to increase the probability that participants were comparable across conditions. **7.** Differential attrition among intervention groups or severe overall attrition is documented. **8.** Sufficient information describing important characteristics of the intervention providers is included, and appropriate procedures to increase the probability that intervention providers were comparable across conditions are used.
Implementation of the Intervention and Description of Nature of Services in Comparison Conditions	**9.** The intervention is clearly described and specified. **10.** Fidelity of implementation is described and assessed in terms of surface (the expected intervention is implemented) and quality (how well the intervention is implemented) features. **11.** The nature of services provided in comparison conditions are described and documented.

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Table 1:
Quality Indicators for Experimental and Quasi-Experimental Group Designs

Outcome Measures	**12.** Multiple measures are used to provide an appropriate balance between measures closely aligned with the intervention and measures of generalized performance. **13.** Evidence of reliability and validity for the outcome measures is provided. **14.** Outcomes for capturing the intervention's effect are measured at the appropriate times. **15.** Data collectors and/or scorers are blind to study conditions and equally (un) familiar to examinees across study conditions. **16.** Adequate inter-scorer agreement is documented.
Data Analysis	**17.** The data analysis techniques chosen are appropriate and linked in an integral fashion to key research questions and hypotheses. **18.** The variability within each sample is accounted for either by sampling or statistical techniques such as analysis of covariance. **19.** The researcher should clearly link the unit of analysis chosen to the key statistical analyses. **20.** A power analysis is provided to describe the adequacy of the minimum cell size and conducted for each unit of analysis to be examined (e.g., school and class as well as student).

Guidelines for Evidence-Based Practice

To guide practitioners and researchers in the identification of evidence-based practices, Gersten et al. (in press) propose two sets of guidelines, which appear in Table 2. One set of guidelines specify the level of evidence necessary to clearly support a practice as being evidence-based. For evidence-based practices, two or more high quality studies, or at least four acceptable quality studies, with mean weighted effect sizes significantly different from zero, must support the effectiveness of the practice.

High quality studies meet the quality indicator criteria specified in Table 1 and acceptable studies meet the majority of the criteria [i.e., Gersten et al. (in press) describe criteria for judging studies as high quality or acceptable]. By weighted effect sizes, they propose a process by which features of the study (e.g., participant, number of effect sizes per study, etc.) are factored into the aggregation of cumulative evidence of the study (see Cooper & Hedges, 1994 for further information about weighted effect sizes).

Table 2:
Guidelines for Evidence-Based Practice from Experimental and Quasi-Experimental Group Designs

Evidence-Based Practices	**1.** Two or more high quality studies that support the practice *or f*our or more acceptable quality studies; *and* **2.** The weighted effect size is significantly greater than zero.
Promising Practices	**1.** Two or more high quality studies or four or more acceptable quality studies that support the practice; *and* **2.** There is a twenty percent confidence interval for the weighted effect size that is greater than zero.

Gersten et al. (in press) also propose that the evidence for some practices may fall below the guidelines for being considered evidence-based, but they may be *promising*, in that some evidence supports their efficacy or there is an accumulating amount of evidence emerging. For these practices, the number of studies necessary to meet the guidelines are identical to the previous criteria for evidence-based practices, but the confidence intervals established for the weighted effect sizes are greater.

Single Subject Research Design

Definition

Single subject designs, like group designs, are an experimental methodology in that they address causal questions (Horner et al., in press). The common title for this design is a bit of a misnomer in that researchers employing these designs usually have more than one participant in a study. In single subject designs, the individual participant is the unit of analysis. An individual participant usually is a single person but may alternatively be a classroom, school system, or community. Individual participants are described in sufficient detail to allow interpretation of results and replication of the study. In single subject methodology, dependent variables (outcomes for individual participants) are measured repeatedly across time rather than only at the beginning or the end of a study. The independent variable is actively manipulated (i.e., implemented and withdrawn or implemented at different times across participants, with the timing of implementation depending on a participant's performance). A baseline condition is typically established to determine a participant's performance in the absence of intervention and used for within-participant comparisons of treatment effect.

In single subject designs, causal inferences are established when the researcher demonstrates experimental control of the independent variable (i.e., reliable changes in a participant's performance when the independent variable is implemented and/or withdrawn). External validity is built empirically through systematic replications of experimental effects in different studies. Single subject designs have the tradition of also establishing social validity, which is the documentation of the social importance of research questions, intervention/instruction procedures that make up the independent variable, and outcomes for participants.

Quality Indicators for Single Subject Designs

Horner et al. (in press) specify quality indicators for seven features of single subject design studies: description of participants and setting, dependent variables, independent variables, baseline, experimental control/internal validity, external validity, and social validity. These indicators are listed in Table 3.

Table 3:
Quality Indicators for Single Subject Design

Description of Participants and Settings	**1.** Participants are described with sufficient detail to allow others to select individuals with similar characteristics (e.g., age, gender, disability, diagnosis). **2.** The process for selecting participants is described with replicable precision. **3.** Critical features of the physical setting are described with sufficient precision to allow replication.
Dependent Variables	**4.** All dependent variables are described with operational precision. **5.** Each dependent variable is measured with a procedure that generates a quantifiable index. **6.** The measurement process is described with replicable precision. **7.** Dependent variables are measured repeatedly over time. **8.** Data are collected on the reliability or inter-observer agreement (IOA) associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%; Kappa = 60%).
Independent Variables	**9.** Independent variable is described with replicable precision. **10.** Independent variable is systematically manipulated and under the control of the experimenter. **11.** Overt measurement of the fidelity of implementation for the independent variable is highly desirable.

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Table 3:
Quality Indicators for Single Subject Design

Baseline	**12.** A baseline phase provides repeated measurement of a dependent variable and establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur. **13.** The procedural characteristics of the baseline conditions should be described operationally.
Experimental Control/Internal Validity	**14.** The design provides at least three demonstrations of experimental effect at different points in time. **15.** The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).
External Validity	**16.** Experimental effects are replicated across participants, settings, or materials to establish external validity.
Social Validity	**17.** The dependent variable is socially important. **18.** The magnitude of change in the dependent variable resulting from the intervention is socially important. **19.** Implementation of the independent variable is practical and cost effective. **20.** Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.

Guidelines for Evidence-Based Practice

Experimental evidence for the effectiveness of practices in special education may also be derived from single subject design studies.

Like the concept of external validity noted previously, such evidence for individual practice occurs through systematic replications in studies that possess the indicators of high quality noted in Table 3. Horner et al. (in press) proposed guidelines for the types of evidence that are necessary for a practice to be documented as evidence-based using single subject design literature (see Table 4). For a practice to be established as evidence-based, it must be supported by five high quality studies published in peer reviewed journals. The studies must have been conducted by three different researchers in three different geographical locations, and include a total of at least 20 participants (i.e., across the five studies).

Table 4:
Guidelines for Evidence-Based Practices from Single Subject Designs

1. Five or more single subject design studies that meet the acceptable criterias:
- **a.** Practice is operationally defined;
- **b.** Context and outcomes are clearly described;
- **c.** Practice is implemented with documented fidelity; and
- **d.** Practice is functionally related to outcomes.

2. Studies must have been published in a peer-reviewed journal.

3. Studies must have been conducted by three different researchers in three different geographical locations.

4. The body of studies must have included 20 or more participants.

Correlational Research Design

Definition

Thompson et al. (in press) note, "Correlational studies are quantitative, multi-subject designs, in which participants have not been randomly assigned to treatment conditions. Analytic methods, commonly (but not exclusively) applied with such designs, are multiple regression analysis, canonical correlation analysis, hierarchical linear modeling, and structural equation modeling."

Quality Indicators for Correlational Research

In addition to specifying quality indicators about specific features of research design, the correlational research subcommittee extended their identification of quality indicators to features of outcome reliability and statistical interpretations of studies. Quality indicators were proposed for measurement, practical and clinical significance, macro-analytic interpretations of outcome, use of confidence intervals for reliability, and effect size estimates. These quality indicators appear in Table 5.

Table 5:
Quality Indicators for Correlational Research

Measurement	**1.** Score reliability coefficients are reported for all measured variables, based on induction from a prior study or test manual, with explicit and reasonable justifications as regards comparability of (a) sample compositions and (b) score dispersions. **2.** Score reliability coefficients are reported for all measured variables, based on analysis of the data in hand in the particular study. **3.** Evidence is inducted, with explicit rationale, from a prior study or test manual that suggests scores are valid for the inferences being made in the study. **4.** Score validity is empirically evaluated based on data generated within the study. **5.** The influences of score reliability and validity on study interpretations are explicitly considered in reasonable detail.
Practical and Clinical Significance	**6.** One or more effect size statistics is reported for each study primary outcome, and the effect statistic used is clearly identified. **7.** Authors interpret study effect sizes for selected practices by directly and explicitly comparing study effects with those reported in related prior studies.

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Table 5:
Quality Indicators for Correlational Research

Practical and Clinical Significance (cont.)	**8.** Authors explicitly consider study design and effect size statistic limitations as part of effect interpretation.
Avoiding Some Common Macro-Analytic Mistakes	**9.** General Linear Model (GLM) weights (e.g., beta weights) are interpreted as reflecting correlations of predictors with outcome variables only in the exceptional case that the weights indeed are correlation coefficients. **10.** When noteworthy results are detected, and the origins of these effects are investigated, the interpretation includes examination of structure coefficients. **11.** Interval data are not converted to nominal scale, unless such choices are justified on the extraordinary basis of distribution shapes and the consequences of the conversion are thoughtfully considered as part of result interpretation. **12.** Univariate methods are not used in the presence of multiple outcome variables. **13.** Univariate methods are not used post hoc to multivariate tests. **14.** Persuasive evidence is explicitly presented that the assumptions of statistical methods are sufficiently well-met for results to be deemed credible.
CIs for Reliability Coefficients, Statistics, and Effect Sizes	**15.** Confidence intervals are reported for the reliability coefficients derived for study data. **16.** Confidence intervals are reported for the sample statistics (e.g., means, correlation coefficients) of primary interest in the study. **17.** Confidence intervals are reported for study effect sizes. **18.** Confidence intervals are interpreted by direct and explicit comparison with related CIs from prior studies.

Guidelines for Evidence-Based Practices

Correlational studies are primarily designed to address descriptive questions (e.g., What is the association between opportunities to respond to academic instruction and academic achievement?). They may also be applied to process questions (e.g., Are teacher or subject characteristics associated with the effectiveness of a teaching strategy or intervention?). Although experimental group designs, quasiexperimental designs with sufficient controls, and single subject designs are experimental (i.e., they actively "manipulate" an independent variable while document changes in the dependent variable, infer causal relationships), some research questions are not amenable to active manipulation. In such situations, sophisticated correlational designs, such has structural equation modeling or hierarchical linear modeling, may be used to make causal-like inferences. Thompson et al. (in press) proposed that this may be done in two ways—through statistically testing rival hypotheses and by logically discounting rival hypotheses (See Table 6).

Table 6:
Guidelines for Evidence-Based Practice from Correlational Research

1. Correlational research designs can generate evidence about the general reliability and validity of assessments or assessment practices that are commonly used. In research, such psychometric information on reliability should be provided for the actual data collected in the research study.

2. Correlational designs such as simple or multiple regression provides descriptive evidence of the association between practices and outcomes. Such evidence may establish initial hypotheses about effective practices, factors that affect the effectiveness of practices, and contexts in which practices are more or less effective.

3. For situations in which causal evidence is important, but the alternatives for using an experimental, quasi-experimental, or single subject designs are impossible, correlational designs may be used to generate causal-like interpretations when proper controls are established.

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Table 6:
Guidelines for Evidence-Based Practice from Correlational Research

a. Structural equation modeling may provide evidence for hypotheses related to effectiveness of practices and examine rival hypotheses that could account for evidence of effectiveness.

b. Correlational designs may provide evidence for the logical exclusions of rival hypotheses when outcomes for groups of students are compared but random assignment was not possible.

Qualitative Design

Definition

Relative to the previously discussed research designs, a more heterogeneous set of methodologies are included within the qualitative genre (e.g., action research, case study, ethnography, naturalistic inquiry, interpretive research). Brantlinger et al. (in press) propose that "…qualitative research is a systematic approach to understanding qualities, or the essential nature of a phenomenon, within a particular context." Like other research designs, qualitative research is scientific in that it is empirical (i.e., derives knowledge from the senses), consists of systematic procedures, and results in a coherent articulation of findings. Often researchers apply qualitative research in an inductive way (e.g., through grounded theory) in that they may begin with focal questions but without hypotheses, then establish and confirm hypotheses from the data collected. Qualitative research may also be used in a deductive manner in which they document through interviews and observations the validity of hypotheses they have about social phenomena. In qualitative research, investigators are sometimes described as the "research instrument," in that they draw on their understanding of the research context, the phenomena under study, and the data collected to draw conclusions.

Quality Indicators for Qualitative Research

Three primary techniques are used in qualitative research — interview, observation, and, document analysis. Quality indicators for each of these techniques appear in Table 7. Additionally, in qualitative research, specific techniques have been developed to document the trustworthiness and credibility of the analysis of qualitative research data. Although not direct analogs to reliability and validity, they allow the researcher to establish readers' confidence in the conclusions drawn from the data and to discount rival hypotheses to conclusions that the researcher has drawn from the data.

Table 7:
Quality Indicators for Qualitative Research

Interview Studies (or Interview Components of Comprehensive Studies)	**1.** Appropriate participants are selected (purposefully identified, effectively recruited, adequate number, representative of population of interest). **2.** Interview questions are reasonable (clearly worded, not leading, appropriate and sufficient for exploring domains of interest). **3.** Adequate mechanisms are used to record and transcribe interviews. **4.** Participants are represented sensitively and fairly in the report. **5.** Sound measures are used to ensure confidentiality.
Observation Studies (or Observation Components of Comprehensive Studies)	**6.** Appropriate setting(s) and/or people are selected for observation. **7.** Sufficient time is spent in the field (number and duration of observations, study time-span). **8.** Researcher fits into the site (accepted, respected, unobtrusive). **9.** Research has minimal impact on setting (except for action research which is purposely designed to have an impact). **10.** Field notes are systematically collected (videotaped, audiotaped, written during or soon after observations). **11.** Sound measures are used to ensure confidentiality of participants and settings.
Document Analysis	**12.** Meaningful documents (texts, artifacts, objects, pictures) are found and their relevance established. **13.** Documents are obtained and stored in a careful manner. **14.** Documents are sufficiently described and cited. **15.** Sound measures are used to ensure confidentiality of private documents.
Data Analysis	**16.** Results are sorted and coded in a systematic and meaningful way. **17.** Sufficient rationale is provided for what was (or was not) included in the report. **18.** Documentation of methods used to establish trustworthiness and credibility are clear.

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Guidelines for Evidence-based Practices

Brantlinger et al. (in press) propose that: "Qualitative research can be done for a multitude of purposes, however, these might be condensed to fit under the National Research Council's categories of producing descriptive or procedural knowledge; that is, answering questions about 'what is happening?' and 'why or how it is happening?' (Shavelson & Towne, 2002, p. 99)." Descriptive information from qualitative studies may lead, for example, to an understanding of individuals with disabilities, factors affecting families, instructional or learning contexts, organizational or policy factors affecting the use and/or effectiveness of instructional techniques, and community variables that affect individuals with disabilities.

Brantlinger et al. (in press) specify that "…qualitative research is not done for purposes of generalization, but rather to produce *evidence* based on the exploration of specific contexts and particular individuals." The results of a qualitative study become *evidence* for effective practices when the reader judges that the participants, setting, and other features of the instructional context of the study are similar to her/his own context and that the qualitative researcher's evidence makes sense (see Table 8).

Table 8:
Guidelines for Evidence-Based Practice from Qualitative Research

In qualitative research, "evidence" depends on the interpretation of the findings by the readers of the research and judgments that the findings would apply in her/his own context. As such, a practice may be evidence-based from a qualitative perspective when:

1. Readers judge that adequate data collection and analysis techniques were used in the study.
2. Readers judge, from a high quality qualitative study or studies, that the practice had important outcomes for participants in the study or result in important changes for participants.
3. Readers judge, from a high quality qualitative study or studies, that the practice is pertinent to the students or other individuals with whom they would apply it.
4. Readers judge, from a high quality qualitative study or studies, that the practice is appropriate and applicable in their context (e.g., classroom, school, community).

Conclusion

The process of creating quality indicators for research is not unique and in fact has been conducted by other professional organizations. The quality indicators in this document, however, differ from previous work of others. First, these indicators, while applicable to other fields, focus on methodologies used most often in special education.

Second, an attempt was made to step beyond the identification of indicators of high quality research and to propose how research findings could be used as evidence for effective practices. Again, this was unique in its application to special education research.

Over time, standards for quality in research methodologies and levels of evidence necessary to substantiate the effectiveness of practices evolve. The current work was a first attempt to specify the necessary features. The Task Force expects that these indicators and guidelines will be provocative, in that they will rouse discussion and foster reflection among researchers, practitioners, and policymakers.

The currency of these indicators and guidelines will erode over time, so Task Force members expect that they will be revised. We do hope, however, that the papers produced by this task force will prove helpful to students learning to conduct research, investigators planning or writing up their research, individuals reviewing journal manuscripts or grant applications, and consumers who are trying to determine if a study is of high quality and whether it provides evidence of the effectiveness of practices in special education. ❖

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