Studying Educational Effectiveness in Rural Settings: A Guide for Researchers

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Introduction—geographical differences and appropriate approaches

America is a nation of large, densely populated urban cities; medium-sized suburban communities; and small towns and rural communities. The nation's public school systems reflect its geographic diversity. New York City enrolls about one million K–12 students within its 305 square miles, about 3,500 students per square mile.[1] Montana, Nebraska, Kansas, and North Dakota enroll about one million K–12 students within their 373,000 square miles, about 3 students per square mile.[2]

All across America, in urban, suburban, and rural communities, effective schools can contribute to economic and social development (Beaulieu & Gibbs, 2005). Effectiveness research, which can provide credible and reliable evidence of the ability of a practice, program, or policy to improve outcomes, is central to educational improvement.

Educational effectiveness studies present challenges because they encompass a wide range of possible research questions and approaches. A study of a whole-school reform model differs from a study of a behavior intervention for students that are acting out; a study of a professional development program for teachers differs from a study of an intervention for struggling readers. Research in rural areas adds the challenges of large distances between schools and less dense populations from which to draw study samples.

This guide is written as a guide for experienced researchers, which include Regional Educational Laboratory (REL) and other education researchers who are interested in conducting effectiveness studies in rural areas. Less experienced researchers also may benefit from the recommendations, but the guide focuses on issues that experienced researchers will recognize. In particular, the discussion assumes that readers are familiar with experimental and quasi-experimental design concepts and terms and have implemented studies and collected data on school settings.

There are four factors to consider when conducting educational effectiveness research in rural settings: (1) study design, (2) recruitment of participants, (3) supporting and monitoring

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[1] Actual 2015/16 school year K–12 total enrollment for the New York City (NYC) Department of Education is 1,062,116 students (as of October 31, 2015); see http://schools.nyc.gov/NR/rdonlyres/20056B95-8351-4E45-B8A1-9901B4B6A93B/0/DemographicSnapshot201112to201516Public_FINAL.xlsx. The total land area for NYC is 304.8 square miles; see http://www1.nyc.gov/assets/planning/download/pdf/community/community-portal/profile/nyc_profile.pdf. Based on these figures, the number of students per square mile for NYC is 3,484.63.

[2] Total K–12 enrollment figures for public elementary and secondary schools were obtained from the Institute of Education Science (IES) National Center for Education Statistics (NCES), "Digest of Education Statistics, Table 203.20. Enrollment in public elementary and secondary schools, by region, state, and jurisdiction: Selected years, fall 1990 through fall 2024;" see https://nces.ed.gov/programs/digest/d14/tables/dt14_203.20.asp. The combined fall 2015 projected enrollments for Kansas, Montana, Nebraska, and North Dakota is 1,056,600 students. The combined land area for these four states is 373,215 square miles; see http://www.worldatlas.com/aatlas/infopage/usabysiz.htm. Based on these estimates, the number of students per square mile for the four respective states is 2.83.

implementation of the intervention, and (4) data collection.[3] This guide discusses each of these factors.

1. Planning an effectiveness study: selecting the research question(s) and determining the research design for rural areas

The first step in an effectiveness study is to decide about the research question(s) to ask. Although rural and urban educators might be interested in the same question, some questions are more relevant in rural areas than in urban areas. Educators in rural areas may want to know about the effectiveness of reading programs that can be carried out with small classes, or the effectiveness of mathematics programs that blend students into heterogeneous classrooms across various skill levels or that blend grade levels; both "blends" can be features of small classrooms in rural schools. In contrast, educators in urban areas may want to know about the effectiveness of grouping or reciprocal teaching strategies that can be used in large classrooms.

The next step in planning an effectiveness study is to determine its research design. A central decision is whether to conduct an experiment, in which a study's participants are randomly assigned to a treatment or control group, or to conduct a quasi-experiment, in which a study's participants are matched with a group of similar students, teachers, or schools. The strength of experiments is that they yield "internally valid" estimates of a program's effects, which means that the measured effect is the program effect and not something else.

Consider validity, cost, and feasibility

A typical random assignment experiment creates two groups that are statistically identical except for the offer to participate in an intervention. If the random assignment experiment is well-designed and well-implemented, "researchers can be more confident than when using other research designs that they are measuring program effects and not effects of something else" (Scher, Kisker, & Dynarski, 2015). The program causes the effect.

Quasi-experiments cannot claim this same kind of causal attribution. Regardless of how well groups are matched, they may differ in characteristics that are not observed but that affect outcomes. However, "when conducting an RCT is not possible, a strong quasi-experimental design study (QED), or quasi-experiment, can provide valuable evidence about a program's effectiveness" (Ibid.). As long as the disadvantages are recognized, these studies can build knowledge in situations where experiments are not feasible.

The greater validity of an experiment over other research designs is unrelated to whether an experiment is conducted in a rural, urban, or suburban area. Experiments in rural areas have the

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[3] The design and execution of studies for rural schools was the focus of the National Center for Research on Rural Education supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C090022.

same strength as experiments in urban areas. But density and distance affect how much experiments will cost and which kinds of interventions or programs are feasible to study. Studying a program that involves in-person observations or regular meetings with teachers, for example, will be less expensive in an urban area where traveling from one school to another might take minutes. The same study will be more expensive in a rural area, perhaps prohibitively so, if traveling to the school, or between schools, takes hours.

Consider economical study designs that still achieve adequate statistical precision

Researchers conducting studies in rural settings should consider economical designs that achieve adequate statistical precision despite challenges of wide geographic distances and the low student density in schools. Studies in rural areas benefit from designs that economize on "size," for example, by reducing the required number of participating schools, teachers, students, or parents or the amount of data needed to measure impact. Standard statistical formulas show that a study's statistical precision increases as its sample size increases.[4] If a study of an innovative education program needs a sample of 3,000 students to determine whether the program is effective (with acceptable precision), researchers could find those students in a couple of square miles of New York City, but it might require a thousand square miles in a rural state like Kansas. Although both sites might be interested in the results of the study, it will obviously cost much more to conduct the study in Kansas. On this basis of density alone, conducting the study in New York City seems desirable. But findings from the study in New York City may have limited applicability in Kansas.

Further, some interventions simply may not be feasible to implement in a rural setting. For example, an effective approach to teaching reading by grouping students according to skill levels might be easily implemented in an urban school but not be possible in a rural school with four students in a grade level.

The array of choices that a research team is faced with in designing an effectiveness study—the intervention, the setting, the desired sample sizes, and the desired follow-up periods—is too wide for any single design to be "the" right one. The following examples discuss units of analysis[5] and describe designs that are appealing, even though implementing programs and collecting data are costly.

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[4] For more information on WWC standards for reporting magnitude of findings, assuring statistical significance, screening and reviewing group designs, and applying other related study standards, see the *WWC Procedures and Standards Handbook*, available at
http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v3_0_standards_handbook.pdf.
[5] According to the WWC, a unit of analysis is defined as "The level at which an analysis is conducted. For example, a study that looks at student outcomes will likely conduct the analysis using student-level data" (see http://ies.ed.gov/ncee/wwc/glossary.aspx). The unit of analysis is determined in the study design phase and generally will be limited by the nature of the specific research questions to be addressed by the study.

For experiments in which whole schools are the units of analysis

- **Match schools into pairs before randomization** (for discussion, see Ji et al., 2008)**.** Matching pairs forces intervention and control groups to be more similar on average for the same number of schools, which increases a study's precision. A study that includes schools with a variety of income levels will have more precision if schools are first paired by their income levels and then schools within each pair are randomized to condition. Not pairing before randomization means that one group might contain more high-income schools or low-income schools by chance, which contributes to greater variability of impacts.

- **Select schools that are more similar to each other.** This is different from pairing, which was discussed in the previous suggestion. Select all schools for the study to be similar in terms of, for example, enrollment, demographics of their students, and average achievement levels. Selecting similar schools will reduce the variance of the outcome, which improves precision.

- **If a study can be conducted over several years, consider a design in which schools are first randomized and then cross over (treatment to control and control to treatment).** For example, a school that is in the intervention group in the first year could be in the control group in the second year, and vice versa for schools in the control group. "Crossover" designs have a long history in clinical trials (Stufken 1996; Jones & Kenward, 2014). The crossover approach increases precision because it eliminates school-specific factors as sources of variance. Researchers can compare outcomes of cohorts in the two years within the same schools (assuming that adjacent cohorts do not differ for other reasons) and can compare outcomes between treatment and control schools in the same years.

- **Use a stepped wedge design.** The "wedges" might be, for example, groups of schools that implement a program at intervals, such as semesters or school years. While a standard treatment group is randomly assigned to receive the intervention in the first year or semester, other schools are assigned to "delayed-treatment control groups" who will eventually receive the treatment as well. For this reason, these designs are sometimes referred to as delayed treatment designs. Since all schools ultimately receive the program, this design increases their appeal to school districts. Hussey and Hughes (2007) discuss technical aspects of these designs, and Brown and Lilford (2006) provide a systematic review of them.

For experiments in which the units of analysis are subgroupings within schools

- If an intervention or a program operates in different grade levels at the same time, assign schools to the treatment group for one grade level and to the control group for the other. For example, if an intervention is a new reading curriculum for fourth and fifth graders, a school can be assigned to the intervention group for fourth grade and to the control group for fifth grade. Other schools would have the opposite assignment, resulting in a complete study but with half the number of schools.

- Depending on the research question, randomizing classrooms or students within schools may be feasible. This design increases statistical power because it eliminates variation that is due to school-specific factors. Within-school designs are appropriate for interventions that are not intended for a whole school (or a whole grade level within a school) and for interventions that are easily controlled so that only the intervention group can access them. Agodini et al. (2003) discuss issues in school-versus classroom-level random assignment.

- *Use single-case designs, also known as single-subject designs.* Variants of single-case designs share this feature: outcomes of individuals when treated are compared to outcomes for those same individuals when not treated. These designs are not appropriate to address some research questions. For example, an intervention to improve student behavior could use this type of design because all students can be observed with and without the intervention; behaviors would be expected to change or improve when an intervention is provided and regress if the intervention is withdrawn. However, an intervention to improve science test scores by using inquiry approaches could not a use single-case design, because once students are exposed to the intervention, effects of the intervention are not expected to diminish if it is withdrawn. Smith (2012) reviews single-case designs, the What Works Clearinghouse provides standards for them, and a 2014 special issue of the *Journal of School Psychology* explores current research issues about them.

For experiments in which the unit of analysis may be either schools or subgroups within schools

- If the subject of the study is teacher behavior, the research team may want to *focus on intermediate outcomes rather than longer term outcomes*, such as student achievement. Interventions or programs often have larger impacts on intermediate outcomes, such as measures of teacher subject knowledge, than on longer-term student outcomes, such as achievement test scores. These larger impacts can be detected with smaller samples. This approach, focusing on intermediate outcomes, can be adopted if there is a conceptual model or previous research indicating that an intervention affects intermediate outcomes that, in turn, affect outcomes that are longer term.

- *Use planned missing data designs*, which can reduce the burden of collecting outcome data. A planned missing data design reduces the number of items in a measure and administers the reduced sets to randomly selected groups of participants. The reduced sets collectively compose the full measure.[6]

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[6] Refinements of this approach include (1)"matrix sampling," in which each subgroup of participants is administered a different measure with no overlap in measures between subgroups (Shoemaker, 1973); (2) "*fractional block designs*," in which each subgroup is administered a fraction of the total battery with some overlap between groups (McArdle, 1994); and (3) "*three-form*" design (Graham, Hofer, & Piccinin, 1994), in which items or measures within a battery are split into four sets and participants are administered one of the four sets plus some of the other sets according to a randomized pattern.

- *Use a regression-discontinuity design.* The opportunity for using regression-discontinuity designs arises when there is a threshold or cutpoint to determine which schools, teachers, or students are served. For example, supplemental services might be provided to students whose test scores fall below some threshold. Especially with increasing availability of state longitudinal data (Levesque et al., 2015), regression-discontinuity designs can be conducted in rural areas for no more cost than in urban areas. Jacob et al. (2012) review regression discontinuity designs, and the WWC establishes criteria for eligible group designs that meet IES standards.

Researchers need to consider tradeoffs in judging whether a design is right for a particular study. Tradeoffs are not unique to studies in rural areas, but features of rural areas, such as small class sizes and large geographic span, may require more compromise than is typical for most studies in nonrural settings. For pilot or exploratory efforts, the research team may elect to conduct a small study; for evaluations of high-profile interventions or programs, it may conclude that a larger study is called for. Regardless of sample size or sampling limitations, the What Works Clearinghouse has standards that can help a research team in making its decision.

2. Recruiting for experiments in rural areas

After selecting the research question for a rural study and deciding on an appropriate design, the researcher's next step is to recruit participants. Before developing a plan for recruiting participants, it will be useful to consider the relevance of the study to the potential pool of district and school candidates. Potential participants will want to know what the benefits and incentives are before agreeing to take part in the study. If a study is aligned with a state-mandated program or initiative, the incentive will be built in for the candidate pool. If subjects have not had any experience with research studies, they may be hesitant about participating because they are unfamiliar with what is involved. Therefore, recruiting for studies in rural schools may be more difficult than recruiting in urban and suburban areas because of rural subjects' hesitancy.

A research study may need several states, entire districts, several schools, or one school, depending on the research design. Recruiting participants in rural areas can be more challenging than urban or suburban areas because of the remote location or distance between schools. It's preferable to have face-to-face communication with potential participants to explain the study and its potential benefits, but that may take more time and resources to arrange. And rural schools and communities may be skeptical about research and wary of researchers who are not from the rural area. The challenges can be surmounted (Sheridan, Kunz, Holmes & Witte, in press). Researchers who focus on rural schools and districts have developed strategies for addressing the challenges (see Table 1) of conducting effectiveness research in rural settings.

Table 1. Challenges and strategies for recruiting rural schools to participate in research studies

Challenges	Strategies
Distrust and skepticism	
• Perceptions about research procedures and the diffusion of inaccurate information may create community distrust of researchers from outside the community.	• Obtain district support for the study before it begins, provide teachers and school leaders with copies of an agreement signed by the superintendent or principal ensuring confidentiality, and adequately address questions of confidentiality during faculty meetings.
• Small settings may create a perception that researchers cannot maintain confidentiality. Identifying study participants based on disability, low achievement, or other disadvantaged criteria may create concerns regarding perceptions of negative stigma.	• Establish an advisory committee of individuals from the region (including teachers and parents) in which the study will take place. Explain the purpose and benefits of the study, discuss how confidentiality will be maintained, and solicit their ideas about how to adapt the study to the community culture.
	• Hire local community members to serve as liaisons or community brokers who are available to answer questions, support recruitment and retention efforts, address issues immediately as they arise, and ensure a visible presence within the school and community.
	• Hire a recruitment manager from the community to visit study schools on a regular basis. This could be a retired principal or teacher who is familiar with the educational system and the community.
	• Send letters to the parents explaining the purpose of the study, assurance of confidentiality, and *voluntary* nature of participation.
Limited information and research experience	
• Because of the limited number of studies previously conducted in rural areas, rural school administrators may not be familiar with research requirements, such as conducting randomization and using protocols for monitoring and data collection.	• Create a document with responses to Frequently Asked Questions (FAQs) to dispel misunderstandings.
	• Avoid educational jargon in written communication.
	• Use Power Point, Prezi, or similar presentations, videos, fliers, and newsletters to explain the benefits of participating in the research.
	• Use clear language that is written at approximately an eighth-grade reading level.
	• Link the research to school goals for improvement or to state-mandated initiatives when possible.
Logistical issues	
• Low enrollment in rural schools means more schools may need to be recruited.	• Ensure that the research team has sufficient funds for personnel, travel, and technology before beginning the study.
• Geographic dispersion makes it difficult to establish relationships through in-person meetings with potential school partners and the local school community.	• Meet participants in their community rather than ask participants to travel to another location.
• Opportunities to conduct virtual meetings may also be limited because of technology limitations.	• Determine whether existing computing and networking technology in the schools will meet the needs of the study.
	• Establish a relationship with teacher leaders in the school who can persuade others to cooperate.
	• For each school participating in the study, get to know the school secretary and the custodian. The secretary is the gatekeeper to the principal, and the custodian can help with meeting space after school hours.

A description of how one study was designed to address the challenges of recruiting for an experiment in rural schools is detailed in Box A. The program involved a complex intervention to reduce student behavior problems.

Box A. Recruiting for an experiment in rural schools: features of the conjoint behavioral consultation study

The "Conjoint Behavioral Consultation" study was designed to measure the effectiveness of an approach for reducing student disruptive behaviors through family-school partnerships.[7] The study set strict criteria for students to be in the treatment group so that only a few students in any school would be eligible to participate. The research team adopted a recruiting strategy that initially spanned several states. Ultimately, 90 students in 54 schools were recruited. More information about the study can be found at http://ruralcbc.unl.edu. The following strategies are used in this study to recruit in rural schools and are recommended for additional studies:

- **Build relationships in the local communities.** The study hired a recruitment manager who had been an experienced administrator in rural Nebraska schools. Because the manager had credibility among other administrators and knew many of them, he used his personal relationships to allay skepticism and build trust among community members and the research team. After the recruitment manager made personal contacts with local educators, recruitment of teachers and families began. Study staff were frequently visible in the communities. Whenever possible, they were assigned to multiple communities within the same region to economize on travel time. They also were encouraged to attend local school events, such as field days and sporting events. Being in communities helped them field questions about the study and dispel misperceptions. Interacting with community members also helped to increase positive word of mouth about the study.

- **Establish partnerships with schools.** The study created coalitions of "partner schools" in the state's rural regions. Administrators in these coalitions helped researchers identify how study procedures could be integrated with existing district or state programs or initiatives and help achieve common goals. Folding study-related training into general professional development with the same staff increased study participation. The coalition also linked the study to state mandates for data-based decision making, which increased its appeal.

- **Engage local specialists.** The study was housed within a land-grant university[8] that operated an extension network. Extension specialists already worked in all counties in the state to make research-based practices accessible to practitioners, and the study drew on their knowledge and experience. Other nonprofit organizations that shared similar goals used their networks to disseminate information about the study to parents and caregivers.

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[7] This research was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324A100115.
[8] Land grant universities emphasize access to higher education, practical applications, and connections beyond the institution.

- **Maximize use of technology.** A study-specific webpage was developed, which provided easy access to enrollment and participation materials. The website featured a map that highlighted participating communities and gave links to primary contacts in the communities. Video testimonies from participants provided a personal experience with project expectations and potential outcomes. Social media venues provided access to information about new opportunities and developments within the study as well as general information related to rural education of interest to partner schools. Web-based meetings served as an inexpensive and convenient tool for recruiters to meet virtually with school leaders. Web-based meetings also enabled staff to connect with administrators for initial meetings. In-person meetings often followed Web-based initial meetings, but being able to share information initially through a virtual meeting helped personalize the study and saved resources if schools were not interested or did not meet the criteria to be in the study.

3. Supporting and monitoring implementation in rural areas

After a research team has (1) determined a study's design and (2) recruited, selected, and assigned participants to treatment or control status, it is important to support and monitor implementation of the study's intervention. In some cases, researchers work with schools and districts to investigate the efficacy of new interventions or programs aimed at achieving important educational outcomes. Researchers in these situations may be responsible for recruiting schools and staff and training them to implement the program, in addition to studying the program's effectiveness. In other cases, researchers are asked to determine the effectiveness of programs being implemented at the discretion of districts or schools. For example, a district might roll out a new program for students struggling to learn fractions, and the role of the researcher is to design a study and assess the implementation and effectiveness of that program. The researcher is not directly responsible for implementing the program. In both situations, the ability to draw conclusions about a program's or intervention's impact on outcomes of interest requires assurance that the program is implemented in an accurate and reliable manner. Oftentimes, this creates a need for researchers to support and monitor intervention implementation in schools.

Supporting Implementation in rural areas

This section describes ways for researchers to support implementation of programs in rural schools. The approaches include providing Web-based training; engaging local staff such as coaches, teacher leaders, school psychologists, or special education teachers to deliver program services directly; monitoring implementation; using permanent products; collecting self-reports; and reviewing two-way video observations or recordings.

Provide Web-based video training

Web-based training provides flexible access to study trainings and materials and bypasses the costs and resources associated with face-to-face training (Kratochwill, Elliott, Loitz, Sladeczek, & Carlson, 2003; Webster-Stratton, 1992). Web-based training is particularly useful in rural areas in which educators have multiple roles within the school and larger community, which limits their time available to participate in training. By using the Web, educators can be trained at their convenience, which avoids disrupting routines and responsibilities. It requires access to high-speed Internet, and interactions between participants and trainers are likely to be less personalized than face-to-face training.

Technological innovations are creating more opportunities for two-way video interaction between trainers at the study center and trainees at study schools. Two-way video interaction offsets the lack of personal contact that characterizes other types of Web-based training. Two-way video also can be used as an occasional check-in to ensure that other forms of Web-based trainings are working effectively (Mortenson & Witt, 1998).

Relying on video-mediated training and coaching raises the potential challenge of forming trusting relationships between trainers and school-based trainees. The research team will have a greater chance of establishing trust through video training than through virtual or electronic training that does not include video, though in-person training is the easiest way to establish trusting relationships. Trust is especially important for supporting implementation fidelity, which requires assessing professional practice and providing feedback about performance. It requires a trainer to be trusted by trainees as someone with credibility who can provide assistance and support in a way that is nonjudgmental and constructive. To address this challenge in one study, research team members visited schools and interacted with participants to build relationships early on, before intensive training and coaching began. Carefully structured training can then involve a significant amount of time interacting with trainees to strengthen relationships that will serve as a foundation for future work. Technology-based support can be interspersed with periodic school visits to maintain these relationships.

Engage implementation partners

When possible, it is desirable to engage local school and district staff in developing intervention plans and programs and gain their commitment to delivering it. Partnership-based strategies in which researchers and intervention implementers (for example, teachers and parents) share responsibility for developing intervention plans and assessing their implementation have been associated with high levels of implementation fidelity (Kelleher, Riley-Tillman, & Power, 2008). Approaching research as a collaboration with rural school partners, clarifying roles and responsibilities, providing training and support to intervention agents (for example, teachers and parents) and using agreed upon checklists to monitor implementation accuracy are useful supports. Table 2 highlights these strategies with practical examples. "Conjoint Behavioral

Consultation (CBC) in Rural Communities" (see project website at http://ruralcbc.unl.edu) used these collaborative strategies, built accountability among the team, and ensured that implementation of individualized behavioral plans was feasible and effective.

Table 2. Examples of strategies for supporting implementation of interventions in rural schools

Approach	Strategies
Collaboratively determine feasible intervention plans.	• Encourage teachers, parents, and other participants to share relevant information about students' behavior, and integrate their ideas into intervention plans. • Solicit information from parents and teachers on regular classroom and household routines to ensure that intervention activities fit within existing procedures. • Develop interventions that include physical materials (i.e., permanent products) that capture instances of implementation (e.g., home-school notes, self-monitoring sheets). • Co-determine all resources (e.g., paraprofessional educators) and materials (e.g., jars to hold tokens) necessary to implement the intervention, and develop a plan to obtain the items.
Establish shared responsibility for intervention implementation.	• Develop a communication system (e.g., home-school note, home-school e-mail) by which parents and teachers can share information about students, their intervention plans, and outcomes. • Determine a plan for research staff to check in with parents and teachers to discuss intervention implementation.
Train teachers and parents to implement interventions.	• Ask teachers to problem-solve barriers to intervention implementation as a training activity. • Model, practice, and role-play intervention implementation. • Review and discuss implementation data (e.g., from checklists) regularly and provide specific feedback to improve intervention delivery.
Co-develop fidelity checklists with teachers, parents, and other participants.	• Start by providing a rationale for collecting information about implementation, and seek agreement on the need to develop a checklist. • Ensure that the checklist is easy to use and that critical steps are delineated. • Pre-determine a location (e.g., refrigerator, bulletin board) to keep the checklist that will prompt parents and teachers to complete the form. • Identify a time and place when teachers, parents, and other participants can fill out the checklist.

Monitoring implementation in rural areas

Supporting implementation, as discussed in the preceding section, mostly begins during the start-up phase of a program or intervention and continues throughout the operation of the program. *Monitoring* implementation begins after the initial start-up phase of a program and assesses whether elements, structure, and services of a program are aligned with the program "model." Monitoring implementation and supporting it should be done by different study staff to prevent biasing findings from the monitoring process. This section describes approaches that researchers

can use to *monitor* implementation, such as examining "permanent products," collecting self-reports, and reviewing video observations and recordings.

A program model typically specifies input requirements—such as staff training, materials and supplies, a physical space—screening or selection approaches to identify participants, and ways for ongoing services to be delivered. To monitor implementation, a study should measure what actually happened during various phases of a program. Monitoring can ask questions such as

- Did staff attend training?

- Was the training curriculum delivered?

- Were supplies purchased and space found?

- Was screening conducted as planned?

- Did staff deliver the program curriculum?

- What was the nature of feedback provided to staff about their delivery of the curriculum?

Wide variation in resources, skills, contexts, buy-in or trust, and technical support can create variability in implementation. Reducing this variability of implementation helps to ensure that programs are implemented with fidelity to their model (Knoche et al., 2010).

Traditional strategies to monitor and support implementation rely on contact with program implementers—for example, by providing on-site trainings, conducting observations of program delivery, and providing face-to-face feedback or coaching. Rural schools may lack the infrastructure needed to support implementation and may be too dispersed for traditional strategies to be feasible. Several strategies can offset the challenges and costs of monitoring implementation, which are explained below and summarized in Table 3.

Use permanent products

Permanent products are records, such as notes between the home and school, behavior charts, and completed assignments (Sheridan et al*.,* 2009). These products can be counted or summarized to measure that program steps were completed. For example, the proportion of classroom worksheets that show student work and teacher comments may be an implementation measure for a program designed to encourage teachers to provide feedback to students (Fiske, 2008). The worksheets are easy to collect without creating a burden on local staff and do not require observers in the field (Sheridan et al., 2009). Likewise, concrete evidence of a student's desirable behavior in response to a teacher's prompt (such as stickers or tokens) can be useful in documenting the delivery of intervention components.

Collect self-reports

Self-reports are an efficient method of assessing implementation when direct observation is infeasible and permanent products do not provide enough information (Sanetti & Kratochwill,

2009; Dusenbury, Brannigan, Falco, & Hansen, 2003; Sheridan et al., 2009; Sheridan, Rispoli, & Holmes, 2014). For example, the stages of an intervention could be laid out on a checklist that local staff use to record whether stages were completed. Contact logs, another kind of self-report, can be used to document time spent delivering an intervention and material or topics covered. One study found that teachers and parents completed self-reports about twice a month and that the information was similar to what was found by direct observation (Sheridan et al., 2009). Of course, researchers who use self-reports need to consider the possibility that respondents are affected by reference bias[9] and should design self-reports accordingly. Items that call for respondents to judge whether an action was performed frequently or rarely, for example, introduce the possibility of reference bias. Staff of one school might consider a weekly occurrence of a behavior to be "frequent," and staff of another school might consider a weekly occurrence of that same behavior to be "rare" (Duckworth & Yeager 2015). Defining terms in the self-report instrument, for example by indicating how respondents should interpret "frequent" and "rarely," can mitigate some of this bias.

Review video observations and recordings

Video observations of implementation can be used to supplement self-reports and to assess their validity. Program or study staff can use video recording equipment to capture program sessions. Researchers can view videos, code observations, and use the codes as measures of implementation. These codes can be compared with self-reports to assess their validity.

Using video to conduct classroom observations of teaching practices is becoming a more acceptable practice to teachers (Kane & Greenberg 2015). Video observations recently were used in two studies in rural schools—one about improving student behavior and the other about delivering professional development to science teachers to promote inquiry-based science teaching (Sheridan et al., 2009; Kunz et al. 2013). For both studies, teachers were provided with video cameras and shown how to use them and send files to researchers. Both studies successfully collected hundreds of observations, and teachers reported that video observations were less intrusive than having observers in classrooms. Teachers situated camcorders in unobtrusive classroom locations that provided in one study a close-up view of a specific student and the student's work area, and in the other study, a full view of the classroom. Teachers uploaded the video files to secure portals provided by the research team.

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[9] Reference bias: a bias that might be present in groups that have different standards or reference points for comparing traits, actions, or conditions. A term might mean different things to different groups of people.

Table 3. Examples of strategies for monitoring implementation in rural areas

Approach	Strategies and tools
Collect "permanent products," which are permanent records of intervention implementation that reflect planned intervention components.	• Home-school notes, charts, tokens, worksheets • Student work products with teacher feedback
Use self-reported data from research participants' reports about implementation plans, dosage of the program offered and received, and quality of program delivery.	• Pre-developed forms or checklists of engagement in intervention implementation • Paper contact logs of time spent implementing an intervention • Digital diaries with real-time tracking of system usage
Conduct video observations, in which teachers self-record their implementation of the intervention and the students engaged in learning the desired behavior in their classrooms.	• Unobtrusive web-cam with wide angle lens and wireless microphone worn by the teacher and used to capture classroom environment and teacher-student interactions • Records of teacher participation in training methods for setting up, recording, and downloading or returning video files

4. Collecting outcome data

The geographic constraints and small classrooms commonly found in rural settings may make collecting data on-site prohibitively expensive. These barriers are problematic for programs that rely on observations of classrooms or program settings or that measure student proficiencies by using on-site tests that require students to read aloud to be scored and thereby require on-site research staff presence. Of course, using existing data is likely to be one of the least expensive approaches. As with monitoring implementation, technology offers approaches that can reduce these costs; also, using local staff can reduce costs. This section discusses more detailed approaches that could be more economical for collecting data in rural settings.

Use existing data in state longitudinal data systems (SLDS)

Depending on the study design and research questions, data that has already been collected and maintained as part of a state system may reduce the amount of original data that the research team needs to collect. Levesque et al. 2015 discuss research uses of state longitudinal data. Rural districts or consortia of districts can be settings for opportunistic experiments, which, in combination with state data, increase options for conducting experiments with minimal data-collection costs. Resch, Berk, and Akers (2014) describe and provide examples of opportunistic experiments in education. To obtain the data needed for the study, the research team may need to talk with state education department staff who maintain the state longitudinal database.

Use available data as pretests

Statistical precision is greater when pretests (administered before or at the beginning of a study) are used to explain posttests (administered during a follow-up period). However, as Bloom et al. (2005) show, in school settings, virtually no precision is lost if school average pretest scores are used in place of individual pretest scores. School average scores are readily available, often on Web pages or online report cards. The research team may determine that it is not necessary to expend resources for testing or to collect other "pre" data or that it is not necessary to expend resources to obtain student or teacher data files.

Use technology

Besides using technology as a means to overcome challenges associated with supporting and monitoring implementation in rural settings, researchers can also use technology to reduce data-collection costs that are incurred because of the larger geographical areas of most rural settings. Technology can also reduce the burden that an on-site data collector might impose in small classrooms, whether or not the setting is rural.

Distance technology software can be used to collect some kinds of data in rural schools, such as focus group data, without the need for an on-site interviewer. These technology applications offer a secure, Web-based video connection that more closely approximates the experience of on-site interviews than a telephone interview would. The challenge in using technology is to make sure that the equipment is in proper working order, the software is up to date, and participants agree to use it. Selecting a teacher who is knowledgeable about technology and, if possible, providing him or her with a stipend to arrange the data collection activities can contribute to the success of this approach. Additionally, researchers have begun to use text messaging to collect data from rural participants (Lori, Munro, Boyd, & Andreatta, 2012).

Tablet computers that are increasingly accessible and available in classrooms for testing and assessment purposes can also be used by researchers to collect study data. Studies in rural areas where high-speed Internet is available could use tablets for testing students and collecting information from them or their classroom teachers. The information can be easily stored on the tablets and uploaded to a server—either at the time of collection, if wireless connections can be made, or later. Research that compares survey responses collected from tablets and traditional paper-and-pencil methods has found that survey respondents provide about the same responses but that respondents prefer using tablets (Newell et al. 2015). When considering the use of tablets for testing students, the research team will need to check with districts for regulations about security concerns and obtain parental approval. The team also may need to inventory tablets and determine who is responsible for distributing and collecting them.

Employ local staff

If assessment of participants requires face-to-face interactions, the team may still be able to collect data at distant sites as long as the study's design does not require data collectors to be members of the study team. Data collectors could be hired from the rural community itself. For example, researchers interested in collecting test scores from rural schools could hire local data collectors to administer tests. The use of local data collectors can reduce time and travel costs associated with testing participants in rural sites. Hiring local staff directly also has the benefit of involving members of the local community in the study and can strengthen partnerships between the research team and communities.

Hiring professionals with relevant skills can minimize the need for extensive training. Local school psychologists, for example, can be an excellent resource for conducting assessments in rural settings. They have experience assessing children as part of their regular role in schools, and are familiar with local schools and administrators. However, the research team should also keep in mind that educators in rural districts and schools often serve multiple roles within their school or the larger community. Thus, a local school psychologist may be too busy to participate in the study. In such cases, graduate students or retired educators in the community may be available to help with the study. When hiring persons who are not research professionals, it is critical that they be well trained in assessment protocols. Training can take place in centralized locations, such as community libraries, and using distance technology for the training can reduce costs further.

Hire a data collection manager

A strategy that helps overcome barriers during the data collection process and that applies to both rural and nonrural settings is to hire a data collection manager. A data collection manager can travel to remote sites to monitor data collection and establish and maintain relationships with research partners and participants. The manager can use these relationships to remind participants of the importance and benefits of research, maintain integrity of assessment protocols, and follow up on missing assessments. Additionally, by developing a relationship with study participants, a data collection manager may be able to help remove barriers associated with researchers being viewed as outsiders. The manager can answer participants' questions and follow up with them if they have not yet responded to a questionnaire or study requirement.

Use practical modes of assessment

Most researchers will not be in close proximity to the rural schools participating in a study. Ease and practicality of assessments are paramount. Having multiple ways, such as paper or Web, to complete an assessment will increase responses. Web-based assessments have demonstrated higher response rates than paper-based assessments (Baruch & Holtom, 2008), but the option of paper-based assessments may be needed in rural areas with limited computer or Web access (Porter, 2004). Using mobile Portable Document Format (PDF) scanners connected to computers provides

a simple and secure tool for transmitting paper forms or assessments. For participants who prefer Web-based assessments, the research team may consider using digital platforms so that participants can enter data on a secure project website or by using online survey software.

Provide incentives

Finally, paying incentives gives participants added motivation to complete and return assessments. Incentives for assessments can be paid either before an assessment is completed ("noncontingent") or after the assessment is completed ("contingent"). Noncontingent (prepaid) incentives are distributed when participants receive the assessment to be completed, such as mailing $2 to the participant with the assessment. Contingent incentives are paid after the assessment is completed and returned. Researchers can use Web-based assessments to deliver an immediate contingent incentive by sending an instant digital gift card redeemable at a local vendor. This option minimizes the time between completion of survey data and incentive, which behavioral theory suggests may increase the likelihood that participants will complete future assessments (Miltenberger, 2008). Both types of incentives can increase response rates (Porter, 2004); however, noncontingent incentives have been shown to be more effective than contingent incentives (Church, 1993).

5. Conclusion

This guide has presented ideas to help guide researchers interested in conducting educational effectiveness studies in rural settings. The four factors that were discussed were selecting a research design that is appropriate for the questions to be asked, recruiting participants for the study, supporting and monitoring the implementation of the intervention or program, and data collection. The scope of a study will depend largely on the resources available to the research team. Studies in rural settings tend to cost more than similar studies in urban or suburban areas because of greater distances that have to be traveled, less concentration of population for a desired sample size, and technology requirements. This guide has presented economical study designs that can help researchers achieve adequate statistical precision, use cost-effective strategies to support and monitor implementation, and develop alternative approaches for reducing the costs of data collection. Some technology-based solutions were presented that may help overcome challenges created by distance and geography—for example, using two-way video to conduct training. However, not all rural schools will have the technology that a research study may require, and it can be expensive to provide. Similarly, there may still be a need to conduct site visits and face-to-face meetings. Therefore, this guide has presented approaches that can help a research team overcome these additional challenges to research in rural settings, such as hiring local staff to conduct training or classroom observations. Also, participant recruitment may require more incentives to persuade principals and teachers to agree to the study, so this guide has offered suggestions for building trust and establishing partnerships with schools, parents, or the local community.

There are obstacles in conducting any research study, whether it is in an urban, suburban, or rural setting. However, the potential gain for improving rural schools by conducting effectiveness studies in rural settings makes it worthwhile to seek ways to make these studies more feasible.

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