CHAPTER SIX

Research Questions and Hypotheses

Investigators place signposts in their research to carry the reader through a plan for a study. The first signpost is the purpose statement, which establishes the central direction for the study. From the broad, general purpose statement, the researcher narrows the focus to specific questions to be answered or predictions (i.e., hypotheses) to be tested. This chapter addresses the second signpost—the research questions, or hypotheses—in a proposal. The discussion begins by advancing several principles involved in designing qualitative research questions; quantitative research questions, objectives, and hypotheses; and finally, mixed methods research questions.

QUALITATIVE RESEARCH QUESTIONS

In a qualitative study, inquirers state research questions, not objectives (i.e., specific goals for the research) or hypotheses (i.e., predictions that involve variables and statistical tests). These research questions assume two forms: a central question and associated subquestions.

The central question is a statement of the question being examined in the study in its most general form. The inquirer poses this question, consistent with the emerging methodology of qualitative research, as a general issue so as to not limit the inquiry. One might ask "What is the broadest question that can be asked in the study?" Beginning researchers trained in *quantitative* research might struggle with this approach because they are accustomed to the reverse logic: identifying specific questions or hypotheses. The following are guidelines for writing broad, qualitative research questions:

- I recommend that a researcher ask one or two central questions followed by no more than five to seven subquestions. Several subquestions follow each general central question, and the subquestions narrow the focus of the study but leave open the questioning. This approach is well within the limits set by Miles and Huberman (1994), who recommend that researchers write no more than a dozen research questions in all. These questions, in turn, become topics specifically explored in interviews, observations, and documents and archival material. For example, they might be used as key questions the researcher will ask himself or herself in the observational procedure or during an open-ended interview.

- Relate the central question to the specific qualitative strategy of inquiry. For example, the specificity of the questions in ethnography at this stage of the design differs from that in other qualitative strategies. In ethnographic research, Spradley (1980) advanced a taxonomy of ethnographic questions that included mini-tour, experience, native-language, contrast, and verification questions. Similarly, in critical ethnography, the research questions may build on a body of existing literature. These questions become "working guidelines" rather than "truths" to be proven (Thomas, 1993, p. 35). Alternatively, in phenomenology, the questions might be broadly stated without specific reference to the existing literature or a typology of questions. An example is "What is it like for a mother to live with a teenage child who is dying of cancer?" (Nieswiadomy, 1993, p. 151). In grounded theory, the questions may be related to procedures in the data analysis such as open coding ("What are the categories to emerge from interactions between caregivers and patients?") or axial coding ("How does caregiving relate to actions by nurses?").

- Begin the research questions with the words "what" or "how" to convey an open and emerging design. "Why" suggests cause and effect, an approach consistent with *quantitative* research.

- Focus on a single phenomenon or concept.

- Use exploratory verbs that convey the language of emerging design of research. These verbs tell the reader that the study will

  - Discover (e.g., grounded theory)
  - Seek to understand (e.g., ethnography)
  - Explore a process (e.g., case study)

  - Describe the experiences (e.g., phenomenology)
  - Report the stories (e.g., narrative research)

- Use nondirectional language. Delete words that suggest or infer a *quantitative* study, words with a directional orientation such as "affect," "influence," "impact," "determine," "cause," and "relate."
- Expect the research questions to evolve and to change during the study in a manner consistent with the assumptions of an emerging design. Often in *qualitative* studies, the questions are under continual review and reformulation (as in a grounded theory study). This approach may be problematic for individuals accustomed to *quantitative* designs, in which the research questions remain fixed throughout the study.
- Use open-ended questions without reference to the literature or theory unless otherwise indicated by a qualitative strategy of inquiry.
- If the information is not redundant with the purpose statement, specify the participants and the research site for the study.

The following are examples of qualitative research questions drawing on several types of strategies.

Example 6.1 *A Qualitative Central Question From an Ethnography*

Finders (1996) used ethnographic procedures to document the reading of teen magazines by middle-class Euro-American seventh-grade girls. By examining the reading of teen zines (magazines), the researcher could explore how the girls perceive and construct their social roles and relationships as they enter junior high school. She asked one guiding central question in her study:

> How do early adolescent females read literature that falls outside the realm of fiction? (Finders, 1996, p. 72)

This central question begins with "how"; it uses an open-ended verb, "read"; it focuses on a single concept, the "literature" or teen magazines; and it mentions the participants, adolescent females, in the study. Notice how the author crafted a concise, single question that needed to be answered in the study.

Example 6.2 *Central Questions From a Case Study*

Padula and Miller (1999) conducted a multiple case study that described the experiences of women who went back to school, after a time away, in a psychology doctoral program at a major Midwestern research university. The intent was to document the women's experiences, with those experiences intended as aids for feminists and feminist researchers. The authors asked three central questions that guided the inquiry.

> (a) How do women in a psychology doctoral program describe their decision to return to school? (b) How do women in a psychology doctoral program describe their reentry experiences? And (c) How does returning to graduate school change these women's lives? (Padula & Miller, 1999, p. 328)

These three central questions all begin with the words "how," they include open-ended verbs such as "describe," and they focus on three areas of the doctoral experience—returning to school, reentering, and changing. They also mention the participants as women in a single doctoral program at a Midwestern research university.

QUANTITATIVE RESEARCH QUESTIONS AND HYPOTHESES

In quantitative studies, investigators use research questions and hypotheses to shape and specifically focus the purpose of the study. Research questions are interrogative statements or questions that the investigator seeks to answer. They are used frequently in social science research and especially in survey studies. Hypotheses, on the other hand, are predictions the researcher holds about the relationship among variables. They are numeric estimates of population values based on data collected from samples. Testing of hypotheses employs statistical procedures in which the investigator draws inferences about the population from a study sample. Hypotheses typically are used in experiments in which investigators compare groups. Advisers often recommend their use in a formal research project, such as a dissertation

or thesis, as a means of stating the direction a study will take. Objectives, on the other hand, indicate the goals or objectives for a study. They are used infrequently in social science research. As such, the focus here will be on research questions and hypotheses.

Guidelines for writing good quantitative research questions and hypotheses include the following.

- The use of variables in research questions or hypotheses is typically limited to three basic approaches. The researcher may *compare* groups on an independent variable to see its impact on a dependent variable. Alternatively, the investigator may *relate* one or more independent variables to a dependent variable. Third, the researcher may *describe* responses to the independent, mediating, or dependent variables.
- The most rigorous form of quantitative research follows from a test of a theory (see Chapter 7) and the specification of research questions or hypotheses that are included in the theory.
- The independent and dependent variables must be measured separately. This procedure reinforces the cause and effect logic of quantitative research.
- To eliminate redundancy, write only research questions or hypotheses, not both, unless the hypotheses build on the research questions (as discussed below). Choose the form based on tradition, recommendations from an adviser or faculty committee, or whether past research indicates a prediction about outcomes.
- If hypotheses are used, there are two forms: null and alternative. A *null hypothesis* represents the traditional approach to writing hypotheses. It makes a prediction that in the general population, no relationship or no difference exists between groups on a variable. The wording is "There is no difference (or relationship)" between the groups. The following example illustrates a null hypothesis.

Example 6.3 *A Null Hypothesis*

An investigator might examine three types of reinforcement for children with autism: verbal cues, a reward, and no reinforcement. Then the investigator collects behavioral measures assessing social interaction of the children with their siblings. A null hypothesis might read:

There is no significant difference between the effects of verbal cues, rewards, and no reinforcement in terms of social interaction for children with autism and their siblings.

- The second form of hypothesis, popular in journal articles, is the *alternative hypothesis*. The investigator makes a prediction about the expected outcome for the population of the study. This prediction often comes from prior literature and studies on the topic that suggest a potential outcome that the researcher may expect. For example, the researcher may predict that "Scores will be higher for Group A than for Group B" on the dependent variable or that "Group A will change more than Group B" on the outcome. These examples illustrate a *directional hypothesis*, because an expected prediction (e.g., higher, change more) is made. Another type of alternative hypothesis is *nondirectional*—a prediction is made, but the exact form of differences (e.g., higher, lower, more, or less) is not specified because the researcher does not know what can be predicted from past literature. Thus, the investigator might write, "There is a difference" between the two groups. The following illustrates a directional hypothesis.

Example 6.4 *Directional Hypotheses*

Mascarenhas (1989) studied the differences between type of ownership (state-owned, publicly traded, and private) of firms in the offshore drilling industry. Specifically, the study explored such differences as domestic market dominance, international presence, and customer orientation. The study was a "controlled field study" using quasi-experimental procedures.

Hypothesis 1: Publicly traded firms will have higher growth rates than privately held firms.

Hypothesis 2: Publicly traded enterprises will have a larger international scope than state-owned and privately held firms.

Hypothesis 3: State-owned firms will have a greater share of the domestic market than publicly traded or privately held firms.

Hypothesis 4: Publicly traded firms will have broader product lines than state-owned and privately held firms.

Hypothesis 5: State-owned firms are more likely to have state-owned enterprises as customers overseas.

Hypothesis 6: State-owned firms will have a higher customer-base stability than privately held firms.

Hypothesis 7: In less visible contexts, publicly traded firms will employ more advanced technology than state-owned and privately held firms. (Mascarenhas, 1989, pp. 585-588)

Example 6.5 *Nondirectional and Directional Hypotheses*

Sometimes directional hypotheses are created to examine the relationship among variables rather than to compare groups. For example, Moore (2000) studied the meaning of gender identity for religious and secular Jewish and Arab women in Israeli society. In a national probability sample of Jewish and Arab women, the author identified three hypotheses for study. The first hypothesis is nondirectional and the last two are directional.

H_1: Gender identity of religious and secular Arab and Jewish women are related to different sociopolitical social orders that reflect the different value systems they embrace.

H_2: Religious women with salient gender identity are less sociopolitically active than secular women with salient gender identities.

H_3: The relationships among gender identity, religiosity, and social actions are weaker among Arab women than among Jewish women.

- Unless the study intentionally employs demographic variables as predictors, use nondemographic variables (i.e., measuring attitudes or behaviors) rather than personal demographics as independent variables. Because quantitative studies attempt to verify a theory, demographic variables (e.g., age, income level, educational level, and so forth) typically enter these models as intervening or control variables instead of major independent variables.

- Use the same pattern of word order in the questions or hypotheses to enable a reader to easily identify the major variables. This calls for repeating key phrases and positioning the variables beginning with the independent and concluding with the dependent variables (as also discussed in Chapter 5 on good purpose statements). An

example of word order with independent variables stated first in the phrase follows.

Example 6.6 *Standard Use of Language in Hypotheses*

1. *There is no relationship between* utilization of ancillary support services and academic persistence for non-traditional women college students.
2. *There is no relationship* between family support systems and academic persistence for non-traditional aged college women.
3. *There is no relationship between* ancillary support services and family support systems for non-traditional college women.

A Model for Descriptive Questions and Hypotheses

Consider a model for writing questions or hypotheses based on writing descriptive questions that are followed by inferential questions or hypotheses. These questions or hypotheses include both independent and dependent variables. In this model, the writer specifies descriptive questions for *each* independent and dependent variable (and important control or intervening variables) in the study. Inferential questions (or hypotheses) that relate variables or compare groups follow these descriptive questions. A final set of questions, then, may add inferential questions or hypotheses in which variables are controlled.

Example 6.7 *Descriptive and Inferential Questions*

To illustrate this approach, assume that a researcher wants to examine the relationship of critical thinking skills (an independent variable measured on an instrument) to student achievement (a dependent variable measured by grades) in science classes for eighth-grade students in a large metropolitan school district. Further, this researcher controls for the intervening effects of prior grades in science classes and parents' educational attainment. Following the model proposed above, the research questions might be written as follows:

Descriptive Questions

1. How do the students rate on critical thinking skills? (A descriptive question focused on the independent variable)
2. What are the student's achievement levels (or grades) in science classes? (A descriptive question focused on the dependent variable)
3. What are the student's prior grades in science classes? (A descriptive question focused on the control variable of prior grades)
4. What is the educational attainment of the parents of the eighth-graders? (A descriptive question focused on another control variable, educational attainment of parents)

Inferential Questions

5. Does critical thinking ability relate to student achievement? (An inferential question relating the independent and the dependent variables)
6. Does critical thinking ability relate to student achievement, controlling for the effects of prior grades in science and the educational attainment of the eighth-graders' parents? (An inferential question relating the independent and the dependent variables, controlling for the effects of the two controlled variables)

This example illustrates how to organize all the research questions into descriptive and inferential questions. In another example, a researcher may want to compare groups, and the language may change to reflect this comparison in the inferential questions. In other studies, many more independent and dependent variables may be present in the model being tested, and a longer list of descriptive and inferential questions would result. I would recommend this descriptive-inferential model.

This example also illustrates the use of variables to describe as well as relate. It specifies the independent variables in the first position in the questions, the dependent in the second, and the control variables in the third position. It employs demographics as controls rather than central variables in the questions, and a reader needs to assume that the questions flow from a theoretical model.

MIXED METHODS RESEARCH QUESTIONS AND HYPOTHESES

Mixed methods research presents challenges in writing research questions (or hypotheses) because so little of the literature has addressed this design step (Creswell, 1999). Authors prefer to make purpose statements rather than specify their research questions. Thus, there is a distinct lack of models on which to base guidelines for writing research questions into mixed methods studies. By examining a number of these studies, however, it is possible to identify some characteristics that might guide the design of the questions.

- Mixed methods studies need to have both qualitative and quantitative research questions (or hypotheses) included in the studies to narrow and focus the purpose statements.
- These questions and hypotheses need to incorporate the elements of good questions and hypotheses already addressed in the quantitative and qualitative approaches.
- In a two-phase, sequential project in which the second phase elaborates on the first phase, it is difficult to specify the second-phase questions in a proposal or plan. After the study is completed, the researcher can state the questions of both phases in the final report. In a single-phase project, it is possible to identify the qualitative and quantitative research questions in the proposal because one set of questions is not contingent on the other set of questions.
- Some attention should be given to the order of the research questions and hypotheses. In a two-phase project, the order would consist of the first-phase questions followed by the second-phase questions so that readers see them in the order in which they will be addressed in the proposed study. In a single-phase strategy of inquiry, the questions might be ordered according to the method that is given the most weight in the design.
- A variation often seen in sequential mixed methods studies is to introduce the questions at the beginning of each phase. For example, assume that the study begins with a quantitative phase. The investigator might introduce hypotheses. Later in the study,

when the qualitative phase is addressed, the qualitative research questions appear.

Example 6.8 *Hypotheses and Research Questions in a Mixed Methods Study*

Houtz (1995) provides an example of a two-phase study with the research hypotheses and questions stated in sections introducing each phase. Her study investigated the differences between middle-school (nontraditional) and junior high (traditional) instructional strategies for seventh- and eighth-grade students and their attitudes toward science and their science achievement. In this two-phase study, the first phase involved assessing pre- and posttest attitudes and achievement using scales and examination scores. Houtz then followed the quantitative results with qualitative interviews with science teachers, the school principal, and consultants. This second phase helped to explain differences and similarities in the two instructional approaches obtained in the first phase.

With a first-phase quantitative study, Houtz mentioned the hypotheses guiding her research:

> It was hypothesized that there would be no significant difference between students in the middle school and those in the junior high in attitude toward science as a school subject. It was also hypothesized that there would be no significant difference between students in the middle school and those in the junior high in achievement in science. (Houtz, 1995, p. 630)

These hypotheses appeared at the beginning of the study as an introduction to the quantitative phase of the study. Prior to the qualitative phase, Houtz raised questions to explore the quantitative results. Focusing in on the achievement test results, Houtz interviewed science teachers, the principal, and the university consultants and asked three questions:

> What differences currently exist between the middle school instructional strategy and the junior high instructional strategy at this school in transition? How has this transition period impacted science attitude and achievement of your students? How do teachers feel about this change process? (Houtz, 1995, p. 649)

Examining this mixed methods study shows that the author included both quantitative and qualitative questions, specified them at the beginning of each phase of her study, and used good elements for writing both quantitative hypotheses and qualitative research questions.

SUMMARY

Research questions and hypotheses narrow the purpose statement and become major signposts for readers of research. Qualitative researchers ask at least one central question and several subquestions. They begin the questions with words such as "how" or "what" and use exploratory verbs, such as "explore" or "describe." They pose broad, general questions to allow the participants to explain their ideas. They also focus initially on one central phenomenon of interest. The questions may mention the participants and the site for the research.

Quantitative researchers write either research questions or hypotheses. These questions or hypotheses include variables that are described, related, categorized into groups for comparison, and measured separately for the independent and dependent variables. In many quantitative proposals, writers use research questions; however, a more formal statement of research employs hypotheses. These hypotheses are predictions about the outcomes of the results, and they may be written as alternative hypotheses specifying the exact results to be expected (more or less, higher or lower of something). They also may be stated in the null form, indicating no difference or no relationship between groups on a dependent variable. Typically in questions and hypotheses, the researcher writes the independent variable(s) first, followed by the dependent variable(s). One model for ordering all the questions in a quantitative proposal is to begin with descriptive questions, followed by the inferential questions that relate variables or compare groups.

Mixed methods research questions should address both the qualitative and the quantitative components in a study. In a proposal, it is difficult to be specific about the second-phase questions when these questions will build or elaborate on the first-phase questions. Typically, if both qualitative and quantitative questions are introduced in a study, their order of sequence in the study suggests their priority in the study. Also, the weight given to the qualitative and quantitative phases will dictate the order of the questions. Finally, one model found in mixed methods studies involves writing the research questions as an introduction to each phase in the study rather than presenting them all at the beginning of the study.

Writing Exercises

1. For a qualitative study, write one or two central questions followed by five to seven subquestions.
2. For a quantitative study, write two sets of questions. The first set should be descriptive questions about the independent and dependent variables in the study. The second set should pose questions that relate (or compare) the independent variable(s) with the dependent variable(s). This follows the model presented in this chapter for combining descriptive and inferential questions.
3. Write research questions for a two-phase, sequential mixed methods project. Include the elements of good questions in both the qualitative and quantitative questions.
4. Return to the working draft of your title. Retitle your study to reflect a qualitative or quantitative approach to the study. To write a qualitative title, consider the suggestions in Chapter 2 and be sure to include the central phenomenon. Use a literary style such as a question. To write a quantitative title, include the major independent and dependent variables and separate them with the conjunction "and." Order the variables from independent to dependent so that they are consistent with the purpose statement and research questions/hypotheses.

ADDITIONAL READINGS

Creswell, J. W. (1999). Mixed-method research: Introduction and application. In G. J. Cizek (Ed.), *Handbook of educational policy* (pp. 455-472). San Diego: Academic Press.

In this chapter, I discuss the nine steps in conducting a mixed methods study. These are as follows:

1. determine if a mixed methods study is needed to study the problem;

2. consider whether a mixed methods study is feasible;
3. write both qualitative and quantitative research questions;
4. review and decide on the types of data collection;
5. assess the relative weight and implementation strategy for each method;
6. present a visual model;
7. determine how the data will be analyzed;
8. assess the criteria for evaluating the study; and
9. develop a plan for the study.

In writing the research questions, I recommend developing both qualitative and quantitative questions, and stating within the questions the type of qualitative strategy of inquiry being used.

Morse, J. M. (1994). Designing funded qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 220-235). Thousand Oaks, CA: Sage.

Janice Morse, a nursing researcher, identifies and describes the major design issues involved in the planning of a qualitative project. She compares several strategies of inquiry and maps the type of research questions used in each strategy. For phenomenology and ethnography, the research calls for meaning and descriptive questions. For grounded theory, the questions need to address "process" questions, whereas in ethnomethodology and discourse analysis, the questions relate to verbal interaction and dialogue. She indicates that the wording of the research question determines the focus and scope of the study.

Tuckman, B. W. (1999). *Conducting educational research* (5th ed.). Fort Worth, TX: Harcourt Brace College Publishers.

Bruce Tuckman provides an entire chapter on constructing hypotheses. He identifies the origin of hypotheses in deductive theoretical positions and in inductive observations. He further defines and illustrates both alternative and null hypotheses and takes the reader through the hypothesis testing procedure.