CHAPTER 4

# CHOOSING A MIXED METHODS DESIGN

Research designs are procedures for collecting, analyzing, interpreting, and reporting data in research studies. They represent different models for doing research, and these models have distinct names and procedures associated with them. Rigorous research designs are important because they guide the methods decisions that researchers must make during their studies and set the logic by which they make interpretations at the end of studies. Once a researcher has selected a mixed methods approach for a study, the next step is to decide on the specific design that best addresses the research problem. What designs are available, and how do researchers decide which one is appropriate for their studies? Mixed methods researchers need to be acquainted with the major types of mixed methods designs and the common variants among these designs. Important considerations when choosing designs are knowing the intent, the procedures, and the strengths and challenges associated with each design. Researchers also need to be familiar with the timing, weighting, and mixing decisions that are made in each of the different mixed methods designs.

This chapter will address

- The classifications of designs in the literature
- The four major types of mixed methods designs, including their intent, key procedures, common variants, and inherent strengths and challenges

- Factors such as timing, weighting, and mixing, which influence the choice of an appropriate design

## CLASSIFICATIONS OF MIXED METHODS DESIGNS ●

Researchers benefit from being familiar with the numerous classifications of mixed methods designs found in the literature. These classifications represent different disciplines, and they use different terminology. Researchers should be aware of the range of mixed methods design types, as well as the discipline-based discussions of mixed methods designs.

Methodologists writing about mixed methods research have devoted a great deal of attention to classifying the different types of mixed methods designs. In the final chapter of the *Handbook of Mixed Methods in Social and Behavioral Research,* Tashakkori and Teddlie (2003b) noted that they had found nearly 40 different types of mixed methods designs in the literature. Creswell, Plano Clark, et al. (2003) have summarized the range of these classifications. Their summary has been updated, and a list of 12 classifications is included in Table 4.1. These classifications represent diverse social science disciplines, including evaluation, health research, and educational research, which span the past 15 years of scholarly writings about mixed methods approaches. The different types and various classifications speak to the evolving nature of mixed methods research.

Seeing the long list of design types in Table 4.1 may be overwhelming. It is easy to get lost in the details, as these classifications are drawn from different disciplines, have emphasized different facets of mixed methods designs, and lack consistency in the names of the designs. It may even appear that little agreement exists among these authors and that there are an infinite number of design options. In fact, although authors have emphasized different features and used different names, there are actually more similarities than differences among these classifications. Based on these similarities, we feel that a parsimonious and functional classification can be created. Thus we advance four major mixed methods designs, with variants within each type.

## THE FOUR MAJOR TYPES OF MIXED METHODS DESIGNS ●

The four major types of mixed methods designs are the Triangulation Design, the Embedded Design, the Explanatory Design, and the Exploratory Design. The following sections provide an overview of each of these designs: their use, procedures, common variants, and challenges.

**Table 4.1** Mixed Method Design Classifications

| *Author* | *Mixed Method Designs* | *Discipline* |
|---|---|---|
| Greene, Caracelli, and Graham (1989) | Initiation<br>Expansion<br>Development<br>Complementary<br>Triangulation | Evaluation |
| Patton (1990) | Experimental design, qualitative data, and content analysis<br>Experimental design, qualitative data, and statistical analysis<br>Naturalistic inquiry, qualitative data, and statistical analysis<br>Naturalistic inquiry, quantitative data, and statistical analysis | Evaluation |
| Morse (1991) | Simultaneous triangulation<br>QUAL + quan<br>QUAN + qual<br>Sequential triangulation<br>QUAL → quan<br>QUAN → qual | Nursing |
| Steckler, McLeroy, Goodman, Bird, and McCormick (1992) | Model 1: Qualitative methods to develop quantitative measures<br>Model 2: Qualitative methods to explain quantitative findings<br>Model 3: Quantitative methods to embellish qualitative findings<br>Model 4: Qualitative and quantitative methods used equally and parallel | Public health education |
| Greene and Caracelli (1997) | Component designs<br>Triangulation<br>Complementary<br>Expansion<br>Integrated designs<br>Iterative<br>Embedded or nested<br>Holistic<br>Transformative | Evaluation |

| *Author* | *Mixed Method Designs* | *Discipline* |
|---|---|---|
| Morgan (1998) | Complementary designs<br>Qualitative preliminary<br>Quantitative preliminary<br>Qualitative follow-up<br>Quantitative follow-up | Health research |
| Tashakkori and Teddlie (1998) | Mixed method designs<br>Equivalent status (sequential or parallel)<br>Dominant–less dominant (sequential or parallel)<br>Multilevel use<br>Mixed model designs:<br>I. Confirmatory, qualitative data, statistical analysis, and inference<br>II. Confirmatory, qualitative data, qualitative analysis, and inference<br>III. Exploratory, quantitative data, statistical analysis, and inference<br>IV. Exploratory, qualitative data, statistical analysis, and inference<br>V. Confirmatory, quantitative data, qualitative analysis, and inference<br>VI. Exploratory, quantitative data, qualitative analysis, and inference<br>VII. Parallel mixed model<br>VIII. Sequential mixed model | Educational research |
| Creswell (1999) | Convergence model<br>Sequential model<br>Instrument-building model | Educational policy |
| Sandelowski (2000) | Sequential<br>Concurrent<br>Iterative<br>Sandwich | Nursing |
| Creswell, Plano Clark, Gutmann, and Hanson (2003) | Sequential explanatory<br>Sequential exploratory<br>Sequential transformative<br>Concurrent triangulation<br>Concurrent nested<br>Concurrent transformative | Educational research |

*(Continued)*

**Table 4.1** (Continued)

| *Author* | *Mixed Method Designs* | *Discipline* |
|---|---|---|
| Creswell, Fetters, and Ivankova (2004) | Instrument design model<br>Triangulation design model<br>Data transformation design model | Primary medical care |
| Tashakkori and Teddlie (2003b) | Multistrand designs<br>Concurrent mixed designs<br>Concurrent mixed method design<br>Concurrent mixed model design<br>Sequential mixed designs<br>Sequential mixed method design<br>Sequential mixed model design<br>Multistrand conversion mixed designs<br>Multistrand conversion mixed method design<br>Multistrand conversion mixed model design<br>Fully integrated mixed model design | Social and behavioral research |

SOURCE: Adapted from Creswell, Plano Clark, et al. (2003, pp. 216-217, Table 8.1).

## The Triangulation Design

The most common and well-known approach to mixing methods is the Triangulation Design (Figure 4.1a) (Creswell, Plano Clark, et al., 2003). The purpose of this design is "to obtain different but complementary data on the same topic" (Morse, 1991, p. 122) to best understand the research problem. The intent in using this design is to bring together the differing strengths and nonoverlapping weaknesses of quantitative methods (large sample size, trends, generalization) with those of qualitative methods (small *N*, details, in depth) (Patton, 1990). This design and its underlying purpose of converging different methods has been discussed extensively in the literature (e.g., Jick, 1979; Brewer & Hunter, 1989; Greene et al., 1989; Morse, 1991). This design is used when a researcher wants to directly compare and contrast quantitative statistical results with qualitative findings or to validate or expand quantitative results with qualitative data.

*Triangulation Design Procedures.* The Triangulation Design is a one-phase design in which researchers implement the quantitative and qualitative

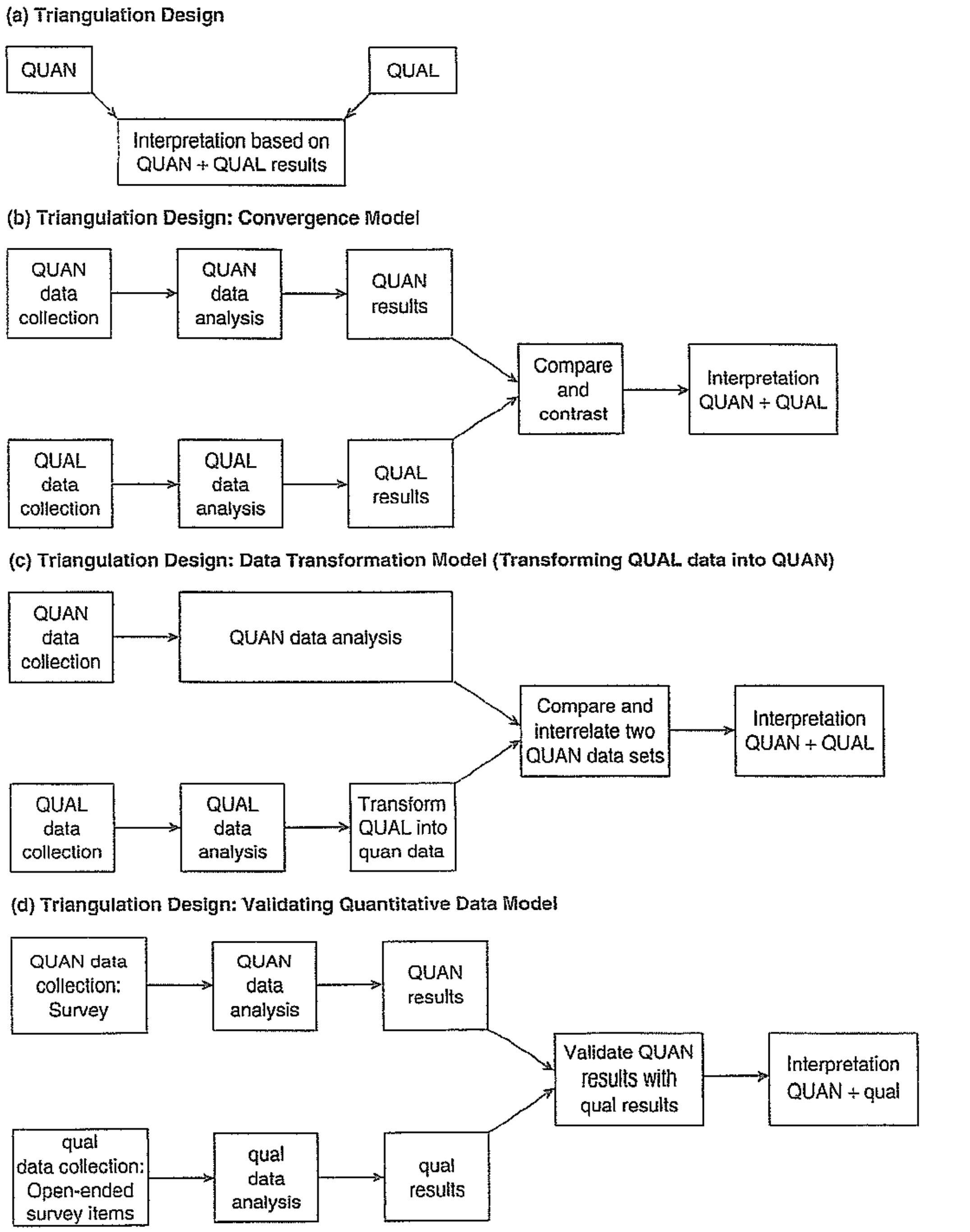


**Figure 4.1** *(Continued)*

(e) Triangulation Design: Multilevel Model

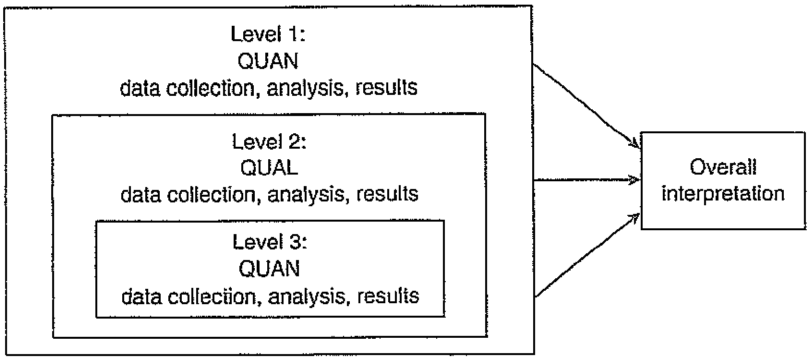


**Figure 4.1** The Triangulation Design

methods during the same timeframe and with equal weight (see Figure 4.1a). The single-phase timing of this design is the reason it has also been referred to as the "concurrent triangulation design" (Creswell, Plano Clark, et al., 2003). It generally involves the concurrent, but separate, collection and analysis of quantitative and qualitative data so that the researcher may best understand the research problem. The researcher attempts to merge the two data sets, typically by bringing the separate results together in the interpretation or by transforming data to facilitate integrating the two data types during the analysis. Jenkins' (2001) single-phase study (appendix A) of rural adolescent perceptions of alcohol and other drug resistance is an example of a Triangulation Design. She collected and analyzed quantitative and qualitative data and merged the two data sets into one overall interpretation, in which she related the quantitative results to the qualitative findings.

*Variants of the Triangulation Design.* The four variants are the convergence model, the data transformation model, the validating quantitative data model, and the multilevel model. The first two models differ in terms of how the researcher attempts to merge the two data types (either during interpretation or during analysis), the third model is used to enhance findings from a survey, and the fourth is used to investigate different levels of analysis.

The convergence model (Figure 4.1b) represents the traditional model of a mixed methods triangulation design (Creswell, 1999). In this model, the researcher collects and analyzes quantitative and qualitative data separately on the same phenomenon and then the different results are converged (by comparing and contrasting the different results) during the interpretation. Researchers use this model when they want to compare results or to validate, confirm, or corroborate quantitative results with qualitative findings. The purpose of this model is to end up with valid and well-substantiated conclusions about a single phenomenon. For example, Anderson, Newell, and Kilcoyne (1999) converged their quantitative survey results with their qualitative focus group findings to better understand the motivations of college student plasma donors.

Researchers may choose to use the data transformation model (Figure 4.1c) (Creswell et al., 2004). This model also involves the separate collection and analysis of quantitative and qualitative data sets. However, after the initial analysis, the researcher uses procedures to transform one data type into the other data type. This is accomplished by either quantifying qualitative findings or qualifying quantitative results (Tashakkori & Teddlie, 1998). This transformation allows the data to be mixed during the analysis stage and facilitates the comparison, interrelation, and further analysis of the two data sets. The study of parental values by Pagano, Hirsch, Deutsch, and McAdams (2002) is an example of this model. In their study, they derived qualitative themes from the qualitative data and then scored those themes dichotomously as present or not present for each participant. These quantified scores were then analyzed with the quantitative data, using correlations and logistical regression to identify relationships between categories, as well as gender and racial differences.

Researchers use the validating quantitative data model (Figure 4.1d) when they want to validate and expand on the quantitative findings from a survey by including a few open-ended qualitative questions. In this model, the researcher collects both types of data within one survey instrument. Because the qualitative items are an add-on to a quantitative survey, the items generally do not result in a rigorous qualitative data set. However, they provide the researcher with interesting quotes that can be used to validate and embellish the quantitative survey findings. For example, Webb, Sweet, and Pretty (2002) included qualitative questions in addition to their quantitative survey measures in their study of the emotional and psychological impact of mass casualty incidents on forensic odontologists. Webb et al. used the qualitative data to validate the quantitative results from the survey items.

The fourth variant of the Triangulation Design is what Tashakkori and Teddlie (1998) referred to as "multilevel research" (p. 48). In a multilevel model (Figure 4.1e), different methods (quantitative and qualitative) are used to address different levels within a system. The findings from each level are merged together into one overall interpretation. For example, Elliott and Williams (2002) studied an employee counseling service using qualitative data at the client level, qualitative data at the counselor level, qualitative data with the directors, and quantitative data for the organizational level.

*Strengths of the Triangulation Design.* This design has a number of strengths and advantages, including the following:

- The design makes intuitive sense. Researchers new to mixed methods often choose this design. It was the design first discussed in the literature (Jick, 1979), and it has become a framework for thinking about mixed methods research.
- It is an efficient design, in which both types of data are collected during one phase of the research at roughly the same time.
- Each type of data can be collected and analyzed separately and independently, using the techniques traditionally associated with each data type. This lends itself to team research, in which the team can include individuals with both quantitative and qualitative expertise.

*Challenges in Using the Triangulation Design.* Although this design is the most popular mixed methods design, it is also probably the most challenging of the four major types of designs. Here are some of the challenges facing researchers using a variant of the Triangulation Design as well as options for addressing them.

For all variants:

- Much effort and expertise is required, particularly because of the concurrent data collection and the fact that equal weight is usually given to each data type. This can be addressed by forming a research team that includes members who have quantitative and qualitative expertise, by including researchers who have quantitative and qualitative expertise on graduate committees, or by training single researchers in both quantitative and qualitative research.
- Researchers may face the question of what to do if the quantitative and qualitative results do not agree. These differences can be difficult to resolve and may require the collection of additional data. The question then develops as to what type of additional data to collect, quantitative data, qualitative data, or both? Chapter 6 discusses the collection of additional data or the reexamination of existing data to address this challenge.

For the convergence model:

- Researchers need to consider the consequences of having different samples and different sample sizes when converging the two data sets. Different sample sizes are inherent in the design because quantitative and qualitative data are usually collected for different purposes (generalization vs. in-depth description, respectively). Researchers can consider collecting large qualitative samples or weighting the cases (see Chapter 6).

- It can be very challenging to converge (integrate) two sets of very different data and their results in a meaningful way. Chapter 7 provides techniques for building comparison matrices. In addition, researchers need to design their studies so that the quantitative and qualitative data address the same concepts. This strategy facilitates merging the data.

For the data transformation model:

- Researchers need to develop procedures for transforming data and make decisions about how the data will be transformed. In general, it is easier for researchers to quantify their qualitative data by transforming qualitative codes or themes into counts or ratings (see Chapter 7).

## The Embedded Design

The Embedded Design is a mixed methods design in which one data set provides a supportive, secondary role in a study based primarily on the other data type (see Figure 4.2a) (Creswell, Plano Clark, et al., 2003). The premises of this design are that a single data set is not sufficient, that different questions need to be answered, and that each type of question requires different types of data. Researchers use this design when they need to include qualitative or quantitative data to answer a research question within a largely quantitative or qualitative study. This design is particularly useful when a researcher needs to embed a qualitative component within a quantitative design, as in the case of an experimental or correlational design. In the experimental example, the investigator includes qualitative data for several reasons, such as to develop a treatment, to examine the process of an intervention or the mechanisms that relate variables, or to follow up on the results of an experiment.

*Embedded Design Procedures.* The Embedded Design mixes the different data sets at the design level, with one type of data being embedded within a methodology framed by the other data type (Caracelli & Greene, 1997). For example, a researcher could embed qualitative data within a quantitative methodology, as might be done in an experimental design, or quantitative data could be embedded within a qualitative methodology, as could be done

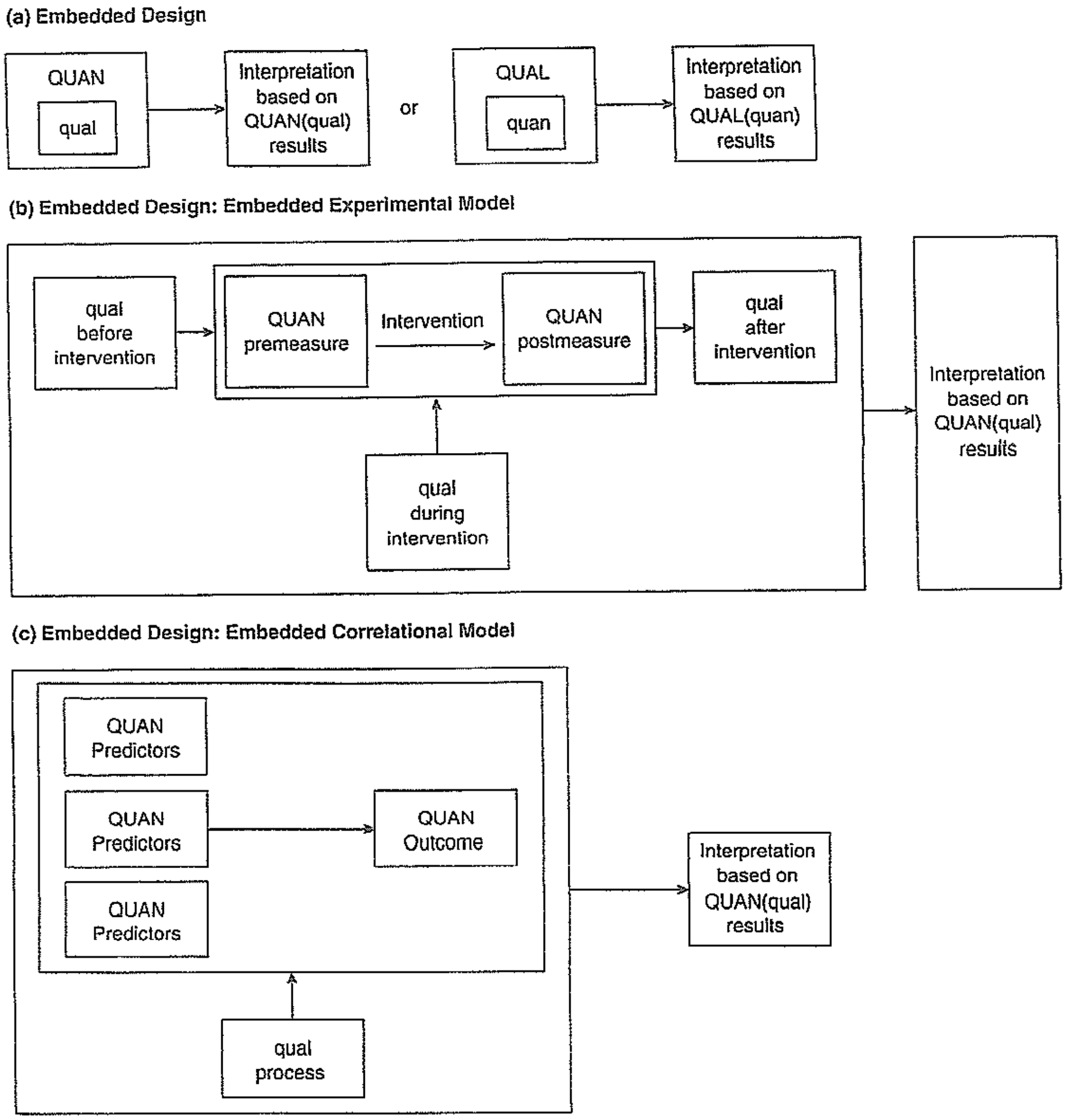


**Figure 4.2** The Embedded Design

in a phenomenology design (see Figure 4.2a). The Embedded Design includes the collection of both quantitative and qualitative data, but one of the data types plays a supplemental role within the overall design. An Embedded Design can use either a one-phase or a two-phase approach for the embedded data (see Figure 4.2b), and the quantitative and qualitative data are used to answer different research questions within the study (Hanson et al., 2005). For example, Rogers et al. (2003) (appendix B) embedded qualitative data within their experimental design in two different ways: before the intervention, to inform the development of the treatment, and after the intervention, to explain the treatment results.

It can be a challenge to differentiate between a study using an Embedded Design and a study using one of the other mixed methods designs. The key question is whether the secondary data type is playing a supplemental role within a design based on the other data type. Consider the question: Would the results of the secondary data type be useful or meaningful if they were not embedded within the other data set? For example, Rogers et al.'s (2003) qualitative explanation of the treatment results would not make much sense or have value if there had not been outcomes measured from an experimental study using those treatments.

*Variants of the Embedded Design.* Although many variants of the Embedded Design are possible, there are two variants that we will discuss. These are the experimental model and the correlational model.

The embedded experimental model (Figure 4.2b) may be the most commonly used variant of the Embedded Design (Creswell, Fetters, & Plano Clark, 2005). This model is defined by having qualitative data embedded within an experimental design (such as a true experiment or a quasiexperiment). The priority of this model is established by the quantitative, experimental methodology, and the qualitative dataset is subservient within that methodology. This design can either be used as a one-phase or a two-phase approach, in which the timing reflects the purpose for including the qualitative data (Creswell et al., 2005; Sandelowski, 1996). For example, in a one-phase approach, qualitative data can be embedded during the intervention phase (see Figure 4.2b), such as when a researcher wants to qualitatively examine the process of the intervention in addition to the quantitative outcomes. This model has also been referred to as a concurrent nested mixed methods design (Creswell, Plano Clark, et al., 2003). Alternatively, qualitative data can come before or after the intervention in a two-phase model (see Figure 4.2b). These sequential approaches are useful when a researcher needs qualitative information before the intervention, to shape the intervention, to develop an instrument, or to select participants, or after the intervention, to explain the results of the intervention or to follow up on the experiences of participants with certain types of outcomes. Victor, Ross, and Axford (2004) collected qualitative data (diaries and audiotapes of treatment sessions) to examine participant perspectives during their intervention trial of a health promotion intervention for people with osteoarthritis of the knee.

Sports psychologists Evans and Hardy (2002a, 2002b) followed up on the results of their experimental study of a goal-setting intervention for injured athletes by interviewing participants from each of the treatment groups to better interpret the findings of the intervention study.

The correlational model (Figure 4.2c) is another embedded variant, in which qualitative data are embedded within a quantitative design. In this design, researchers collect qualitative data as part of their correlational study to help explain how the mechanisms work in the correlational model. For example, Aikens (2004) is conducting a study of the factors relating depression and diabetes as moderated by race. Within his larger correlational study, he is embedding qualitative interviews about beliefs and experiences with depression for African American patients with diabetes to help explain the predictive relationships.

*Strengths of the Embedded Design.* The advantages specific to this design include the following:

- It can be used when a researcher does not have sufficient time or resources to commit to extensive quantitative and qualitative data collection because one data type is given less priority than the other.
- This design may be logistically more manageable for graduate students because one method requires less data than the other method.
- This design may be appealing to funding agencies because the primary focus of the design is traditionally quantitative, such as an experiment or a correlational analysis.

*Challenges in Using the Embedded Design.* There are many challenges associated with the variants of the Embedded Design. These challenges, and suggested strategies for dealing with them, include the following.

For all variants:

- The researcher must specify the purpose of collecting qualitative (or quantitative) data as part of a larger quantitative (or qualitative) study. Researchers can state these as the primary and secondary purposes for the study. See Chapter 5 for further discussion of examples for writing these primary and secondary purpose statements.
- It can be difficult to integrate the results when the two methods are used to answer different research questions. However, unlike the Triangulation Design, the intent of the Embedded Design is not to converge two different data sets collected to answer the same question. Researchers using an Embedded Design can keep the two sets

of results separate in their reports or even report them in separate papers (see Chapter 8 for further discussion about these writing strategies).

- Few examples exist and little has been written about embedding quantitative data within traditionally qualitative designs. Researchers may consider the timing of the quantitative data in relation to the larger qualitative design, as suggested by Sandelowski (1996) and Creswell et al. (2005) for experimental designs with embedded qualitative data.

For the embedded experimental model:

- The researcher must decide at what point in the experimental study to collect the qualitative data (before, during, or after the intervention). This decision should be made based on the intent for including the qualitative data (e.g., to shape the intervention, to explain the process of participants during treatment, or to follow up on results of the experimental trial).
- For before-intervention approaches, the researcher needs to decide which qualitative results will be used in the quantitative phase and to consider how to plan the quantitative phase before the qualitative phase has been conducted. Again, the qualitative data collection should be carefully designed to match the intent for including qualitative data, such as to develop an instrument or shape the intervention.
- For during-intervention approaches, the qualitative data collection may introduce potential treatment bias that affects the outcomes of the experiment. Suggestions for addressing this bias through collecting unobtrusive data are discussed in Chapter 6.
- For after-intervention approaches, decisions must be made about which aspects of the trial will be further explored, and the researcher must specify the criteria used to select the participants for the follow-up data collection. Researchers may want to follow up in depth only with participants who received the treatment or with select cases based on positive and negative treatment outcomes, as discussed further in Chapter 6.

## The Explanatory Design

The Explanatory Design is a two-phase mixed methods design (see Figure 4.3a). The overall purpose of this design is that qualitative data helps explain or build upon initial quantitative results (Creswell, Plano Clark, et al., 2003). For example, this design is well suited to a study in which a researcher needs qualitative data to explain significant (or nonsignificant) results, outlier results, or surprising results (Morse, 1991). This design can also be used when a researcher wants to form groups based on quantitative results and follow up with the groups through subsequent qualitative research (Morgan, 1998; Tashakkori & Teddlie, 1998) or to use quantitative participant characteristics to guide purposeful sampling for a qualitative phase (Creswell, Plano Clark, et al., 2003).

*Explanatory Design Procedures.* The Explanatory Design (also known as the Explanatory Sequential Design) is a two-phase mixed methods design (see Figure 4.3a). This design starts with the collection and analysis of quantitative data. This first phase is followed by the subsequent collection and analysis of qualitative data. The second, qualitative phase of the study is designed so that it follows from (or connects to) the results of the first quantitative phase. Because this design begins quantitatively, investigators typically place greater emphasis on the quantitative methods than the qualitative methods. Aldridge et al.'s (1999) study (appendix C) of classroom environments is an example of an Explanatory Design. They started with a quantitative survey study and identified statistically significant differences and anomalous results. They then followed up these results with an in-depth qualitative study to explain why these results occurred.

*Variants of the Explanatory Design.* There are two variants of the Explanatory Design: the follow-up explanations model and the participant selection model. Although both models have an initial quantitative phase followed by a qualitative phase, they differ in the connection of the two phases, with one focusing on results to be examined in more detail and the other on the appropriate participants to be selected (see center boxes of Figures 4.3b and 4.3c). They also differ in the relative emphasis often placed on the two phases.

The follow-up explanations model (Figure 4.3b) is used when a researcher needs qualitative data to explain or expand on quantitative results (Creswell, Plano Clark, et al., 2003). In this model, the researcher identifies specific quantitative findings that need additional explanation, such as statistical differences among groups, individuals who scored at extreme levels, or unexpected results. The researcher then collects qualitative data from participants who can best help explain these findings. In this model, the primary emphasis is usually on the quantitative aspects. Ivankova's (2004) dissertation study of doctoral students' persistence in an online learning environment is an example of this variant. In the initial quantitative phase, she collected quantitative survey data to identify factors predictive of students'

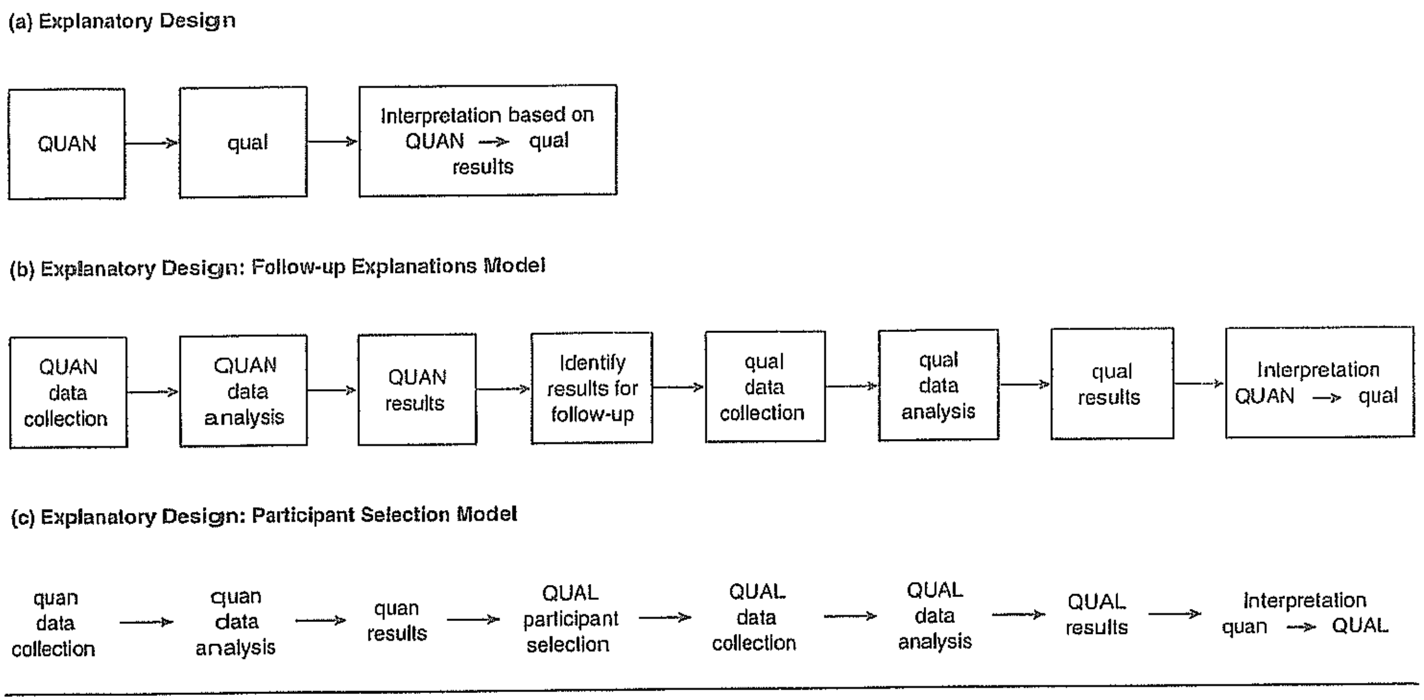


**Figure 4.3** The Explanatory Design

persistence. In the second phase, she used a qualitative multiple case study approach to help explain why certain factors identified in the first phase were significant predictors of student persistence in the program.

The participant selection model (Figure 4.3c) is used when a researcher needs quantitative information to identify and purposefully select participants for a follow-up, in-depth, qualitative study. In this model, the emphasis of the study is usually on the second, qualitative phase. For example, May and Etkina (2002) collected quantitative data to identify physics students with consistently high and low conceptual learning gains. They then completed an in-depth qualitative comparison study of these students' perceptions of learning.

*Strengths of the Explanatory Design.* The Explanatory Design is considered the most straightforward of the mixed methods designs. The advantages of this design include the following:

- Its two-phase structure makes it straightforward to implement, because the researcher conducts the two methods in separate phases and collects only one type of data at a time. This means that single researchers can conduct this design; a research team is not required to carry out the design.
- The final report can be written in two phases, making it straightforward to write and providing a clear delineation for readers.
- This design lends itself to multiphase investigations, as well as single mixed methods studies.
- This design appeals to quantitative researchers, because it often begins with a strong quantitative orientation.

*Challenges in Using the Explanatory Design.* Although the Explanatory Design is straightforward, researchers choosing this approach still face challenges specific to this design.

For all variants:

- This design requires a lengthy amount of time for implementing the two phases. Researchers should recognize that the qualitative phase (depending on the emphasis) will take more time than the quantitative phase, but that the qualitative phase can be limited to a few participants. Still, adequate time must be budgeted for the qualitative phase.
- The researcher must decide whether to use the same individuals for both phases, to use individuals from the same sample for both phases, or to draw participants from the same population for the two phases.

Chapter 6 explores approaches to using individuals from the same sample or population in this approach.

- It can be difficult to secure internal review board approval for this design because the researcher cannot specify how participants will be selected for the second phase until the initial findings are obtained. Approaches to addressing this issue by tentatively framing the second, qualitative phase for the internal review board are discussed in Chapter 6.

For the follow-up explanations model:

- The researcher must decide which quantitative results need to be further explained. Although this cannot be determined precisely until after the quantitative phase is complete, options, such as selecting significant results and strong predictors, can be discussed and weighed as the study is being planned, as discussed further in Chapter 6.

For the participant selection model:

- Investigators need to specify criteria for the selection of participants for the qualitative phase of the research. Options include the use of demographic characteristics, groups used in comparisons during the quantitative phase, and individuals who vary on select predictors.

## The Exploratory Design

As with the Explanatory Design, the intent of the two-phase Exploratory Design (see Figure 4.4a) is that the results of the first method (qualitative) can help develop or inform the second method (quantitative) (Greene et al., 1989). This design is based on the premise that an exploration is needed for one of several reasons: Measures or instruments are not available, the variables are unknown, or there is no guiding framework or theory. Because this design begins qualitatively, it is best suited for exploring a phenomenon (Creswell, Plano Clark, et al., 2003). This design is particularly useful when a researcher needs to develop and test an instrument because one is not available (Creswell, 1999; Creswell et al., 2004) or identify important variables to study quantitatively when the variables are unknown. It is also appropriate when a researcher wants to generalize results to different groups (Morse, 1991), to test aspects of an emergent theory or classification (Morgan, 1998), or to explore a phenomenon in depth and then measure its prevalence.

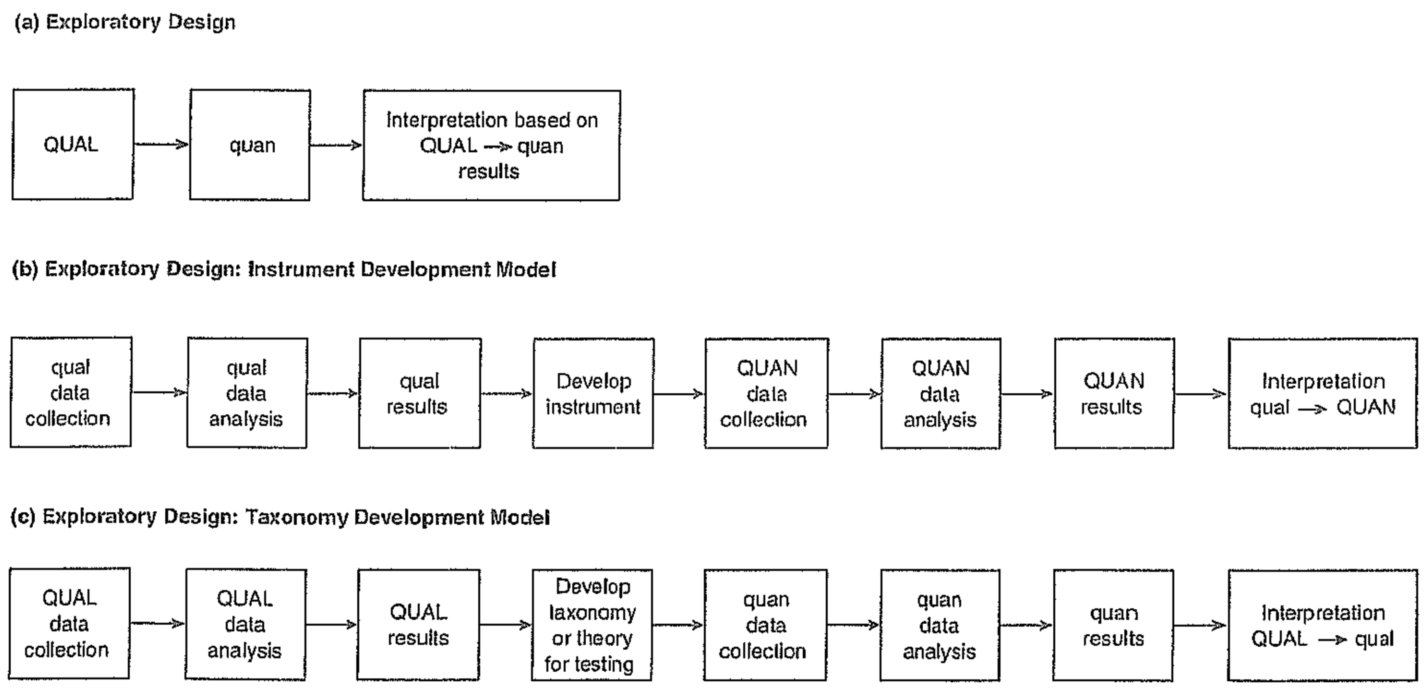


**Figure 4.4** The Exploratory Design

*Exploratory Design Procedures.* Like the Explanatory Design, the Exploratory Design is also a two-phase approach, and writers refer to it as the Exploratory Sequential Design (Creswell, Plano Clark, et al., 2003). This design starts with qualitative data, to explore a phenomenon, and then builds to a second, quantitative phase (see Figure 4.4a). Researchers using this design build on the results of the qualitative phase by developing an instrument, identifying variables, or stating propositions for testing based on an emergent theory or framework. These developments connect the initial qualitative phase to the subsequent quantitative component of the study. Because the design begins qualitatively, a greater emphasis is often placed on the qualitative data. Myers and Oetzel's (2003) study in appendix D on organizational assimilation is an example of an Exploratory Design. They first explore the topic qualitatively and develop themes from their qualitative data. They then develop an instrument based on these results and subsequently use this instrument in the second, quantitative phase of the study.

*Variants of the Exploratory Design.* This design has two common variants: the instrument development model and the taxonomy development model. Each of these models begins with an initial qualitative phase and ends with a quantitative phase. They differ in the way the researcher connects the two phases (see center boxes of Figures 4.4b and 4.4c) and in the relative emphasis of the two methods.

Researchers use the instrument development model (see Figure 4.4b) when they need to develop and implement a quantitative instrument based on qualitative findings. In this design, the researcher first qualitatively explores the research topic with a few participants. The qualitative findings then guide the development of items and scales for a quantitative survey instrument. In the second data collection phase, the researcher implements and validates this instrument quantitatively. In this design, the qualitative and quantitative methods are connected through the development of the instrument items. Researchers using this variant often emphasize the quantitative aspect of the study. Using this model, Mak and Marshall (2004) initially qualitatively explored young adults' perceptions about the significance of the self to others in romantic relationships (that is, how they perceive that they matter to someone else). Based on their qualitative results, they developed an instrument and then implemented it during a second quantitative phase in their study.

The taxonomy development model (see Figure 4.4c) occurs when the initial qualitative phase is conducted to identify important variables, develop a taxonomy or classification system, or develop an emergent theory, and the secondary, quantitative phase tests or studies these results in more detail (Morgan, 1998; Tashakkori & Teddlie, 1998). In this model, the initial qualitative phase produces specific categories or relationships. These categories or relationships are then used to direct the research questions and data collection used in the second, quantitative phase. This model is used when a researcher formulates quantitative research questions or hypotheses based on qualitative findings and proceeds to conduct a quantitative study to answer the questions. In addition, a researcher may identify emergent categories from the qualitative data and then use the quantitative phase to examine the prevalence of these categories within different samples (Morse, 1991) or use taxonomy affiliation as a basis for identifying comparison groups. For example, Goldenberg, Gallimore, and Reese (2005) describe how they identified new variables and hypotheses about predictors of family literacy practices based on their qualitative case study. They then conducted a quantitative path analysis study to test these qualitatively identified variables and relationships.

*Strengths of the Exploratory Design.* Due to its two-phase structure and the fact that only one type of data is collected at a time, the Exploratory Design shares many of the same advantages as the Explanatory Design. Its advantages include the following:

- The separate phases make this design straightforward to describe, implement, and report.
- Although this design typically emphasizes the qualitative aspect, the inclusion of a quantitative component can make the qualitative approach more acceptable to quantitative-biased audiences.
- This design is easily applied to multiphase research studies in addition to single studies.

*Challenges in Using the Exploratory Design.* There are a number of challenges associated with the Exploratory Design and its variants.

For all variants:

- The two-phase approach requires considerable time to implement. Researchers need to recognize this factor and build time into their study's plan.
- It is difficult to specify the procedures of the quantitative phase when applying for initial internal review board approval for the study. Providing some tentative direction in a project plan for the internal review board will be discussed further in Chapter 6.
- Researchers should discuss whether the same individuals will serve as participants in both the qualitative and quantitative phases (see the use of different participants that we propose in Chapter 6).

For the instrument development model:

- The researcher needs to decide which data to use from the qualitative phase to build the quantitative instrument and how to use these data to generate quantitative measures. In Chapter 7, we will discuss procedures for using qualitative quotes, codes, and themes to generate aspects of quantitative instruments.
- Procedures should be undertaken to ensure that the scores developed on the instrument are valid and reliable. In Chapter 6, we will review rigorous steps of instrument and scale development for this process.

For the taxonomy development model:

- Decisions must be made in determining the relevant qualitative findings to use. Options include using themes for variables and the relationships between themes and subthemes (codes) for taxonomy development.

## SELECTING A TYPE OF MIXED METHODS DESIGN

Rigorous, high-quality studies result from well-designed research procedures. Mixed methods researchers should select a specific design to use in their studies. We often find researchers wanting to use more than one of the four major designs in a study or to blend different aspects of the designs together. However, we strongly recommend that researchers carefully select a single design that best matches the research problem. This will make the study more manageable and simpler to implement and describe. In addition, it provides the researcher with a framework and logic to guide the implementation of the research methods.

What are the key factors that researchers should consider when choosing a mixed methods design for their studies? Researchers should consider the research problem that they want to study. A primary consideration is that the design should match the research problem, as discussed in Chapter 2. In addition, researchers should evaluate their own expertise and consider the quantitative and qualitative skills that they possess. If they lack expertise with certain methods (e.g., quantitative survey skills or collection of qualitative field notes), they should consider working in a team or selecting a design that does not emphasize that method. Consideration must also be given to the available resources, such as the length of time available to complete the study and funding resources for work in a team or the hiring of research

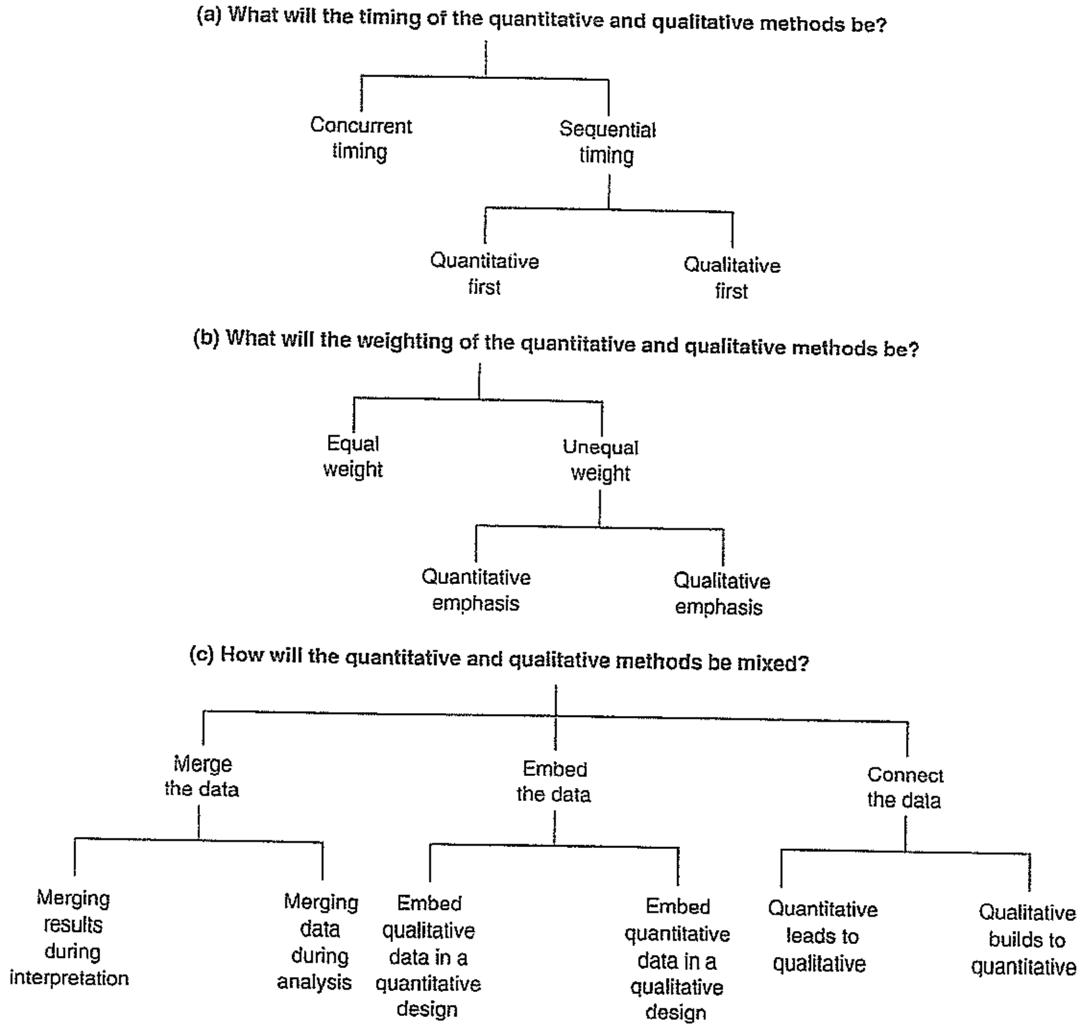


**Figure 4.5** Decision Tree for Mixed Methods Design Criteria for Timing, Weighting, and Mixing
SOURCE: Based on Creswell, Plano Clark, et al. (2003); Hanson et al. (2005); and Plano Clark (2005).

assistants. The expectations of audiences for the research can also influence the design choice, particularly if the audience values one type of evidence over the other type.

In addition to these factors, the choice of a research design relates to three decisions: the timing of the use of collected data (i.e., the order in which the data are used in a study), the relative weight of the quantitative and qualitative approaches (i.e., the emphasis given to each), and the approach to mixing the two datasets (i.e., how the two datasets will be related or connected). A decision tree, shown in Figure 4.5, can help identify choices for each of these three decisions.

## The Timing Decision

When selecting a mixed methods approach, researchers must answer the question: What will the timing of the quantitative and qualitative methods be? (Figure 4.5a). Timing (also referred to as "implementation" or "sequence") refers to the temporal relationship between the quantitative and qualitative components within a study (Greene et al., 1989). Timing is often discussed in relation to the time the data sets are collected. However, most importantly, it describes the *order in which the researchers use the data* within a study (Morgan, 1998). Therefore, timing relates more to when the data are analyzed and interpreted than to when the data are collected, although these times are often interrelated.

As shown in Figure 4.5a, timing within a mixed methods design is classified in one of two ways: concurrent or sequential (Morse, 1991). Concurrent timing occurs when the researcher implements both quantitative and qualitative methods during a single phase of the research study. This means that the quantitative and qualitative data are collected, analyzed, and interpreted at (approximately) the same time. Sequential timing occurs when the researcher implements the methods in two distinct phases, using (collecting and analyzing) one type of data before using the other data type. There are two options for sequential timing. A researcher may choose to start by collecting and analyzing quantitative data and may then subsequently collect and analyze qualitative data. The reverse is also possible: Qualitative data are collected and analyzed first and then quantitative data are collected and analyzed.

## The Weighting Decision

In addition to choosing the timing, researchers also need to consider the relative weighting of the two approaches in the study (Figure 4.5b). Weighting refers to the relative importance or priority of the quantitative and qualitative methods to answering the study's questions. This choice has been referred to as the "priority decision" (Morgan, 1998) because a researcher decides whether both methods will have equal priority or one method will have a greater priority than the other.

There are two possible weighting options for a mixed methods design, as depicted in Figure 4.5b. The two methods may be given equal weight so that both play an equally important role in addressing the research problem. On the other hand, the research design may weight them unequally. In this case, one of the methods (quantitative or qualitative) will have a greater emphasis within the study than the other method (qualitative or quantitative).

How does a researcher select a study's weighting? Numerous considerations influence the comparative weights of the qualitative and quantitative data in a study. Morse (1991) suggested that the theoretical drive, or worldview, used to guide a study determines its weighting. That is, a postpositivistic worldview calls for a quantitative priority, a naturalistic worldview calls for a qualitative priority, and a pragmatic worldview calls for either equal or unequal weighting, depending on the research question. Morgan (1998) advised that the weighting in a study be based on the strength of which data collection method (quantitative or qualitative) is best suited to address the study's goals or purpose. The weighting is thus influenced by the goals, the research question(s), and the use of procedures from research traditions such as quantitative experimental designs or qualitative case study designs.

Practical considerations also influence weighting (e.g., Creswell, 2003). For example, it takes more resources to implement a study that gives equal weighting to the two methods. Therefore, with limited resources, a researcher may choose to prioritize one method (quantitative or qualitative) and devote fewer resources to the secondary method (qualitative or quantitative). The weighting may also reflect the researcher's relative experience with the two methods, particularly if he or she is significantly more familiar with one method than the other. Finally, consider the audiences for the research. Audiences include advisors, committee members, journal editors and reviewers, funding officers, and the disciplinary research community at large. If a study's target audiences are unaccustomed to or unaccepting of one approach (quantitative or qualitative), then the other method may receive a greater priority in the study's design.

Researchers should indicate a study's weighting within their written reports, and research consumers can look for these indications as they read published mixed methods studies. Indicators of a study's weighting include the following:

- The way the researcher words the title: Quantitative or qualitative terms indicate unequal weighting, and the lack of such terms indicates equal weighting
- The explicit identification of the guiding worldview used in the study
- A purpose statement that uses terms that indicate unequal weighting, such as "primary aim" or "secondary purpose"
- A statement identifying the weighting in the methods section

- More space being devoted to one method in the article or the emphasis of one method within the abstract
- More sophisticated and complex procedures used for one method compared to the other

## The Mixing Decision

The third procedural consideration for choosing a mixed methods design is how the quantitative and qualitative methods will be mixed (Figure 4.5c). Mixing is the explicit relating of the two data sets. A study that includes both quantitative and qualitative methods without explicitly mixing the data derived from each is simply a collection of multiple methods. A rigorous and strong mixed methods design addresses the decision of how to mix the data, in addition to timing and weighting.

What procedures are available for mixing quantitative and qualitative data? Conceptually, there are three overall strategies for mixing quantitative and qualitative data (see Figure 4.5c). The two data types can be merged, one can be embedded within the other, or they can be connected.

*Merging Data Sets.* The data are merged when the researcher takes the two data sets and explicitly brings them together or integrates them. Researchers can merge the two data sets during the interpretation (by analyzing them separately in a results section and then merging the two sets of results together during the interpretation or discussion phase) or during the analysis of the data (by transforming one data type into the other type or consolidating the data into new variables).

*Embedding Data at the Design Level.* The researcher could decide to embed data of one type within a design of the other type. This is an example of mixing at the design level, not just at the level of data. A researcher may choose to embed qualitative data within a larger quantitative (e.g., experimental) design or to embed quantitative data within a larger qualitative (e.g., phenomenology) design. One form of data can be embedded in a concurrent data collection with the other dataset; alternatively, the embedded data may be collected sequentially before or after the other dataset. Researchers may make interpretations from using the secondary, embedded dataset by bringing the two datasets together in the concurrent approach and keeping them separate in the sequential approach.

*Connecting From Data Analysis to Data Collection.* A researcher could choose to connect the two data types. Connecting the data occurs when the analysis of one type of data leads to (and thereby connects to) the need for the other type of data. This can occur in one of two ways. A researcher may obtain quantitative results that lead to the subsequent collection and analysis of qualitative data. A researcher can also start with qualitative results that build to the subsequent collection and analysis of quantitative data. The mixing occurs in the way that the two data types are connected. This connection can occur in different ways, such as in specifying research questions, selecting participants, or developing an instrument or other materials.

## IMPLEMENTING THE DESIGN DECISIONS

Researchers could choose to use any combination of timing, weighting, and mixing for their mixed methods design. However, based on the underlying logic of the mixed methods designs introduced in this chapter, these criteria are best used in certain combinations. Table 4.2 summarizes the four major designs and their corresponding timing, weighting, and mixing decisions. These decisions, combined with the different research purposes, lead to the following design choices:

- If there is a single phase, both types of data are given equal emphasis, the two sets of results are converged during the interpretation, and the intent is to draw valid conclusions about a research problem, then the choice of design is the Triangulation Design–convergence model.
- If there is a single phase, both types of data are given equal emphasis, one type of data is transformed into the other type, and the intent is to interrelate different data types about a research problem, then the choice of design is the Triangulation Design–data transformation model.
- If both types of data are collected at the same time from a survey and the intent is to use qualitative information to validate the quantitative results, then the choice of design is the Triangulation Design–validating quantitative data model.
- If different types of data are collected to represent different levels of analysis within a system, with the intent of forming an overall interpretation of the system, then the choice of design is the Triangulation Design–multilevel model.
- If quantitative data are used to answer the primary question in an experimental design and qualitative data are embedded within the experimental design (before, during, or after the intervention) with the intent of answering a secondary question related to the experiment, then the choice of design is the Embedded Design–experimental model.

**Table 4.2** The Major Mixed Methods Design Types

| *Design Type* | *Variants* | *Timing* | *Weighting* | *Mixing* | *Notation* |
|---|---|---|---|---|---|
| Triangulation | • Convergence<br>• Data transformation<br>• Validating quantitative data<br>• Multilevel | Concurrent: quantitative and qualitative at same time | Usually equal | Merge the data during the interpretation or analysis | QUAN + QUAL |
| Embedded | • Embedded experimental<br>• Embedded correlational | Concurrent or sequential | Unequal | Embed one type of data within a larger design using the other type of data | QUAN(qual) or QUAL(quan) |
| Explanatory | • Follow-up explanations<br>• Participant selection | Sequential: Quantitative followed by qualitative | Usually quantitative | Connect the data between the two phases | QUAN → qual |
| Exploratory | • Instrument development<br>• Taxonomy development | Sequential: Qualitative followed by quantitative | Usually qualitative | Connect the data between the two phases | QUAL → quan |

- If quantitative data are used to answer the primary question in a correlational design and qualitative data are embedded within the correlational design with the intent of explaining the mechanisms that relate the predictor and outcome variables, then the choice of design is the Embedded Design–correlational model.
- If one phase is followed by another phase, the first phase is quantitative, quantitative methods or data are emphasized, the second phase is connected to the results of the first phase, and the intent is to explain these results using qualitative data as a follow-up, then the choice of design is the Explanatory Design–follow-up explanations model.
- If one phase is followed by another phase, the first phase is quantitative, the qualitative phase is emphasized, the second phase is connected to

the results of the first phase, and the intent is to purposefully select participants to best address the qualitative research question, then the choice of design is the Explanatory Design–participant selection model.

- If one phase is followed by another phase, the first phase is qualitative, the two phases are connected by the development of an instrument based on the results of the first phase, and the intent is to develop and implement an instrument on the topic of interest, then the choice of design is the Exploratory Design–instrument development model.
- If one phase is followed by another phase, the first phase is qualitative and results in a taxonomy or emergent theory, the two phases are connected by quantitative testing of the results of the first qualitative phase, the qualitative phase is emphasized, and the intent is to quantitatively generalize the qualitative results, then the choice of design is the Exploratory Design–taxonomy development model.

## WRITING A PARAGRAPH TO IDENTIFY A STUDY'S DESIGN

Because many researchers and reviewers are currently unfamiliar with the different types of mixed methods designs, it is important to include an overview paragraph that introduces the design when writing about a study in proposals or research reports. This overview paragraph generally is placed at the start of the methods discussion and should address four topics. First, identify the type of mixed methods design and variant model, if appropriate. Next, give the defining characteristics of this design, including its timing, weighting, and mixing decisions. Third, state the overall purpose or rationale for using this design for the study. Finally, include references to the mixed methods literature on this design. An example of an overview paragraph is included in Figure 4.6, along with comments that will assist in identifying these features within the paragraph.

### Summary

Researchers designing a mixed methods study can choose among the four major types of mixed methods designs: Triangulation, Embedded,

| Mixed Methods Sequential Explanatory Design | |
|---|---|
| The mixed methods sequential explanatory design consists of two distinct phases: quantitative followed by qualitative (Creswell, Plano Clark, et al., 2003). | Names design |
| In this design, a researcher first collects and analyzes the quantitative (numeric) data. The qualitative (text) data are collected and analyzed second in the sequence and help explain, or elaborate on, the quantitative results obtained in the first phase. | Discusses timing, weighting |
| The second, qualitative, phase builds on the first, quantitative, phase, and the two phases are connected in the intermediate stage in the study. | Discusses mixing |
| The rationale for this approach is that the quantitative data and their subsequent analysis provide a general understanding of the research problem. The qualitative data and their analysis refine and explain those statistical results by exploring participants' views in more depth | Discusses design rationale |
| (Rossman & Wilson, 1985; Tashakkori & Teddlie, 1998; Creswell, 2003). | Cites methodological references |

**Figure 4.6** Sample Paragraph Introducing a Mixed Methods Design
SOURCE: Ivankova et al. (2006, p. 5).

Explanatory, or Exploratory. Mixed methods researchers choose a design based on which design best addresses the research problem and the advantages inherent in each design. Researchers should carefully consider the challenges associated with their design choice and plan strategies for addressing these challenges. As part of choosing a design, decisions need to be made about the use of concurrent or sequential timing for the two methods, whether the two methods will have equal or unequal weighting, and how the two methods will be mixed. These decisions, the underlying logic that is best suited to the research problem, and practical considerations are the foundation researchers should use in selecting which variant of the four major mixed methods designs to use for their study.

## Activities

1. Which of the four major design types will you use in your study? Write a one-paragraph overview that identifies this design; defines its timing, weighting, and mixing; and states your rationale for choosing it for your study.

2. What challenges are associated with your design choice? Write a paragraph that discusses the challenges that you anticipate occurring with your design and how you might address them.

3. Draw a diagram of the procedures you will use, following one of the major variants of the four types of designs advanced in this chapter. Use the depictions of the different variants in the figures as examples to follow.

## Additional Resources to Examine

For additional information on the major mixed methods design types, consult

Creswell, J. W., Plano Clark, V. L., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209–240). Thousand Oaks, CA: Sage.

Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*(3), 255–274.

Good discussions on timing, weighting, and mixing in mixed methods studies can be found in

Caracelli, V. J., & Greene, J. C. (1993). Data analysis strategies for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 15*(2), 195–207.

Morgan, D. L. (1998). Practical strategies for combining qualitative and quantitative methods: Applications to health research. *Qualitative Health Research, 8*(3), 362–376.

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research, 40,* 120–123.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage.