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Mixed Methods

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Pre-reading questions

1. What are the main characteristics of quantitative research? Of qualitative research? In what ways do they differ from each other?
2. What do you know about mixed methods research? What are its main characteristics?
3. In what research situations do you think it is appropriate to use mixed methods research?
4. From your prior readings of research studies, can you identify any specific ways for combining quantitative and qualitative data within one study?
5. What are the main steps in designing and conducting a research study? Do you think these steps will be very different for designing and conducting a mixed methods study?

Illustrative example

Li Jie and Qin Xiaoqing are foreign language education researchers in China. They are intrigued by a growing tendency in recent literature on ESL/EFL classroom research to relate student learning style and learning strategy to English language learning success. They decide to examine this relationship through research on university students in China. After careful consideration, they decide to use a mixed methods approach because they believe it will allow for a more complete understanding of the research problem. They choose to investigate three research questions: What are students' learning styles? How do their learning styles affect their use of learning strategies? How do high and low achievers with the same learning styles use learning strategies differently? Jie and Xiaoqing first collect quantitative data from a sample of 187 second-year non-English major undergraduate students from two universities in China. There were three sources for this data: a standardized personality test to measure students' learning styles; a self-developed questionnaire on the use of learning

strategies; and end-of-term English tests to indicate students' language learning outcomes. After analyzing this data, they find that learning styles have a significant influence on learners' learning strategy choices. To probe their major findings from the quantitative data in more depth and to understand how high and low achievers with the same learning styles use learning strategies differently, Jie and Xiaoqing then select a small group of three high and three low achiever students (based on the end-of-term English test) from their sample, and interview them to obtain qualitative data. Qualitative analysis reveals that high achievers are more capable of employing learning strategies typically associated with their nonpreferred styles.

Using both quantitative and qualitative data gives the researchers an opportunity to obtain an overall picture of the learning style distributions of the students and the relationship between learning styles and learning strategies. It also provides greater insights into the differences of learning strategy deployment between high and low achievers of the same learning style. Based on the study results the authors conclude that learning styles may influence learners' language learning outcomes through their relationship with learning strategies. They make the following recommendations: (a) teachers should help students become self-aware learners; (b) teachers should encourage students to experiment with extending their preferred styles; and (c) teachers should incorporate learning styles into learning strategy training. (Based on Jie & Xiaoqing, 2006)

Overview

The complexity of the modern world demands more sophisticated approaches to understand it. To best research an issue, we need to be flexible, and finding 'what works' often calls for combining complementary **research methods** within a single study. **Mixed methods research**, with its focus on the meaningful integration of both quantitative and qualitative data, can provide a depth and breadth that a single approach may lack by itself. However, because of this integration, mixed methods research can often prove challenging for novice researchers.

Over the last two decades, the practice of collecting and analyzing both quantitative and qualitative data within one study has become relatively popular in the social sciences (Creswell, 2003). In applied linguistics, this 'mixed methods approach' is still a relatively new phenomenon, but will be used more often in the future as it becomes clear that combining quantitative and qualitative data provides a more multidimensional and accurate view of the process of second language acquisition (Rocco, Bliss, Gallagher, Perez-Prado, Alacaci, Dwyer et al., 2003). Mixed methods can be used in case study and action research, and can use observation, interviews, open-response questionnaire items, verbal reports, and diaries to collect data. This chapter is designed to introduce you to the mixed methods approach

to research and the use of this approach in applied linguistics research. We describe four basic mixed methods designs – Explanatory, Exploratory, Triangulation, and Embedded – and then offer an eight-step process for designing and conducting a mixed methods study.

What is mixed methods research?

There are three broad research traditions in the social sciences: quantitative, qualitative, and mixed methods. Both the quantitative and qualitative traditions are well established. In **quantitative research,** researchers gather numeric data, for example, proficiency test scores or multiple choice question (or 'closed-response item') responses on questionnaires; they then try to objectively analyze this data using a variety of statistical techniques, and let the numeric results prove or disprove a hypothesis so that those results can be generalized from a sample to a larger population.

On the other hand, in **qualitative research** researchers try to understand participants' experiences with the central phenomenon (the focus of the study) in a natural setting, using research approaches such as ethnography or case study. Instead of numbers, researchers collect words (text, such as interviews or observation notes), and images (pictures or audio-visual footage) about the phenomenon of the study. Without preconceived hypotheses or ideas they analyze the data for common patterns (themes) in order to allow multiple interpretations of participants' individual experiences (Denzin & Lincoln, 2005). In this type of research, the goal is not to try to prove or disprove something; rather, the aim is to explore and then describe in rich detail the phenomenon that is being investigated.

As compared with quantitative and qualitative research, mixed methods research is an emerging field of study and may be less recognized than more conventional research traditions. It is defined as a procedure for collecting, analyzing, and **mixing** quantitative and qualitative data at some stage of the research process within a single study in order to understand a research problem more completely (Creswell, 2008). In mixed methods research, a researcher collects both numeric information (for example, through closed-response items on questionnaires) and text (from face-to-face interviews, picture descriptions, and so on) to better answer a study's research questions. The term 'mixing' implies that the data or the findings are integrated and/or connected at one or several points within the study. Although many models and designs have been discussed in the mixed methods literature (Creswell & Plano Clark, 2007; Greene, Caracelli, & Graham, 1989; Morgan, 1998; Tashakkori & Teddlie, 1998), the four mixed methods designs most frequently used are Explanatory Design, Exploratory Design, Triangulation Design, and Embedded Design. Following is a description of the general characteristics these designs share and then a brief discussion of each one.

Characteristics of mixed methods research

Mixed methods research has defined procedures for collecting, analyzing, and mixing quantitative and qualitative data in a study, based upon three main characteristics: (a) **timing**, or the sequence or order of collecting and analyzing quantitative and qualitative data in a study; (b) **weighting**, or the priority given to one type of data in the study; and (c) **mixing**, or the way quantitative and qualitative data and results are integrated during the research process (Creswell & Plano Clark, 2007).

These characteristics will be introduced here and then elaborated on in the description of mixed methods designs which follows, using Creswell's (2003) widely used notation (based upon Morse, 1991, and Tashakkori & Teddlie, 1998): large and small letters in the labels (QUAL/quan or qual/QUAN) indicate weight of the quantitative and/or qualitative approaches, and the symbols → and + indicate timing in the data collection and analysis.

There are three main characteristics of mixed methods research:

- *Timing*: Timing refers to the sequence or order of the implementation of the quantitative and qualitative data collection and analysis procedures in the study when one phase builds on another. The two possible timing options include: (1) sequentially – collecting and analyzing the data one after the other (quantitative → qualitative, or qualitative → quantitative); or (2) concurrently – collecting and analyzing both quantitative and qualitative data at the same time (quantitative + qualitative) (Morse, 1991).
- *Weighting*: Weighting refers to the relative importance or priority given to each type of data. The two possible weighting options include giving equal weight to the quantitative (QUAN) and qualitative (QUAL) data, or giving one type greater emphasis – to quantitative data (QUAN vs. qual) or qualitative data (QUAL vs. quan). When making the weighting decision, there are a number of things to consider: What is more strongly emphasized in the purpose statement, exploration (qualitative) or prediction (quantitative)? Which data collection process, quantitative or qualitative, is most central to the study? Which data analysis procedures, quantitative or qualitative, are more sophisticated, complex, and discussed more extensively when the study is presented?
- *Mixing:* Mixing refers to how the two methods, quantitative or qualitative, are integrated within the study. It is an essential component of mixed methods research (Greene et al., 1989; Tashakkori & Teddlie, 1998). Mixing quantitative and qualitative data can occur at different stages in the study: during the data collection, the data analysis, or the interpretation of results. Deciding on how to mix depends on the purpose of the study, its design, and the strategies used for data collection and analysis.

If the purpose of the study is to *explain* quantitative results that were obtained first, qualitative data can be collected after quantitative data by interviewing (or administering an open-response questionnaire) to a small number of participants, based on these quantitative results (see *Explanatory Design* below). Mixing here occurs at two points: when selecting participants for interview and creating interview questions grounded in the statistical results (connecting the quantitative and qualitative phases), and at the interpretation stage of the study, when discussing the results from the two phases. If the purpose of the study is to *develop a closed-response questionnaire or survey* grounded in the views of the participants, first qualitative data is collected through interviews and then the questionnaire is developed; then quantitative data is collected using this questionnaire. Mixing here occurs while analyzing the qualitative data for codes and themes and transforming them into questionnaire items and scales (see *Exploratory Design* below). If the purpose of the study is to *compare* the quantitative and qualitative results, both quantitative and qualitative data are collected and analyzed separately. Mixing here occurs at the data interpretation stage, when the results from two data sets are compared (see *Triangulation Design* and *Embedded Design* below).

Principal mixed methods designs

Four mixed methods designs that are most frequently used by researchers are the Explanatory Design, the Exploratory Design, the Triangulation Design, and the Embedded Design. In the following sections we will describe and illustrate each design using the notation system discussed above.

Design 1: Explanatory Design

The **Explanatory Design** is the most straightforward mixed methods design (Creswell, Plano Clark, Gutmann, & Hanson, 2003), and it is used extensively in applied linguistics research. The word *explanatory* in the design name suggests explanation: qualitative findings are used to help explain, refine, clarify, or extend quantitative results. Quantitative and qualitative data are collected and analyzed in sequence: first quantitative data is collected and analyzed, and then qualitative data. A typical example would include conducting follow-up qualitative interviews of representative or extreme cases to more deeply explore quantitative results. An example of this is Saito and Ebsworth's (2004) exploration of Japanese ESL students' perceptions of the classroom activities and classroom-related behaviors of their English teachers in the United States and in Japan. They first surveyed a large sample of Japanese ESL learners in both countries using a 49-item questionnaire, and then they conducted follow-up interviews with three students to help interpret and elaborate the results obtained from the survey. Figure 7.1 presents the visual diagram of the Explanatory Design procedures in this study.

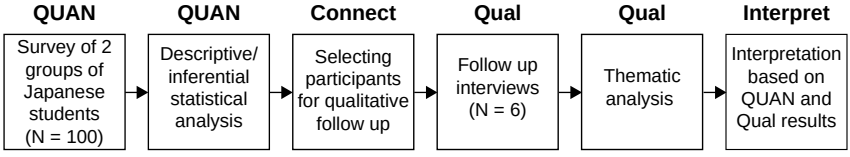

Figure 7.1 Explanatory Design procedures in Saito and Ebsworth's (2004) study

The weight in this design is typically placed on quantitative data because the quantitative data collection represents the major aspect of this mixed methods data collection process; it also comes first in the sequence. The mixing of the two methods occurs at two stages in the research process: first, while developing the qualitative interview protocol and choosing the participants for in-depth exploration of the quantitative results; and second, while integrating the results from both quantitative and qualitative phases at the interpretation and discussion stage of the study.

The data analysis typically involves several options. A researcher might choose to follow up on extreme or representative cases from the quantitative analysis, or seek to explain the quantitative results in more depth. The structure of an Explanatory Design report typically follows the sequential character of the design: the quantitative data collection and analysis is described first, followed by the description of the qualitative data collection and analysis. A separate section in the report might discuss how the two phases were connected in the research process. During the discussion of the study results, a researcher explains how the qualitative findings helped elaborate or extend the quantitative results.

An advantage of the Explanatory Design is that its two separate phases make it straightforward and reasonably easy to implement for novice researchers. This sequential nature also makes it simple to describe and report on. However, compared to a straightforward quantitative study, an Explanatory Design study may take longer to complete.

Design 2: Exploratory Design

The **Exploratory Design** is used when a researcher needs first to explore a topic using qualitative data before measuring or testing it quantitatively. This design is particularly appropriate when studying a topic which has been little explored, so there is little information about the relevant constructs (ways of conceptualizing the topic) and how to measure important variables. In this design, the qualitative data is collected and analyzed first, followed by the collection and analysis of the quantitative data.

As the name suggests, this design allows a researcher first *to explore* a topic by collecting qualitative data to help identify principal themes and possibly generate a theory. Then, the researcher collects quantitative data to examine the initial qualitative results, such as to test a theory or to develop

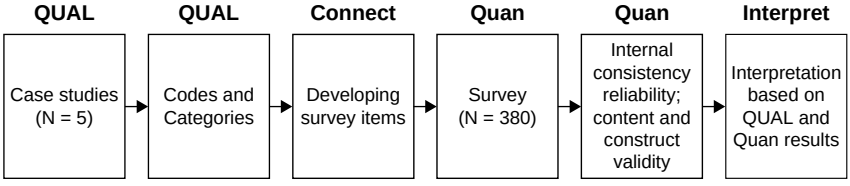

Figure 7.2 Exploratory Design procedures in Daud's (1995) study

a measurement instrument such as a questionnaire or survey (Morgan, 1998). For example, Daud (1995) applied the Exploratory Design to investigate teachers' attitudes toward computer-assisted language learning (CALL). In the first phase, five case studies were conducted in four schools and a university to explore teachers' attitudes toward CALL. Next the qualitative findings from these studies were used to develop a 56-item questionnaire to measure those attitudes, which was then tested for reliability and validity with a larger sample of school and university teachers. Figure 7.2 presents the visual diagram of the Exploratory Design procedures in this study.

The weight in the Exploratory Design is typically given to the qualitative data, because it provides the foundation for the quantitative exploration of the topic. The mixing of the two methods occurs while developing the quantitative survey items based on the qualitative data analysis and also while comparing the quantitative results with initial qualitative findings. The most popular approach for data analysis is to use the qualitative themes and categories to develop the quantitative measurement instrument (Creswell, 2008). In writing up the research, a researcher first reports the qualitative data collection and analysis and then explains the development of the instrument. Next, the quantitative data collection and analysis are discussed, and finally the overall results of the study are presented.

Like the Explanatory Design, the two-phase nature of the Exploratory Design makes it straightforward for a researcher to design, implement, and report on. However, like in the Explanatory Design, implementing the two separate phases of the study can be time consuming. In addition, developing a measurement instrument is not easy. A researcher must use careful procedures to ensure that it is grounded in the qualitative results – that it is not constructed from common sense or theory, but based upon the qualitative data collected – and that it is tested for reliability and validity.

Design 3: Triangulation Design

The **Triangulation Design** is the most common mixed methods design, and also the most complex. The name *triangulation* comes from the same term used in surveying and in ship navigation in which multiple measurements are used to provide the best estimate of the location at a specific point, like the point at the top of a triangle (Jick, 1979). The Explanatory

and the Exploratory Designs are straightforward to implement because of the sequential order of each data collection and analysis phase; however in the Triangulation Design, quantitative and qualitative data are collected simultaneously. For instance, both a questionnaire and focus group interviews are conducted at the same time with the same participants, and then a researcher compares the quantitative and qualitative results. Often quantitative and qualitative data are collected using a questionnaire that contains closed-ended (quantitative) and open-ended (qualitative) response items. Triangulation design is best suited when a researcher wants to collect both types of data at the same time about a single phenomenon, in order to compare and contrast the different findings to produce well-validated conclusions (Creswell et al., 2003). For example, Lopez and Tashakkori (2006) applied the Triangulation Design to investigate the effects of two types of bilingual programs (two-way and transitional) on the academic performance and attitudes of fifth grade students who entered kindergarten or first grade with different levels of English proficiency. They collected both quantitative data, such as students' academic achievement scores, Spanish reading skills, and attitudes toward bilingualism, and qualitative data, including interviews with the randomly selected subsample of 32 students. Both quantitative and qualitative data were collected, analyzed, and reported separately. Quantitative data analysis revealed no significant differences in standardized measures of English achievement between the two programs, although significant differences were found among students in oral language acquisition in English, Spanish-reading ability, their attitudes, and perceived levels of proficiency in English and Spanish. Qualitative data indicated that students in the two-way bilingual education program had more positive attitudes toward bilingualism. Based on the quantitative and qualitative results of the study Lopez and Tashakkori concluded that despite some similarities in the outcomes, each bilingual education program also has its unique effects. Figure 7.3 presents the visual diagram of the Triangulation Design procedures in this study.

The weight in this design can be given to either quantitative or qualitative data, or equally to both. The mixing of the two methods occurs either at the data analysis stage or during the interpretation of the results from the two components of the study. As for data analysis, there are a lot of options. The most popular approach is to compare the quantitative results and qualitative findings to confirm or cross-validate the findings from the entire study. Another commonly used strategy is to transform qualitative data into quantitative data by counting codes, categories, and themes (called **quantifying**), or quantitative data into qualitative data through cluster or factor analysis (called **qualifying**) in order to compare it directly with another data set or include it in the overall analysis. The reporting structure of the Triangulation Design differs from the sequential Explanatory and

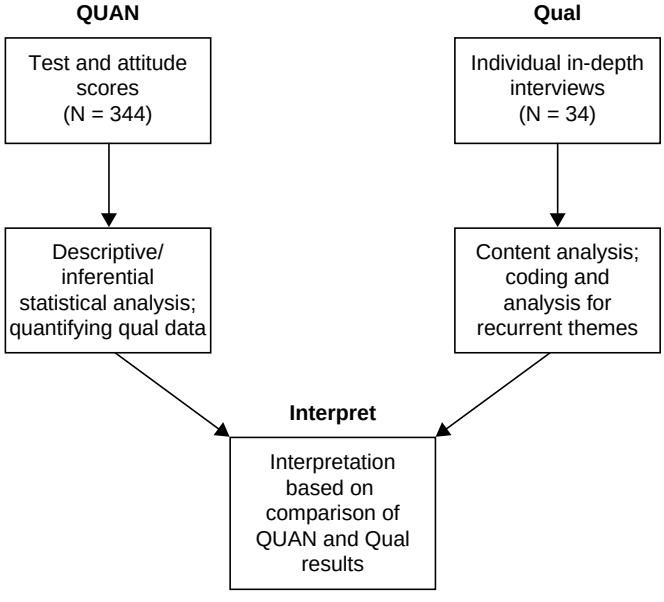

Figure 7.3 Triangulation Design procedures in Lopez and Tashakkori's (2006) study

Exploratory designs. A researcher presents the quantitative and qualitative data collection and analysis in separate sections, but combines the interpretation of the quantitative and qualitative findings into the same section, to discuss whether the results from both study components converge or show divergence.

An advantage of the Triangulation Design is that it typically takes less time to complete than the sequential Explanatory and Exploratory designs. It can also result in well-validated and substantiated findings because it offsets the weaknesses of one method with the strengths of another method (Creswell et al., 2003). There are, however, two significant challenges: first, it requires a lot of effort, as well as expertise, to collect and analyze two separate sets of data simultaneously; and second, it is sometimes technically difficult to compare different quantitative and qualitative data sets, especially if the two sets of results do not converge.

Design 4: Embedded Design

The **Embedded Design** is used when a researcher needs to answer a secondary research question that requires the use of different types of data within a traditional quantitative or qualitative design. To accomplish this, one type of data collection and analysis is embedded or nested within the design associated with another type of data. For example, a researcher may need

to embed qualitative data within a quantitative experimental design and will conduct qualitative interviews during the research study to understand the reasons for certain participants' behaviors. Less frequently, a researcher may embed quantitative survey data within a traditionally qualitative case study to help describe the broader context in which a case is situated. Unlike the Triangulation Design, the Embedded Design has a predominant method (quantitative or qualitative) that guides the research study (Creswell et al., 2003). For example, Andrews (2006) used the Embedded Design to study the development of teachers' second language awareness with specific reference to cognitive processes of teaching English and particularly grammar. The study was primarily qualitative by nature, as the data was collected in the form of interviews with teachers, classroom observations, and teacher narratives. The quantitative data, in the form of test scores, was used to answer one study research question, 'What is the present level (as measured by a test) of each teacher's subject-matter knowledge as it relates to grammar?' (p. 4), and inform the discussion of the teachers' past and present subject-matter knowledge. The analysis of the test scores over time indicated that teachers' language awareness and grammar-related cognition had changed very little, while the overall study described teachers' underlying beliefs about grammar pedagogy and the role of explicit grammar teaching. Figure 7.4 presents the visual diagram of the Embedded Design procedures in this study.

The weight in this design is given to the predominant method, quantitative or qualitative, that guides the project (Creswell et al., 2003) and within which another method is embedded. The mixing of the quantitative and qualitative data occurs either at the data analysis stage if the data is collected concurrently (like in the Triangulation Design), or at the interpretation stage if the two types of data are collected sequentially (like in the Explanatory and the Exploratory Designs). The quantitative and qualitative data analysis in this design is conducted separately because they seek to answer different research questions. Depending on the timing of the data collection, the structure of the report could follow either a sequential or concurrent design model.

The main advantage of the Embedded Design is that a researcher builds the study on a design that is well known (for example, a case study). Another advantage is that a researcher can collect the two types of data at the same

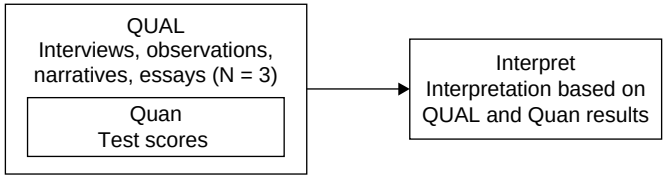

Figure 7.4 Embedded Design procedures in Andrews's (2006) study

time. However, it might sometimes be challenging to integrate the quantitative and qualitative results because the two methods are used to answer different research questions. Nevertheless, due to the nature of the questions, researchers can present the two sets of results separately.

Why use mixed methods in applied linguistics research?

Compared to quantitative and qualitative research approaches, mixed methods research is still relatively new. However, its perceived legitimacy is growing and this new approach is increasingly being used in many social science fields, including applied linguistics. In fact, Patton (2002) argues that studies that use only one method are more vulnerable to errors linked to that particular method compared with studies that use multiple methods, in which different types of data can help validate each other. Mixed methods research is also an intuitive way of conducting inquiry: many individuals look to both numbers and stories to make sense of everyday events. In addition, mixed methods research is flexible and allows a researcher to choose the best strategies, quantitative and qualitative, to address the study research questions and place more emphasis on finding answers to these questions rather than the methods used. Thus, it can provide answers to both 'what' and 'why' questions and this way gain a more complete understanding of the research problem than if qualitative or quantitative methods were used alone.

A mixed methods approach can have a number of benefits. It can be helpful in gaining in-depth understanding of trends and patterns; generating and testing theories; developing new measurement instruments; studying diverse perspectives; or understanding the relationship between variables. In any of these situations, collecting and analyzing quantitative and qualitative data within one study will produce a more comprehensive understanding of the research situation than collecting only one type of data or the other (Greene et al., 1989; Tashakkori & Teddlie, 1998).

Creswell et al. (2003) identified four main reasons for combining quantitative and qualitative methods within one study. Each of these objectives is addressed by a specific mixed methods design that we discussed above: (a) explain or elaborate on quantitative results with subsequent qualitative data (the Explanatory Design); (b) use qualitative data to develop a new measurement instrument or theory that is subsequently tested (the Exploratory Design); (c) compare quantitative and qualitative data sets to produce well-validated conclusions (the Triangulation Design); and (d) enhance a study with a supplemental data set, either quantitative or qualitative (the Embedded Design).

In the illustrative example, Jie and Xiaoqing used a mixed methods approach to study the relationship between Chinese students' learning styles and learning strategies to English language learning success. Collecting and analyzing both quantitative and qualitative data gave them an opportunity to gain in-depth

understanding of the trends and patterns in such relationships. They pursued the first objective outlined by Creswell et al. (2003) – to explain or elaborate on the initial quantitative results with subsequent qualitative data. Specifically, they collected quantitative data to get an overall picture of the students' learning style distributions and the relationship of learning styles to learning strategies, while the qualitative interview data helped them explore the significant quantitative results to gain greater insights into the differences of using learning strategies by high and low achievers.

Designing and conducting a mixed methods study

While designing and conducting a mixed methods study it is useful, especially for novice researchers, to follow a set of logical steps. Here we present eight basic research steps, steps that can also be used to evaluate mixed methods studies conducted by other researchers. Their order does not necessarily follow the logic of typical approaches to designing a study, but, in the end, the major aspects of design will be addressed. In our approach, the selection of a research design is completed early in the process, and this selection, in turn, informs many other aspects needed to design the study. We will describe these steps and illustrate them with Jie and Xiaoqing's mixed methods study. The eight steps include:

- Step 1: Determine if mixed methods research is the best approach to address the research problem that you want to study.
- Step 2: Select a specific mixed methods design (Explanatory, Exploratory, Triangulation, Embedded).
- Step 3: Write a detailed mixed methods purpose statement for your study.
- Step 4: Write specific research questions to address the quantitative and qualitative aspects of your study.
- Step 5: Choose the quantitative and qualitative data to collect.
- Step 6: Draw a visual diagram of the procedures in your study.
- Step 7: Collect and analyze the quantitative and qualitative data for your study – this is the major part of the study.
- Step 8: Write the final report reflecting the mixed methods design you used in the study.

Step 1: Determine if mixed methods is the best approach

You need to decide if a mixed methods approach is the best choice for your study. Here are some questions to guide your decision: Would quantitative or qualitative data alone provide too limited an understanding of the research problem? Would the use of both quantitative and qualitative data enhance understanding? Are there advantages in having both a large sample representative of the population (quantitative data) and the views or experiences

of selected individuals (qualitative data)? On the practical side, do you have the knowledge and skills necessary to conduct both quantitative and qualitative research? Is there enough time for collecting both types of data?

If you can answer 'yes' to all of these questions, then a mixed methods approach would be better for your study than using a single method. From here, you need to clarify your rationale for choosing this approach. What is the specific purpose for using mixed methods research? Will it help you gain in-depth understanding of trends and patterns, develop a new measurement instrument, or produce well-validated conclusions?

In the illustrative example, Jie and Xiaoqing expected that the quantitative data would help them get an overall picture of the learning style distributions of the participants and the relation of learning styles to learning strategies. Then, significant quantitative results could be explored through qualitative interviews to gain greater insights into the differences of learning strategy use between high and low achievers. Thus, the rationale for using mixed methods was that the qualitative findings were anticipated to help explain the results of the quantitative investigation.

Step 2: Select a specific mixed methods design

Once you have decided that mixed methods is the right approach, you must next determine which mixed methods design is the most appropriate for your study – Explanatory, Exploratory, Triangulation, or Embedded. Think again about the purpose of the study and the rationale for using a mixed methods approach. Also, consider the timing of the quantitative and qualitative data collection and analysis, the weight given to quantitative and qualitative data sets in the study, and the stage in the research process where mixing or integration of the quantitative and qualitative aspects of the study would occur.

Jie and Xiaoqing used the Explanatory Design because the purpose of their study was to obtain a general picture of the relationship between learning styles and language strategies of foreign language learners, and then use the qualitative findings to obtain a more in-depth understanding. The quantitative and qualitative data were collected and analyzed in two sequential stages, in which the qualitative phase was built on the quantitative through purposeful sampling. The weight was given to the quantitative data, and the two methods were connected after the quantitative data analysis was completed and the participants for the follow up qualitative interviews were selected.

Step 3: Write a detailed mixed methods purpose statement

Getting focused is an important part of the process of research in general. A mixed methods purpose statement can help you do that. It typically consists of three sentences and includes the overall purpose of the study and

the purpose of each quantitative and qualitative component. It should also indicate the site and sample for each phase. We recommend using the following sample script to assist in writing a purpose statement – fill in the information that applies to the study in the space between the parentheses (Ivankova, Creswell, & Plano Clark, 2007):

> The purpose of this (Explanatory/Exploratory/Triangulation/Embedded) mixed methods study is to (state the overall intent and the reason for collecting both types of data for this study). The goal of the quantitative phase of the study is to (state the purpose of the quantitative aspect of the study; indicate independent and dependent variables, instruments, participants, and site). The goal of the qualitative phase of the study is to (state the purpose of the qualitative aspect of the study; indicate the central phenomenon, type of data, participants, and site).

Since Jie and Xiaoqing did not provide a mixed methods purpose statement in their published study, we developed one following the suggested script:

The purpose of this Explanatory mixed methods study is to examine the relationship between learning styles and learning strategies of foreign language learners in China. The goal of the quantitative phase of the study is to obtain an overall picture of the learning style distributions of 187 Chinese tertiary-level English learners and the relationship of learning styles to learning strategies. The goal of the qualitative phase of the study is to more deeply explore the differences of learning strategy use between high and low achievers of the same learning style through individual interviews with six purposefully selected participants.

Step 4: Write specific research questions

Next you need to write up the specific questions that you are going to investigate. Specific research questions should be developed for both quantitative and qualitative aspects of the study. When writing the quantitative research questions or hypotheses it is necessary to specify independent and dependent variables and focus on their relationship. When writing the qualitative research questions it is necessary to indicate the central phenomenon that is to be explored. We recommend also developing a mixed methods research question that spans both quantitative and qualitative data collection and that reflects the rationale for choosing a specific mixed methods design.

In the illustrative study, Jie and Xiaoqing did not specify the research questions for the quantitative and qualitative phases of the study; instead they listed three research questions which follow the quantitative-qualitative pattern of the Explanatory Design:

a) *What are the learning style distributions of the Chinese tertiary-level English learners? (quantitative)*

b) How do learning styles affect the use of learning strategies of tertiary-level English learners in China? (quantitative)

c) What differences relating to learning strategy deployment exist between high and low achievers of the same learning styles? (qualitative)

These three questions are clear and focused, but we would suggest adding an overall mixed methods research question, such as:

d) 'How do the qualitative findings explain the statistical results obtained in the quantitative phase about the relationship between learning styles and language strategies of foreign language learners?'

This would emphasize the Explanatory Design of the study.

Step 5: Choose the quantitative and qualitative data to collect

Your research questions should guide the decision about the types of quantitative and qualitative data to collect in the study; it is important to choose the types of data that will best answer the study research questions *and* that are not too difficult to collect. Quantitative data that researchers can consider collecting include closed-response questionnaire items, test scores, checklists, and records. Typical qualitative data collection methods include open-response questionnaires, individual and focus group interviews, observations, and artifact analysis (documents and objects).

At this stage in the process, it is important to decide on the weight that the quantitative and qualitative data sets will have in the overall study design. Where will your emphasis be? Additional things to think about are the type and size of sample needed for each phase of the study. Quantitative research often requires a large random sampling to allow for the generalization of the study results to a wider population. Alternatively, qualitative research generally uses a small purposeful sampling to promote an in-depth understanding of the explored phenomenon. In a mixed methods study, it is typical to select both quantitative and qualitative samples from the same population. For example, all students in a class may be surveyed, and then a few of those students interviewed to investigate typical or extreme cases revealed in the survey findings.

Jie and Xiaoqing's quantitative research questions, 'What are the learning style distributions of the Chinese tertiary-level English learners?' and 'How do learning styles affect the use of learning strategies of tertiary-level English learners in China?', led them to ask their 187 second-year undergraduate participants to complete the Myers-Briggs Type Indicator, Measure of Learning Styles, and a self-developed questionnaire on the use of learning strategies. In addition, they used the scores on the final English tests as indicators of students' language learning outcomes. To answer the qualitative research question, 'What differences relating to learning strategy deployment exist between high and low achievers of the same learning styles?' and to gain the students' perspectives, they interviewed six of the 187 participants,

selecting three students from the top group and three others from the bottom group.

Step 6: Draw a visual diagram

Since mixed methods studies are often complicated with multiple stages of data collection and analysis, it can be useful to create a **visual diagram** of all the procedures in your study. A visual diagram helps you envisage the big picture, so you can see the flow and timing of the quantitative and qualitative data collection, the weight given to the quantitative and qualitative data and where the mixing of the two methods will occur within a study. Including the visual diagram in a research report also helps the readers understand the study (see Ivankova, Creswell, & Stick (2006) for specific rules for drawing mixed methods visual models).

Jie and Xiaoqing did not provide a visual diagram for their study, so we developed a visual model of the Explanatory Design used in their study based on their report (see Figure 7.5).

Step 7: Collect and analyze the quantitative and qualitative data

After the data is collected, you need to organize it into files to prepare for analysis. You should follow the basic procedures specified for each type of data, quantitative and qualitative. The choice of strategies for the quantitative and qualitative data analysis depends on the research questions and the type of the mixed methods design used in the study. Quantitative data can be analyzed using both descriptive and inferential statistical analysis. Explaining these analytical procedures goes beyond the scope of this chapter; however, for a basic introduction to statistical analysis, see Creswell (2008) and Gravetter and Wallnau (2007). Alternatively, qualitative data can be coded for descriptions and themes using, for example, the constant comparative method (Lincoln & Guba, 1985). Please also see the 'Organizing and Interpreting Your Data' section in other chapters of this book. In both quantitative and qualitative analysis we recommend using software programs such as SPSS for quantitative analysis and MAXqda, Atlas.ti, or NVivo8 for qualitative analysis to help organize and process the data. However, both quantitative and qualitative programs operate on different principles and require time to learn. Of note is that the qualitative programs only help researchers organize and manage the data during the analysis process that the researcher conducts himself/herself.

Depending on the type of the mixed methods design, consider choosing one or more of the data analysis strategies discussed earlier within each design:

- Explanatory Design: explain or expand the quantitative results, or further investigate the typical or extreme cases revealed in the quantitative results. The choice of the cases for qualitative follow-up depends on the purpose of the study and the results of the quantitative data analysis. For example,

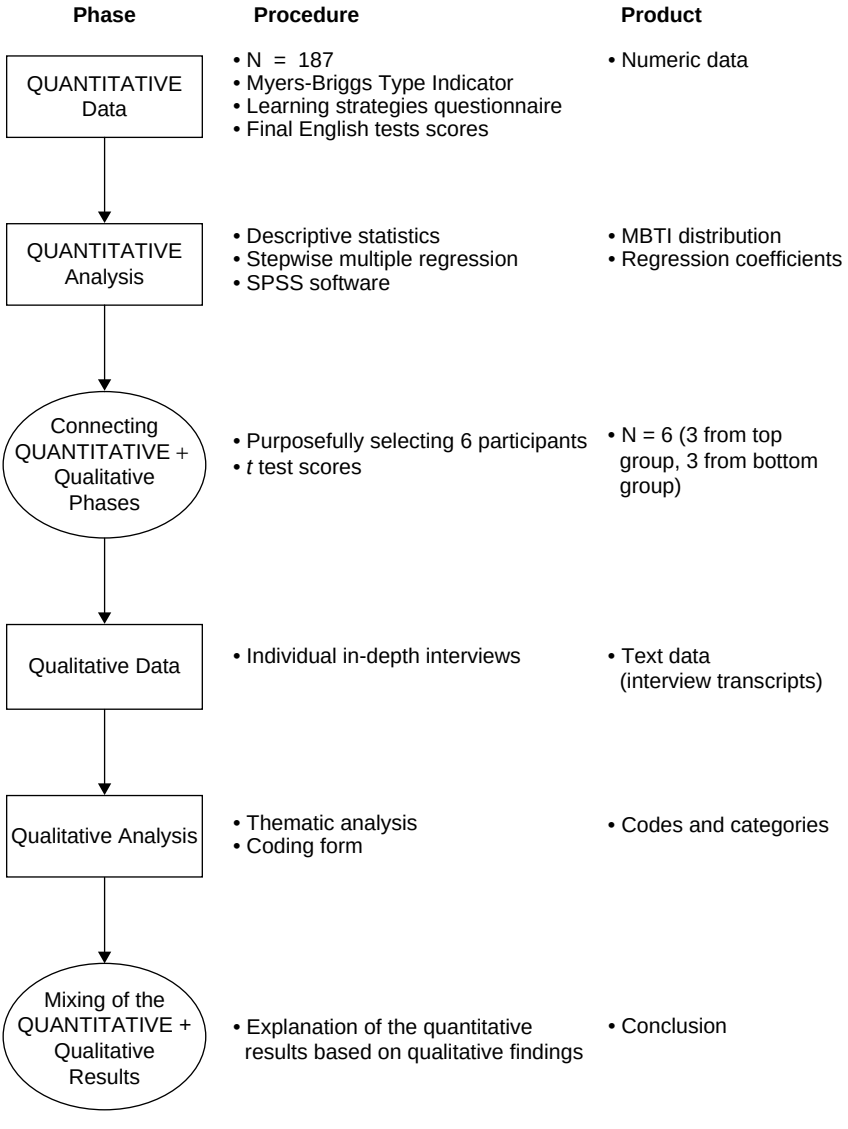

Figure 7.5 Visual diagram of Explanatory Design procedures in Jie and Xiaoqing's (2006) study

if the purpose of the study is to identify significant predictors, it might be useful to further qualitatively explore selected typical cases; if the purpose is to reveal trends in the data, it might be reasonable to follow up with outlier or extreme cases.

- Exploratory Design: develop an instrument or identify new variables. The qualitative data collected via interviews or focus groups is analyzed for codes and themes. If the purpose of the study is to design a survey instrument, qualitative codes, themes and quotes are used as a basis for developing items and scales of the survey; if the purpose is to form new variables to further test them quantitatively, qualitative themes are used to help inform the quantitative phase of the study.
- Triangulation Design: transform data (quantifying qualitative data or qualifying quantitative data) or compare the results. Depending on which data set, quantitative or qualitative, carries more weight in the study, qualitative codes and themes may be counted for frequencies of occurrences (quantifying), or quantitative data is statistically transformed into themes using cluster or factor analysis (qualifying). Then transformed data is compared with the other data set or both are used in further analysis. When the purpose of the study is to draw well-validated conclusions about the explored phenomenon, quantitative and qualitative results are compared to see whether they support each other or diverge (Creswell & Plano Clark, 2007).
- Embedded Design: use regular strategies for quantitative and qualitative data analysis, and depending on the study purpose, follow the procedures described for other mixed methods designs.

In the illustrative study, the quantitative analysis included descriptive statistics for the Myers-Briggs Type Indicator distributions of the participants and the stepwise multiple regression analysis for the examination of the relationship between learning styles and learning strategies. The stepwise regression analysis was aimed at revealing whether a learning style can be a significant predictor of the learning strategy choice. The qualitative data from individual interviews was analyzed using a specific coding form. Then the results of learning styles and learning strategies obtained from the qualitative data were compared against the participants' quantitative results for consistency.

Step 8: Write the final report

The last step in any research study is writing up the report. The structure of your report should follow the type of the mixed methods design used. You should be careful to make clear distinctions between the quantitative and qualitative phases of your study, and indicate their weighting. Depending on the sequential or concurrent timing of the data collection and analysis in the study, the procedures and the results should be reported differently. For example, in the Explanatory, Exploratory, and sometimes Embedded Designs, where the quantitative and qualitative data sets are collected and analyzed one following another, the procedures should be reported in different sections to emphasize the sequential order and the connections between the phases. In the Triangulation, and sometimes the Embedded Designs, the procedures

should be reported jointly to show the convergence of the two methods. The findings from the quantitative and qualitative components of the study should also be compared and interpreted in the Discussion section of the report.

More specifically, the structure of an Explanatory or Exploratory Design report typically follows the sequential character of the design: the initial data (quantitative or qualitative) collection and analysis is described first, followed by the description of the further qualitative or the quantitative data collection and analysis. A separate section in the report discusses how the two phases were connected in the research process – for example, selecting follow-up cases in the Explanatory Design or developing a survey instrument in the Exploratory Design. During the discussion of the study results, a researcher explains how the qualitative findings helped elaborate or extend the quantitative results in the Explanatory Design, or how the qualitative findings lead to the quantitative results in the Exploratory Design. When reporting a Triangulation Design study quantitative and qualitative data collection, analysis, and results are presented in separate sections. During the discussion of the overall study results, a researcher combines the interpretation of the quantitative and qualitative findings to see whether they support each other or diverge. The structure of an Embedded Design study report could follow either a sequential (the Explanatory Design) or concurrent (the Triangulation Design) design model depending on the timing of the data collection.

Examples of published research for each design are listed in the second part of the Further Reading section below. Reading these will show you how other researchers have written up their mixed methods research.

> *The reporting structure in Jie and Xiaoqing's study is consistent with the sequential nature of the Explanatory Design. First the quantitative procedures, including the description of the sample, data collection, and analysis, are presented; they are followed by a similar description of the qualitative procedures. The results are also presented in a sequential manner: first the results from the statistical tests are reported and then the findings from the individual interviews are provided. In the conclusion, the major findings from both phases of the study are discussed and integrated.*

Improving the quality of mixed methods research

Like with any research, it is important that the results of a mixed methods study are reliable and valid. To ensure the quality of results generated from the quantitative and qualitative data sets in the study, it is recommended to carefully address each component separately and to apply procedures specific to each research tradition. These procedures are well described in quantitative and qualitative research literature and are recommended by mixed methods authors as initial steps in establishing the quality of a mixed methods study. For example, the reliability and validity of the quantitative

data can be assessed using different reliability measures and different types of validity (Thorndike, 2005), while the credibility and trustworthiness of the qualitative data can be established through the use of various verification procedures (Creswell & Miller, 2000). In addition, since mixed methods research produces knowledge generated from the integration of the quantitative and qualitative data, it is also necessary to ensure that such knowledge is correct and legitimized (Onwuegbuzie & Johnson, 2006). This is not an easy task because due to the different nature of quantitative and qualitative research approaches, different quality standards are applied. Teddlie and Tashakkori (2003) identified establishing validity of mixed methods results as one of the six major issues in mixed methods research.

In the mixed methods literature, validity is defined as the ability of the researcher to draw meaningful and accurate conclusions from all the data in the study, quantitative and qualitative (Creswell & Plano Clark, 2007). It is recommended to address validity from the standpoint of the mixed methods design chosen for the study and consider potential threats to validity that might arise during the data collection and analysis at each study stage; for example, problems associated with different sampling strategies used in quantitative and qualitative research, or choosing weak quantitative results for qualitative follow-up, or using inadequate procedures for data transformation. To avoid or minimize these threats and achieve accurate and meaningful results from the integration of the two data sets in a mixed methods study, a researcher needs to design and conduct the study carefully (following the suggested eight steps), systematically apply the appropriate procedures in the quantitative and qualitative components of the study, and integrate the two methods as the mixed methods design dictates.

In the illustrative study, to ensure the quality of the quantitative results, Jie and Xiaoqing used two validated questionnaires: the Myers Briggs Type Indicator and Measure of Learning Styles. For a self-developed questionnaire on the use of learning strategies they reported reliability for both pilot testing of the instrument and its use in the study. On both occasions reliability was high (.85 and .88), which indicated the obtained numeric scores were reliable. However, the authors did not report whether they assessed the credibility of the qualitative findings. Some useful procedures that they could have used include member checking (letting participants verify the accuracy of the interview transcripts) and inter-coder agreement (both researchers independently coding the data and then establishing themes based on the reached consensus). The authors did not discuss the validity of the integrated mixed methods results either or problems associated with the use of two different data sets; however, they addressed the limitations of the study, such as drawing conclusions based on a limited and nonrepresentative sample of the introductory level second-year students.

Final thoughts

The world today is more complex than ever before and gaining knowledge about it often requires researchers to study it from a number of different perspectives. The mixed methods approach, which combines both quantitative and qualitative data collection and analysis within one study, offers such an opportunity. Drawing on the strengths of both methods and integrating them in the ways discussed in this chapter, researchers can gain a richer and more complete understanding of the research problem they study. The steps for designing and conducting a mixed methods study outlined in this chapter should help researchers in accomplishing this task as well as provide them with the tools to be critical consumers of mixed methods research. In addition, the feasibility of the project, access to both types of data, and expertise in both quantitative and qualitative research design and analysis are important factors for novice researchers to consider before launching a mixed methods research project in applied linguistics.

This discussion, using examples from applied linguistics research, extends the application of the mixed methods approach to the area of language education. In time, designs specific to applied linguistics will develop and perhaps the four mixed methods designs advanced in this chapter will need to be modified. Also, it will be useful to track the present and future studies of mixed methods to determine if the core definition advanced in this chapter needs to be adjusted or expanded to better fit the area of applied linguistics. At the same time, as mixed methods research continues to emerge in applied linguistics, it is hoped that this discussion will prompt more investigators to explore the feasibility of this research approach and to apply the steps in designing a mixed methods study as they examine language learning and classroom practices, the specifics of language acquisition, and language program evaluation.

In the illustrative example, Jie and Xiaoqing used a mixed methods approach to study the relationship between Chinese students' learning style and learning strategies to English language learning success. Collecting, analyzing, and integrating both quantitative and qualitative data gave them an opportunity not only to obtain an overall picture of the students' learning style distributions and the relation of learning styles to learning strategies, but also allowed them to gain greater insights into the differences of using learning strategies by high and low achievers. The next step for these researchers might be to investigate whether different aspects of learning style interact with other cognitive, affective, and personality factors to predict foreign language learning success. They might again apply mixed methods research approach to get a more complete understanding of this research problem – an understanding that only mixed methods approach can provide.

Summary

- Mixed methods research is a procedure for collecting, analyzing, and 'mixing' quantitative and qualitative data at some stage of the research process within a single study in order to understand a research problem more completely.
- Mixed methods research has defined procedures for collecting, analyzing, and mixing quantitative and qualitative data in a study, based upon three main characteristics: (a) *timing*, or the sequence or order of collecting and analyzing quantitative and qualitative data in a study when one phase builds on another; (b) *weighting*, or the priority given to one type of data in the study; and (c) *mixing*, or the way quantitative and qualitative data and results are integrated during the research process.
- The four most frequent mixed methods designs are Explanatory Design, Exploratory Design, Triangulation Design, and Embedded Design.
- Mixed methods research has four main objectives, each addressed by one specific mixed methods design: (a) explaining or elaborating on quantitative results with subsequent qualitative data (the Explanatory Design); (b) using qualitative data to develop a new measurement instrument or theory that is subsequently tested (the Exploratory Design); (c) comparing quantitative and qualitative data sets to produce well-validated conclusions (the Triangulation Design); and (d) enhancing a study with a supplemental data set, either quantitative or qualitative (the Embedded Design).
- In the Explanatory Design, quantitative and qualitative data are collected and analyzed in a sequence; first quantitative data is collected and analyzed, and then qualitative data. The weight is typically placed on the quantitative data because it comes first in the sequence and represents the major aspect of this mixed methods data collection process. The mixing of the two methods occurs at two stages in the research process: first, while developing the qualitative interview protocol and choosing the participants for in-depth exploration of the quantitative results; and second, while integrating the results from both quantitative and qualitative phases at the interpretation and discussion stage of the study.
- In the Exploratory Design, the qualitative data is collected and analyzed first, followed by the collection and analysis of the quantitative data. The weight is typically given to the qualitative data, because it provides the foundation for the quantitative exploration of the topic. The mixing of the two methods occurs while developing the quantitative survey items based on the qualitative data analysis and also while comparing the quantitative results with initial qualitative findings.
- In the Triangulation Design, quantitative and qualitative data are collected simultaneously. The weight can be given to either quantitative or qualitative data, or both. The mixing of the two methods occurs either at

the data analysis stage by quantifying qualitative data or qualifying quantitative data, or during the interpretation of the results from the two components of the study by comparing quantitative and qualitative results.

- In the Embedded Design, one type of data collection and analysis (quantitative or qualitative) is embedded or nested within a predominant quantitative or qualitative design to answer a secondary research question. Depending on the study purpose the data can be collected and analyzed sequentially or concurrently. The weight is given to the predominant method that guides the project and within which another method is embedded. The mixing of the quantitative and qualitative data occurs either at the data analysis stage if the data is collected concurrently or at the interpretation stage if the two types of data are collected sequentially.
- To design and conduct a mixed methods study, it is suggested to follow eight steps: (a) determine if the topic is best approached using mixed methods research; (b) select a specific mixed methods design (Explanatory, Exploratory, Triangulation, Embedded); (c) write a detailed mixed methods purpose statement; (d) write specific research questions to address the quantitative and qualitative aspects of the study; (e) choose the quantitative and qualitative data to collect; (f) draw a visual diagram of the procedures in the study; (g) collect and analyze the quantitative and qualitative data; (h) write the final report.

Post-reading questions

1. What is mixed methods research? Give a definition using your own words. Explain how it is different from quantitative and qualitative research approaches.
2. Why do researchers choose to use mixed methods research approach? What advantages does it offer?
3. What are four major mixed methods research designs? Explain each using your own words.
4. How do researchers decide which of the four designs to use? What characteristics should they consider?
5. What steps should researchers follow to design and conduct a mixed methods study?
6. What should researchers consider to improve the quality of their mixed methods study?

Key words

Embedded Design
Explanatory Design
Exploratory Design
mixed methods research

mixing
qualifying data
qualitative research
quantitative research
quantifying data
research methods
timing
Triangulation Design
visual diagram
weighting

Tasks

1. Choose a mixed methods research study in foreign language education from the Further Readings list. Read the article, paying specific attention to how the authors implemented each of the eight steps for designing and conducting a mixed methods study discussed in this chapter.
2. Consider a topic of interest to you. Using the eight steps for designing and conducting a mixed methods study discussed in this chapter write a short outline explaining each step that you will take in designing and conducting your study; draw a visual diagram of the mixed methods procedures of that study.

Further reading

Overviews of mixed methods research

Creswell, J. W., & Plano Clark, V. L. (2007). *Designing and conducting mixed methods research*. Thousand Oaks, CA: Sage Publications.

The most recent textbook in mixed methods research that addresses both methodological issues and application of mixed methods designs.

Ivankova, N. V., Creswell, J. W., & Plano Clark, V. L. (2007). Foundations and approaches to mixed methods research. In K. Maree (Ed.), *First steps in research*. Pretoria, South Africa: Van Schaik Publishers.

This chapter provides a basic overview of mixed methods research, its historical and philosophical foundations, characteristics, and basic designs.

Plano Clark, V. L., & Creswell, J. W. (2008). *The mixed methods reader*. Thousand Oaks, CA: Sage Publications.

The book offers a rich balance of foundational mixed methods works and exemplary studies across a range of disciplines.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Applied social research methods series, 46. Thousand Oaks, CA: Sage Publications.

The book introduces the reader to mixed methods research. It discusses its history, philosophical foundations, and major characteristics, and provides a typology of mixed methods designs and models.

Tashakkori, A., & Teddlie, C. (Eds.). (2003). *Handbook on mixed methods in the behavioral and social sciences*. Thousand Oaks, CA: Sage Publications.

The handbook provides a comprehensive overview of the use of mixed methods research in different disciplines. It also addresses its methodological and procedural issues.

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