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Chapter 5: Mapping Mixed-Methods Research: Theories, Models, and Measures

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Mapping Mixed-Methods Research: Theories, Models, and Measures

Chapter Overview and Objectives

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As we saw in [Chapters 3](#) and [4](#), quantitative and qualitative researchers pursue different approaches to gathering and analyzing data. For many years, these differences have underscored broader political disagreements (Jick, 1979). For a new generation of researchers, the either/or approaches of the past are incomplete and outdated. Instead, the complexity of today's research problems requires more comprehensive and nuanced efforts (Wheeldon, 2010b). Indeed, past divisions among researchers often failed to consider that, in many ways, qualitative and quantitative data are inherently related. All quantitative data are based on qualitative judgments; all qualitative data can be described numerically. As presented in [Chapter 1](#), all research is a series of decisions (Palys, 1992). Mixed-methods research provides more choices, options, and approaches to consider. For this reason, it has emerged as the “third methodological movement” (Creswell & Plano Clark, 2007, p.13). As an important new research community, it involves research in which both qualitative and quantitative approaches to data gathering, analysis, interpretation, and presentation are used (Teddlie & Tashakkori, 2009, p. 7).

Both concept maps and mind maps can be used as part of mixed-methods research. This chapter will provide examples of how concept maps can be used as part of pre/post mixed-methods designs and will offer a new mixed-methods measure based on the use of mind maps. To understand these examples, it is important to understand the theoretical basis for this sort of integration and to know how different data-collection procedures can be used together. Finally, through the use of a research example, readers will be encouraged to consider how the use of mixed methods offers another means to address activities presented in [Chapters 2](#), [3](#), and [4](#). By the end of this chapter, readers should be able to do the following:

- describe the potential of mixed-methods research and one theoretical basis often associated with it;
- explain the different ways data, methods, and approaches can be mixed;
- provide examples of research designs to which different maps are best suited; and
- define the salience score and explain its potential.

Theoretical Justification

As we have seen in previous chapters, the existing theoretical bases for quantitative and qualitative research are rooted in postpositivism and constructivism. To understand how mixed-methods research provides a different sort of theoretical understanding of research, it may be useful to recall that earlier discussion. Postpositivists see human knowledge as speculative and, therefore, not based on unchallengeable, rock-solid foundations. They argue that the external world exists independently of an individual's experience of it, and thus knowledge is not hypothetical and foundationless. They acknowledge that all research will be incomplete in one way or another, and they hold that approaches that can be tested and explored through the scientific method should be favored. This often results in the application of deductive approaches that rely on a series of steps to reach specific conclusions based on general premises.

In general, quantitative research seeks generalizability through controlled, value-free (or value-neutral) processes that can test and validate theories through a process of falsification. The emphasis on falsification often leads quantitative researchers to focus on sample size and statistics to showcase broad generalizability. At its most shortsighted, some quantitative research considers the role of setting and context either irrelevant or unmanageable. A central critique is that some quantitative research models are statistics dependent, inflate the importance of mathematical averages, and cannot capture the complexity associated with human behavior (Goertzel & Fashing, 1981). By focusing solely on numeric information, some approaches miss the depth and detail that are assigned to phenomena by participants themselves.

Another view is one promoted by constructivists. Skeptical of the idea of one universalistic notion of truth, they view meaningful understanding as contingent on human practices and thus different people's ability to socially construct reality in different ways. Although many qualitative researchers acknowledge the limitations inherent in reporting individual understandings of complex ideas and concepts, in their view research must do a better job in telling the stories of individuals. This often results in inductive approaches to research that rely on a series of steps to reach general conclusions based on specific premises. Qualitative research seeks to understand or make sense of the world based on how individuals experience and perceive it. Framed through social interaction and personal histories and

narrative experiences (Creswell & Plano Clark, 2007), knowledge is inherently localized, and the notion of generalizability overly mythologized.

Unlike quantitative researchers, qualitative researchers focus on the development of theories based on an interpretive or individualized process. Because there are many possible interpretations of the same data, however, qualitative researchers refuse to assign value to one interpretation of meaning without acknowledging the role they themselves play within this construction (Guba & Lincoln, 1989). This requires that researchers study the experiences, influences, and activities of research participants while explicitly and reflexively acknowledging their own personal biases. Yet the acceptance within qualitative research of the inherent bias of any researcher challenges the tradition of objectivity and threatens the potential for nonpartisan research. In addition, while privileging localized understanding through the inclusion of depth and detail, qualitative research sometimes proudly presents findings that would benefit from more rigorous analysis.

An emergent tradition based on a more pragmatic approach rejects either/or approaches to understanding reality and developing knowledge. Through multiple stages and methods of data collection and/or analysis, researchers can get a better understanding of a phenomenon by combining the reliability of empirical counts with the validity of lived experience. As discussed in [Chapter 1](#), mixed-methods research is understood as an *abductive* process that values the expertise, experience, and intuition of researchers themselves. To understand the value of pragmatism and its connection to abductive reasoning, it may be useful to recount our discussion of key issues in social science research and reexamine a table presented in [Chapter 1](#). [Table 5.1](#) provides an important reminder about some of the key issues in social science research.

Table 5.1 Key Issues in Social Science Research

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	Quantitative Approach	Qualitative Approach	Pragmatic Approach
Connection of Theory and Data	Deductive	Inductive	Abductive
Relationship to Research Process	Objectivity	Subjectivity	Intersubjectivity
Inference From Data	Generality	Context	Transferability

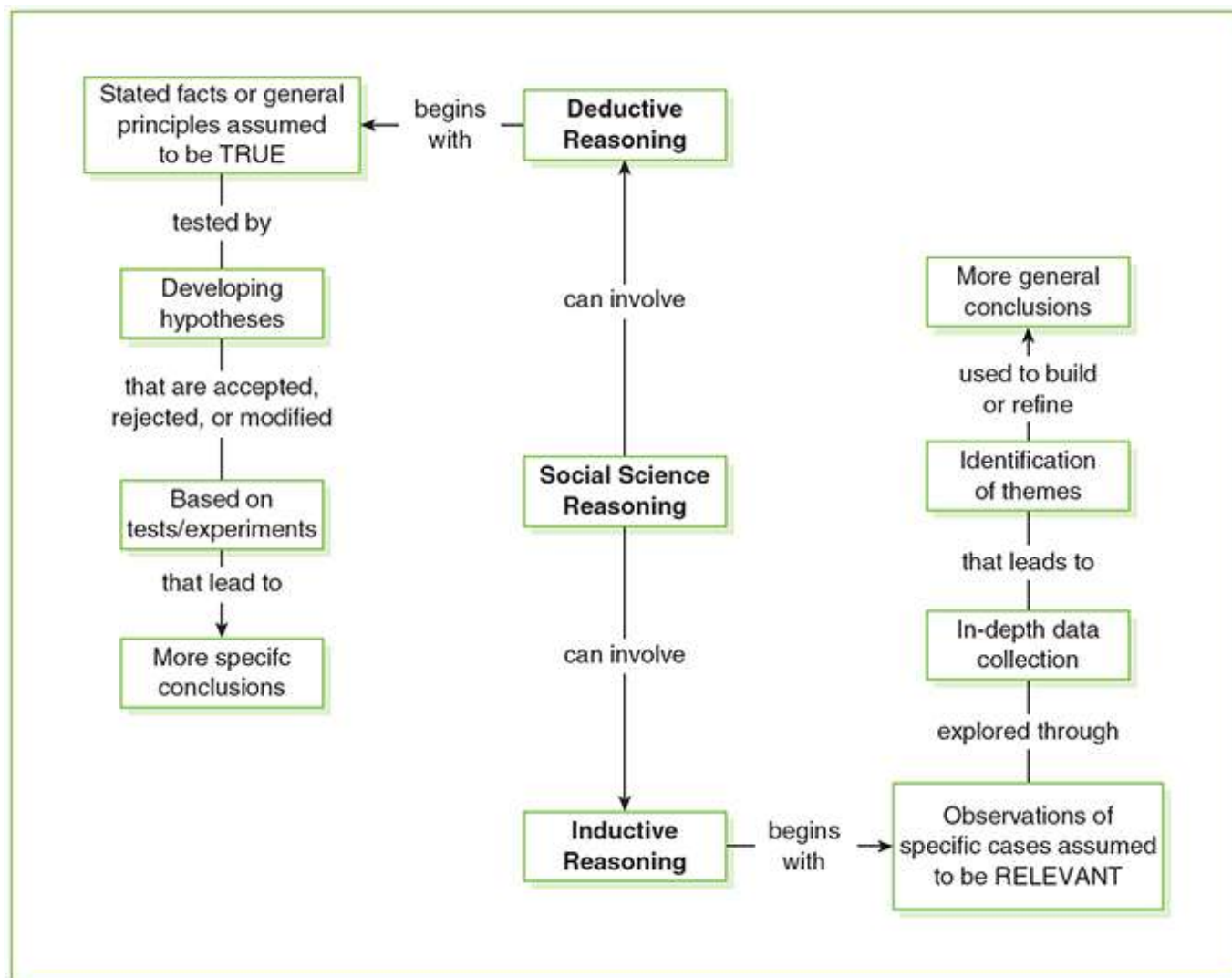
Source: Morgan (2007, p. 71).

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As we saw in [Chapter 3](#), deductive reasoning is associated with quantitative research and uses a top-down process that tests general premises though a series of steps to reach specific conclusions. Researchers seek to be objective through the research process and strive for generalizable findings by testing hypotheses through a deliberate series of steps. In contrast, inductive reasoning is associated with qualitative research and develops general conclusions based on the exploration of how individuals experience and perceive the world around them. Presented in [Chapter 1](#), [Figure 5.1](#) provides some differences between deductive and inductive reasoning.

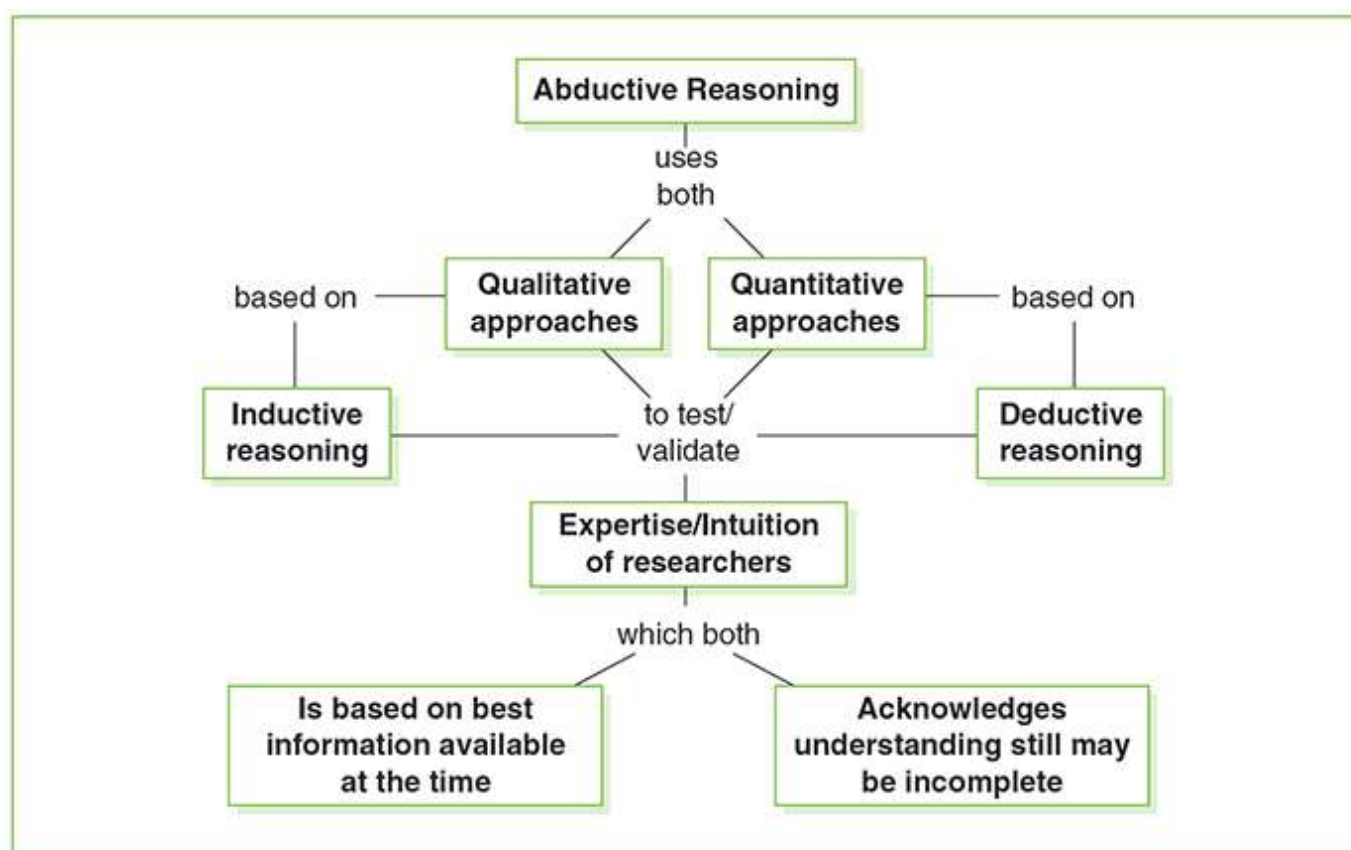
Figure 5.1 Comparing Deductive and Inductive Reasoning


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Mixed-methods research represents an important departure from the either/or assumptions of quantitative or qualitative approaches because it allows that both methods may be valuable depending on the type of research question under investigation. A central assumption in mixed-methods research is that there are many social science issues that can be better explored through the combination of different methods and techniques. *Abductive reasoning* can be understood as a process that values both deductive and inductive approaches but relies principally on the expertise, experience, and intuition of researchers (see [Figure 5.2](#)). Associated with mixed-methods research, through the *intersubjectivity* of researchers and their understanding based on shared meaning, this approach to reasoning encourages testing intuitions theoretically and empirically. Based on the best information at hand, tentative explanations and hypotheses emerge through the research process and can

be developed and/or tested using methods that are either quantitative, qualitative, or a mix of both.

Figure 5.2 One View of Abductive Reasoning



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By relying on abductive reasoning, mixed-methods research offers an important new way to conceive of research and can produce more robust measures of association while allowing that multiple paths to meaning exist (Wheeldon, 2010b). In addition to escaping the trap of seeing research as an either/or choice between quantitative or qualitative designs, mixed methods provide practical benefits as well. For example, students are often overcome by the nature of quantitative information collected within some data sets and the view that, to be valid, quantitative research requires a large number of cases to analyze. As discussed in [Chapter 3](#), this is because of the assumptions required by certain statistical tests often used in the analysis of numeric information. On the other hand, whereas qualitative research can require smaller samples and thus may be easier for students to engage in, many are uncertain about how to identify a good group from which to gather data or are unclear

multiple analyses, and nuanced thinking; however, they also can provide flexibility for researchers. Miles and Huberman (2002) urge all researchers to entertain mixed models. By avoiding polarization, polemics, and life at the extremes, they suggested that

both quantitative and qualitative inquiry can support and inform each other in important ways. Narratives and variable-driven analyses need to interpenetrate and inform each other. Realists, idealists and critical theorists can do better by incorporating other ideas than remaining pure. (Miles & Huberman, 2002, p. 396)

Beyond these practical benefits, conceptually mixed-methods research and the associated methodological concerns that may emerge can perhaps be addressed by pragmatism (Morgan, 2007). John Dewey has been associated with both postpositivism and constructivism, but he is perhaps best understood as a pragmatic philosopher who has influenced contemporary thinkers, including Richard Rorty. As a philosophical movement, *pragmatism* holds that claims about the truth of one view or another must be connected to the practical consequences of accepting that view. Although Rorty rejects the idea of one truth, he does consider the value of consensus or intersubjective agreement about various beliefs as a means to understanding provisional or conditional truths. One means to obtain what he called “reflective equilibrium” is through research that can provide both realistic and socially useful outcomes (Rorty, 1999). In this way, mixed-methods approaches may be valuable to new social science research procedures because they provide “new ways to think about the world—new questions to ask and new ways to pursue them” (Morgan, 2007, p. 73).

This kind of flexibility arises because instead of starting from theories or conceptual frameworks and testing them through deductive approaches or starting from observations or facts, researchers can view both of these processes as part of the broader research cycle (Teddle & Tashakkori, 2009, pp. 87–89). For example, quantitative approaches can be used to identify groups or individuals to interview and/or relevant issues that make these people unique or interesting based on the analysis of numeric data. In addition, qualitative techniques can lead researchers to discover existing data sets, develop survey questions, and/or weight data in different ways based on narrative data (Wheeldon, 2010b). Maps may be especially valuable from a pragmatist's point of view because visualizing and imagining

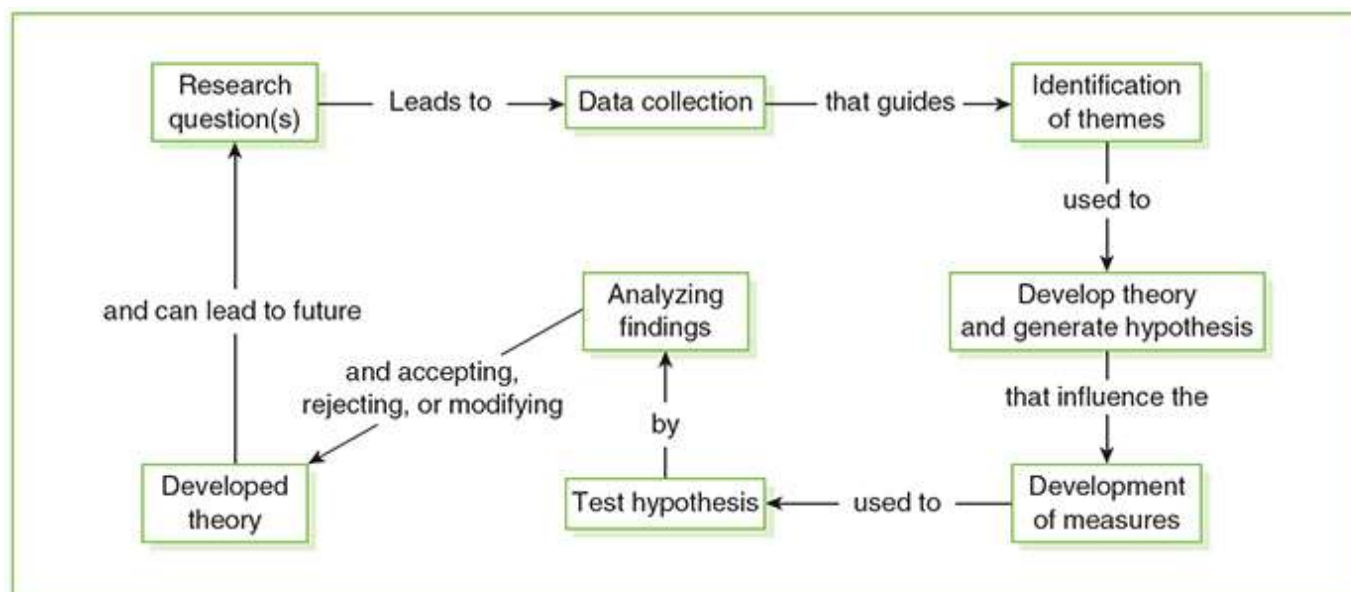
kinds of data collection may not be. A broader understanding about how maps can be used in mixed-methods research requires an understanding of current models, approaches, and techniques.

Understanding, Planning, and Describing Mixed-Methods Research

Mixed-methods research has been defined by Creswell and Plano Clark (2007, p. 5) as a research design based on assumptions that guide the collection and analysis of data and the mixture of qualitative and quantitative approaches. A central premise is that the use of quantitative and qualitative approaches together can provide a better understanding of research problems. Mixed methodologies can provide a useful and novel way to communicate meaning and knowledge (Johnson & Onwuegbuzie, 2004) because they can combine the reliability of counts with the validity of lived experience and perception. Mixed approaches to social science research are increasingly popular. Tashakkori and Teddlie (1998) included 152 references in their exploration of the growth of mixed methods in research areas such as evaluation, health science and nursing, psychology, sociology, and education, among others.

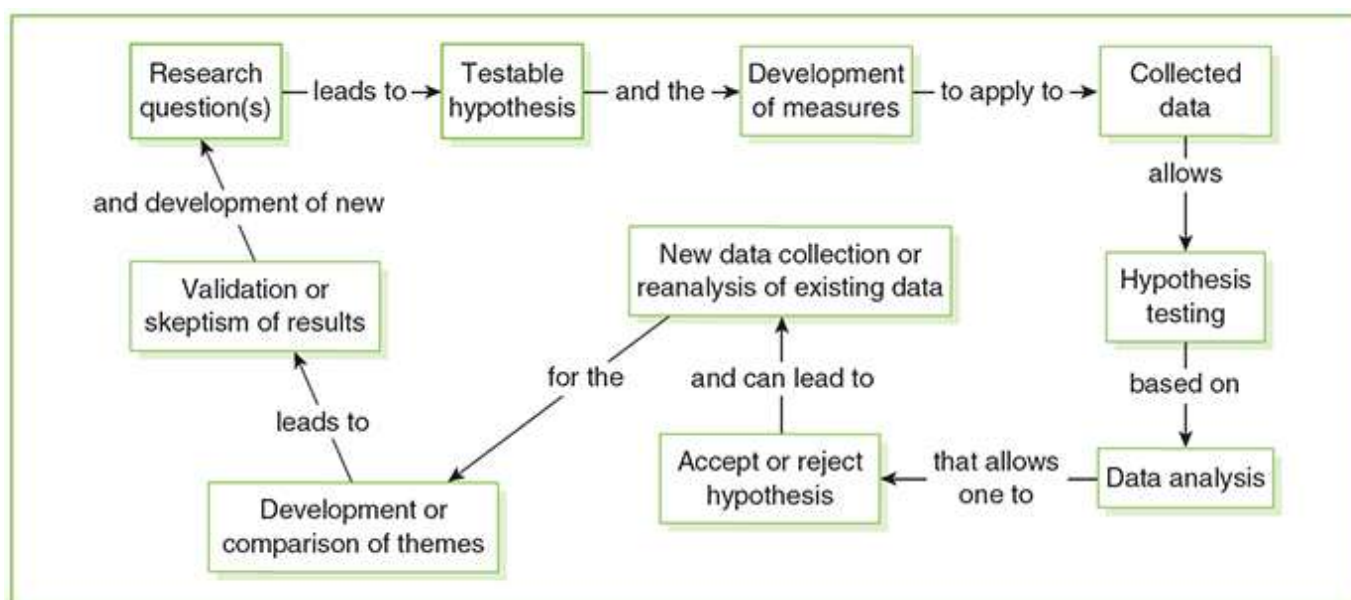
As mixed-methods research has grown during the past two decades, different approaches to mixed-methods designs have been developed (Greene, Caracelli, & Graham, 1989), revised (Creswell & Plano Clark, 2007), and reorganized (Teddlie & Tashakkori, 2009). As discussed in [Chapter 1](#), a variety of types and approaches of mixed-methods research have been defined (Creswell & Plano Clark, 2007). One approach is to use qualitative techniques to develop a theory that can then be tested by establishing a conceptually connected hypothesis and quantitative means. [Figure 5.3](#) provides an example.

Figure 5.3 Quantitatively Testing Qualitative Findings


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Another approach is to develop a quantifiable means that can test a generated hypothesis and then explore these findings using more qualitative techniques, as presented in [Figure 5.4](#).

Figure 5.4 Qualitatively Validating Quantitative Findings


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With the use of these mixed approaches, research problems can benefit from both qualitative and quantitative approaches to data analysis and the measurement of meaning.

the sake of simplicity we describe three considerations based on the useful overview provided by Creswell and Plano Clark (2007, pp. 79–85). These include timing, weighting, and mixing.

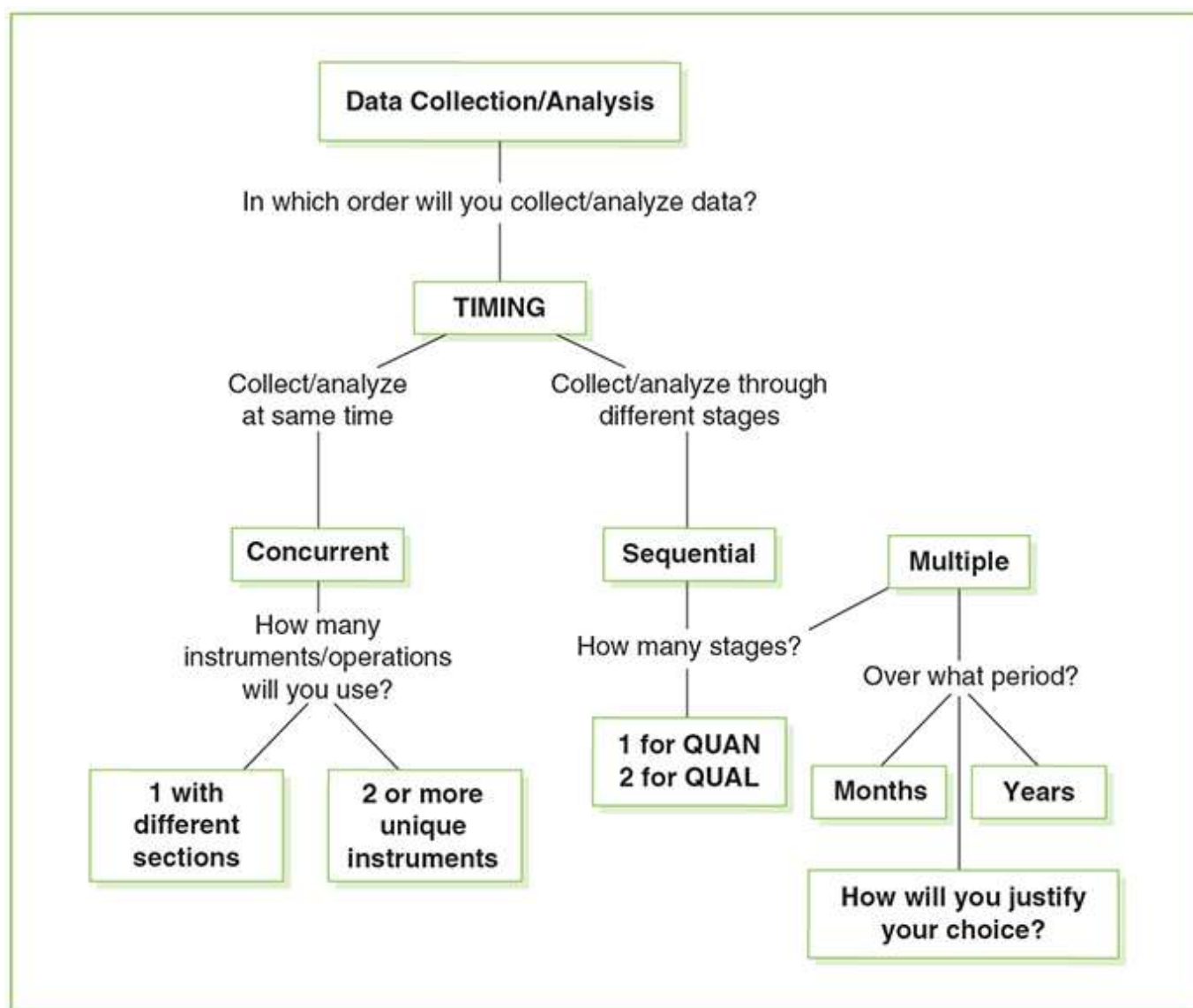
The first surrounds the *timing* and *ordering* of methods within your study. Sometimes these terms refer to when the data were collected and whether they were collected at the same time (simultaneously) or during different periods (sequentially). Some researchers interested in comparing how different tools capture perceptions collect both qualitative and quantitative data at the same time (Gogolin & Swartz, 1992; Jenkins, 2001). Others have collected and analyzed data sequentially and at different times. For example, in a study on cross-national differences in classroom learning environments in Taiwan and Australia by Aldridge, Fraser, and Huang (1999), qualitative data were used to explain, in more detail, quantitative results. The authors used two separate data-collection phases. The first was a quantitative instrument with multiple subscales to assess aspects of the classroom environment. Some months later, they used classroom observations and qualitative interviews with students and teachers to get a more detailed picture of the differences in classroom environments in each country.

Another example of interest is a study by Myers and Oetzel (2003) that used qualitative data to create and validate a quantitative instrument. This study was also organized through two phases of data collection. Based on qualitative interviews, the authors first gathered data through field notes and transcripts. Later they engaged in analysis using techniques drawn from qualitative data including coding, theme identification, and connection to existing literature. Based on this analysis, the authors developed an instrument that could provide quantitative measures based on the qualitative interviews. They then administered this instrument, and the quantitative data were analyzed to test correlations from the qualitative interviews.

However, data collection and data analysis may not always be so closely intertwined. There may be times that data collected simultaneously are analyzed separately, in different ways, and at various times. Other studies might collect data through multiple data-collection phases over longer time periods. Although collecting data in multiple settings may be useful,

and at the same time. Thus, there is an important difference between descriptive and analytic timing/ordering considerations (Creswell & Plano Clark, 2007). Descriptive considerations focus on whether data were collected at the same time or over a longer period of time. Analytic considerations focus on whether the data were analyzed together, at the same time, or separately, one after another. Whereas both may require some justification, they ought not be confused. [Figure 5.5](#) provides a visual overview of some of these considerations.

Figure 5.5 Timing and Ordering of Data Collection/Analysis in Mixed Methods



Note: QUAN = primarily quantitative; QUAL = primarily qualitative.

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The second question is related to how you *weight* different methods in your study, or the relative importance of each approach. This is often indicated using capital letters for the dominant approach (QUAN or QUAL) and lowercase letters for the secondary, less dominant methodological approach (qual or quan). Of course, you may choose to give equal weight to both traditions, in which case both would be capitalized (QUAL/QUAN). More often one tradition is selected as dominant. Whether your approach is primarily quantitative or qualitative in nature depends to a large degree on the type of research question you are interested in. Both approaches have strengths and weaknesses, of course, but thinking about how and why some methods might work together better than others is important. Some researchers have gathered data through quantitative surveys and qualitative interviews (Baumann, 1999; Way, Stauber, Nakkula, & London, 1994). This allows researchers to define beforehand the kind of data they seek by utilizing specific data-collection tools. In essence this question boils down to whether you will assign equal or unequal weight to the different sorts of data you have collected and whether your analysis emphasizes quantitative or qualitative assumptions about meaning. Your decision about how to weight data may also be related to the research question, your epistemological view, practical issues surrounding access to data, data types, and additional issues associated with research—such as deadlines and due dates.

To assist researchers in clearly presenting how they mixed methods within a study, a series of useful notations has been developed. These can indicate not only which approach was more dominant in a mixed-methods design but also whether data collection and/or analysis was simultaneous or sequential (Morse, 2003, p. 198). [Table 5.2](#) provides some notation examples.

Table 5.2 Notions in Mixed-Methods Research	
Symbol	Meaning
QUAN	Primarily a quantitative mixed-methods project
QUAL	Primarily a qualitative mixed-methods project
Plus sign (+)	Data collection/analysis conducted at the same time

quan	Secondarily a quantitative mixed-methods project
qual	Secondarily a qualitative mixed-methods project

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Exercise 5.1: Think You Get It?

What kind of mixed-methods projects do the following notations indicate?

QUAN + qual _____

QUAL → quan _____

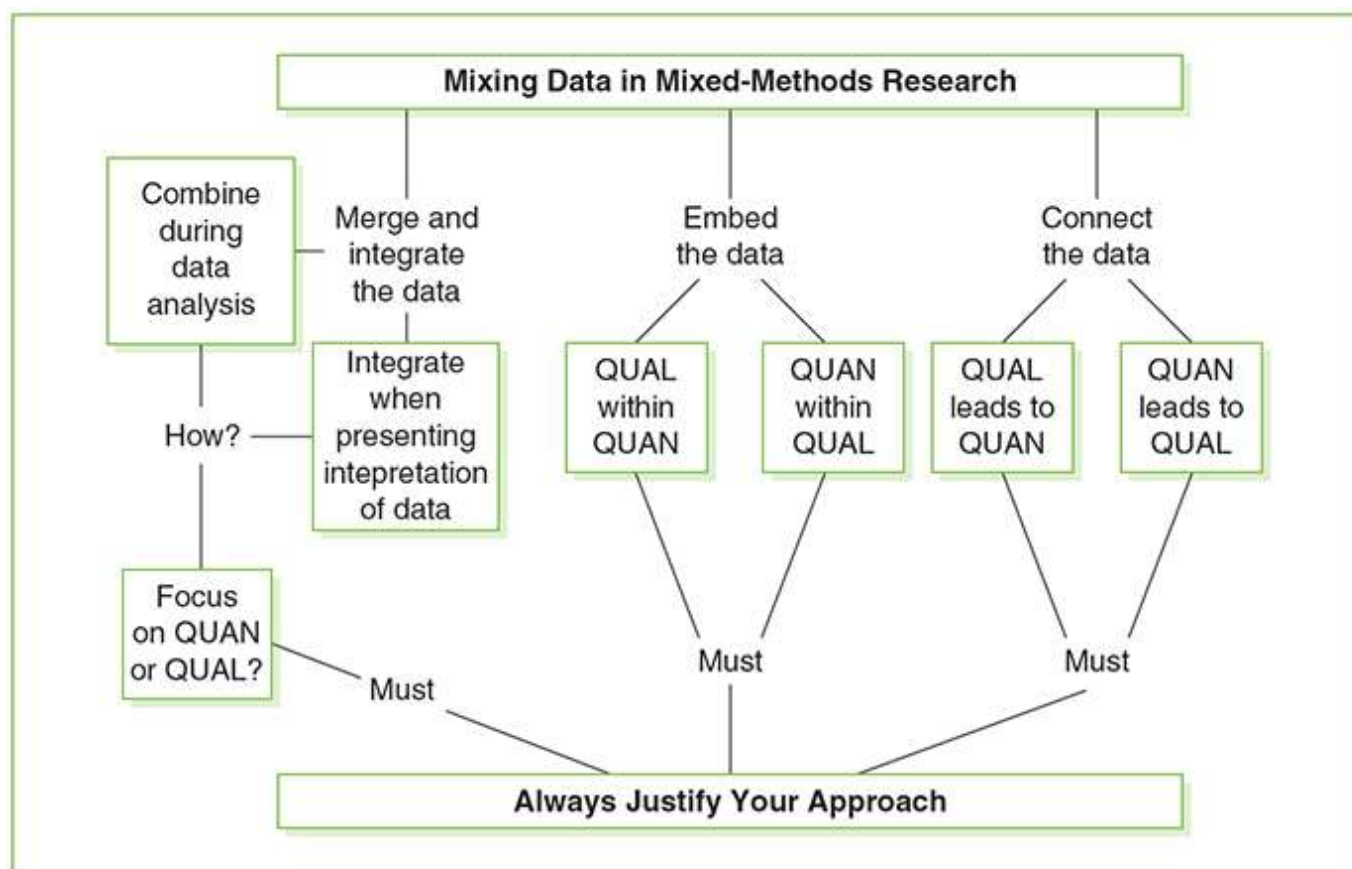
quan + QUAL _____

QUAL → qual _____

These notations can help researchers present their approaches and think about their designs. However, simply noting which design they have chosen, whether a quantitative or qualitative approach will be dominant, or how their data will be mixed is not enough. Central to any research, and perhaps especially to mixed-methods research, is how researchers justify their approach. This is especially important with regard to the question of *mixing*. There are at least three options available when deciding how and why to mix your data. Data can be merged by transforming and/or integrating two data types together, one data type can be embedded within another, or they can be presented separately and then connected to answer different aspects of the same or a similar research question. Creswell and Plano Clark (2007, p. 80) have compiled a useful decision tree that provides an overview of a

number of relevant mixed-methods concerns. Building on their work, [Figure 5.6](#) provides some examples of how data might be mixed.

Figure 5.6 Mixing Strategies in Mixed-Methods Research



Note: QUAL = primarily qualitative; QUAN = primarily quantitative.

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But what about mixed-methods approaches that seek to integrate data analysis in a more interactive way? Teddlie and Tashakkori (2009, pp. 280–281) presented a study by Jang, McDougall, Pollon, Herbert, and Russell (2008) that analyzed both QUAN and QUAL data independently and then attempted more integrative analysis by presenting both QUAN and QUAL to participants for feedback. By transforming QUAN factors into QUAL themes, and vice versa (for comparison), they consolidated the themes and factors that emerged through both analyses and used QUAL data to provide nuance to the consolidated themes/factors. This is perhaps more complex than is practical to consider at this point; however, that example points to one of the major strengths of mixed-methods data. By providing multiple options, researchers can experiment with different analysis strategies and, provided they

The mind map research example in this chapter provides perhaps a more simplistic example of how different sorts of data can be integrated and combined in a novel and potentially useful way.

Maps, Data, and Integrity in Mixed-Methods Research

Before we turn to a couple of mixed-methods research examples, it may be useful to reflect on our discussion in [Chapter 2](#) about maps as data. Although mixed-methods research has emerged as an important approach to social science research, it still relies on data collection often associated with either quantitative or qualitative research. As discussed in [Chapter 2](#), quantitative data are often based on instruments that measure individual performance and attitudes, based on clearly predefined categories. By contrast, qualitative data are generally based on themes that emerge through open-ended interviews, observations, or the review of various documents. As we have seen in [Chapters 3](#) and [4](#), whereas both concept maps and perhaps mind maps can be used to generate social science data, the kind of data elicited by each approach to mapping requires some discussion.

This book presents the idea that knowledge and understanding are based on patterns (Kaplan, 1964) and these patterns can be represented and analyzed in a variety of ways. As [Chapter 2](#) argued, and [Chapters 3](#) and [4](#) explained, these patterns might be better identified, recognized, and understood through more graphic representations of knowledge, experience, and perception (Wheeldon, 2010b). We have presented a number of examples of quantitative and qualitative research using concept maps and mind maps; however, it may be that the mapping process is best suited to mixed-methods researchers because as a data-collection technique, it can offer both numeric and narrative data, provide a means to showcase analysis procedures, or even be a means to present research findings. This flexibility is in line with mixed methods as a pragmatic approach to research (Johnson & Onwuegbuzie, 2004), and whereas researchers may choose to rely on traditional data-collection means and ordering, combining, or embedding findings through existent models, other approaches exist and should be explored.

Another issue is how to consider reliability and validity in mixed-methods research. As you may recall, in [Chapter 3](#) we discussed the idea that in quantitative research, *reliability* is concerned with questions of stability and consistency and whether the same measurement tool can yield stable and consistent results over time. In contrast, *validity* considers how well we were able to design methods or measures to investigate the broader constructs under investigation. In qualitative research, the focus on these concepts is slightly different. As discussed in [Chapter 4](#), these same concepts mean different things within the context of the qualitative paradigm. This requires that researchers focus on how they justify their approach, whether they consider alternate explanations and approaches, and whether they address the researcher's reflexivity. We will return to these issues in [Chapter 7](#). It is important to acknowledge that depending on the mixed-methods design, each of these approaches must be considered, either separately or together.

It is important to recognize that the quality of mixed-methods research is based on the integrity of the process used to integrate or combine different methods within one project. For mixed-methods projects that emphasize quantitative research, key questions surround the hypothesis under investigation, the size and justification for the gathering of data from the samples selected, and the appropriateness of the statistical tests and operations employed. For mixed-methods projects that emphasize qualitative research, key questions surround the nature of data collection, the analytic process used to discover themes and commonalities and differences, and how the data are presented. Although mixed methods involve both quantitative and qualitative components that consider the elements described above, they must do more than simply report the results of two separate projects (Teddle & Tashakkori, 2009). Meaningful mixed-methods research combines the quantitative and qualitative results to offer more than the sum of each part. Qualitative approaches might be used to contextualize numeric findings, or quantitative methods might be used to assist readers to understand the generalizability of narrative findings. New approaches to mixed methods can build on past designs that aim to explore topics from more than one angle and use maps to collect data in a variety of ways and for a variety of purposes. It may be useful to explore in practical terms how concept maps and mind maps can be used through two mixed-methods research examples.

Research Examples Using Concept Maps and Mind Maps

Based on research by Wheeldon (2010b), this example shows how maps can offer a unique way for research participants to represent their experiences while assisting researchers to make better sense of gathered data. Maps can be used both in established pre/post designs and in the construction of unique and novel mixed-methods measures constructed by assigning weights to different data-collection stages. Do you agree with the notion that data can be weighted in this way? On what assumptions is it based?

Pre/Post Concept Maps and Validation in Mixed-Methods Research

As discussed in [Chapters 2](#) and [3](#), concept maps are most commonly used in quantitative research. This may be because earlier versions of concept maps were used to explore science education (Stewart, Van Kirk, & Rowell, 1979) and were often quantitatively scored by an expert to assess how understanding was demonstrated through the structure of the map itself. A focus on structure remains an integral feature for many concept map researchers (Novak & Cañas, 2008) because structured maps can be consistently assessed, scored, and/or compared to assess an individual's understanding of a topic. Novak and Gowin (1984) described the utility of maps to assess understanding in education. They argued that by having students complete concept maps on certain topics, structured interview questions can be posed to a student to explore areas of misunderstanding or confusion based on the student's map. To score a concept map, Novak and Gowin suggested that maps be assessed by a subject matter expert based on the number of valid propositions, levels of hierarchy, and number of branchings, cross-links, and specific examples provided in the maps. As presented in [Chapter 2](#), there are a number of ways to score a map, including based on the map's structure.

By using concept maps as a pre/post data-collection tool, we can quantitatively test if understanding, views, and/or perceptions change over time (Kilic, Kaya, & Dogan, 2004). In mixed-methods designs, scoring pre/post concept maps can also be used to test hypotheses that emerge from qualitative data analysis. Based on a pilot study to assess different

teaching strategies for internship students related to values and ethics in criminal justice (Wheeldon, 2008), the example below provides one way that concept maps might be used to test qualitative findings. As you read this example, consider which qualitative findings were validated by the analysis of the pre/post concept maps. Which questions remain?

Overview and Mixed Design

Forty-five students enrolled in the Administration of Justice internship program at George Mason University were assigned unique identifier codes and tracked during 16 months between 2007 and 2009. This program involved the completion of a preinternship course and a subsequent 4-month internship at a criminal justice agency. Of interest was which methods of ethical instruction used in the preinternship class students would identify as most useful. Based on a debate within the literature about the best means to guide instruction on values and ethics (Cederblom & Spohn, 1991), a variety of approaches were used. Through nine scenarios students were presented with dilemmas and had to work together to identify the best course of action. An equal number of scenarios were drawn from texts that used a more general philosophic approach, a more practical criminal justice-focused approach, and a hybrid approach that involved criminal justice examples and step-by-step deliberation. Student perceptions were based on data collected in a variety of ways. Quantitative data about personal ethics and their origins were collected before and after the preinternship class through concept maps. Some time later, qualitative data through surveys and focus groups were collected before and after students' criminal justice internships.

As described above there are three central concerns related to mixed-methods design. These include the timing, weighting, and mixing of data. In this example, the timing aspect of the mixed-methods design might be described as multistage and sequential. First, the quantitative data were collected through the pre/post concept maps, and later, qualitative data were collected through surveys and focus groups. Descriptively, this might be represented by the notation $\text{quan} \rightarrow \text{QUAL}$. However, in this case, the pre/post data were used to test whether the change in views suggested by qualitative data collection through a survey and focus groups could be quantitatively validated. Thus, in analytic terms, it may be

was principally a qualitative project (QUAL). Quantitative data were collected first; however, they were analyzed only later. The mixing strategy involved connecting some of the qualitative findings to the quantitative pre/post analysis to corroborate key themes identified.

Collecting and Analyzing Qualitative Data

Data were collected during a 16-month interval from a student's first preinternship class to his or her final class following a criminal justice internship. The first stage of data analysis was based on the qualitative data collected through the surveys and focus groups. The open-ended survey and focus groups allowed students to provide their views on the importance of ethics to their placements and the value of the different approaches, exercises, and scenarios used to teach ethical decision making during the preinternship course (Wheeldon, 2008). This provided more nuance and context to the quantified differences expressed in the maps. The survey questions of interest are outlined in [Table 5.3](#).

Table 5.3 Mapping Values Survey Questions	
Number	Question
1	How important are one's ethics and values to a career in criminal justice?
2	How well did ADJ 479 assist you to consider where your values and ethics come from?
3	How useful were the exercises and discussions to assist you to identify and address ethical c
4	List any scenarios you recall from class that were useful in exploring values, ethics, and crim
5	Anything you would like to add?

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Following the conclusion of their internships, these same students participated in focus groups on values, ethics, and the criminal justice system in their last class, Administration of Justice 480. Following these discussions, students were encouraged to write to the researcher privately and/or anonymously to share their views about their experiences.

The qualitative analysis strategy built on past approaches (Wheeldon & Faubert, 2009) and involved mapping the survey responses to identify common perceptions. This included combining the presence and frequency of unique individual concepts into a color-coded Excel spreadsheet. Perhaps simplistic, this concept-counting approach (Wheeldon, 2011) offered a useful way to present common sentiments expressed by students. Another approach was to connect common sentiments to illustrative quotations from the students. These quotations provided a means to identify thematic findings while rooting any conclusions in the language of those surveyed. This approach was repeated in the focus groups held within class after students had completed their internships. Wide-open discussion ensued, and students offered insights into perceived strengths and weaknesses of the preinternship course, teaching strategies, and the internship program overall. Both common concepts and sentiments were again captured to provide additional and reflective data. The qualitative findings provided key insights into student perceptions.

Based on the survey results, virtually all students identified values and ethics as important or very important to a career in criminal justice, and most identified the course and the exercises as important or very important to their ability to identify and address ethical dilemmas. One theme that emerged was the belief that the course helped “students to understand their own values, and identify and address ethical dilemmas.” When asked which scenarios were most useful, the majority of students identified examples drawn from a text that combined specific real-work situations with a step-by-step approach to identifying the dilemmas and possible solutions. Another important theme was that teaching ethics required that real-life scenarios be used to “help students to evaluate how ethics are connected to the criminal justice system.” These should not be “too easy,” because they can provide a false sense of security and a limited understanding of the “real-world complexity of ethics.”

The focus group results offered another view of the role of ethics. Although many students acknowledged that the class “helped them identify ethical dilemmas in their placements,” many more students saw ethics as “situational” and varied “depending on the type of agency.” Some students wished that the course had “taught [them] what the ethics in the criminal justice system were” and focused on the specific guidelines required at the agencies where they did their internships. Other students shared more personal accounts of their internship experience and some of the challenging or traumatic incidences they faced during their placements. These included seeing a dead body, interviewing a victim of domestic violence, and accompanying a sheriff to a home where a youth was to be taken to a juvenile facility jail. For these students the value of ethics instruction was very personal. They suggested the experience of thinking through the ethical dilemmas prepared them because they said they “knew themselves a bit better” as a result.

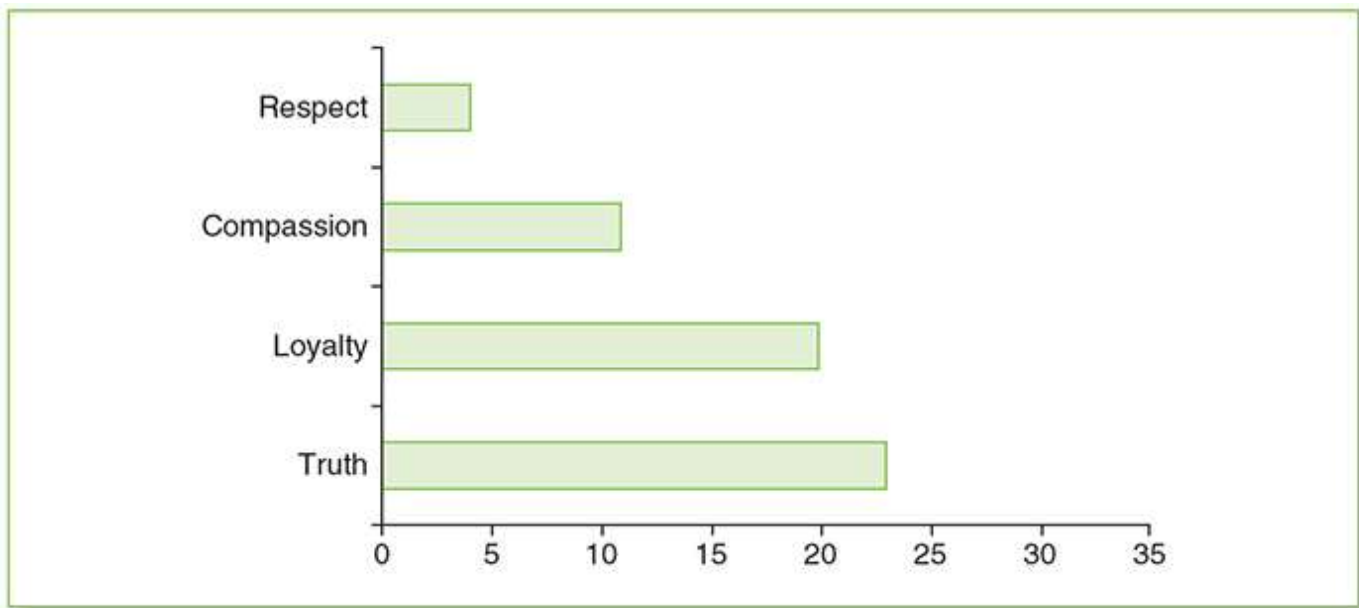
Testing the Findings: Quantitative Pre/Post Concept Map Analysis Strategy

To test the extent to which the preinternship class assisted students to consider and reflect on their values, the pre/post concept maps were quantitatively assessed. As you may recall, students were asked to complete concept maps during the first preinternship class based on the general instructions to identify both important values and ethics and their origin(s). These maps demonstrated how, beginning with themselves, participants could provide what they believed to be core values and connect them with lines to where they believed these values originated. They were provided an exemplar map for how their maps should be constructed as well as basic instructions about which sorts of concepts might be included (e.g., honest, hardworking) and where these concepts may have originated (e.g., parents, religion, school). Each student was asked to complete another concept map using the same instructions and exemplars near the end of the course.

If the qualitative data are to be believed, we ought to be able to see a change in student concept maps before and after the course. To test this idea the premaps and postmaps were quantitatively assessed, and values and ethics identified in the maps and their perceived origins before and after the preinternship class were compared. In this case, the null

postmaps. The research hypothesis was that the maps completed after the course would contain more concepts and would be constructed in more complex ways. To test this hypothesis, all relevant data for each student were compiled into an Excel table. Based on this process, a descriptive analysis was made possible that included the values in the maps and data about from whom, or from where, students suggested they had originated. Values in the premaps and postmaps were first compared in a table, as presented in [Figures 5.7](#) and [5.8](#) below.

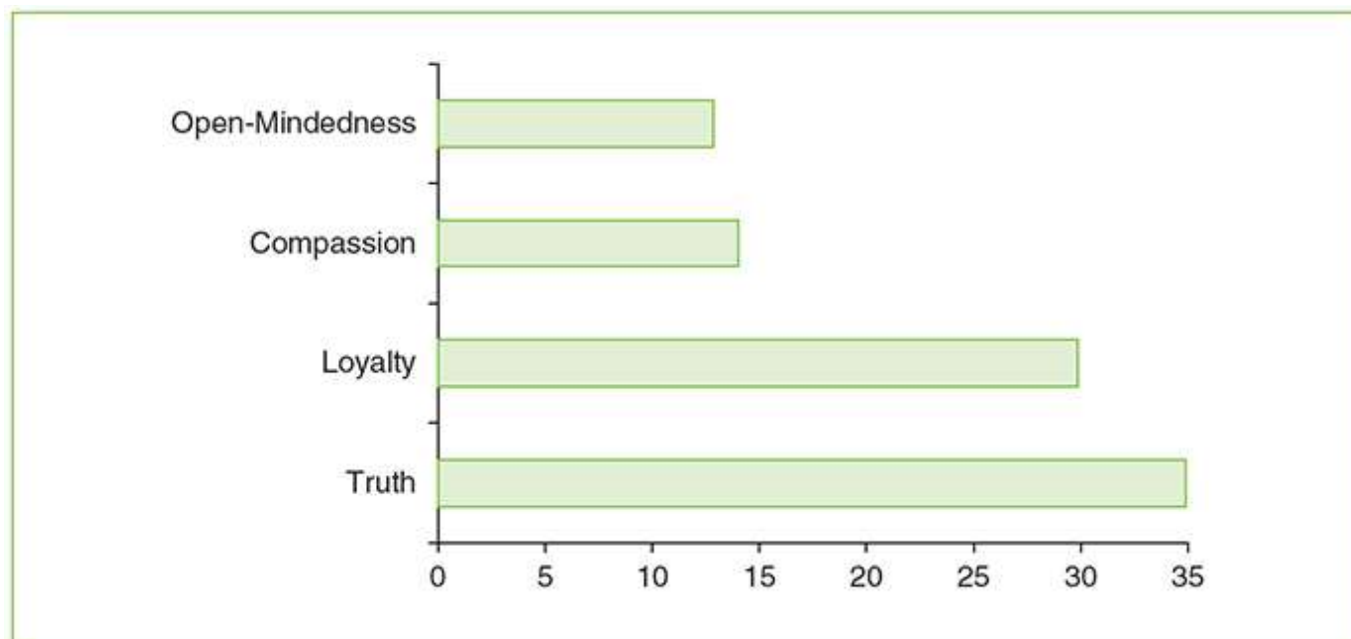
Figure 5.7 Most Common Premap Values



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Figure 5.8 Most Common Postmap Values

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As you can see, truth and loyalty remained important for these students throughout the course, but compassion was identified more often in the postmaps, with open-mindedness identified for the first time in the postmaps. The use of traditional tables is common, but another approach is based on a computer program called Wordle (Feinberg, 2010). This online program is free for all, is easy to use, and provides another means to visualize which values were important. To create [Figures 5.5](#) and [5.6](#), one can simply copy the text into the Create box at <http://www.wordle.net>. The more words you type, the more placement of the text changes, and the size of an individual word depends on the number of times you enter the word into the Create box. The resultant “wordle” is another way to visualize data. [Figures 5.9](#) and [5.10](#) show the most common values in the student pre- and postmaps.

Figure 5.9 Premap Values in Wordle



A Wordle visualization showing the frequency of values in a postmap. The words are arranged in a cross shape. 'LOYALTY' is at the top, 'TRUTH' is on the right, 'COMPASSION' is in the center, and 'RESPECT' is on the left. The words are in a bold, black, sans-serif font, with 'LOYALTY' and 'TRUTH' being the largest.

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Figure 5.10 Postmap Values in Wordle

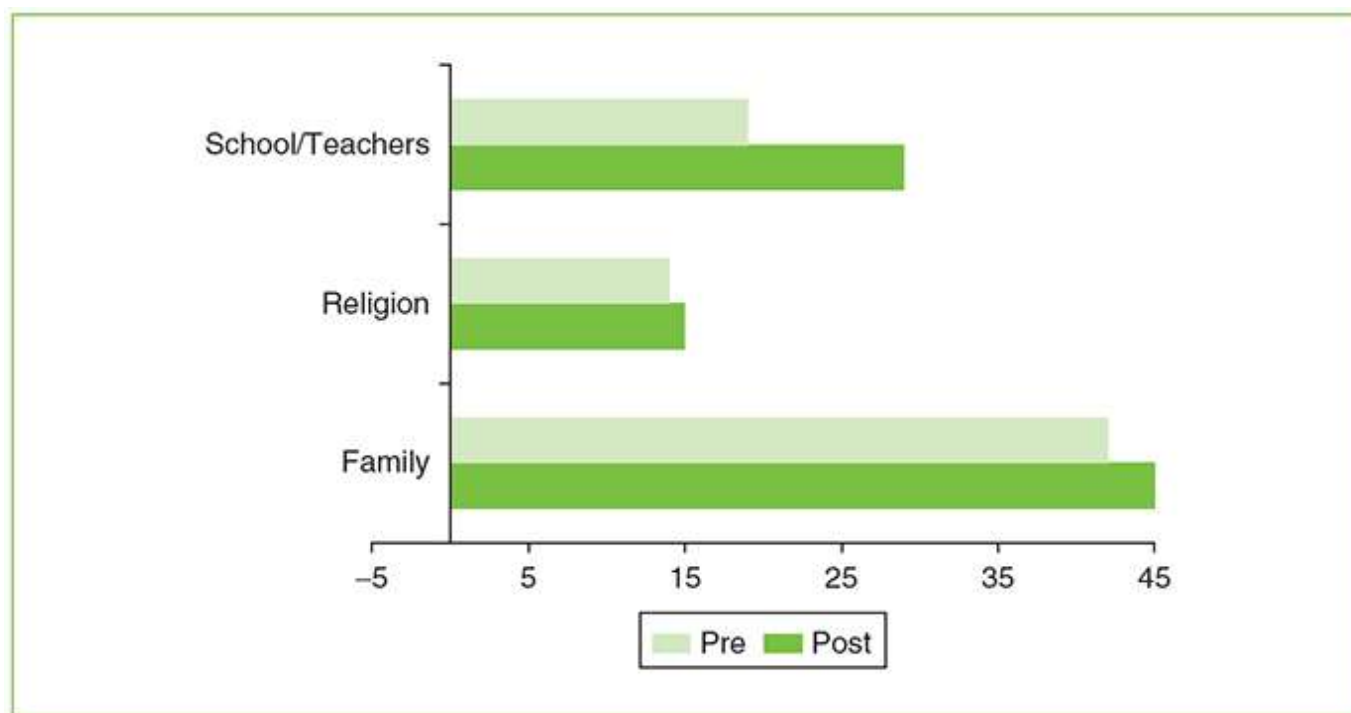


A Wordle visualization showing the frequency of values in a postmap. The words are arranged in a cross shape. 'LOYALTY' is at the top, 'TRUTH' is on the right, 'COMPASSION' is in the center, and 'OPEN-MINDEDNESS' is on the left. The words are in a bold, black, sans-serif font, with 'LOYALTY' and 'TRUTH' being the largest.

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In addition, the student maps provided data about where these values originated. As [Figure 5.11](#) presents, these changed pre- and postcourse.

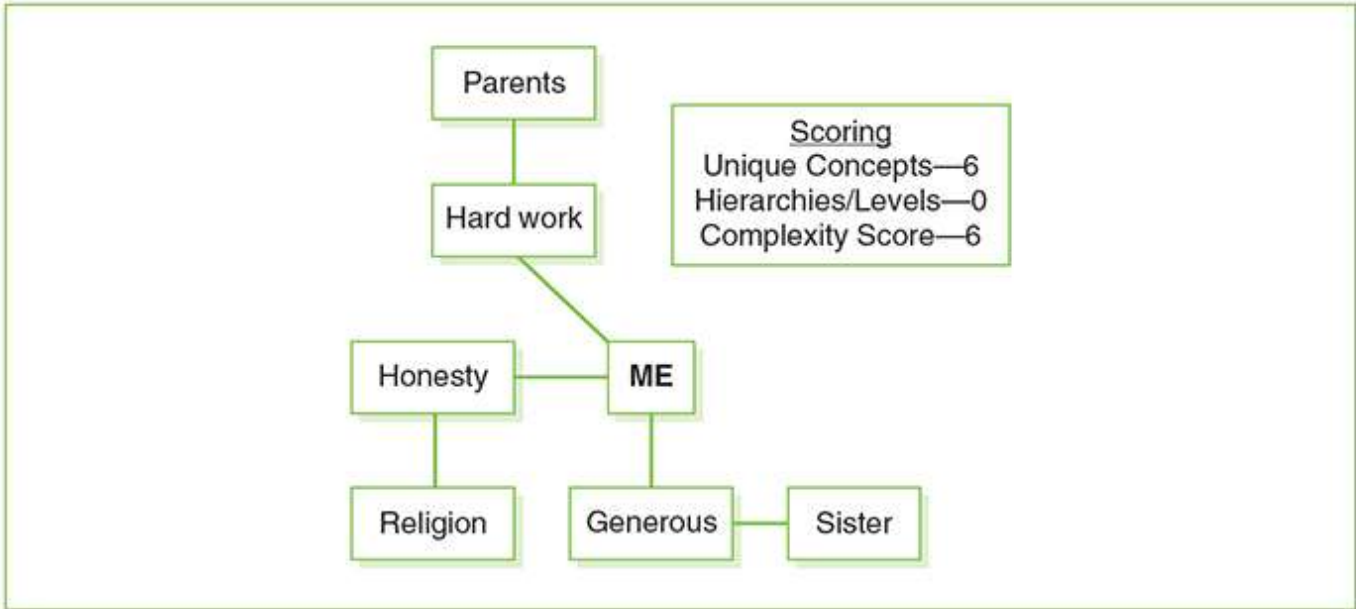
Figure 5.11 Pre/Post Comparison of Value Origins



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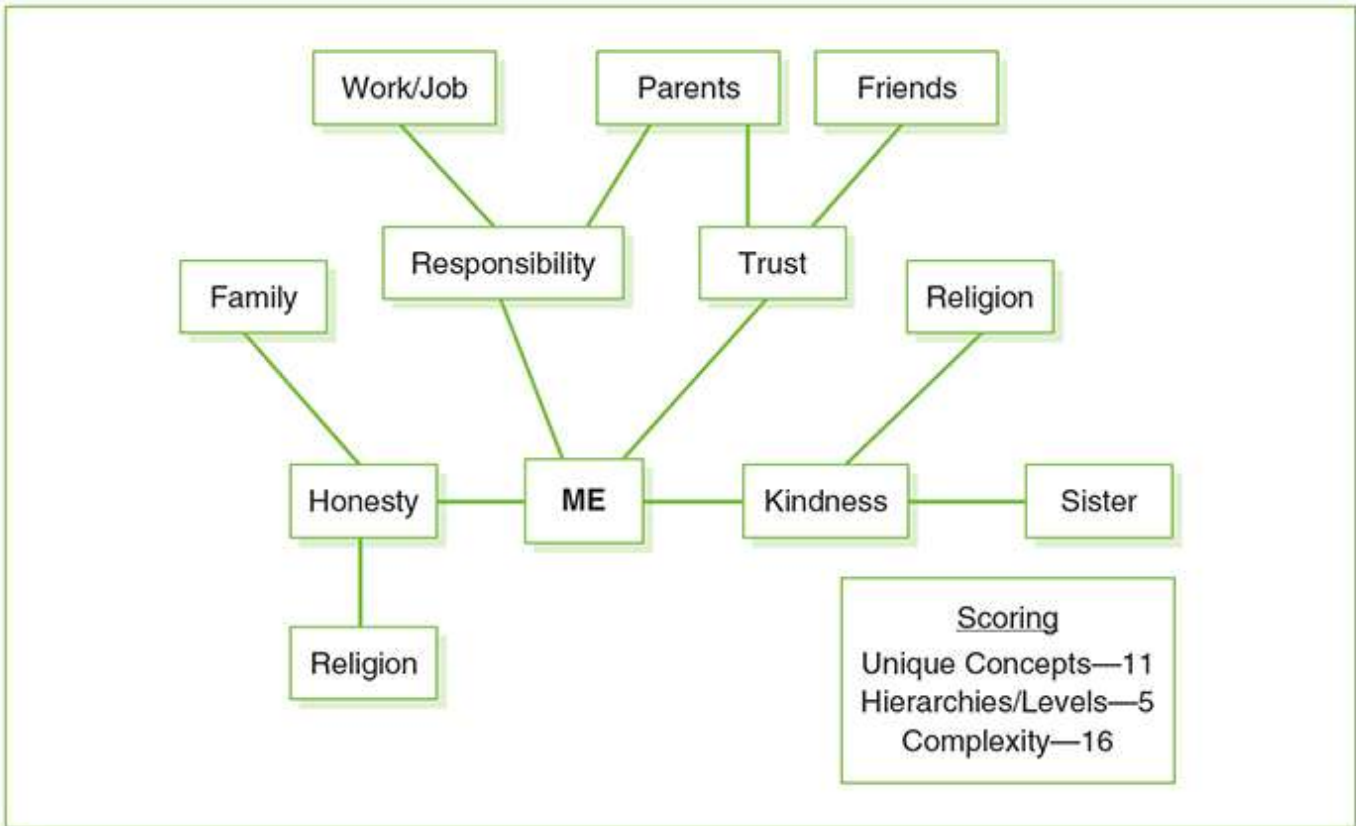


As discussed above the value of using maps is that they can provide both narrative and numeric data. Through a comparison of the pre- and postmaps, a number of interesting narrative observations can be made. The values of honesty and loyalty remained important for students both before and after the course; compassion as a value of importance was identified more often postcourse, and open-mindedness was identified for the first time postcourse. In terms of value origins, family, friends, school, and religion all remain core sites of value origin. Postcourse, however, school was identified more often. In addition to this descriptive information, the pre- and postmaps also provided numeric data. The maps were scored based on the number of concepts and the maps' complexity, as outlined in [Figures 5.12](#) and [5.13](#). In this study, a complexity score was calculated based on one point for each unique concept and five points for maps that included two or more connections between values and origins.



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Figure 5.13 Scoring Complexity in Pre- and Postmaps, Example 2



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To assess the significance of the changes in the pre- and postmaps, we can return to our

when we are comparing pre/post data from the same people. By compiling the mean number of concepts in the premaps and the postmaps, and the mean complexity of the pre- and postmaps, you might get something that looks like [Table 5.4](#).

Table 5.4 Pre-/Postmap Concept and Complexity Comparison

Gender	n	Mean Pre Concepts	Mean Post Concepts	Mean Pre Complexity	Mean Post Complexity
Male	18	8.05	13.87	9.72	17.94
Female	27	9.83	15.88	11.85	20.59

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By using a one-tailed dependent t test, the mean difference on the number of concepts is reported as 5.49 (with a standard error of .42) and a p value of less than .001. The mean difference on the complexity score is reported as 8.53 (with a standard error of .68) and a p value again less than .001. As you will recall, a p value less than .05 is considered significant enough that we can reject the null hypothesis that there were no differences between the pre and post means. Based on the scoring of pre- and postmaps, maps completed postcourse contained more concepts and were constructed in more complex ways. The differences were statistically significant and suggested that the course assisted students to provide a more detailed account and understanding of their values.

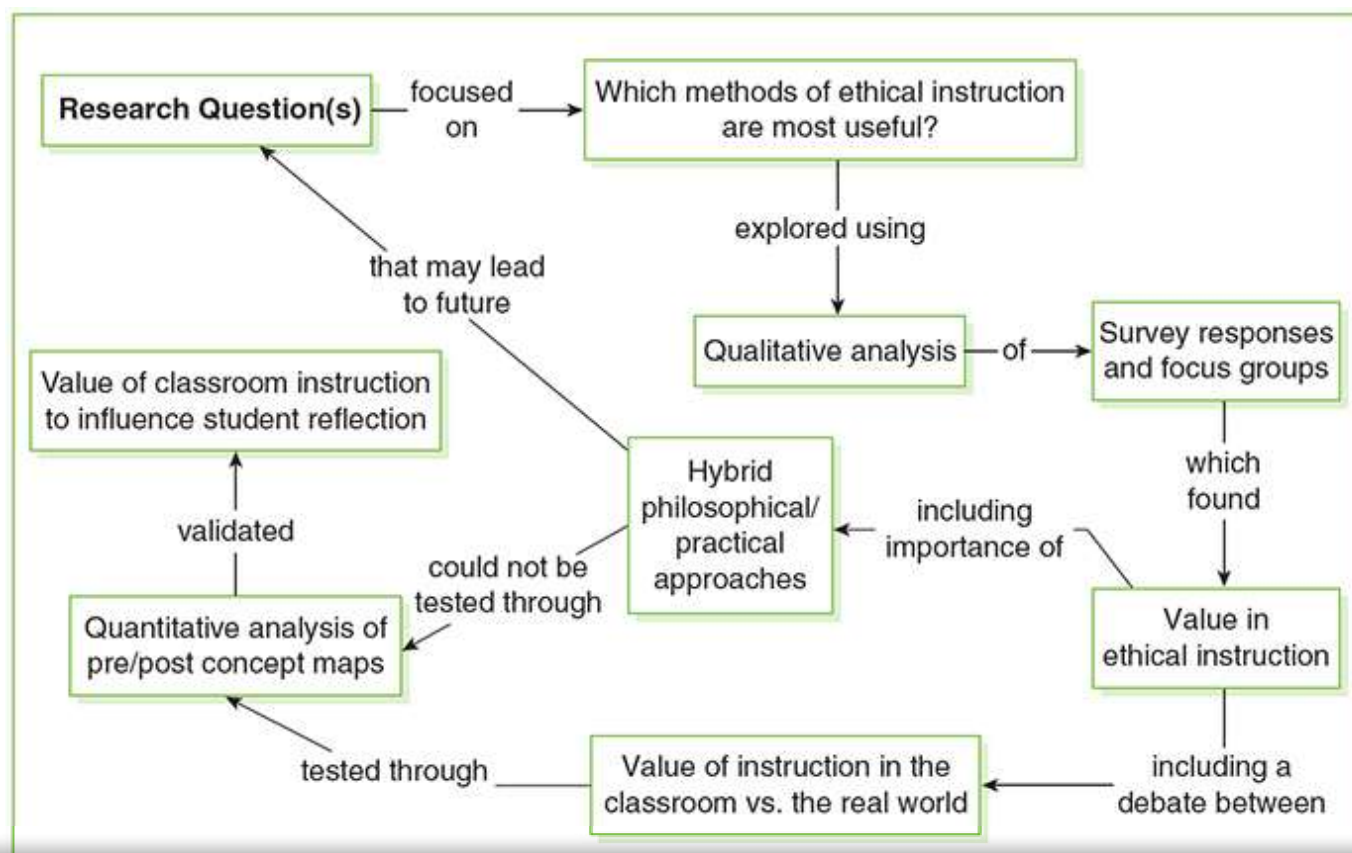
Discussion and Limitations

In this example, of interest were the types of ethical instruction identified by students based on the three approaches to this training provided during the preinternship class. This involved a qualitative analysis of student surveys and focus groups that suggested that approaches to ethical instruction should not be “too easy” and not shy away from the “real-world complexity of ethics.” Some common themes were that ethical instruction needed to provide (a) a means for students to understand their own values and (b) opportunities to identify and address ethical dilemmas. Examples drawn from a text that combined specific

solutions were identified as useful by students (Wheeldon, 2008). Yet not all students saw the preinternship course as valuable, and as some suggested in the focus groups, ethics in the classroom and ethics in the real world were two different things.

These qualitative findings led to the second, more general research question designed to better understand the role of the preinternship class. The pre/post concept maps were used to validate the hypothesis that exposure to ethical dilemmas would influence how students represented their ethics and values and understood their origins. Overall, the qualitative data suggested that students saw ethical decision making as very important in the justice system and that the instruction was most useful when it provided them with an opportunity to work in groups to identify ethical dilemmas and analyze different approaches to resolving them. Although the pre/post concept maps could not be used to corroborate all the qualitative data, they did validate the general notion that the course was useful in assisting students to reflect on their values and ethics and provided some additional hypotheses that could be tested in subsequent studies. This analysis strategy is represented in [Figure 5.14](#).

Figure 5.14 Validating Qualitative Data on the Value of Ethical Instruction





Although this pilot study has since been built on and more data have been collected and analyzed from the sample, it provides a useful example to consider how maps can be used in mixed-methods designs and how to think about the timing, weighting, and mixing of the data. Nevertheless, a number of limitations should be noted. These include the size of the sample, the limited geographic location of the students, and the failure to capture other kinds of demographic data such as ethnicity, income level, and previous criminal justice employment. Another issue refers to how the data from the maps and data drawn from surveys were combined and compiled. In this example the qualitative findings were tested quantitatively. Yet the quantitative analysis did not consider all of the qualitative data that emerged from the surveys and focus groups. Thus, we can say the pre-/postmaps suggested the course assisted students to provide a more detailed account and understanding of their values; however, they did not (and could not) validate the survey data that suggested which types of ethical instruction were best. The choice to focus principally on qualitative data collection might be seen as a limitation.

Another approach might have tried to find new ways to combine the map data and survey results by individual students. In addition, by having students complete yet another concept map on how best to teach ethics, these data might have suggested how changes in values orientation were specifically connected to the style of ethical instruction favored by each student. Another concern in this example might be the assumption that concept count/complexity measures are useful proxies for knowledge transfer. This has not yet been fully demonstrated. Although there is research on the value of concept maps in education, science, and nursing, their application and the validity of different approaches in criminal justice is still emerging (Wheeldon, 2010b).

Mind Maps and Constructing a Mixed-Methods Measure

Another approach to the use of maps in mixed-methods research attempts to locate the strength of mind maps with the kind of research being undertaken. Using pre/post concept maps as in the example above may be a useful way to measure how views change over time,

their individual understanding. Using less formal mind maps to collect data may provide an important window into how participants understand issues, events, or approaches. This technique was used in a study to assess training approaches in the development of the first probation service in Latvia (Wheeldon, 2010a). Although this example also relied on sequential multistage data collection, the ways in which the data were weighted and mixed is quite different from the pre/post concept map example presented above. Instead of comparing pre- and postmaps, in this example the identification of themes within the maps led to another, more complex analysis process that combined and quantified the frequency of individual variables identified during a variety of data-collection stages.

Overview and Mixed Design

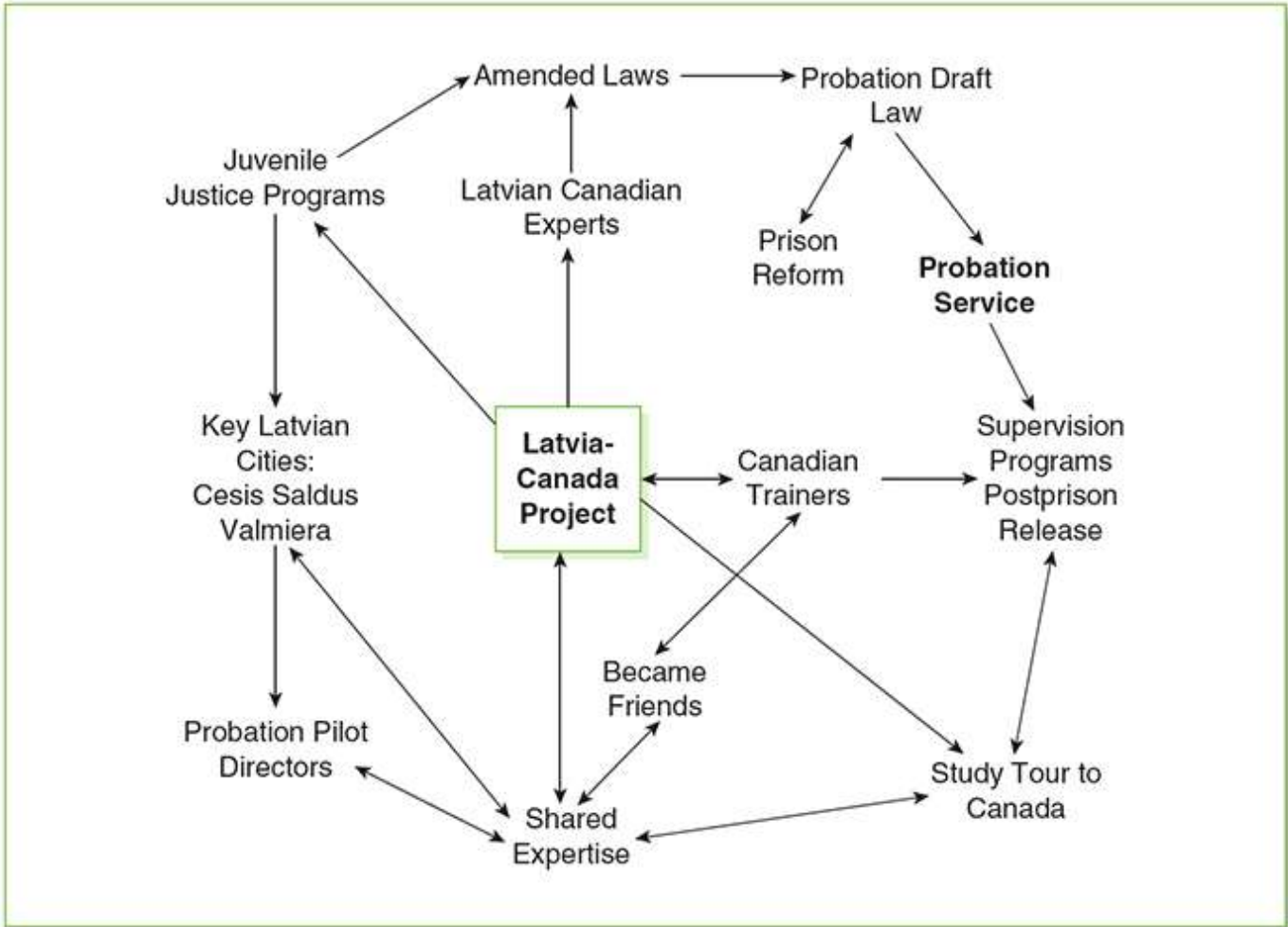
Through an innovative, exploratory mixed methodology involving a multistage data-collection process, mind maps were used to gather evidence, capture experience, and frame additional interviews among 14 research participants who during a 2-year period were exposed to a variety of training methods. This project considered which training approaches were of most value to participants based on a dichotomy within the organizational change literature between sharing specific organizational training tools and the development of individual capacity to pursue reform through local innovation (Wheeldon, 2010a). Building on past research, this study contributed to emerging knowledge-transfer scholarship and considered the potential of legal technical assistance projects to model democratic values in the former Soviet Union. In terms of the timing, weighting, and mixing of data, this example provides yet another approach to thinking about mixed-methods research. The timing once again involved sequential data collection as the mind maps were collected first and the themes contained within them informed the development of subsequent interviews. However, once the interview data were collected, both the maps and the interviews were reanalyzed concurrently. During this reanalysis concepts that emerged through more unsolicited data-collection techniques were weighted higher than concepts identified in other stages. This allowed for the construction of a novel mixed-methods measure, the salience score that was used to identify the most common elements that emerged through

Once again, in this example, the sequence of data collection was less important than the process by which the data were weighted and analyzed. As described below, the salience score emerged from concurrent analyses that could be represented by the notation QUAL + quan. On the other hand, although the sample was small, one could argue that the quantitative measure developed through a series of numeric operations is equally important as the qualitative assumptions from which it is drawn. If this view is correct, the notation could also be described as QUAL + QUAN. As you read the example, consider which notation you think is more appropriate. As we will see the mixing strategy involved merging and integrating the data to develop a mixed measure and then embedding the qualitative findings within the numeric salience score.

Data Collection and the Quantitative Salience Score

Like in the example above, the process of data collection and analysis here also involved a number of steps and stages. In the first stage of data collection, participants were asked to complete mind maps about their experience of a legal technical assistance project. Participants were provided with an exemplar map and encouraged to make their own as reflective of their experiences during the project as possible. One map adapted from the maps that were returned is presented in [Figure 5.15](#).

Figure 5.15 Example of Latvian Mind Map



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In the second stage of data collection, participants were asked general interview questions. Listed in [Table 5.5](#), these general questions were open ended and probed positive and negative experiences, perceived results and challenges, and previously indentified concepts, gathered through a literature review.

Table 5.5 General Interview Questions

Question Number	Question Text
1	Describe your most positive or memorable experience with Canadian trainers
2	Describe your most negative or challenging experience with Canadian trainers
3	What if anything did you learn through the mind map exercise?
4	How important was the role of the translator/translation within the training se
5	What if anything did you learn through the mind map exercise?

6	What would you say was the biggest result of Latvian-Canadian cooperation?
7	What would you say was the biggest challenge of Latvian-Canadian cooperati
8	Was working with Canadians different than working with other international e
9	If you could change one thing about Canada's involvement with Latvia, what w

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In addition to the general questions, conclusionary and more reflective open-ended questions followed the more directive data-collection stages. By providing participants an opportunity to identify areas not previously addressed, the researcher hoped they would reflect on their experience as whole, restating aspects of particular significance, or provide additional clarifying commentary. By combining the maps with the different stages of follow-up interviews, the frequency with which individual variables were identified through the multiple data-collection stages was recorded.

To analyze the interview data in a more meaningful way, a mixed-methods measure called a “salience score” was developed (Wheeldon, 2010b). The construction of a mixed-methods salience score may involve a number of separate yet rather simple operations. In the first step, unique, individual concepts, elements, and activities identified by participants in different stages of data collection can be recorded as variables. Individual variables might be identified in mind maps, through general or specific interviews, or in summative and reflective statements. They also may be identified in one, multiple, or all stages of data collection. These variables can then be quantified through the use of a concept-counting technique that records the frequency or presence of individual variables throughout data collection. [Table 5.6](#) lists some of the variables identified through the study.

Table 5.6 Individual Variables Identified

Tools	On this page
-------	--------------

Presentence Report	Job Shadowing
Risk/Needs Assessment	Role-Plays
Prison Intake Assessment	Working Groups
Reintegration Plan	Canada Site Visits
Case Management	Regional Coordination Councils
Canadian Program Manuals	Networking
Probation Draft	Personalities
Legislative Reform	Pilot Projects
Police Reform	Restorative Justice Exercises

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The number of times a variable was identified in total across the data-collection stages and the number of times each participant identified a variable across multiple data-collection stages were interesting, but these sorts of frequency measures can provide only a sense of whether, and how often, these variables were identified. An important assumption in this study was that the way in which the variables were identified might more usefully demonstrate the relevance or legitimacy of a proposed association (Cash et al., 2002).

For each variable identified in multiple stages of data collection, a salience score or weighted measure was developed using a weighted count system (Stillwell, Winterfeldt, & John, 1987). This strategy allows the researcher to assign participants a score for each individual variable they identify depending on the stage(s) at which these variables were recorded. For example, individual variables that emerge from user-generated, open-ended, and unsolicited data-

measure. In this example, user-generated concepts gathered through the maps were deemed worth four points, and the responses to general, nonspecific questions were worth three. Concepts identified following conclusionary questions asked at the end of both the general question sets were worth two points. Given that participants came back to these concepts after several other data-collection stages, they were felt to be less valuable than concepts generated without the priming of earlier data collection.

This approach to data transformation allowed a score to be tabulated for each individual variable, the common unique variables identified in each mind map (Turns, Atman, & Adams, 2000), and those that emerged through the qualitative interviews (Sandelowski, 2001). These were combined for each individual by adding the points assigned through each stage of the data-collection process. Salience scores for identified variables can produce values ranging from 0 (*not salient*) to 9 (*extremely salient*). [Table 5.7](#) presents an example of how a salience score of 5 might be tabulated for a concept identified in two out of four stages of data collection.

Table 5.7 Example of Salience Scoring Procedure

Data-Collection Stage	Frequency	Weighted Measure	Percentage
Mind map	1	4	50.0
General Interview	0	3	0.0
Reflective Statement	1	2	50.0
Total	2		100.0
Salience Score		6	

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By repeating this process, a mixed-methods salience score was tabulated for each variable. The individual variable salience scores (IVSSs) for each individual were then combined to get an overall variable salience score (OVSS) for the total sample. All participants' IVSSs were added together, and the result was divided by the total number of people in the sample (*n*). This operation is represented by the formula $OVSS = [(IVSS1 + IVSS2 \dots IVSSn) / n]$. This

for variables identified throughout multiple data-collection stages. When combined with the more nuanced qualitative data gathered through interviews, this approach may provide a strengthened means to clarify and build on the results of one method with the perspective of another (Greene & Caracelli, 1997). Top OVSSs are reported in [Table 5.8](#).

Table 5.8 Top Overall Variable Salience Score for Sample	
Individual Variable	Salience Score
Personalities	5.64
Site Visits	4.86
Networking	4.71
Role-Plays	3.93
Probation Draft	3.64
Pilot Projects	3.42

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A final step involved validating the salience score by considering whether differences between groups within the sample had skewed the findings. Differences between groups can mean that what you thought were generalizable findings are instead the results of strongly held views within one or more groups. In this example there were three groupings of interest. These included male and female, participants from Riga and outside Riga, and headquarters staff and probation officers. There were mean differences between the groups within the sample; through *t* tests (adjusted for undertaking multiple tests), these differences were found to be statistically insignificant in all instances. This means that the findings that

Qualitative Nuance and Embedding Data

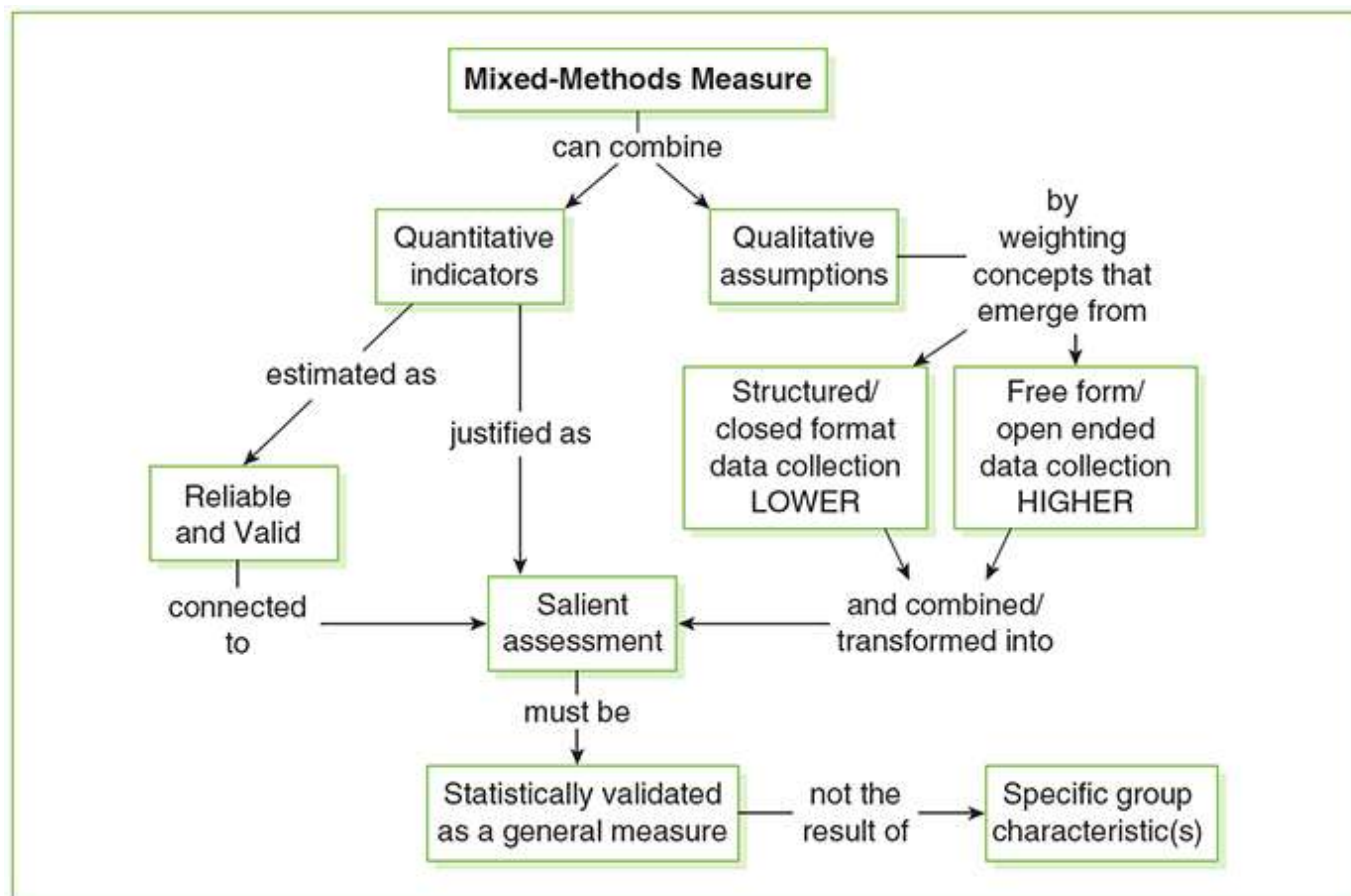
As we saw above, the data were collected sequentially and weighted in such a way as to privilege data collected through the mind maps and open-ended interview questions. Although the quantification of qualitative data (Sandelowski, 2001) provided a means to develop a unique “mixed methods measure” (Wheeldon, 2010b), this study relied on qualitative data gathered from the interviews to provide another means to understand the value of the project from the participant's point of view. These data were mixed in such a way that compiled interview data were embedded within the numeric findings to provide a more detailed means to understand “why the concepts were identified as important, and how they might be interrelated” (Wheeldon, 2010a, p. 519). Using this approach allowed the qualitative data drawn from the interviews to provide some context to the numeric salience scores. As depicted above, personalities were identified as the single most important feature of the project. As such, interview results that spoke to the nature of the relationships should be presented first. These included statements about the trust participants had in the “experience and expertise” of the trainers and how they saw them as “friends and role models” who were willing to share both their successes and their failures and “took time to learn about Latvia.” Embedding qualitative data based on numeric salience also lends itself to the inclusion of interview data that considered site visits to Canada. These were described as integral in allowing the participants a chance to “see a variety of programs and services” and learn about “pre-sentence reports, risk needs assessments, mediation programs, and post-penitentiary assistance.” By seeing the “work in action” the tour provided important “practical experience.” Finally, the third most “salient” aspect of the training was networking. Participants suggested project activities had assisted “team building between Latvians” and helped to create a “common strategy” for Latvia (Wheeldon, 2010a).

Discussion and Limitations

This study developed an approach that allowed for the numeric salience score to help present and organize qualitative findings about which elements of the training methods and approaches were most useful. By mixing methods in this way, the research not only

how. The participants also noted the utility of the maps. Virtually all participants identified the maps as a “useful way to see experience.” Some suggested this was because making a map “helped them to remember events from years ago” and “organize their thoughts about the experience systematically.” Others suggested that as visual aids, maps helped put the experience in “context,” provided a “clearer view” by allowing them to look at events again and realize how much had happened, and helped them to “focus on the key experiences, concepts and connections.” For these participants, there was value in visualizing their experiences and organizing their thoughts through maps. Although the data collected in this study have been analyzed in a variety of ways (Wheeldon, 2010a, 2011), they also provide a useful example to consider another way maps can be used in terms of the timing, weighting, and mixing of data. Using mind maps in this way allows researchers to embrace quantitative measures that use qualitative assumptions about which sorts of data are valuable and how they might be privileged. The mixed measure should be built on and revised, but it represents a unique way to combine quantitative and qualitative data as presented in [Figure 5.16](#).

Figure 5.16 One View of a Mixed-Methods Measure


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Some limitations with this study include the sample size and the choices made within the method and analysis strategy. The development of a mixed-methods measure called the salience score usefully combines elements from both the quantitative and the qualitative traditions; however, it remains untested and only a first draft of sorts. By privileging more user-generated data-collection stages by assigning more weight to the variables that emerge through these stages, the mixed-methods measure combined the “clarity of counts, with the nuance qualitative reflection can provide” (Wheeldon, 2010b, p. 87). Yet its novelty is an inherent limitation. There are few studies that have attempted to weight data in this way, and more study is needed to understand the value of a mixed-methods measure. One useful approach for others testing this measure would be to develop an additional validation process in which focus groups made up of a study's participants could validate the main findings. In this way, one could test whether the main findings that emerged through the score were seen as important by focus groups representative of the total sample. These sorts of validation exercises can allow the findings to be reviewed by the participants

Student Activity

Review the student activities in [Chapters 2, 3, and 4](#). Consider how adding another method to either of these activities can assist you to better understand the issue under investigation. In [Chapter 2](#), your class might have considered students' ability to recall key concepts and their relationships based on a lecture using concept maps. In contrast, your class might have used mind maps to consider student perceptions of the value of the material presented on that day. How might a mixed approach give you more data from which to draw conclusions? Imagine each person in your class completed a mind map about the perceived value of that week's lesson at the beginning of class, based on that week's readings. Now imagine that following the lesson, each person completed a concept map in which he or she was to connect concepts and propositions based on the lesson. Generate some hypotheses about what you might see if you were to compare an individual's prelesson interest level with his or her postlesson understanding. What might this approach to student comparison miss? How might you address this limitation?

Based on [Chapter 2](#)'s activity and the analysis presented in [Chapter 3](#), how could concept maps be used to explore how students learned concepts presented in a weekly lesson? What additional information might be useful to gather? How could questions to students about the most difficult concepts, propositions, or connections assist them to reflect on their own learning and allow for teachers to better understand student difficulties? How might you combine different sorts of data based on the timing, weighting, and mixing considerations described above? Based on [Chapter 4](#)'s activity and the analysis presented in [Chapter 5](#), how could mind maps and interviews be scored to assess their description of key people or events in their lives? How might the different approaches to data gathering influence how you might score the data collected in each? Are there common ideas that continually emerge? What additional information might be useful to gather? How does this attempt to quantify qualitative data assist your understanding, and to what extent do the numbers in your scoring system connect to your experience interviewing your participant?

As mixed-methods research continues to grow, the use of maps as an alternative form of data collection can be seen as part of a more pragmatic understanding of intuitive and abductive connections between theory and data. Indeed by combining quantitative and qualitative approaches alongside their associated data analysis strategies, mixed methods provide a means to gain a better understanding of phenomena under investigation. As visual records of understanding, concept maps and mind maps may be important tools in this regard because the data that are represented through their construction can be assessed both quantitatively and qualitatively.

This chapter has provided both a theoretical justification for the use of concept maps and mind maps in mixed-methods research and some examples of how maps might be used in this way. Pre/post concept maps offer one way to investigate how views have quantitatively changed over time and suggest a means to explore in more detail some of the reasons why using qualitative techniques makes sense. The mixed-methods measure is a unique way to consider how data gathered through multiple stages of data collection can be compiled. This single measure explicitly values data collected through more unsolicited means while at the same time ensuring the reliability of counts is respected.

Review

1. Define mixed-methods research, and explain the assumptions about knowledge on which it is based. How is it different from quantitative and qualitative research?
2. What are three ways mixed-methods studies have been undertaken in the past?
3. Why might concept maps and mind maps be useful for mixed-methods research?
4. How can pre/post concept maps be used with other kinds of methods?
5. What is a mixed-methods measure? How was it first constructed, and how might it be improved?

Suggested Additional Readings

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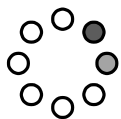
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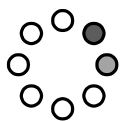
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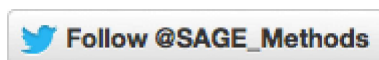
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