Abstract
The combination of qualitative and quantitative approaches to research within a single study has become an accepted technique for exploratory and evaluative research. Mixing methods, however, places significant demands on the researcher or research team, and opportunities for training in the issues and techniques involved are rare. Because of the pre-requisite knowledge required, courses of training to gain competency in mixed methods research will necessarily be pitched to senior graduate students, particularly where full integration of methods is to be included within the course experience. The key foci for a practitioner-oriented mixed methods course will be design, analysis techniques and report writing. Competency in use of software is essential for integration of data. Although techniques can be taught, the essential element for successful application of mixed methods is to have sufficient understanding of methodology that one can be flexible, adaptable and often innovative in the application of methods. This requires ‘deep learning’ built on breadth as well as depth of knowledge, practical experience, and a personality that can tolerate ambiguity and ‘messiness’.

Introduction
The term mixed methods is most commonly applied to research involving a combination, within a single project, of quantitative and qualitative approaches to data gathering and/or analysis. Most researchers ‘know’ mixed methods when they meet them, but attempts to precisely define the term have been largely unsuccessful. Tashakkori and Teddlie (1998, 2003) created a typology in which they attempted to distinguish mixed models, mixed methods and multimethod research, yet within the same edited volume, Morse (2003), for example, applies these terms in an opposing way. These difficulties are perhaps not surprising, given that methodologists are still arguing over how to define qualitative and quantitative (Bazeley, 2003a).

Although social researchers have been combining approaches for a very long time (e.g. the sociological studies of community life in the 1920s), there was a period, peaking in the 1980s, when it was considered unacceptable to do so, based on the assumption that using different data types or different methods necessarily implied creating a conflict in ontology and epistemology. The ‘paradigm wars’, as they became known, were largely put to rest in the more pragmatic approach of the 1990s, and mixed methods research has been burgeoning in popularity as an approach to research over the past decade, evidenced, for example, by the publication of the Sage Handbook of Mixed Methods in the Social and Behavioral Sciences (ed. Tashakkori & Teddlie,
2003) and the inclusion of mixed methods as a third major approach (adding to quantitative and qualitative approaches) in the second edition of Creswell’s Research Design text (2003). Acceptance of mixed methods has occurred particularly in the areas of applied social research and evaluation: “Evaluators have learned that combining quantitative and qualitative information is not only advisable but inevitable” (Riggin, 1997, p.87).

Despite their popularity and utility, however, few graduate students are prepared for the specific demands of this genre of research methods. Combination or integration of diverse methods demands of the researcher multiple knowledges of methodological traditions, a capacity to understand, employ and adapt diverse (statistical and text-interpretive) methods of data analysis, prescience to envision what might be possible (and useful) and an ability to resolve the technical and interpretive complications which arise.

The agenda for the Teachers Conference’ Mixed Methods stream

The mixed methods workshop stream at the Wisconsin Teachers’ Conference (University of Wisconsin Madison, April 2003) considered the possibilities for and issues involved in training students to be competent as mixed methods researchers and/or to work within mixed methods teams. Some of these issues included:

- What is being defined as mixed methods research;
- The learning objectives of a mixed methods course;
- The level at which training should/might occur;
- Prerequisites for mixed methods training;
- The content to be covered in a training program;
- Learning activities at various levels;
- Writing skills for mixed methods;
- Resources available—print resources and computer software.

The domain of mixed methods research

For the purposes of the workshop, mixed methods research was simply defined as any research in which both qualitative and quantitative approaches to research are employed in either the data collection and/or the data analysis and interpretation phases within a single study, i.e. to answer a single question (or integrated set of questions). Mixed methods are typically employed for purposes of corroboration (do the results of different methods support each other?), expansion (use of a different method to add to the understanding being gained) or initiation (use of contrasting methods to spark new ideas and understandings) (Rossman & Wilson, 1985, 1994). Typically discussions of mixed methods research design have been limited to those in which each of the component (quantitative and qualitative) parts is separately conducted, either in sequence or in parallel and with one being more dominant than the other (Morgan, 1998; Morse, 2003). Caracelli and Greene (1997) move beyond such limitations and provide a particularly clear outline of different designs for mixing methods which includes a number of integrated as well as component designs (Table 1).
Table 1: Designs for mixed methods research (Caracelli & Greene, 1997)

| Component designs: methodologically discrete, combination at level of interpretation only |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| triangulation                                 | seeking convergence on one aspect                                                                                              |
| complementarity                               | seeking enhancement or clarification of an aspect                                                                           |
| expansion                                     | considering different aspects (side-by-side)                                                                                 |

<table>
<thead>
<tr>
<th>Integrated designs: integrate methods and elements of different paradigms</th>
</tr>
</thead>
<tbody>
<tr>
<td>iterative</td>
</tr>
<tr>
<td>embedded/nested</td>
</tr>
<tr>
<td>holistic</td>
</tr>
<tr>
<td>transformative</td>
</tr>
</tbody>
</table>

**Learning objectives, and skills required of the practitioner**

A mixed methods course can be distinguished from a multiple methods course in that the former will directly address issues arising from the combination of methods in a single study, rather than simply cover a number of separate methods. Whether it is carried out with the objective of simply alerting students to the issues and possibilities inherent in mixed methods, or with the objective of developing proficiency in carrying out a mixed methods study will, of course, be the decision of the course committee. These different objectives, however, carry implications for very different course design and expectations of outcomes for the students, and have very different requirements with regard to the skills the students must bring with them to the course.

Assuming a goal of developing proficiency in carrying out a mixed methods study, students should have background knowledge of, and ideally experience in, gathering both text and numeric data, and in working analytically with both text and numeric data (i.e. both statistical methods and interpretive analysis of unstructured data). While it is necessary for those coming into mixed methods to have a background in both qualitative and quantitative approaches, it is important that they gain that background in a non-prejudicial way, i.e. that they do not see each of these approaches as exclusive and opposed. Where knowledge of particular methods is lacking, the student should first complete courses in the areas with which they are not familiar. A mixed methods course of this type would be most appropriately pitched, therefore, to a senior graduate student audience, rather than to undergraduates.

Students who complete a practitioner-oriented mixed methods course should, by the end of that course:

- Be familiar with key literature and debates in mixed methods, and with exemplars of a variety of mixed methods approaches to research;
• Have sufficient understanding of the philosophical bases of research to determine if and how apparent paradigmatic differences in approach might influence their work and be resolved;
• Be able to determine the appropriateness of a selected method or methods, based on the question(s) being asked (be question-driven in their choice of methods), and be able to determine whether mixing methods provides a cost-effective advantage over use of a single method;
• Have knowledge of the variety, rules and implications of different sampling methods, and of alternative approaches to dealing with ‘error’ or deviance from the norm;
• Have well developed skills in carrying out research using at least one major methodological approach, but also a comprehensive understanding of a range of approaches and methods (if they didn’t already), particularly to understand the principles underlying those methods;
• Have an ability to interpret data meaningfully, and to ask questions of the data, rather than to simply follow a formula;
• Know and understand how software can be used to assist analysis tasks;
• Be prepared to recognise and admit what is not known, and seek advice;
• Learn to take risks, but also to justify choices made;
• Develop new ways of thinking about the presentation of research results, especially where the methods used and information gained does not neatly fit a conventional format;
• Develop skills in working collaboratively with researchers using different approaches or methods.

Those who use mixed methods need to be flexible, adaptable and prepared to innovate. There is rarely a prescribed approach to be taken when employing mixing methods, and the researcher has to not only determine what might be best in the situation, but also be able to cope when unexpected divergences and contradictions arise in their data. A high level of understanding of principles is required because methods are frequently modified and methodological assumptions may be challenged. It is important, therefore, to understand the implications of such modifications and challenges for interpretation of results.

Course design

As with all methods courses, the teacher is faced with issues of whether, in the time available, potentially invaluable practical experience can be obtained through working through a real exercise in designing, conducting, analysing and writing up a study. This problem is compounded where mixed methods are concerned because use of multiple approaches, by definition, requires more time than a single approach. Thus, what can be achieved will depend on whether the course runs for one or two semesters, and the unit loading (hours/week) allocated. It is important, however, to place learning within an experiential context as much as possible, while still attending to the need for theoretical development and familiarity with the mixed methods literature. For such a complex topic, a full year program during which some practical experience could be incorporated would be very much preferable to a single semester.

The distinctive and, therefore, essential components that need to be covered by a mixed methods course are twofold, assuming background knowledge has already been acquired through general
methods courses or courses based on a variety of specific methods or approaches. These distinctive elements are: 1) mixed methods study design, and 2) analysis and interpretation of mixed data sources. A third element, ideally, would cover methods of writing up results derived from mixed approaches to data analysis. Focusing on these two (or possibly three) elements assumes that data collection procedures and related issues (e.g. questionnaire design, interviewing skills) should not need to be specifically addressed.

The methodological design component of the course would focus around how one or more studies might be framed and constructed, each to answer a specific question. These questions would probably be of an evaluative or exploratory type, and selected to be of relevance to the class group. Questions would be selected to elicit a variety of approaches to design. In this context the philosophical and methodological issues raised by mixing methods can be canvassed, ensuring lively debate in class sessions. Examples of reported studies would also be reviewed. Potential designs would be evaluated to determine their fit (or lack of) with current models for mixing methods (e.g. as described by Creswell, Plano Clark et al., 2003; Maxwell & Loomis, 2003; Morse, 2003; Tashakkori & Teddlie, 1988; 2003), with choices of design, sample and data collection strategies needing to be justified in terms of the questions asked in the study and in light of available data sources. If possible (given time and ethical issues) some pilot data could be gathered as this will have ramifications for refining the design of the study and of the data collection sources and instruments.

As noted above, it is most unlikely that a full study could be carried out, so the analysis element of the course would need to be constructed using alternative (i.e. existing) data sources, such as might be available in national data archives, supplemented by news reports, web based material, or novels, for example. From these materials a series of sample projects could be developed to ensure that students have experience with a range of both commonly used and less common analysis techniques, including:

- Separately analysing numeric and text sources, comparing conclusions which might be drawn from those different sources, and figuring ways of resolving apparent conflicts—which may involve returning to the data, or possibly designing the collection of further data (Erzberger & Kelle, 2003; Jick, 1979);
- Using the analysis of statistical (e.g. survey) data sources as the basis for designing a sampling strategy for unstructured interviews (Nickel et al., 2001; West & Tulloch, 2001);
- Using qualitative material to design appropriate questions for a quantitative survey;
- Importing statistical data into a qualitative data base to use in combination with the textual data, for example, to make comparisons between people with different demographics, different responses to closed questions, or with different scores on a scaled item (Bazeley, 1999);
- Exporting numeric coding information (binary and/or continuous) from a qualitative data base and merging it with existing demographic and other statistical data to use, for example, for building predictive models, or for dimensionalising a concept (Bazeley, 2002);
- Merging statistical and qualitative coding information to generate new variables for use in further analyses (Kemp, 2001).
In order to carry out these kinds of analyses, students would need to already have some familiarity with procedures for analysis of numeric data (i.e. statistical techniques) and also with procedures for analysis of unstructured, textual data (i.e. using one or more of a variety of interpretive analysis techniques). While it is likely that they will have been introduced to statistical software of one kind or another already (though they may not be especially proficient in it), it is less likely that they will be familiar with a qualitative data analysis program such as N6 or NVivo (which are the programs most suited to this type of analysis). It is also quite likely that they will not have had prior experience in dealing with multi-response data (which is what is typically generated from qualitative coding) or the kinds of multivariate exploratory statistical techniques (such as cluster and correspondence analysis) which are often most appropriate for mixed methods analyses. Where these deficiencies exist, they will need to be specifically addressed in terms of principles of application, ‘how to’ mechanics, and interpretation of results.

A briefer version!

Where it is not possible (or not wished) to develop skills to the level suggested above, for example, where the time available for a course is more restricted or the students are at a less senior level, the coverage of the course might be reduced to cover just the most commonly occurring mixed methods situations. These are the conduct of interviews or focus groups in order to design appropriate questions for a quantitative study, and the inclusion of open-ended questions within a questionnaire in order to elaborate fixed choice responses. In the former situation, students should be encouraged to see their qualitative material as potentially theory generating (to be tested for generality through the quantitative approach) rather than simply a source of ‘themes’, and also encouraged not to ‘throw away’ the qualitative material once they have developed their questions, but to see that it will have a continuing role in assisting interpretation of later data. In the latter situation, the student needs to learn, in the first instance, how to make a judgment about the level of analysis needed for the open ended texts, for example, whether the information they contain can simply be categorised and dealt with statistically, or whether they warrant detailed interpretive analysis requiring use of qualitative data analysis (QDA) software. Then, if using QDA software, developing understanding of how to use the categorical data from the survey to provide a basis for comparisons of qualitative responses would be a minimum technical skill required of students.

Where does software fit into the picture?

Only in the last six years has software with the capacity to combine data types or to generate data of one form from another (most notably, statistical data out of qualitative coding) become readily available, making integration of approaches more feasible (Bazeley, 2003b). The field is still open for development, with few guidelines on what might be achieved, and thus methods instructors need flexibility and imagination, both for themselves and for their students, to be able to break through traditions, see new possibilities and then help to create the means of achieving those.

Researchers universally use software to assist in statistical analyses, and increasingly also use software to assist in interpretive analyses of text. In a component type of mixed methods study (i.e. for the first three of the analysis exercises outlined above) the researcher would use software separately for each component, as they usually do. Students should be alerted, however, to the additional benefits which arise when different data types for the same respondents can be
matched and then combined or compared, rather than keeping the comparisons at a more general (whole group) level only. With just the simple matching of separate data sources, for example, specific anomalies can be analysed, scale scores can be compared in relation to associated non-numeric data (enhancing validation of the scale), or statistical results elaborated with explanation or examples.

The employment of software for analysis becomes most significant with respect to integrated analysis methods which involve not just the addition of matched data of another format, but the conversion of data from one form to another. For example, qualitative coding might be converted to a case based numeric format suitable for statistical analysis, or matrix (cross-tabulated) data based on the co-occurrence of coding in a qualitative dataset might be generated. As well as an understanding of how software programs are used for their primary purposes, then, the mixed methods researcher needs to become proficient in generating non-traditional output from an analysis. They will also become proficient in transferring data in categorical or numeric form between programs, to be matched and added to an existing database. These proficiencies require technical competencies in manipulating a variety of programs (often innovatively, often requiring considerable problem solving ability). A combination of a ‘can do’ attitude and practical experience is often needed to achieve the desired end.

Finally, a course in mixed methods research will provide some training in and experience of writing up results based on complex and varied data sources and analyses. It will do so, ideally, because writing up occurs concurrently with analysis and serves to prompt a more complete analysis. The student will learn that conventional forms of presentation are based on clearly structured experimental methods and are therefore not particularly appropriate to the ‘messy’ material generated in a mixed methods study. In mixed methods approaches (as is often the case with qualitative approaches more generally), published literature may become relevant at any stage through the process (not just at the beginning), partial analysis may occur before a new data collection method is introduced, results and interpretation cannot (and should not) be readily separated, and the conclusions offered are arrived at through an inductive process where the evidence is derived from multiple data sources supported by reporting the ‘audit trail’ by which those conclusions were reached, based on those data sources. Students, therefore, will learn to ‘tell the story’ of moving from question to conclusions, structuring their presentation to include various components as and when they are relevant and most helpful to the reader.

**Working alone or working collaboratively?**

Clearly, a comprehensive practitioner-oriented course in mixed methods is a ‘big ask’ of both the instructor and the students, and is not for the beginning researcher. Integration of methods, as described above, demands a knowledge base, intellectual, personal and experiential skills of the practitioner which are not often available in a single individual. It is common, therefore, for large scale mixed methods projects to involve a multi-disciplinary and multi-skilled team. Working in such a team, while it relieves the individual researcher of having to have such broad knowledge, requires instead a tolerance for and ability to work collaboratively with those who have different approaches—different perspectives and different methodological traditions. If the goal is to train students to work in such a team, then projects undertaken in class would logically draw on the specific skills of class members, and would be undertaken in mixed approach groups.
Responding to the challenge

Teaching mixed methods offers a high level of challenge, but also a great opportunity for innovation and development. Techniques will change, and while background methodological knowledge and technical competencies each provide important bases, the key to unlocking successful application of mixed methods is most likely to be found in attitudes taken, such that both teacher’s and students’ imaginations are set free to explore new approaches to investigating their research questions.

References

Note that this list includes both those sources quoted above, and some other useful references.


