

Mixed-method Research: A Basic Understanding

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ABSTRACT

Aim and objective: Describe the basics of the mixed-method type of research.

Background: Traditionally, the research has been quantitative in nature which provided measures for the parameter of interest. This was followed by the era of qualitative research which helped in a detailed understanding of a phenomenon. This is especially important in healthcare research as it also gives an account of the individual interaction with their environment which is a significant contributor to health. Around the 1970s, the concept of combining both these approaches was used in social sciences. Recently, this mixed-method approach was integrated into health research and educators. However, there has been a continuing debate on the basic nature of this research design. Thus, a complete understanding of this type of research is important.

Review results: Various authors described various purposes of the mixed-method approach. The main ones being triangulation, complementarity, development, initiation, and expansion. Theoretical drives, timings, and point of integration are the three factors that need to be considered for the development of studies using this design. Throughout times, different classifications for mixed-method studies have evolved, however, the most accepted one, based on the utility and internal consistency is the classification by Creswell and Clarke. They describe four major designs for mixed-method research as triangulation design, embedded design, explanatory design, and exploratory design. The application, principle, variants, strengths, challenges, and examples of each have been described extensively in this article.

Conclusion and clinical significance: Mixed-method approach is a valuable research type as it capitalizes on the strength of both qualitative and quantitative research. It is of significance in health research as it gives a broader range of perspectives to the complex phenomena studied. Thus, proper knowledge of the basics is required to accurately combine and interpret findings of the qualitative and quantitative aspects. This article is a contribution to this basic understanding of mixed-method research.

Keywords: Explanatory, Integration, Mixed-method, Qualitative, Quantitative.

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BACKGROUND

Evolution of Mixed-method Approach

Quantitative research was the only known research design in the 19th century and was, therefore, most used.¹ Quantitative data provide a measurement orientation in which data can be collected from numerous individuals and assessed trends across large geographic regions.² At the turn of the 20th century, the theory of qualitative analysis came into being.¹ Qualitative research provides comprehensive details recorded in the participants' voices and contextualizes the contexts in which they have experiences and the meanings of their experiences.² Between 1900 and 1950, there was a primary historical moment as described by Denzin and Lincoln (2005) for qualitative research. It was then shortly after this era, that the concept was introduced of mixing the two approaches.^{1,3} Jick (1979) first proposed the idea of combining methods as a way of finding convergence between qualitative and quantitative methods within the social sciences.^{4,5} Since the 1960s, research into mixed methods has become more popular in many disciplines including health sciences and education.¹

REVIEW RESULTS AND DISCUSSION

What is Mixed-method Research?

Mixed-method research is the form of study in which a researcher contains elements of qualitative and quantitative research methods (e.g., using both qualitative and quantitative viewpoints, a compilation of data, analysis, critical thinking techniques) for clear understanding and substantiation functions.⁶

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This term is defined by Tashakkori and Creswell as “research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both qualitative and quantitative approaches or methods in a single study or a program of inquiry”.⁷

Mixed-method vs Multimethod

Mixed-method research is kin of multimethod research which combines either only numerous qualitative approaches or various quantitative approaches.⁸ Multimethod design involves implementing two or more research methods in one project, each performed precisely and complete in itself. Then, the results are triangulated into a complete whole.⁹

Purpose/rationale

The aim of research on mixed-methods, of integrating qualitative and quantitative components of analysis, is to extend and reinforce the findings of a report.

The following five reasons for mixing in mixed research methods were explained by Greene and Hall (2010):^{8,10}

- Triangulation for confluence, confirmation, congruity of results from different approaches.
- Complementarity for evolution, improvement, visual, elucidation of the results from different approaches.
- Development requires using one method's outcomes to help create or advise the other method in which development is normally expected to include sampling and execution, as well as reviewing decisions.
- Initiation to facilitate the analysis of paradoxes and contradictions, new insights into systems, the reformulation of questions, or the outcomes of one approach with questions or outcomes of the other approach.
- Expansion means widening the scale and length of investigations by using particular methods for different components of the survey.

Further, in 2006, Bryman¹¹ articulated more specific grounds for conducting mixed-method research. The list was a breakdown of Greene et al. (1989)¹² categories and also, several aspects were added, such as the following:

- Credibility—Using both methods improves the appropriateness of findings.
- Context—Refers to instances where the blend is justified in terms of qualitative research providing contextual understanding along with either generalizable, externally applicable findings or unique relationships identified through a survey between variables.
- Illustration—Refers to the use to explain quantitative results of qualitative data. This stimulates the “dry” quantitative data.¹¹
- Utility or maximizing the utility of the outcomes—Refers to a suggestion that the combination of the two methods will be more beneficial to clinicians as it is more likely to be popular among journals with an emphasis on applied research.
- Confirm and discover—This involves constructing hypotheses using qualitative data and using quantitative analysis within a specific project to test them.
- Diversity of views—This incorporates two somewhat variable reasons: through quantitative and qualitative analysis, incorporating the perspectives of researchers and participants, and identifying the relationships between variables through quantitative research, while also revealing similarities through qualitative research between research participants.

Factors to be Considered for the Development of Different Mixed-method Research Designs

These are the points to be kept in mind while deciding which design to use for the mixed-method analysis.

Theoretical Drive

Like any other research design, a mixed-method study also has an overall theoretical drive. The theoretical drive had two components—the “core” component and the supplemental component. The former has a major component in the overall

theoretical drive. It is helpful to have this drive mentioned in the title of the article, whenever possible. There has been criticism of the concept of the theoretical drive as stated by Morse and Niehaus. We see a theoretical move, for instance, as a characteristic not of whole analysis, but a research question, or, more specifically, an understanding of a research question. In case a study has multiple research questions, there may be several theoretical drives for it.^{8,13}

Thus, Johnson et al.⁴ describe three different drives that mixed-method research can have:

- Qualitative dominant (or qualitatively driven).
- Quantitative dominant (or quantitatively driven).
- Qualitative-quantitative continuum (or, *equal status*).

Timings

This refers to when both the qualitative and quantitative components of the study are carried out.

There are two phases to the timing: simultaneity and dependence.¹³

- Based on simultaneity, these can be either sequential or concurrent.

The quantitative aspect takes place before the qualitative component in a sequential arrangement or vice versa. On the contrary, both components are implemented (almost) simultaneously in a concurrent configuration. According to Morse protocol (1991), a “+” between components represents concurrence (e.g., QUAL + quan), while a “ ” between the components represents sequential (QUAL quan).¹⁴

Another way to illustrate is the use of the upper and lower case letters. The former denotes the core component and the latter is secondary or supplemental.

- Based on the dependence of the two components, these can be either dependent or independent.

In the former, the data analysis results of the first component determine the fulfillment of the second component, whereas in the latter, the implementation of the data is not contingent on the results of the other component. The study also has the choice of independently conducting the data analysis or not.

Generally, sequential is considered to be dependent and concurrent to be independent. However, simultaneity and dependence should be considered two different aspects of timing. Thus, a study can be sequential and independent where the data for different components is gathered sequentially, however, the implementation of one component does not depend on data analysis of the first. Likewise, it can be concurrent and dependent. It is the researcher's purpose to determine whether a concurrent-dependent design, a concurrent-independent design, a sequential-dependent design, or a sequential-independent design is required to answer a specific research question(s) in a particular case.⁸

Point of Integration

So-called the point of interface, it is that juncture where both the qualitative and quantitative components are brought together.

As defined by Guest, the point of integration is defined as “any point in a study where two or more research components are mixed or connected in some way”.¹⁵

In a mixed-method study design, these are known to occur at several levels. In a true sense, integration is a better term to describe this rather than just mixing.

Various integration points have been described by various authors.

For instance, Morse and Niehaus¹⁶ identified two possible integration stages: at the level of the results and the level of the analysis.

In the former, the second portion's outcomes were applied to and merged into the first element. To promote this process, it is possible to use a joint show reporting all of the quantitative and qualitative outcomes and a consolidated statement. However, in the latter, the first analytical phase of a qualitative portion follows a second analytical phase in which the topics found in the first analytical phase are quantified.

Other investigators like Teddlie and Tashakkori distinguished four different stages of an investigation: the conceptualization stage, the methodological experimental stage (data collection), the analytical experimental stage (data analysis), and the inferential stage.¹⁷

By these authors, throughout all four stages, merging is feasible. Nonetheless, to distinguish those ways of mixing, the four possible integration points employed by these writers are still too crude. Experiential mixing can take various forms, such as using cognitive interviews to refine a questionnaire (tool development) or choosing people for an interview based on the results of the questionnaire (sampling).¹⁷

A few of the basic ways to integrate the different elements are as follows:

- Combining the two data sets.
- Determining from the results of one data set, the collection of the second information pool.
- Embedding one sort of information into a broader design or procedure.
- Using a framework to tie the sets of data together (theoretical or program).¹⁸

Generally, mixing can take place at either one or all of the following research steps: aim, research questions, theoretical drive, methodology, data analysis, and results.

Mixed-method Research Designs

Considering all these factors, a variety of research designs have been described.

Tashakkori and Teddlie (2003) presented an exhaustive list of 35 mixed-method research designs.^{1,19}

Following are the six "major mixed methods design" as commonly used designs, described by Creswell and Plano Clark.¹⁸

- *Convergent parallel design*—Both the aspects are carried out separately, and the results are incorporated in the comprehensive analysis.
- *Explanatory sequential design*—Collecting and analyzing the data quantitatively is the first phase which is followed by the qualitative aspect of the study. The qualitative data are used here to clarify the initial quantitative outcomes.
- *Exploratory sequential design*—It begins with accumulating the qualitative data which is followed by the collection of quantitative data to explore the initial qualitative results.
- *Embedded design*—This is a conventional qualitative or quantitative design, a section of some other form is introduced to improve the overall design.
- *Transformative design*—A conceptual transforming structure forms the qualitative and quantitative dimension of connection, priority, timing, and mixing,

- *Multiphase design*—In a research program that examines a total expected plan, more than two phases or both sequential and concurrent strands are integrated over some time.

Creswell and Clark emphasized that while there is a multitude of types as defined by many leading authors' research, it is important to note that there are a variety of features and many names used by different authors. This leads to the conclusion that these classifications have more similarities than variations.¹⁸

Thus, because of these similarities, Creswell and Clark presented a practical and internally consistent classification that had four major mixed-method designs, with variants within each type. These are the triangulation design, the embedded design, the explanatory design, and the exploratory design.¹⁸

These are explained below in details under common subheadings:

Triangulation Design

Use

This concept is used to compare statistical findings in quantitative terms directly with qualitative findings or to verify or extend quantitative results with qualitative data. Morse described that this could be used to acquire additional separate data on the related topic to best understand the research problem.¹⁴

It gives the means to corroborate the varying strengths and non-overlapping shortcomings of quantitative methods (extensive sample size, trends, generalization) with those of qualitative methods (limited N, details, in-depth).²⁰

Procedure

It is a one-phase system in which researchers apply quantitative and qualitative methods of equal status over the same timeframe. It typically requires the compilation and analysis of quantitative and qualitative data at the same time, but separately, so that the researcher can better understand the research issue.

The researcher tries to combine both data sets, usually by putting together the different outcomes in the interpretation or by manipulating data to allow the convergence during the analysis of the two data types.

Variants

The different variants are the convergence model, the data transformation model, the validating quantitative data model, and the multilevel model.

Strengths Including Advantages

Good for the beginners in mixed-method research.

Efficient architecture in which both data types are gathered at roughly the same point during one phase of the research.

The individuals with both quantitative and qualitative proficiency can be included in the research type as both the quantitative and qualitative data are gathered and evaluated separately.

Disadvantages

Demands proficiency and effort as the data is gathered simultaneously and the fact both the aspects of the study are equally important.

The consequences of no agreement between the quantitative and qualitative results must be considered. At times, these

disparities can be difficult to overcome and may need other supplementary data to be gathered.

Example

Such a study design would include a longitudinal study of parents and children's experience in pediatric clinics at a dental school using in-depth interviews and collecting quantitative data using questionnaires where they can rate their experiences on a Likert scale, at the same visit. The experiences identified by the interviews can be corroborated in the quantitative questionnaire. Thus, the use of qualitative and quantitative measures will add to the depth as well as the scope of findings.

Embedded Design

Use

This is a mixed-method design in which the study is mainly based on one data type and the other data set has a secondary role.²¹ This model assumes that a single set of data is not appropriate, that different questions need to be answered, and that different data types are necessary for each type of question.

Procedure

This incorporates the various sets of data at the design level, one form of data being enclosed in a design framed by the other type of data.²² Both the quantitative and qualitative data is gathered, however, within the overall architecture, one of the data types plays a complementary role.

Such study models can use either a single-phase or a two-phase approach for the embedded data. In addition, the quantitative and qualitative data are used to answer different research questions within the study.

Variants

Experimental model and the correlational model.

Strengths/advantages

Can be used when there is not adequate time to conduct the research.

Can be used by beginners as one part has more emphasis than the other.

May also be pleading to fund agencies since the design's key objective is typically quantitative, such as an experiment or a correlational analysis.

Challenges

The aim of gathering qualitative (or quantitative) data should be well specified.

Also, the primary and secondary purposes should be well-identified.

It can be challenging to integrate the results when the two methods are used to address multiple research questions.

Example

The research conducted by Dyer and Robinson²³ is an example of this design where they explored the variables that could affect the provision of general health promotion through seven different health interventions by dental teams in a general dental practice in South Yorkshire. The authors used a mixed-method study because qualitative methods suit topics such as this where there is little preexisting knowledge. However, qualitative research cannot make

quantifiable generalizations, so a cross-sectional survey of dentists was also undertaken.

Explanatory Design

Use

This model aims to help explain or generate initial quantitative findings from qualitative data.

For a study in which a researcher requires qualitative data to explain significant (or meaningless) findings, outdated results, or unexpected results, it is appropriate.¹⁴ This approach can also be used when a researcher chooses to create groups with the groups based on quantitative data²³ and subsequent qualitative analysis or to use quantitative participant attributes to direct a qualitative process of purposeful sampling.¹⁸

Variants

Two variants: the follow-up explanations model and the participant selection model. While both models have an initial quantitative phase followed by a qualitative phase, the relation between the two phases varies, with one concentrating on the findings to be tested in more detail and the other focusing on the relevant participants to be chosen.¹⁸

Strengths/advantages

Easy to execute as it is two-phased and in different phases, the researcher performs the two methods and collects only one type of data at a time.

Also, an individual researcher can carry on such a study and does not need a research team.

With regards to writing the report, this is as straightforward as it can be written in two phases and it has a clear characteristic.

This design is ideal for multi-phase as well as single mixed-method studies.

Quantitative researchers also like this design as this mostly starts with a strong quantitative background.

Challenges

Overall, this method is a time-consuming process.

The researchers need to understand that the qualitative process (depending on the significance) may be more time-consuming than the quantitative phase and can be limited to a few participants in the qualitative phase. Again, sufficient time for the qualitative phase must be planned.

For both stages, the researcher must determine whether to have the same participant or those from the same group for both phases, or select participants from the same population for both phases.

Example

If a study is designed to understand the clinical reasoning of the undergraduate dental students (third and fourth year) for diagnosis and treatment planning of periodontal cases, this will involve a mixed-method approach. Clinical reasoning is instrumental to the learning of healthcare professionals. It is a cognitive process and thus, involves not only quantitative but qualitative aspects. Hence, it would be a good example to study using a mixed-method approach.

The first aspect of the study is quantitative to measure the reasoning skills of the students with respect to the experts and also to compare between the third and final years to see if the year of training has any impact on their reasoning abilities. The results of

this phase will further be investigated in detail by the qualitative phase which means to understand why or why not the year of training affected the students' clinical reasoning, interviews will be conducted.

If we look closely at this process and explain it in terms of the factors required to design the mixed-method approach, as outlined at the beginning of this article, it will include:

Theoretical Drive

There is a core component and a supplemental component of the study. Both quantitative and qualitative aspects relate equally to the awareness of this method for this review. Thus, this study would be considered a qualitative-quantitative continuum, (or equal status) in terms of theoretical drive.

Timings

- In terms of the sequence: The quantitative phase is followed by the qualitative stage, hence, sequential.
- In terms of dependency: The qualitative phase explains the results from the quantitative phase, so dependent.

Point of Integration

In this study, it would occur at the methodological phase as well as the inferential stages. In the inferential stage, the results of both these aspects will be integrated to answer the research question.

Thus, this is an example of an explanatory sequential mixed-method study design.

Exploratory Design

Use

This two-phase exploratory design is used to help improve or inform the second (quantitative) method through the results of the first (qualitative) process. This design assumes that for one of many reasons an exploration is needed: metrics or instruments are either not available or not suitable, the variables are uncertain, or there is no guidance system or theory. As this approach begins qualitatively, the study of a phenomenon is ideally suited to this.¹⁵

This design is especially useful when a researcher wants to create and evaluate an instrument because one is not available or recognizes significant variables to be tested quantitatively when the parameters are unknown. This is also necessary to investigate forms of an emerging approach or concept or analyzing a phenomenon in detail and then assess its popularity.^{14,24}

Procedure

It is a two-phase approach and is often referred to as exploratory sequential design.²¹ To investigate a phenomenon, this design starts with qualitative data and then builds on a second, quantitative level.

Variants

This design has two common variants: the instrument development model and the taxonomy development model.

Strengths/advantages

Ease of description, implementation, and reporting with this design as it is conducted in separate phases.

Although the qualitative dimension is typically emphasized by this design, the inclusion of a quantitative aspect will make the qualitative method more suitable for quantitative audiences.

This method can be used for both multiphase and single studies.

Challenges

The two-phase approach requires a significant amount of time to incorporate.

Researchers need to consider the aspect and build time into the schedule for their analysis.

Researchers will explore whether the same individuals at both the qualitative and quantitative phases should serve as participants.

The researcher will determine the data to use from the qualitative process to create the quantitative method and how to use the data to produce quantitative measures.

Procedures should be followed to ensure the validity and reliability of scores produced on the instrument.

Example

The research has described the experience of the parents of the children feeling fearful for a dental visit. If a study is designed to scale the stress of these parents, an exploratory mixed-method approach will be needed.

First, the data will be collected qualitatively from these parents. The themes emerging from the data will then be used to create a scale, which is tested for reliability and validity.

CONCLUSION AND CLINICAL SIGNIFICANCE

Mixed-method studies are important to understand a process completely. Mixed-method studies are gaining popularity in health-related research. Extensive work has been done in medicine and nursing education using a mixed-method study design. However, its application to dental research is emerging especially among educators and policymakers. This literature review gives an insight into the basics needed to design and execute a mixed-method study.

REFERENCES

1. Onwuegbuzie L. A typology of mixed methods research designs. *Quality & Quantity* 2009;43(2):265–275. DOI: 10.1007/s11135-007-9105-3.
2. Creswell JW, Garrett AL. The “movement” of mixed methods research and the role of educators. *South Afr J Educat* 2008;28(3):321–333. DOI: 10.15700/saje.v28n3a176.
3. Denzin NK, Lincoln YS. Introduction: The discipline and practice of qualitative research. In: Denzin NK, Lincoln YS, ed., *The Sage handbook of qualitative research*, Thousand Oaks, CA: Sage Publications; 2005. pp. 1–32.
4. Jick TD. Mixing qualitative and quantitative methods: triangulation in action. *Adm Sci Quarterly* 1979;24(4):602–611. DOI: 10.2307/2392366.
5. Ostlund U, Kidd L, Wengstrom Y, et al. Combining qualitative and quantitative research within mixed method research designs: a methodological review. *Int J of Nursing Studies* 2011;48(3):369–383. DOI: 10.1016/j.ijnurstu.2010.10.005.
6. Johnson BR, Onwuegbuzie AJ, Turner LA. Toward a definition of mixed methods research. *J Mixed Methods Res* 2007;1(2):112–133. DOI: 10.1177/1558689806298224.
7. Tashakkori A, Creswell JW. Editorial. The new era of mixed methods. *J Mixed Methods Res* 2007;1(1):3–7. DOI: 10.1177/2345678906293042.
8. Schoonenboom J, Johnson RB. How to construct a mixed methods research design. *Köln Z Soziol* 2017;69(Suppl 2):107–131. DOI: 10.1007/s11577-017-0454-1.

9. Morse JM. Principles of mixed methods and multi-method research design. In: Teddlie C, Tashakkori A, ed. *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage Publication; 2003. pp. 189–208.
10. Greene JC, Hall JN. Dialectics and pragmatism. In: Tashakkori A, Teddlie C, ed. *Handbook of mixed methods in social & behavioral research*. 2nd ed., Los Angeles: Sage; 2010. pp. 119–167.
11. Bryman A. Integrating quantitative and qualitative research: How is it done? *Qualitative Research* 2006;6(1):97–113.
12. Greene JC, Caracelli VJ, Graham WF. Toward a conceptual framework for mixed-method evaluation designs. *Educational evaluation and policy analysis*. Fall 1989;11(3):255–274.
13. Schoonenboom J. The multilevel mixed intact group analysis: a mixed method to seek, detect, describe, and explain differences between intact groups. *J Mixed Methods Res* 2016;10(2):129–146. DOI: 10.1177/1558689814536283.
14. Morse JM. Approaches to qualitative-quantitative methodological triangulation. *Nurs Res* 1991;40(2):120–123. DOI: 10.1097/00006199-199103000-00014.
15. Guest G. Describing mixed methods research: an alternative to typologies. *J Mixed Methods Research* 2013;7(2):141–151. DOI: 10.1177/1558689812461179.
16. Morse JM, Niehaus L. *Mixed method design: principles and procedures*. Walnut Creek, CA, USA: Left Coast Press Inc.; 2009.
17. Teddlie CB, Tashakkori A. *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioral sciences*. 1st ed., Los Angeles: Sage Publications Inc; 2009.
18. Creswell JW, Plano, Clark VL. *Designing and conducting mixed methods research*. 2nd ed., Los Angeles: Sage Publications Inc; 2011. p. 89.
19. Teddlie C, Tashakkori A. Major issues and controversies in the use of mixed methods in the social and behavioral sciences. In: Tashakkori A, Teddlie C, ed. *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage Publications; 2003. pp. 3–50.
20. Patton MQ. *Qualitative evaluation and research methods*. 2nd ed., Newbury Park CA: Sage Publications Inc; 1990.
21. Creswell JW, Piano Clark VL, Gutmann ML, et al. Advanced mixed methods research designs. In: Tashakkori A, Teddlie C, ed. *Handbook on mixed methods in the behavioral and social sciences*. Thousand Oaks, CA: Sage Publications Inc; 2003. pp. 209–240.
22. Caracelli VJ, Greene JC. Crafting mixed-method evaluation designs. *New Direct Evaluat* 1997;74(74):19–32. DOI: 10.1002/ev.1069.
23. Dyer TA, Robinson PG. General health promotion in general dental practice — the involvement of the dental team part 2: a qualitative and quantitative investigation of the views of practice principals in South Yorkshire. *Br Dent J* 2006;201(1):45–51. DOI: 10.1038/sj.bdj.4813774.
24. Morgan DL. Practical Strategies for combining qualitative and quantitative methods: applications to health research. *Qual Health Res* 1998;8(3):362–376. DOI: 10.1177/104973239800800307.