

## **An overview of mixed methods research – revisited**

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## **Abstract**

Mixed methods has become increasingly popular in health related research allowing a broader and deeper understanding of complex human phenomena. This growth in popularity has increased the range of usage and complexity in design approaches producing greater need for understanding of logistical and practical application in this field. This paper aims to provide an overview of mixed methods research and orientate to the critical issues that arise for researchers. It provides an introduction to mixed methods design and the rationale and philosophical underpinnings for this methodological approach. It navigates the reader through some of real world or 'hot topics' within mixed methods including data analysis, integration and quality appraisal criteria.

## **Keywords**

Mixed methods, qualitative research, quantitative research, integration, healthcare research.

## **Introduction**

The landscape of mixed methods research has advanced significantly in the years since the publication of our original ‘overview of mixed methods research’ (Doyle et al. 2009). Its popularity as a research design has continued to grow, particularly in the fields of nursing and health sciences (Creswell, 2015a) where it is commonly used as a design for graduate theses and evaluation research. Concomitant with the increased use of mixed methods is an exponential increase in the amount of instructional texts guiding novice and experienced researchers alike (Sandelowski, 2014; Creswell, 2015a). This paper aims to provide an overview of the current state of mixed methods research with a focus on a number of critical issues. There continues to be significant debate about what constitutes mixed methods research (Hesse-Biber, 2015); we are guided by the definition of Creswell (2015a) who suggests that mixed methods research is an approach in which the researcher collects, analyses and interprets both quantitative and qualitative data, integrates the two approaches in various ways, and frames the study within a specific design.

## **Rationale for mixed methods research**

It is critically important that the research question is one that lends itself to a mixed methods design; ideally one in which using quantitative or qualitative methods alone would be insufficient. The assumption that mixed methods research is inherently better than a mono-method approach is being challenged (Sandelowski, 2014), thus strengthening the need for mixed methods researchers to be explicit about the add-on value of their design (Creswell, 2015b). However, despite this being an essential step and an important quality criterion (O’Cathain, 2010) mixed methods research is often insufficiently justified (Bryman, 2008). The justification of mixed methods designs has been considered in depth by Greene et al. (1989) who identified five main purposes for mixing methods (triangulation, complementarity, development, initiation, expansion) and by Bryman (2006) who further

expanded upon this scheme. The most commonly identified rationales for mixed methods studies are presented in Table 1:

**Table 1.** Rationales for mixed methods research

<i>Triangulation (convergence)</i>	<ul style="list-style-type: none"> <li>• Using quantitative and qualitative methods so that findings may be mutually corroborated.</li> <li>• This may also be an unanticipated outcome of the study where a mixed methods study was undertaken for another reason, but convergence was evident.</li> </ul>
<i>Expansion:</i>	<ul style="list-style-type: none"> <li>• The first phase has findings that require explanation qualitatively,</li> <li>• Unexpected findings that need to be explained.</li> </ul>
<i>Exploration:</i>	<ul style="list-style-type: none"> <li>• An initial phase is required to develop an instrument or intervention, identify variables to study or develop a hypothesis that requires testing.</li> </ul>
<i>Completeness:</i>	<ul style="list-style-type: none"> <li>• Provides a more comprehensive account of phenomena under study.</li> </ul>
<i>Offset weaknesses:</i>	<ul style="list-style-type: none"> <li>• Ensures that weaknesses of each method are minimised (Creswell, 2015a).</li> <li>• Caution is required when identifying this as a primary rationale as each method should be sufficiently rigorous in its own right (O’Cathain, 2010).</li> </ul>
<i>Different research questions:</i>	<ul style="list-style-type: none"> <li>• Both quantitative and qualitative questions may be posed at the beginning of the study in addition to mixed methods questions (Creswell, 2015b)</li> </ul>
<i>Illustration:</i>	<ul style="list-style-type: none"> <li>• Qualitative data are used to illuminate quantitative findings.</li> <li>• Putting ‘meat on the bones’ of dry quantitative data (Bryman (2006).</li> </ul>

In addition to methodological reasons, there has been an increase in funding agencies explicitly requiring mixed methods designs. This is often the case in health research in which interdisciplinary research is increasingly popular requiring collaboration across a range of disciplines grounded in a variety of research approaches. Mixed methods research therefore heralds an opportunity for greater interdisciplinary collaboration (Hesse-Biber, 2015).

## **Philosophical underpinnings**

Paradigms can be viewed as a system of beliefs and practices that influence how researchers select both the questions they study and the methods they used to study them (Morgan, 2007). The ‘paradigm wars’, which centred on the perceived differences in philosophical assumptions between the positivist/post-positivist paradigms and the constructivist/interpretivist paradigms raged from the 1970s to the 1990s (Teddlie and Tashakkori, 2003). This war fuelled the ‘incompatibility thesis’; the belief that the two paradigms could never be mixed due to the inherent differences underlying them. It is beyond the scope of this paper to provide an in-depth discussion of the paradigm wars; readers are directed elsewhere (Howe, 1988; Morgan 2007; Sale et al. 2002; Teddlie and Tashakkori, 2003). However the incompatibility thesis does pose a challenge – how can researchers mix methods when the paradigms on which they are based have vastly difference ontological, epistemological and methodological assumptions? For some, the adoption of a dialectical approach which advocates using two or more paradigms together (Shannon-Baker, 2015) provides a solution to this issue. For most however, the answer is to adopt an alternative paradigm that embraces a plurality of assumptions and methods (Greene, 2007). Critical realism is one such paradigm which supports the belief that quantitative and qualitative research can work together to address the other’s limitations (Shannon-Baker, 2015) and offers strategies for mixed methods researchers to better understand the context of what they study (Maxwell and Mittapalli, 2010). Other approaches include the transformative paradigm which is a framework of belief systems that places priority on social justice and human rights (Mertens, 2010) and the incorporation of value-based goals within a mixed methods study (Shannon-Baker 2015).

Pragmatism however is the most frequently identified alternative paradigm on which mixed methods researchers base their work (Feilzer, 2010). The utility of pragmatism is that

it aims to find middle ground between philosophical dogmatism (Johnson and Onwuegbuzie, 2004). On a practical level, pragmatism offers health researchers the freedom to choose the best methods to answer the research question to hand (Bishop, 2015a), advocating for a balance between subjectivity and objectivity throughout the research (Shannon-Baker, 2015). On a philosophical level, pragmatism supports the view that while qualitative and quantitative methods are distinct, they are also commensurate as both advance knowledge production (Bishop, 2015a) and shared meaning making (Shannon-Baker, 2015).

### **Mixed Methods Designs**

A plethora of mixed methods designs and typologies have emerged which can be confusing for both novice and experienced mixed methods researchers. Some of these designs are overly complex and there is a call for mixed methods researchers to return to more simple mixed methods designs with the option of seeking out variants of them if required (Creswell, 2015a). In this paper three basic mixed methods designs (convergent, explanatory sequential and exploratory sequential) and one advanced design (embedded intervention) are presented with examples of their use in health research.

*The convergent design (Figure 1):* sometimes called the convergent parallel or concurrent triangulation design (Creswell et al., 2003; Creswell and Plano Clark, 2011), addresses one over-arching research question and is used primarily, although not exclusively, when researchers are looking for convergence affording a more complete understanding of phenomena (Doyle, 2015). Within this design, quantitative and qualitative data are collected concurrently but remain separate – the findings of one phase are not dependent on the results of another (Creswell and Plano Clark, 2011). In most convergent designs, equal priority is assigned to quantitative and qualitative data and results are usually merged in the interpretation phase of the research where meta-inferences are developed. It is an efficient

design as all data are gathered around the same time so the population remains accessible. This is particularly beneficial in nursing and healthcare research where the sample (frequently patients) may be discharged thereby making a second phase of recruitment difficult. One of the main challenges of a convergent design is deciding what to do if, instead of converging, the findings actually diverge. Novice researchers in particular often express a desire for convergence in their study in the hope of tying all the results up neatly and strengthening the validity of their findings. However, as discussed later in this paper, it is important to note that divergence is not necessarily a sign that something is wrong with the study (O’Cathain et al., 2010). Stoddart et al. (2014) utilised a convergent (concurrent) design to explore the new clinical leadership role of senior charge nurses. Quantitative data were collected from 50 participants through the use of an online survey and 9 participants took part in qualitative interviews to explore the views and experiences of senior nurses regarding the implementation of a national clinical leadership policy. This design provided a depth of responses that would not have been achievable with the sole use of quantitative methods with the additional benefit of a good degree of convergence between quantitative and qualitative responses thereby increasing the validity of the study.

*Insert Figure 1 here.*

*The explanatory sequential design (Figure 2):* this design usually consists of a larger quantitative phase followed by a smaller qualitative phase, the aim of which is to follow up and explain the quantitative results. Data collection and analysis usually occurs sequentially, and as the results of the quantitative phase guides the development of the qualitative phase, the quantitative phase is normally dominant. The advantage of this design is that it is relatively straightforward with distinct sequential phases of data collection making it possible for a lone researcher to complete (Creswell and Plano Clark, 2011). Challenges include the fact that because it is generally an emergent design where the second phase cannot be fully

developed until the first phase has been completed, the study may have to go before an ethics committee or institutional review board (IRB) for a second time to gain approval for the qualitative phase (Creswell and Plano Clark, 2011). Furthermore, the longer timeframe required to undertake the study may make recruitment for the qualitative phase problematic as the sample may no longer be available to the researcher. An explanatory sequential design was used by Jellesmark et al. (2012) to explore fear of falling (FOF) and functioning ability among older people following a hip fracture. In the first phase, surveys were used to identify FOF and related factors. This was followed up by qualitative interviews with a sub-group of participants who were identified from survey data as having a high degree of FOF. The qualitative data allowed for an in-depth explanation of what influenced participants' fear of falling and how this impacted on their life.

*Insert Figure 2 here.*

*The exploratory sequential design* (Figure 3): this design is characterised by a primary qualitative phase which builds into a quantitative phase. The qualitative phase is useful in the development of instruments where none exist, in the identification of variables that are unknown and in the development of theory or hypotheses (Creswell and Plano Clark, 2011). The quantitative phase can serve to test the instrument and/or generalise the qualitative results to a wider population. Priority in an exploratory design depends on the purpose of its utilisation; if used to develop a theory, the qualitative phase is normally dominant but if used to develop and test an instrument the quantitative phase usually takes priority. Similar advantages and challenges arise with this design as the explanatory design however an additional challenge concerns the added complexity that is inherent in developing and testing a new instrument (Creswell, 2015a). Stoller et al. (2009) conducted a sequential exploratory study to explore factors that affect the decision to curtail alcohol consumption in those with hepatitis C; a previously under-researched topic. Interviews were conducted with 42



participants with hepatitis C who had been advised to curtail alcohol. From these interviews, 17 decision factors were identified which then fed into the development of a survey measuring these 17 new factors. This survey was then administered to 577 people with hepatitis C thereby testing these new factors in a larger sample and providing prevalence estimates.

*Insert Figure 3 here.*

*The embedded intervention design (Figure 4):* this design, also called the experimental intervention design (Creswell, 2015b), is characterised by the inclusion of a qualitative phase embedded within an experiment or intervention trial which can help to minimise some of the problems associated with intervention studies. The qualitative phase can serve a number of different functions and can be used prior to, during or after the intervention, or at all three time points (Creswell, 2015a; Sandelowski, 1996). Prior to the study a qualitative phase can be introduced to develop an instrument or inform recruitment for the trial. During the study, a qualitative phase can enhance understanding about how participants are experiencing the intervention leading to modification of the intervention if there is a clearly identifiable, fixable problem (Creswell, 2015a). However, this needs to be done cautiously to avoid threatening the validity of the trial (Creswell, 2015a; Fetters et al., 2013). After the trial, a qualitative component can contribute to an understanding of why the intervention did or did not work, can identify how it might be improved and can aid exploration of statistically non-significant cases who responded very well or not at all (Sandleowski, 1996; Drabble and O’Cathain, 2015). The use of qualitative research within intervention trials has increased in response to the realisation that within healthcare research, such trials may have little or no clinical significance or real life importance to patients, clinicians and policy makers (Drabble and O’Cathain, 2015). By increasing the ‘human element’ of rigorous controlled trials, an embedded intervention design can make the findings more meaningful for all concerned

(Creswell, 2015a). An embedded design was utilised by McCabe et al. (2013) wherein a randomised control trial (RCT) sought to determine the effect of new media art using a virtual window on health-related quality of life in patients experiencing stem cell transplantation. Findings from the RCT demonstrated that patients exposed to the intervention had better overall experiences of treatment including more positive depression and anxiety scores. Findings of embedded qualitative interviews provided participants with the opportunity to explain the beneficial effects of the intervention, thereby providing an example of how embedded intervention designs can not only identify *if* interventions work, but importantly, *how* they might work.

*Insert Figure 4 here.*

### **Critical Issues in Mixed Methods research**

Attention is now focused on a number of key issues in the application of mixed methods designs including data analysis, integration and quality appraisal.

#### *Data analysis*

Most mixed methods studies separately analyse quantitative and qualitative data with methods suitable to their own tradition merging the findings in the interpretation phase (Creswell and Plano Clark, 2011). However, there is potential to further integrate data analysis in mixed methods research using a number of techniques:

*Typology development:* analysis of one method provides a framework for analysis of the second; in most cases, quantitative data provide a framework to ‘hang’ qualitative data on. A coding matrix is developed which identifies the main quantitative findings with a text box underneath for the explanatory qualitative data. The qualitative data are then usually subjected to another level of thematic analysis. This method is particularly useful in

sequential explanatory designs as it helps to ensure that questions raised in the quantitative phase are answered. However, it is important not to ignore other qualitative data which may not be directly linked to the quantitative data, but may nonetheless provide valuable insights.

*Data transformation:* here one form of data is transformed into another. It can take the form of qualitisng data, where quantitative data are transformed into qualitative data. This is not a frequently used method and usually involves constructing narrative profiles from quantitative data. The most common form of data transformation occurs when qualitative data are transformed into quantitative data (quantitising). This can occur when qualitative data are assigned a binary value and then analysed statistically (Collingridge, 2013). Quantitising can also take the form of 'counting' where responses of participants to various questions are counted. This generates descriptive statistics which allows for the identification of patterns in the data which may have been missed through qualitative analysis (Collingridge, 2013). However there is a note of caution with the use of quantitising; qualitative data by their nature are not randomly selected or normally distributed so caution is required when interpreting statistical tests and the generalisability of the results (Maxwell, 2010). Furthermore, there is a real danger that the very essence of qualitative research (production of rich, depth data) will be lost through this method so quantitisation should not *replace* qualitative analysis.

*Software programmes:* programmes such as NVivo and MAXQDA can incorporate quantitative data into a qualitative analysis. They can also facilitate the linking of demographic detail or responses on a survey to qualitative data from individual cases (Bazeley, 2012), thereby facilitating further integration of data.

## *Integration*

Data integration has become a ‘hot topic’ in mixed methods research and is one of the major issues facing those using these designs (Creswell, 2015b). Although much of the literature refers to integration as the mixing of qualitative and quantitative *data*; it is broader than that and can be defined as the bringing together of quantitative and qualitative *components* of a study (O’Cathain et al., 2010). It is essentially the point(s) where quantitative and qualitative phases intersect – it is the ‘mixing’ in a mixed methods study. Bryman (2007) suggests that those reading mixed methods research deserve more from the findings than being presented with parallel accounts that barely connect. Good integration in a mixed methods study should provide ‘a whole greater than the sum of its parts’.

In a move away from the notion that integration in mixed methods research refers only to data integration, Fetters et al. (2013) have identified how it can occur at the design, methods and reporting/interpretation levels of research:

*Integration at design level:* An overlooked point of integration in mixed methods studies is the setting of qualitative and quantitative questions within one study and/or the setting of research questions that are inherently mixed methods from the outset (Creswell, 2015b).

Research questions that require both quantitative and qualitative methodologies to answer them necessitate a mixed methods design – the development of which is a second point of integration in mixed methods studies. The research design of a mixed methods study should have at least one connecting point of integration and may have more. In the explanatory and exploratory designs, one phase feeds directly into another. In convergent designs, the two forms of data are directly compared.

*Integration at methods level:* At the methods level there may be several points of integration, particularly in studies using a sequential design. Findings from the first phase may inform

development of a sampling frame for the second. This may occur in an explanatory design where the qualitative sample is purposively selected to follow-up unusual results. Integration can also occur when findings from the first phase are used to inform the development of the second phase, termed integration through building by Fetters et al. (2013). In an exploratory study, findings from interviews may be used to develop an instrument that is then tested quantitatively in phase two. In an explanatory study, findings from the quantitative phase can inform the development of the interview guide and other data collection tools such as vignettes to help inform the qualitative phase. The final point of integration at the methods phase is at data analysis level as previously discussed.

*Integration at reporting/interpretation level:* In many mixed methods studies, findings are presented separately however there is a move to increase integration of data in the findings section. One method is to present quantitative and qualitative findings together on a theme by theme basis. This type of integration is particularly useful for convergent designs where meta-themes are presented which cut across findings from both methods (Farmer et al., 2006; O’Cathain et al., 2010). In studies where findings are presented separately, there is still potential to increase integration through ‘weaving’ (Fetters et al., 2013). This can work well in explanatory designs where quantitative and qualitative findings are mostly presented separately, but where the main quantitative findings are also briefly weaved into the qualitative findings to act as a hook for the explanatory findings. Another strategy to increase integration is the use of a joint display. Creswell (2015b) provides an example of how this might be done for a sequential explanatory study where within a table, one column presents the quantitative findings, a second column presents the qualitative findings, and a third presents information about how the quantitative findings were explained by the qualitative ones.

*Integration at discussion level:* At the very least, a mixed methods study must be integrated at discussion level (Creswell and Plano-Clark, 2011). Within the discussion section, inferences may be drawn from each phase of the study separately. A crucial step forward is to then develop meta-inferences which are integrated understandings derived from both the quantitative and qualitative data (Tashakkori and Teddlie, 2008). Meta-inferences go beyond what is learned from the quantitative and qualitative components in isolation; they provide a sense of the overall findings. In essence, the meta-inference(s) should answer the mixed methods questions.

#### *Quality in mixed methods studies*

Current debate about quality in mixed methods research focuses on whether there should be separate quality appraisal criteria applied to the quantitative and qualitative components or whether there should be bespoke mixed methods criteria (O’Cathain, 2010). In recognition that high quality quantitative and qualitative components are necessary but not sufficient for a quality mixed methods study (Taskakkori and Teddlie, 2008), a number of mixed methods quality frameworks have been advanced; however there are no agreed criteria for evaluating mixed methods studies (Ivankova, 2014). In a bid to advance the ‘quality’ argument, O’Cathain (2010) developed an eight-domain quality framework focusing on important components including planning quality, design quality and reporting quality. This quality framework can be a useful tool to determine quality however there are two caveats; firstly O’Cathain herself recognises that in practice, this framework has too many criteria and there is a need to prioritise the most important elements and secondly, quality frameworks should not be viewed as rigid templates but rather general guidelines for use (Creswell, 2015b).

## **Challenges when undertaking a mixed methods design**

One of the main challenges when conducting mixed methods research is what to do about divergent findings. Most researchers strive for congruency between quantitative and qualitative findings; however divergent findings can uncover new theories and insights (Creswell et al., 2008). Nonetheless, there is a requirement that mixed methods researchers acknowledge and attempt to address inconsistencies between the two sets of findings as the quality of a study may be adversely affected by not addressing divergent findings (Ivankova, 2014). One potential reason for divergence is methodological differences between the two phases of research; for example the use of anonymous methods in a quantitative phase and non-anonymous methods in a qualitative phase might lead to different responses, particularly when exploring sensitive topics as reported in a study of suicidal behaviour (Safer 1997). Another explanation is that quantitative measures may not be sensitive enough to pick up on complex experiences that have been reported qualitatively, as reported in a study of maternal mental health following miscarriage (Lee and Rowlands, 2015). Divergence may also have a theoretical explanation (Fetters et al., 2013) and it may be appropriate to collect additional data to resolve the discrepancy leading to the development of a new study (Creswell et al., 2008; Fetters et al., 2013), however this may not always be possible where the study period is limited.

A further challenge in mixed methods research is the potential threat of tokenistic use of qualitative research within a prominently quantitative design perhaps stemming from the historical dominance of quantitative methods in health research (Bishop, 2015b). While Morse (2015) suggests that the quantitative/qualitative imbalance will correct itself with time, there is still the risk that qualitatively driven mixed methods research will continue to be dwarfed by quantitative research and will continue to play a secondary role in terms of importance and function (Hesse-Biber et al., 2015; Giddings, 2006).

## **Conclusion**

The use of mixed methods research continues to grow and as a design it has much to offer nursing and healthcare researchers. Its appeal is largely grounded in its ability to offer a broader and deeper understanding of complex health circumstances and human phenomena and in its ability to incorporate ‘the patient’s voice’ (Morse, 2015). This is evident in some of the examples of mixed methods designs presented in this paper in which patients’ experiences were qualitatively elucidated to explain results in more detail making them more meaningful to healthcare practitioners. To date, there have been limited texts providing an overview of mixed methods research for those considering its use in healthcare research. The focus instead has been on specific issues within mixed methods including the paradigm wars and the issue of data integration. This paper provides a sound starting point for novice researchers and more experienced researchers unfamiliar with mixed methods designs by identifying key issues and potential challenges in the use of this design. We hope that this paper encourages healthcare researchers to undertake mixed methods studies, successful application of which will be characterised by wisely selected research designs and careful diligence in planning and addressing issues such as integration, analysis and quality appraisal.

## **Keypoints for policy, practice and further research**

- Mixed methods research remains a popular design in nursing and healthcare research.
- The increasing complexity of some designs can be perplexing particularly to novice researchers.
- Nursing and healthcare researchers should focus on identifying a rationale for their mixed methods study, choosing an appropriate design to meet the objectives and identifying clearly where integration takes place.



- An integrated mixed methods study can ultimately facilitate a greater understanding of complex human phenomena that exist in healthcare research in addition to allowing the patient's voice be heard.

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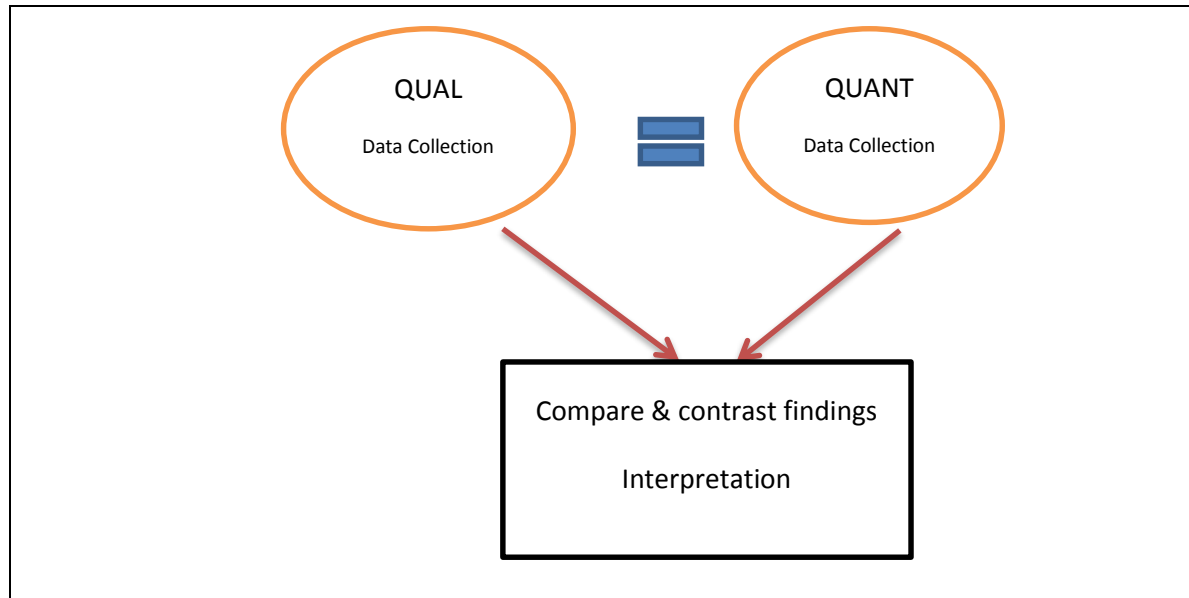
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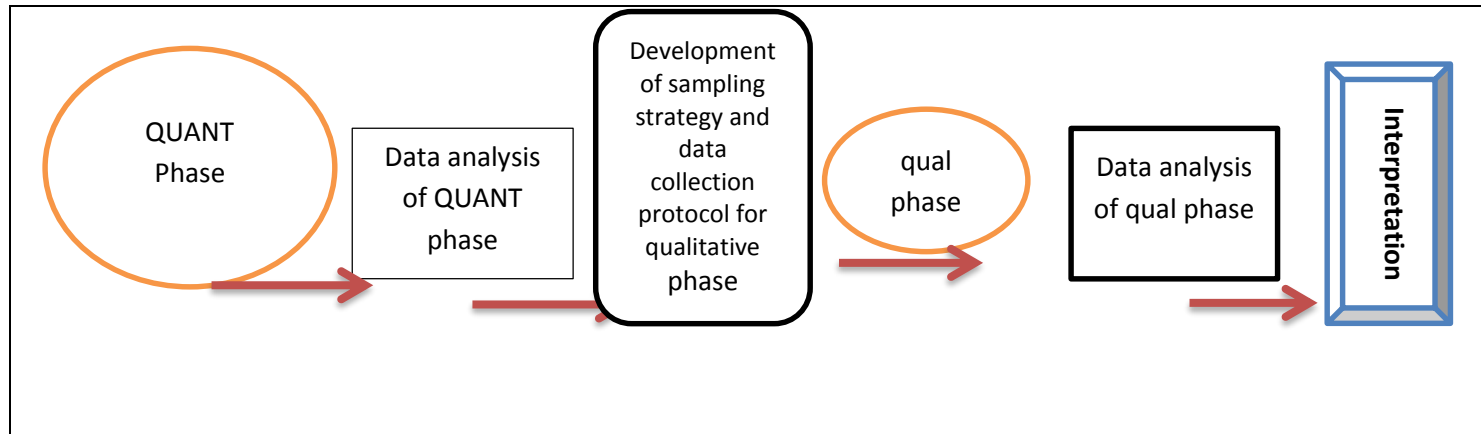
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**Figure 1.** Convergent Design

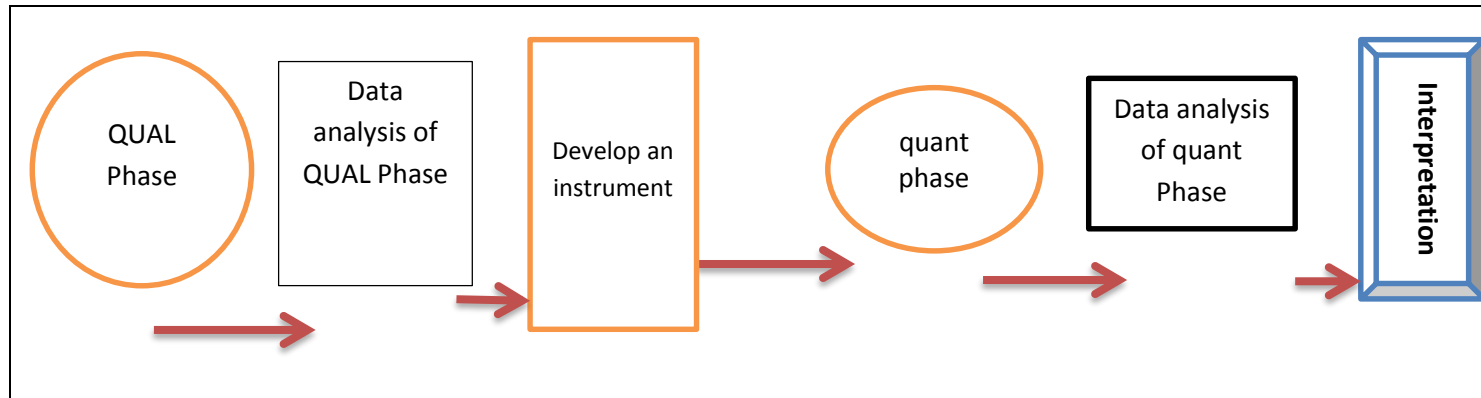
Source: Adapted from Figure 3.2(a): Creswell and Plano Clark (2011: 69).



**Figure 2.** Explanatory Sequential Design

Source: Adapted from Figure 3.2(b): Creswell and Plano Clark (2011: 69).

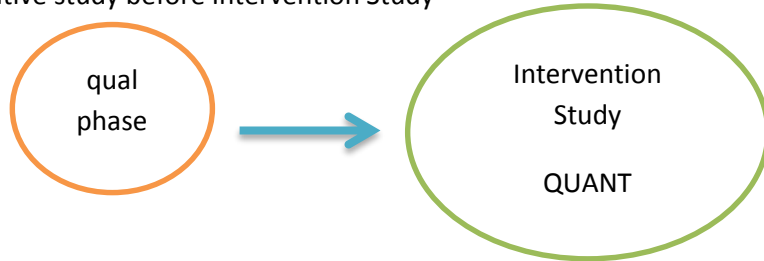




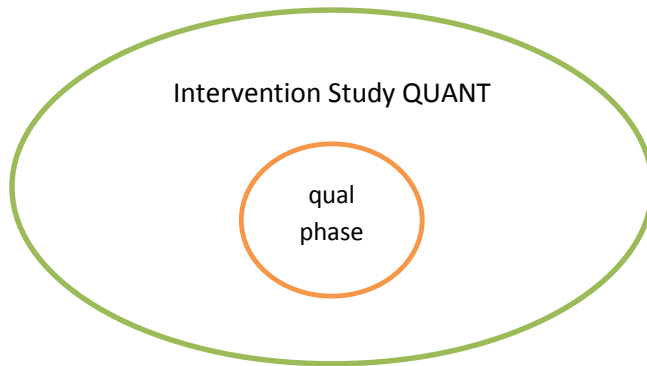
**Figure 3.** Exploratory Sequential Design

Source: Adapted from Figure 3.2(c): Creswell and Plano Clark (2011: 69).

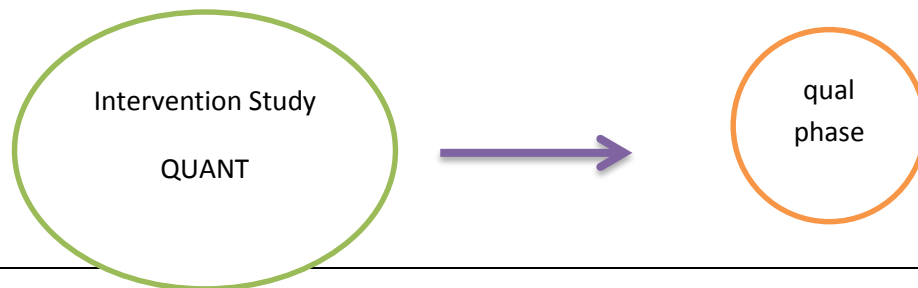
Qualitative study before Intervention Study

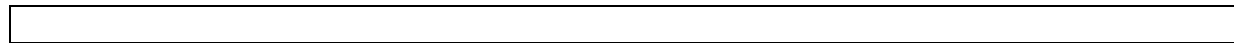


Qualitative Study occurs during the intervention study



Qualitative Study occurs after the Intervention Study





**Figure 4.** Embedded Intervention Design