**East African Journal of Education and Social Sciences**
EAJESS September-October 2025, Vol. 6, No. 5, pp. 63-75.
ISSN: 2714-2132 (Online), 2714-2183 (Print). Published by G-Card
**DOI:** https://doi.org/10.46606/eajess2025v06i05.0466.

# Integration Challenges and Best Practices in Mixed Methods Research: A Meta-Analysis Study

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## Abstract
This study synthesized findings from 128 empirical mixed methods studies published between 2000 and 2024. A structured coding scheme was employed to extract data on integration features, reported difficulties, mitigation strategies and indicators of methodological success. Results indicate that a significant majority of studies (82%) reported at least one major integration challenge, with paradigmatic tensions (63%) and logistical constraints (58%) being the most prevalent. However, the implementation of specific, deliberate integration strategies was strongly associated with higher perceived study quality. The use of joint displays (Cohen's *d* = 0.71), the formulation of explicit meta-inferences (Cohen's *d* = 0.65) and the adoption of iterative, interactive team processes (Cohen's *d* = 0.59) emerged as particularly effective practices. There is a debate and controversy among scholars and researchers about the assumption that data from these differing worldviews can be seamlessly merged. One of the primary disadvantages of MMR is the complexity involved in designing and implementing research. Since MMR integrates two distinct research paradigms (qualitative and quantitative), researchers need to carefully plan how the methods will complement each other while addressing research questions. This approach requires a clear understanding of both methodologies and the ability to integrate them meaningfully. In this perspective, academic institutions should prioritize and strengthen methodological training that emphasizes not only the "how" but also the "why" and "for what purpose" of method integration. Through such an approach, MMR will not only answer research questions but also contribute to the development of critical, analytical and sustainable knowledge.

**Keywords:** Mixed methods; integration; meta-analysis. meta-inference. joint display; rigor.

**How to cite:** Muya, M. S. (2025). Integration Challenges and Best Practices in Mixed Methods Research: A Meta-Analysis Study**.** East African Journal of Education and Social Sciences 6(5), 63-75.
**DOI:** https://doi.org/10.46606/eajess2025v06i05.0466.

## Introduction
Mixed-methods research (MMR) is a research approach that integrates quantitative and qualitative research. It can also be defined as a form of inquiry that involves analyzing both types of data and integrate findings (Siregar, 2025) to ultimately draw comprehensive conclusions (Figure 1). This approach represents a methodological refinement that synthesizes the strengths of both quantitative and qualitative paradigms (Lall, 2021). The fundamental assumption underlying mixed methods research (Żukowska & Strelau, 2025) is that the combination of quantitative and qualitative approaches yields a more detailed and nuanced understanding of a phenomenon than either approach alone. Therefore, researchers must exercise caution when selecting a research method, as each approach entails distinct advantages and limitations (Elf, 2023; Siregar, 2025).

The quantitative and qualitative approaches are implemented simultaneously and independently during data collection and analysis (Siregar, 2025). On the quantitative research method side, the process involves data collection, analysis and findings. The qualitative side follows similar steps. After both streams are completed, the quantitative

and qualitative results are brought together. The next key step is to compare and contrast the two sets of findings. This appears in Figure 1 (Grant & Parker, 2009); Siregar (2025).

This integration process allows researchers to synchronize or confirm results from the two different perspectives (Im, 2021; Siregar, 2025). The approach aims to gain a more holistic and robust understanding of the research problem, ultimately integrating findings to draw comprehensive conclusions (Terrell, 2012). It is effective for converging numerical and narrative data to answer complex research questions. As a result, synthesizing these two approaches generates a deeper, more comprehensive interpretation, yielding a more detailed and nuanced understanding of a phenomenon than either approach alone.

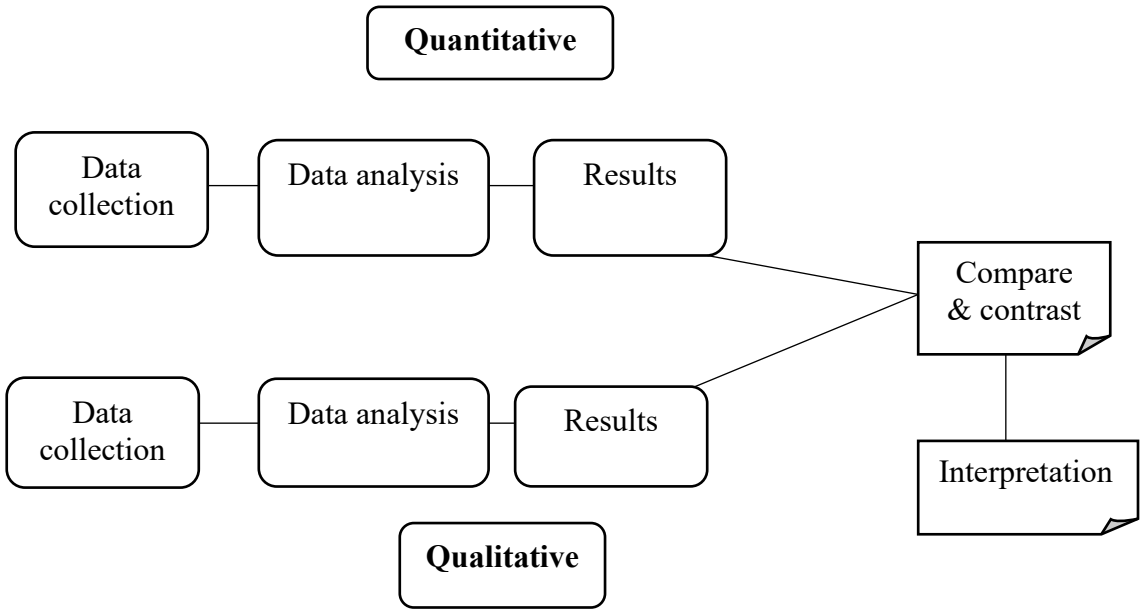


**Figure 1: Research flow diagram of MMR**

Mixed methods research (MMR) has firmly established itself as a legitimate and valuable paradigm across the social, health and behavioral sciences. Its primary appeal lies in its pragmatic approach to inquiry (Lim, 2025; Matimbwa & John, 2025), which seeks to leverage the complementary strengths of quantitative and qualitative methodologies (Alex et al., 2024). Quantitative approaches provide breadth, generalizability and ability to test hypotheses while qualitative approaches offer depth, contextual understanding and discovery of new themes (Creswell, 2009). The promise of MMR is not merely in the sequential or parallel application of these methods but in their thoughtful integration. Integration is the defining cornerstone of MMR, referring to the intentional combination or linking of quantitative and qualitative data at one or more stages of the research process, be it in the design, data collection, analysis or interpretation phases to generate insights, inferences and conclusions that are greater than the sum of the individual parts (Fetters et al., 2013).

According to some notable works in the field, despite its theoretical appeal and widespread advocacy, the practical execution of integration remains a formidable challenge (Dawadi & Giri, 2021; Marc, 2025). Empirical studies and methodological reviews consistently document a "rhetoric-reality gap," in which the ideal of seamless integration is not realized in practice(Molina-Azorin, 2016, Matimbwa & Ochumbo, 2018). Common difficulties include navigating inherent paradigmatic tensions between positivist and constructivist worldviews, managing the significant logistical and resource demands of conducting two strands of research, aligning disparate sampling frames and most critically reconciling divergent or conflicting findings into a coherent meta-inference (Cathain et al., 2010; Guetterman, 2015). Furthermore, a lack of specialized training in integration techniques often leaves researchers ill-equipped to move beyond a

simple side-by-side presentation of results (Creswell, 2009).

Given the persistence of these challenges over the past two decades (early 2000s to 2020s), a systematic and evidence-based synthesis is urgently needed. While numerous methodological texts prescribe integration strategies, there is a scarcity of aggregated empirical evidence on which strategies are most effective in mitigating specific challenges and enhancing study outcomes. A meta-analytic approach allows for the aggregation of findings across a large corpus of mixed methods studies, enabling the identification of patterns, the quantification of effect sizes associated with various practices and the derivation of generalizable, evidence-based guidelines. While researchers have combined quantitative and qualitative data for several years, data integration (which defines the feature of MMR) remains a persistent challenge for researchers due to design complexities, substantial resource requirements and philosophical tensions. Despite growing interest in MMR over the years (Fetters et al., 2013; Żukowska & Strelau, 2025), it is noticeable that authors apply mixed methods in their research but as far less frequently. This study suggests that a lack of publications about challenges and limitations of mixed methods research is evident, thus, taking a closer look at the gap.

## Methodology

The study adhered to established systematic review protocols (Centre for Reviews and Dissemination, 2009; Moher et al., 2009) to ensure a comprehensive and replicable synthesis of evidence. The process was organized into four sequential steps: (1) defining selection criteria, (2) executing a systematic search strategy, (3) collecting data and (4) displaying the synthesized data (Ntawuruhunga et al., 2023). Specifically, a systematic approach was used to identify and select publications aligning with the research objectives, following the precedent set by Major (2010) for employing a pre-defined meta-analysis protocol. Subsequent analysis mapped the selected studies to synthesize existing knowledge, a technique noted by Ntawuruhunga et al. (2023) as effective for identifying empirical research gaps and illuminating future research opportunities to advance the scientific field. Consequently, this meta-analysis aggregates and summarizes scientific evidence on Mixed Methods Research (MMR) in the social sciences through these rigorous, systematic methods.

### Article Selection

To ensure a focused and homogenous sample, strict eligibility criteria were established. The study included empirical mixed methods studies published in peer-reviewed journals between January 2000 and December 2024. The operational definition of an empirical mixed methods study was one that explicitly collected, analyzed and integrated quantitative and qualitative data. Key inclusion criteria mandated that studies must report at least one explicit attempt at integration between the quantitative and qualitative strands. This approach is defined using the framework of Fetters et al. (2013). It involves connecting, building, merging or embedding and providing sufficient methodological detail in the MMR procedural description to allow for reliable coding of integration features (e.g., point of interface, techniques used). A comprehensive and systematic search of the literature was conducted in February 2025. Selected electronic databases, such as PsycINFO, Web of Science, Scopus, PubMed and ERIC, were searched using a Boolean search string, combining terms related to MMR and integration (Table 1). The core search string included mixed method, multimethod study, integration, meta-inference, joint display, merging data, connecting data, building data, empirical study and research study.

**Table 1: Procedure to Reach Sample Size**

| Search items | Number of articles |
|---|---|
| Total articles before screening | 1,547 |
| Articles after removing duplicates | 1,254 |
| Articles after title and abstract screening | 342 |
| Articles excluded based on quality assessment | 214 |
| Final articles included in the review | 128 |

In PsycINFO, Web of Science, Scopus, PubMed and ERIC databases, the following search strings were used: <mixed method">OR <multimethod study> AND <integration> OR <meta-inference> OR <joint display> OR <merging data> OR <connecting data> OR <building data> AND <empirical study> OR <research study>. The search was limited to studies

indexed in these databases and published between 2000 and 2024.

The initial database search yielded 1,547 records. After removing duplicates, 1,254 unique records remained. A two-stage screening was then implemented. First, titles and abstracts were screened against the eligibility criteria, resulting in 342 full-text articles. In the second stage, these full-text articles were rigorously assessed by estimating if they were appropriate, meet the purpose of the study and promote understanding of the field, yielding 128 studies (Table 1). The study excluded dissertations, conference abstracts, book chapters and purely methodological or review papers. Studies that presented quantitative and qualitative findings in isolation were also excluded (Table 2).

**Table 2*:* Article Inclusion and Exclusion Criteria**

| Criteria | Included | Excluded | Justification for Criteria Application |
|---|---|---|---|
| Publication date | January 2000 and December 2024 | Before January 2000 | Used empirically published collections from carefully chosen databases to investigate the challenges and limitations related to conducting research with the use of mixed methods, upon deeper literature studies, and showing what practices lead to success. |
| Language of publication | Collections published in English | Articles not written in English | To increase the audience's readability and due to the co-authors' knowledge of English as their professional language |
| Publication theme | Articles on MMR | Articles outside the scope of MMR | To remain within the scope of the meta-analysis |
| Availability of the article | Fully available open-access articles | Complete articles not available | Due to not being open access, thereby requiring purchasing |
| Type of article | Peer-reviewed research journal articles | Conference abstracts, unavailable book chapters, review papers, and bibliometric reviews, and meta-analyses | Interested in available peer-reviewed empirical or original research |
| Publication content | Article with abstract | Publication without an abstract | To allow a quick grasp of the essence of the research and help decide, if need be, to delve deeper |

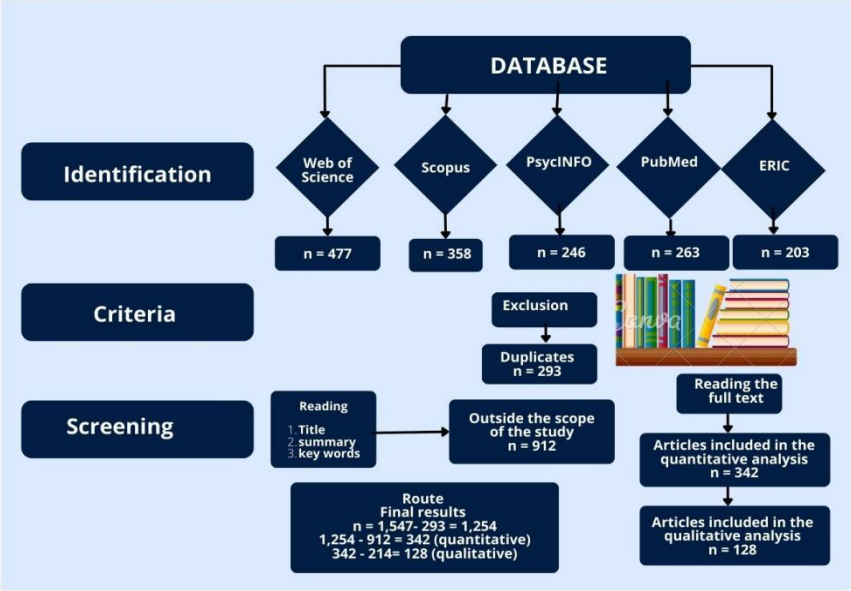


**Figure 2*:* Flow Diagram for Sample Selection**

Accordingly, with the support of a Canva (2020) the protocol followed in sample selection is portrayed in Figure 2. The reference lists of key methodological reviews (e.g., Fetters et al., 2013; Åkerblad, 2021) were hand-searched to identify any additional relevant studies; forward citation tracking was performed on seminal MMR papers.

A detailed coding scheme was developed *a priori*, drawing from established MMR frameworks (Creswell & Plano Clark (2018), Fetters et al., 2013) to ensure methodological rigor, thematic alignment with existing literature and structured data analysis. The codebook was piloted on 20 randomly selected studies and refined before full-scale application. The major coding domains included study characteristics (author, year, discipline), MMR design features, integration features (points of interface, specific techniques), reported challenges, reported mitigation strategies and outcome indicators. A critical outcome metric was the composite "Integration Success Score" (ISS), scoring from 0 to 3 on a scale where 0 indicated no or poor integration and 3 indicated exemplary, insightful integration. Two trained coders independently coded all 128 studies. Inter-rater reliability, calculated using Cohen's kappa (κ) averaged .85 across all categorical variables. Discrepancies were resolved through consensus discussion.

### Data Analysis

Given the nature of the data, a mixed methods approach to synthesis was adopted. Quantitative synthesis involved calculating descriptive statistics, using chi-square tests to examine associations between categorical variables and computing standardized mean differences (Cohen's *d*) to assess the impact of specific strategies on the ISS. Qualitative synthesis involved a thematic analysis of researchers' narrative descriptions of challenges and successful strategies, with exemplar quotations extracted to illustrate key themes. Cohen's *d* was used to identify which integration practices were effective. The common effect size is Cohen's *d*, where given two samples $X_1$ and $X_2$ ,
$d = |X \downarrow 1 - X \downarrow 2/S$ where $S$ is the standard deviation of the combined sample $X_1$ and $X_2$.
Cohen classified *d* as follows (Said et al., 2020):

Cohen's *d* measures the magnitude, for example, not just whether a treatment affects people, but how much it affects them. Effect size is a quantitative measure of the study's effect. The larger the effect size, the more powerful the study. Statistical significance is a poor metric in meta-analysis because it only indicates whether an effect is likely to have occurred by chance. It does not provide information about the magnitude or practical importance of the effect. Effect size, on the other hand, offers a standardized measure of the magnitude of the effect, allowing for a more meaningful interpretation of the findings(McLeod, 2017).

## Results and Discussion

This section presents the findings, integrating the presentation of results with immediate interpretation and discussion. This integrated approach allows for a more nuanced and coherent narrative, connecting empirical data directly to its methodological implications.

**Research Question 1:** What MMR integration challenges, pitfalls and problems are prevalent in empirical studies for researchers in the social sciences?

This research question sought to identify and quantify the most prevalent integration challenges. The study established that 82% (n=105) of the 128 studies reported at least one significant challenge related to integration. The distribution of these challenges is detailed in Table 3 (p. 68), which also provides exemplary evidence from the reviewed literature.

The prevalence of paradigmatic and epistemological differences shows that MMR is a social and philosophical undertaking rather than a technical one. The Liu's (2022) case study is the perfect example of this conflict, where differences in the epistemologies of the team led to a stalemate. This finding is in line with the earlier work by Molina-azorin (2016) on integration obstacles that hypothesized, despite increased methodological acceptability, fundamental philosophical differences between research teams continue to exist. Good integration involves creating a mutual team culture that appreciates both "ways of knowing," something we will return to when discussing effective methods.

This study examined the philosophical conflicts (paradigmatic tensions) and practical challenges of combining different data types (quantitative and qualitative samples). In MMR integration, the primary challenge is reconciling the different philosophical underpinnings of qualitative and quantitative research. There are a debate and

controversy about the assumption that data from these differing worldviews can be seamlessly merged. The complexity involved in designing and implementing the study is one of the primary disadvantages of MMR. Since MMR integrates two distinct research paradigms (qualitative and quantitative), researchers need to carefully plan how the methods will complement each other while addressing the research questions. This approach requires a clear understanding of both methodologies and the ability to integrate them meaningfully (Oranga, 2025). The complexity of co-managing both qualitative and quantitative data often complicates the development of a coherent research design that effectively integrates both approaches (Creswell, 2009). Accordingly, researchers may encounter challenges in determining the optimal timing and sequence for collecting and analyzing both types of data, which can result in complicating the study's execution and prolonging and delaying the research process (Oranga, 2025).

**Table *3*: Frequency and Exemplars of Reported Integration Challenges (N=128) ***

| Challenge Category | n | % | Representative Exemplar Evidence |
|---|---|---|---|
| 1. Paradigmatic Tensions | 81 | 63.3% | (Liu, 2022) reported "Our team struggled to reconcile the positivist assumptions underlying the survey with the constructivist approach of the interviews, leading to debates during interpretation about what constituted valid evidence." |
| 2. Logistical and Resource Constraints | 74 | 57.8% | Vargas et al. (2019) reported, "The time required for qualitative analysis was underestimated, delaying the integration with the quantitative results and creating a sequencing problem that compromised our original explanatory sequential design." Conducting MMR is more demanding than single-method studies, requiring the dedication of time and money to design, data collection, analysis, and reporting while integrating at least two different types of data. |
| 3.Sampling Misalignment | 58 | 45.3% | According to Franklin et al. (2011), "Merging data was challenging because the quantitative sample was large and random while the qualitative participants were a small, purposively selected subset from a different geographic area, making direct comparison untenable." Literature informs that sample misalignment is a common issue in MMR because of distinct quantitative and qualitative research goals: quantitative research uses random sampling for generalizability. In contrast, qualitative research uses purposeful sampling for in-depth understanding. More precisely, the core issues include the disproportionate sample sizes (larger quantitative sample sizes and smaller qualitative sample sizes can make meaningful integration difficult), non-corresponding participants (if surveyed subjects in each strand do not correspond, linking the data to draw integrated conclusions becomes compromised), conflicting findings (quantitative and qualitative sampling strategies can lead to conflicting results difficult to reconcile), and the generalizability versus depth trade-off (within the same sampling framework, it is challenging to simultaneously achieve the breadth needed for quantitative generalizability and the depth required for rich qualitative insights). |
| 4. Divergent/Conflicting Findings | 45 | 35.2% | "The survey showed high teacher confidence with new technology but the interviews revealed deep frustration and minimal use. We spent weeks figuring out how to interpret this contradiction meaningfully" (Nguyen, 2020). |
| 5. Lack of Integration Expertise | 41 | 32.0% | Peterson and Kim (2016): "We knew we were supposed to integrate, but beyond a discussion section, we weren't sure what to do. There was no guidance in our doctoral training on specific integration techniques." |

Logistical and resource constraints were not merely mentioned in passing but were typically significant obstacles, such as in Vargas et al. (2019). This issue is an indication of a deeper flaw in MMR planning

and funding: it is less time- and cost-efficient than monomethod research. The ripple effect of delays in sequential designs is a particular weakness that typically ends up being underestimated on project schedules. This means that institutional review boards and grant-making agencies could be required to establish some expectations and guidelines regarding the provision of funds for MMR projects.

Sampling alignment issues, particularly fraught in convergent designs as noted by Franklin et al. (2011) point out a frequent flaw in the research design at the initial stage. The aim to converge or compare datasets directly is often overtaken by an oversight of employing identical sampling strategies at the onset. This implies there ought to be greater methodological caution in the design process, where sampling for both strands is given thought in an integrated, rather than parallel fashion.

Divergent or contradictory results, while confusing at first, such as in Nguyen (2020), can oftentimes be a catalyst for deeper insight if handled appropriately. This challenge tests the very substance of MMR that divergence is not failure but an invitation for a finer understanding. The high percentage of accounts of this issue indicates that scholars are increasingly willing to face contradictory evidence, a sign of methodological maturity.

Ultimately, another significant challenge in MMR research lies in qualitative and quantitative data integration, as the findings may not always align properly or produce conflicting results (Oranga, 2025). There is a ubiquitous distinction between qualitative data (often narrative and descriptive) and quantitative data (numerical and statistical). If the two datasets are particularly inconsistent or incompatible, integrating them can be a challenge, requiring advanced analytical techniques (Cathain et al., 2010). For illustration, results in a quantitative survey might show a positive correlation between two variables while qualitative interview results may reveal complex underlying reasons or nuances that contradict the statistical results (Oranga, 2025). This contradiction can lead to misinterpretation of the findings and creation of a cohesive conclusion (ALAN, 2006; Oranga, 2025). As emphasized by Dawadi and Giri (2021), researchers need to carefully manage the integration process, which often requires training and advanced analytical skills to get significant, clear results. Hence, researchers must be skilled in both approaches, which requires extensive expertise and training (Oranga, 2025).

**Research Question 2:** To what extent do researchers overcome the identified challenges?

This research question sought to identify effective integration practices to overcome the identified challenges in MMR. The study discovered a collection of strategies not only widely reported but also statistically associated with higher Integration Success Scores (ISS). Table 4 shows the effect sizes for the most effective strategies.

**Table *4*: Effectiveness of Common Integration Strategies on Integration Success Score (ISS)**

| Integration Strategy | Studies Using Strategy (n) | Mean ISS (Strategy Used) | Mean ISS (Strategy Not Used) | Cohen's *d* |
|---|---|---|---|---|
| Use of Joint Displays | 47 | 2.51 | 1.82 | 0.71 |
| Explicit Meta-inference Statement | 89 | 2.38 | 1.65 | 0.65 |
| Iterative Team Analysis | 52 | 2.44 | 1.79 | 0.59 |
| A Priori Integration Plan | 61 | 2.29 | 1.84 | 0.48 |
| Data Transformation | 28 | 2.25 | 1.95 | 0.32 |

Joint Displays were a particularly powerful approach, with the highest effect size for ISS (*d* = 0.71). Their utility was evident in their capacity to solve the problem of discrepant findings. Alvarez et al.'s (2021) study of patient adherence employed a joint display to compare quantitative pill-count data against qualitative interview quotes. This approach of visual presentation of data using a matrix or joint display (Johnson et al., 2017) allowed the researchers to see that individuals with "poor" adherence as quantitatively measured often had complex, context-dependent reasons (e.g., side effects, cost) that made sense from their perspective. The display did not merely depict conflict; it interpreted it to a more nuanced meta-inference about the meaning of "non-adherence." The outcome empirically substantiates the methodological appeal to shared displays by innovators like Guetterman and Creswell (2015), demonstrating that they are more than a

presentation strategy; they are an analytical tool that forces researchers to confront the interface of their datasets.

Building an overt meta-inference was another high-impact practice (*d* = 0.65). Contrasting two studies demonstrates this. Booker et al. (2018) featured a section headed "Integrated Conclusions" which stated categorically: "While the quantitative data revealed a relationship between workload and burnout, the qualitative data made it clear what the mechanism is: it is not how much work but rather the lack of autonomy in controlling it, that causes stress." By contrast, a lower-scoring study, Chandler and Wells (2015), presented quantitative and qualitative findings in different sections with a later general discussion that connected them only implicitly, leaving integration largely to the reader. The process of formulating an explicit meta-inference compels investigators to carry out the difficult interpretive work that is the hallmark of quality MMR, a change from "methods-centric" to "inference-centric" orientation (Fetters & Freshwater, 2015).

Iterative, interactive team processes were strongly predictive of success (*d* = 0.59). This strategy directly confronted the paradigmatic tensions identified in research question 1. Jensen and Powell (2019) described holding "mixed methods data clinics" where quantitative researchers would present initial statistical models and qualitative researchers would follow up by questioning these models with "how" and "why" questions based on their emerging themes. This process, they suggested, broke down epistemological silos and transformed potential conflict into a rich, dialectical process that enhanced both strands of the analysis. This finding underscores that integration is a social process; the most auspicious techniques are insufficient if the research team does not have a formal, respectful arena for ongoing discussion.

Priori integration plan processes were predictive of success (*d* = 0.48). This finding concurs with numerous sources in mixed methods research (MMR) literature, suggesting that a priori integration planning is crucial for successful, rigorous studies. Planning integration at the design stage (Siregar, 2025) helps ensure that the qualitative and quantitative strands are genuinely combined to produce a richer understanding of a phenomenon, rather than just being conducted as two separate studies. Intrinsically, having a well-defined, explicit plan for “why”, “when” and “how” data will be integrated from the beginning, is a strong benchmark and predictor of achieving the full potential and success of a mixed-method study (Lall, 2021).

Data transformation or conversion consists of converting qualitative data into numerical codes or vice versa to facilitate mixing and analysis. Data transformation or conversion, as another approach to the effectiveness of common integration Strategies on integration success, showed a score of *d* 0.32. Nzabonimpa (2018) opined that the existing overlaps between quantitative and qualitative methods make it an interesting point of inquiry when it comes to transforming data from one data type to another. Existing evidence indicates that there is no pure “quantitizing” (the process of transforming qualitative data into quantitative forms for integration) that does not involve a qualitative thumbprint and vice versa (Nzabonimpa, 2018), thus bringing about overlaps and cross-fertilization (Voils et al., 2009). Onwuegbuzie (2009) argued that both quantitative and qualitative methods entail each other and quantitative methods do not escape “qualitizing”, and vice versa (Im, 2021).

**Research Question 3:** What contextual factors influence integration approaches vis-à-vis their design complexities and how can they affect the reliability of the results?

The analysis for the third research question was built on the following hypothesis:

$$Hypothesis_0 = the\ variables\ of\ interest\ are\ independent$$
$$Hypothesis_1 = the\ variables\ of\ interest\ are\ associated$$

Where $hypothesis_0$ is the null hypothesis and $hypothesis_1$ is the alternative hypothesis, determining whether contextual factors influencing MMR integration are independent (of each other) or associated. Across different measurement levels (by discipline, by design and by time), a significant test rejecting the null hypothesis would suggest that within the sample, one variable is associated with a second variable (Franke et al., 2012). A series of chi-square analyses revealed significant variations,

summarized in Table 5. The chi-square results revealed that, regarding the variation by discipline, e.g., health sciences versus social sciences, health sciences studies were more likely to use joint displays while social sciences studies reported more paradigmatic tensions ($p < 0.05$). The disciplinary variation is informative.

**Table *5*: Contextual Variations in Integration Challenges and Strategies**

| Contextual Factor | Key Finding | Statistical Significance | Exemplar Study Illustrating Trend |
|---|---|---|---|
| Discipline (Health Sciences vs. Social Sciences) | Health sciences studies were more likely to use joint displays; Social sciences studies reported more paradigmatic tensions. | $\chi^2(3, N=128) = 11.24, p < .05$ | **Health**: Alvarez et al. (2021) - Joint Display. **Social**: Lee and Abundo (2014) - Philosophical debates in peer review. |
| Design (Convergent vs. Sequential) | Convergent designs had more sampling issues; Sequential designs had more logistical/timing issues. | $p < .01$ for both associations | **Convergent**: Franklin et al. (2011) - Sampling misalignment. **Sequential**: Vargas et al. (2019) - Timeline delays. |
| Publication Era (Pre-2015 vs. Post-2015) | Post-2015 studies had a higher mean ISS, used more joint displays, and made explicit meta-inferences. | $t(126) = 2.89, p < .01$ for ISS; $p < .01$ for strategy use. | **Post-2015**: Jensen & Powell (2019) Iterative team analysis. **Pre-2015**: Chandler & Wells (2015) - Implicit integration. |

The higher rate of joint presentations in health sciences is likely to be due in part to the availability of prominent journals like the Annals of Family Medicine (e.g., Guetterman et al., 2015) and an ethos that values standard, open procedures. By comparison, the larger number of paradigmatic tensions in social sciences, such as in Lee and Abundo's (2014) educational study, could be a consequence of additional focus given to epistemological controversies in social sciences. This would mean that methodological training and support must be modified according to the specific cultural and philosophical traditions of different disciplines.

For the variations by design, convergent designs had more sampling issues; sequential designs had more logistical/timing issues ($p < 0.01$). The correspondence between design type and specific difficulties is understandable and highlights the inherent trade-offs of different designs of MMR. Convergent designs, with their potential for straightforward comparison, are especially vulnerable to sampling mismatch (Franklin et al., 2011). Sequential designs, while delivering a clear procedural order, are highly susceptible to logistical limitations (Vargas et al.2019).These findings constitute an evidence base for the typically anecdotal warnings about design-specific pitfalls, in that subsequent researchers can better expect and be prepared for such pitfalls.

The most encouraging outcome of this meta-analysis is the positive trends over time. The analysis revealed that, regarding the variations by time or publication era (pre-2015 versus post-2015), post-2015 studies had a higher mean ISS, used more joint displays and made explicit meta-inferences ($p < 0.01$). The sudden rise in ISS and uptake of state-of-the-art approaches post-2015 signals a maturing field that is adapting to more methodological guidance and higher standards from journals and funders. Jensen and Powell (2019) is one representation of new times in the form of advanced, considered MMR practice. This trend indicates that the collective effort to improve MMR quality over the past two decades is having a tangible, positive effect.

**Research Question 4:** What are the best practices and trends in MMR integration?

The fourth research question sought to establish best practices of MMR integration and trends. This section highlights MMR best practices and trends found in the literature and identifies key elements, such as intentional data integration, the use of specific research designs (e.g., sequential, convergent parallel) and combining qualitative and

quantitative methods to gain a more complete understanding of complex phenomena (Siregar, 2025).

The mixed-methods research endeavor was conceived as an intentional effort to reinforce the complementary strengths of both approaches to achieve a more holistic and in-depth understanding of complex social or scientific phenomena(Creswell, 2009). However, in its early stages, this integration sparked intense academic debate and contradictions due to fundamental philosophical differences between the two dominant paradigms (positivism, which underpins quantitative research and constructivism, which forms the foundation of qualitative inquiry) (Lall, 2021). This controversy persisted for an extended period (Siregar, 2025), culminating in the "paradigm wars" in research methodology. However, over time, scholars and researchers began to shift their focus from debating differences toward strategically integrating the two approaches to address research questions that could not be adequately resolved through a single method alone (Siregar, 2025).

In the contemporary era, MMR has evolved into one of the most widely recognized and utilized methodological approaches across disciplines, including education, health sciences, social sciences and public policy (Elf, 2023; Siregar, 2025). From this point of view, MMR is not merely a technical amalgamation but rather an epistemological framework rooted in pragmatism, wherein the primary focus is on solving research problems rather than rigid adherence to a single paradigm (Fetters et al., 2013). Table 6 highlights key best practices and trends in the contemporary era. Research on best practices in MMR highlights the importance of methodological rigor and intentionality throughout the research process (Elf, 2023; Siregar, 2025).

**Table *6*: Highlights of Key Best Practices in MMR**

| Key best practices | Focus |
|---|---|
| Clear rationale and questions | Methodology should be driven by research goals and questions, with a clear rationale for why an MMR approach is necessary to answer the research problem more effectively than a single method. |
| Appropriate design selection | Specific MMR design approaches, such as explanatory sequential, exploratory sequential and convergent parallel, should be used as they align with the research objectives and plan the integration of data from the outset. |
| Rigorous data management | Applying systematic sampling criteria and collecting sufficient data for both analyses remains crucial to maintaining rigor in both quantitative and qualitative research components. |
| Thoughtful integration | A thoughtful integration of data, not just a side-by-side presentation, constitutes the hallmark of strong MMR. This approach entails using joint displays, data matrices or narrative structures to illustrate how different data sources inform each other |
| Addressing ethical considerations | Extra attention to ethical issues is recommended for the complexity of MMR (Terrell, 2012), such as ensuring informed consent for multiple data collection methods and protecting participant confidentiality across diverse data types. |
| Team expertise | For the complexity of MMR, successful MMR often involves a multidisciplinary team with expertise in both qualitative and quantitative methodologies to support and challenge one another, and ensure high-quality research. |

On the other hand, MMR continues to evolve, with several trends (Table 7, p. 73) emerging to enhance its application and impact (Franke et al., 2012; Lall, 2021; Żukowska & Strelau, 2025).

In contemporary academia, MMR has become a dominant approach across disciplines. For example, in education, today researchers seek not only to measure improvements in test scores (quantitative) but also to understand lived learning experiences (qualitative). In health sciences, the effectiveness of a vaccine is assessed not only by immunization coverage but also by community perceptions of vaccine safety (Siregar, 2025). The same trend is observed in computer science and information technology: AI system evaluations now combine performance metrics (e.g., accuracy, precision) with user interviews on trust and usability (Johnson et al., 2017). Some dedicated journals, such as the Journal of Mixed Methods Research (launched in 2007), support this trend. Nonetheless, significant challenges remain (Siregar, 2025): many researchers still equate "mixed methods" with merely using both questionnaires and interviews in a single study,

without considering meaningful integration. Hence, a deep understanding of the philosophical and procedural essence of MMR (not merely its technical execution) is crucial for conducting. holistic, impactful research (Nzabonimpa, 2018).

**Table *7*: Emerging trends in MMR**

| Emerging trends | Focus |
|---|---|
| Increased integration | MMR is employed to obtain more complete and objective information (Siregar, 2025). MMR involves moving beyond merely collecting data separately to actively integrating it at multiple stages of the research process to achieve a more cohesive understanding. |
| Emphasis on context and culture | MMR uniquely positions itself to blend statistical measures with ethnographic insights in the growing recognition of the significance of context, culture, and environment in shaping research outcomes. |
| Advanced analytical techniques | In the current era of technological advances, the use of advanced analytical tools, including data visualization platforms and machine learning algorithms, is being used to manage and uncover connections within vast and varied datasets. |
| Interdisciplinary collaboration | MMR is increasingly used to foster collaboration between researchers from different backgrounds (e.g., health sciences, social sciences, education, business) to address complex, real-world, most pressing issues. |
| Technological enhancement | In this era of technological advancement, the use of technology and specialized software tools facilitates the management, analysis, and integration of mixed data types, including biometric data. |

## Conclusions and Recommendations

Based on the findings, we conclude that integration challenges in mixed-methods research, primarily paradigmatic tensions and logistical constraints, are prevalent but surmountable through deliberate strategies. Specifically, the use of joint displays, explicit meta-inferences and iterative team processes significantly improve integration quality and outcomes. Therefore, we recommend that researchers proactively adopt these evidence-based practices from the outset of study design, that teams prioritize interactive processes to navigate complexity and that methodological training institutions shift focus toward building competency in structured integration rather than ad-hoc approaches.

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