



An Educational Study Focused on the Application of Mixed Method Approach as a Research Method

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Abstract

This paper introduces and analyses a mixed-methods approach and further analyses the strengths and limitations of the convergent parallel design in the educational research studies. Our study serves a valuable purpose in clear patterns, trends, and statistical association relevant to the impact of independent variables on dependent variables throughout the course of the study. Concurrently, this research design facilitates a holistic comprehension of the research problem by enabling a complicated examination from various perspectives. The analysis of this paper is based on books, articles, dissertations, and online papers where different research methods are applied in different studies.

The analysis highlights that qualitative and quantitative data are collected simultaneously and independently in a convergent parallel mixed methods design. It is followed by integrating and comparing the two data types during the analysis and interpretation phase. The analysis further highlights that a quantitative survey could be administered to a larger population sample to collect numerical data based on the research questions and other relevant variables. The analysis also suggests that once the data collection is completed, the author should independently conduct separate analyses for the quantitative and qualitative data. The analysis signifies that quantitative analysis can cover descriptive statistics, inferential tests, and binary logistic regression analysis to analyze the quantitative data and identify significant associations between the independent and dependent variables. The qualitative data analysis method is content analysis to identify codes, key codes, subcategories, and main categories within the qualitative data.

The analysis shows that during the integration phase, a comparative analysis has to be conducted between the quantitative and qualitative findings to identify convergence, divergence, and contrast points between the two data sets. The results highlight that a triangulation approach supports establishing a cohesive analysis, which involves exploring the interconnections and mutual reinforcement between the qualitative and quantitative outcomes in the same format with more clarity. The analysis of this integrated analytical effort is subsequently incorporated into the discussion section. The analysis further indicates that the convergent parallel design is one of the mixed methods designs. In this section, the author's responsibility lies in elucidating the consequences and interpretations drawn from the integrated results, encompassing theoretical foundations and practical implications.

Keywords: *compared and contrasted, convergent parallel design, mixed method approach, numerical data, qualitative methods, qualitative methods*

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Introduction

The definition of the mixed methods approach (MMA) provided by Greene, Caracelli, and Graham (1989) emphasizes combining quantitative and qualitative methods without being restricted by any specific research paradigm. The authors mentioned above suggest that MMA can involve any quantitative and qualitative methods appropriate for addressing the research question. In addition, they advocate for separating methods from philosophical paradigms, indicating that MMA can be conducted within any research paradigm, which underscores the flexibility and potential for creativity in mixed-methods research. A mixed methods approach has emerged to address an incomplete understanding of complex phenomena, which often requires a multifaceted understanding (Tashakkori & Teddlie, 2010). A balanced and integrated approach, such as a mixed methods approach, is often better suited to provide a comprehensive and reliable understanding of complex research problems (Tashakkori and Creswell, 2007). In a broader context, integrating mixed methods introduces an array of benefits. It bolsters research context, as while quantitative methods proficiently furnish numerical data, they often lack the depth and contextual richness required to grasp diverse research issues especially those deeply embedded within qualitative intricacies (Tashakkori and Creswell, 2007).

Furthermore, the mixed methods approach effectively mitigates the tendency toward overgeneralization, a risk inherent in exclusively relying on a single method (Creswell & Piano Clerk, 2018). A mixed methods approach can address exploratory questions to explore new phenomena, relationships, or trends that can benefit from an initial qualitative exploration to generate hypotheses, followed by quantitative methods to evaluate, and validate hypotheses.

We introduce and analyse using a mixed-methods approach in educational research studies. Using a single method might not capture all the issues of the research problem. For example, relying solely on a single research method can lead to methodological limitations that hinder the research findings' depth, breadth, and accuracy and can also create limited insights into the research problem and create confirmation bias that might not

capture all dimensions of the research problem, leading to an incomplete picture and inadvertently reinforcing preconceived notions. For example, a quantitative researcher might design questions that unintentionally skew the results in a certain direction (Creswell & Piano Clerk, 2007).

While effective in providing numerical data, a single research approach can mislead the research context. Quantitative methods might lack the depth and context necessary to comprehend certain research issues, particularly in qualitative-rich areas. It also maximizes over generalization because depending solely on a single method can lead to over-generalizing findings. Alternatively, qualitative research, for example, focuses on understanding the specific issues of a particular context, which might not be generalizable to larger populations (Cohen et al., 2011). Relying exclusively on a single research method can result in restricted insights and an increased susceptibility to confirmation bias, which arises from the potential for unintentional reinforcement of preconceived notions or biases. For example, a quantitative researcher might unknowingly design questions that subtly guide results toward a predetermined direction. A single method cannot understand complex phenomena. For instance, consider research questions that pertain to complex and multifaceted phenomena. In such cases, relying solely on numerical data might be insufficient to fully capture the intricacies, contextual nuances, and underlying factors (Creswell & Piano Clerk, 2011).

The MMA is also helpful in answering what interventions can effectively address the weaknesses of using a single approach in educational studies. It can provide a framework for investigating the complex relationship between research phenomena because it facilitates comprehensive understanding by combining both quantitative and qualitative data (Tashakkori & Teddlie, 2010); the mixed methods approach allows us author to gain a comprehensive understanding of the research problems where triangulation enables researchers to triangulate findings, verifying and validating results across different data sources, and enhances the credibility and robustness of the study's conclusions (Creswell & Piano Clark, 2018).

MMA also facilitates contextualization because

qualitative data helps contextualize quantitative findings of educational studies. It offers a deeper understanding of the sociocultural, economic, and contextual factors contributing to research problems and their impact on dependent variables (Curry, Nembhard & Bradley, 2009). After all, qualitative methods, for example, interviews, can allow researchers to capture rich insights from participants, shedding light on nuances, personal stories, and unique perspectives that may not be captured through quantitative measures. In the meantime, the MMA approach provides flexibility in research design, allowing researchers to adapt and refine their methods based on preliminary findings, which iterative process enhances the study's depth and relevance (Johnson, Onwuegbuzie & Turner, 2007). A mixed methods approach allows researchers to tackle integrated aspects of the problem, providing a more holistic view (Curry et al., 2009).

Creswell (2014); Cohen, Manion & Morrison (2018); Creswell and Plano Clerk (2007;2011, 2018); Greene, Caracelli, and Graham (1989); Hesse-Biber (2010); Tashakkori and Teddlie (1999; 2003); Johnson, Onwuegbuzie, and Turner (2007); Mayring (2007); Tashakkori and Creswell (2007), Briggs, Coleman & Morrison (2012), Collins, Deist & Riethmeier (2009) and Greene (2007) were used as literature resources to analyze further information in this paper (see Table 1).

In a scholarly inquiry, Johnson, Onwuegbuzie, and Turner (2007) analyzed 19 distinct definitions of mixed methods research (MMR) from 21 highly cited published papers. The objective of this study was to synthesize a comprehensive understanding of this term. Johnson et al.(2007) observed that

these definitions exhibited variations across several dimensions, including the aspects subjected to mixing, the juncture in the research process where mixing occurred, the extent of mixing, the underlying rationale, and the driving constituents of the research. Upon meticulously considering these diverse viewpoints, the authors synthesized a composite definition of MMR, characterizing it as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study. This definition notably underscores the incorporation of diverse research techniques and approaches within a singular study, thereby highlighting the interdisciplinary and integrative nature that distinguishes MMA.

Johnson et al. (2007) concluded that MMA involves the integration of qualitative and quantitative research approaches, such as using different viewpoints, data collection and analysis techniques, and inference methods. This combination is intended to enhance the breadth and depth of understanding of the research topic and to corroborate research findings. In essence, MMA is a type of research where a researcher or research team combines multiple research approaches to address a research question (Curry et al., 2009; Greene, 2007; Johnson et al., 2007; Tashakkori and Creswell, 2007; Tashakkori & Teddlie (1999; 2003). Again, Tashakkori and Creswell (2007) highlight that MMA involves the collection, analysis, integration, and inference drawing from both qualitative and quantitative approaches in a single study or program of inquiry. However, Greene (2007) provided a different conceptualization of MMA to look at the social

Table 1: Authors and their Focus on MMA

Author (s) and Year	Focus of Definition
Greene, Caracelli, and Graham (1989)	Methodology (the process of research)
Tashakkori and Teddlie (1999; 2003)	Viewpoints (philosophy), methods, and research purpose
Johnson, Onwuegbuzie, and Turner (2007)	Methodology and methods
Tashakkori and Creswell (2007)	Multiple ways of seeing, hearing, and making sense of the social world
Greene (2007)	Methods, Methodology, and Philosophy
Creswell and Plano Clerk (2007)	Methods and core characteristics.
Creswell (2014)	Emerging Methodologies and Methods Practices in the Field of Mixed Methods
Hesse-Biber (2010)	Research. Methods and contested territory
Collins, Deist & Riethmeier (2009)	Research Guides: Saint Louis University History: Theses and Dissertations
Clough & Nutbrown (2007)	A student's guide to methodology
Creswell & Tashakkori (2007)	Developing publishable mixed-methods manuscripts.
Kothari (2004)	Research Methodology
Teddlie & Tashakkori (2009)	Foundations of mixed methods research
Curry, Nembhard & Bradley (2009)	Qualitative and mixed methods provide unique contributions to the outcomes of research.

world that encourages active participation in the dialogue. MMA involves considering multiple ways of seeing and hearing, interpreting the social world, and valuing different perspectives and viewpoints (Mayring, 2007).

Research Problems Addressed by MMA

Before using MMA, it is crucial to identify the research problems that can benefit from it. Researchers should justify why mixed methods design are the most appropriate to address their research question. It is important to recognize the strengths of mixed methods and carefully plan and design the study to ensure its validity and reliability. A clear rationale for using mixed methods design can help ensure the study is well-designed and effectively addresses the research problem (Creswell & Plano Clark, 2011).

MMA would not always be the most appropriate approach for a given research question. Qualitative research would be more suitable for exploring complex problems, honouring participant voices, and conveying multiple perspectives (Creswell, 2024). In contrast, quantitative research would be better suited for understanding relationships among variables or comparing groups. It is important to choose the most appropriate research design for a given situation, and mixed methods design should not be seen as a replacement for either quantitative or qualitative methods (Cohen et al., 2018). However, mixed methods design can apply to different social, behavioural, and health sciences fields, and many research problems can benefit from this approach. While some researchers would choose not to use mixed methods design due to personal preferences, most topics can be effectively studied using the MMA (Creswell & Plano Clark, 2011).

Rather than matching different research methods to specific content topics, it is more beneficial to consider which methods best suit different research questions or problems. For example, a quantitative survey is well-suited for understanding the views of an entire population, while a quantitative experiment can determine whether a treatment is effective (Curry et al., 2009). A qualitative ethnography approach is best for understanding how a culture-sharing group operates. However, when one data source is insufficient or results must be explained or generalized, MMA may

be appropriate (Guetterman et al., 2015). Other situations that would warrant the MMA include enhancing a primary experimental design, comparing multiple cases, involving participants in the research, or evaluating a program. Over time, researchers have identified multiple reasons for using mixed methods, and we will focus on the major ones Convergent Parallel Design (Creswell & Plano Clark, 2011).

Justification of Mixed Methods Approach in Educational Studies

The MMA can comprehensively understand a research question by triangulating multiple data sources and perspectives. However, it is crucial to carefully plan and design the study to ensure that the different methods are integrated effectively and that the survey remains rigorous and valid (Creswell & Plano Clark, 2011).

To Address the Research Problem Comprehensively

Before designing the MMA design, it is crucial to identify the research problems best suited for it. It is assumed that MMA would be the most effective way to address their specific research problems. In order to do so, investigators must provide a rationale or justification for why mixed methods are the most appropriate strategy for their topics and research questions (Tashakkori & Teddlie, 2010). Not all research problems require mixed methods, as there are situations where a qualitative or quantitative approach may be more appropriate. Qualitative research is valuable when exploring a problem, capturing the situation's complexity, and presenting various participants' perspectives (Briggs, Coleman & Morrison, 2012; Hesse-Biber, 2010). Quantitative research, on the other hand, is best for determining relationships among variables or comparing groups. However, MMA is not limited to specific fields or topics and can be applied in various social, behavioural, education, and health sciences disciplines. While the specialists would not be interested in either qualitative or quantitative research, most research problems can be addressed using mixed methods (Creswell & Plano Clark, 2007).

Hesse-Biber (2010) suggested that MMA is more appropriate to select research methods based on the type of research problem rather than the topic being

studied. Quantitative survey methods are suitable for understanding the views of a population, while a qualitative ethnography approach is better for understanding a culture-sharing group (Hesse-Biber, 2010). MMA is best suited for situations where one data source is insufficient. It is suited when results need further explanation, exploratory findings need to be generalized, multiple cases need to be compared, or the participants need to be involved in the research. There are different reasons why mixed methods might be appropriate, as identified by authors in the mixed methods field (Creswell & Plano Clark, 2011).

To Obtain Comprehensive and Corroborated Results

Qualitative research provides a detailed understanding of a problem by studying a few individuals and exploring their perspectives deeply (Hsieh & Shannon, 2005). In contrast, quantitative research provides a more general understanding by examining many people and assessing responses to a few variables. Each method has its limitations, as qualitative research cannot be generalized to many people, and quantitative research lacks a deep understanding of any individual (Lichtman, 2013). Therefore, combining both issues approaches provides a more comprehensive understanding of the research problem than either approach alone (Tashakkori & Creswell, 2007). Adhikari (2022) highlighted that using only one type of data source may not be sufficient in addressing specific research problems. He further noted that there are situations where one type of evidence would not provide a complete understanding, or the researcher would doubt the ability of one kind of evidence to address the problem entirely. Additionally, Curry et al. (2009) indicated that the results from one data source would be inconsistent with those from another, which would not be detected if only one data type is used in a research study. Furthermore, different levels of an organization would yield different types of evidence. MMA would be the most suitable strategy for addressing the critical issues. For instance, in a study conducted by Shannon-Baker (2016) on culture shock experienced by students during a short-term study abroad program, both quantitative survey data and qualitative data in the form of reflective journals, self-portraits, and

artist statements were collected. Using both forms of data was required in gaining a comprehensive understanding of the problem because relying on one form alone would not have been sufficient. Using limited approaches to investigate a research problem restricts our ability to explore it fully, as we can only access information that is relevant to those specific approaches. In contrast, using multiple forms of inquiry enables us to investigate information that is not accessible through a single design (Creswell, 2014). As Shannon-Baker (2016) suggests, using a combination of quantitative and qualitative data allowed her to explore aspects of the problem that would have been inaccessible if she had relied on only one research approach.

To Explain the Initial Results Clearly

When the results of a study can be insufficient in providing a complete understanding of a research problem, requiring further elaboration, in such cases, researchers can adopt the MMA, using a second database to supplement the first and offer a better comprehension of the problem. It is particularly relevant when quantitative outcomes demand an explanation to grasp their significance. Although statistical tests can describe general associations between variables, they might not provide an in-depth understanding of the results (Lichtman, 2013). In these instances, qualitative data can provide additional context and insight. Eckert's (2012) applied mixed methods study exemplifies this approach in exploring the relationship between teacher qualifications, efficacy, and retention in high-poverty urban schools. The quantitative phase established linkages between the above-mentioned variables, while the qualitative phase used interviews with interviewees to provide a nuanced and contextual understanding of research questions. Our rationale for using mixed methods was to comprehend better the evidence connecting research problems (Cohen et al., 2011).

To Explore Research Questions Initially Before Administering Instruments.

According to Eckert (2013), in specific research studies, the investigators may not clearly understand the questions that need to be asked, the variables that need to be measured, or the theories that can guide the study. Adhikari (2022) highlights that MMA could be due to the

newness of the research topic, or the specific, remote population being studied. In this situations, the MMA is recommended to foreground the research phenomenon. The researcher starts with a qualitative phase to explore and then follows up with a quantitative phase to test whether the qualitative results generalize or vice versa. For instance, Mbuagbaw et al. (2014) used the MMA to study the acceptability and readiness of a text-messaging program to improve adherence to therapy for individuals with the human immunodeficiency virus in Cameroon. They began with focus on group interviews, and the themes from these interviews were used to develop an instrument administered to a larger sample to test the generalizability of the themes. We argued that this design enhances their ability to generalize qualitative findings, develop questions to measure community acceptability/readiness, and facilitate collaboration between researchers with qualitative and quantitative backgrounds (Curry et al., 2009; Creswell & Piano Clerk, 2018).

To Enhance an Experimental Study with a Qualitative Method

Experimental studies aim to test the effectiveness of a treatment to produce specific quantitatively-outcomes. Sometimes, an additional qualitative research method can be incorporated into the experimental design to understand better some aspects of the intervention, which can be done by embedding the qualitative approach within the primary experimental methodology (Guetterman et al., 2015). For instance, Donovan et al. (2002) conducted an experimental trial comparing the outcomes of three groups of men with prostate cancer who received different treatments.

However, due to recruitment difficulties, the authors added a qualitative component to the study, which involved interviewing the men to identify effective recruitment strategies (e.g., how best to organize and present information). The authors reflected on the value of the preliminary, smaller, qualitative component that can be used to design procedures for recruiting participants into the trial. They showed that integrating qualitative research methods helped them understand the recruitment process, identify necessary changes to the content and delivery of information, and ultimately maximize recruitment while ensuring

effective and efficient trial conduct (Cohen et al., 2018; Guetterman, Fetters & Creswell, 2015).

To Describe and Compare Different Types of Cases

MMA involves gathering both qualitative and quantitative data to develop a deep understanding of different cases and comparing them based on specific criteria. The data is collected simultaneously and then analyzed together to create distinct cases (Mondal & Mondal, 2018). For example, Walton (2014) used a case study approach to investigate a cross-sector partnership working to lead science education reform. In addition to qualitative interviews and document analysis, she included a quantitative survey to measure the collaboration among stakeholders in the partnership. Using multiple data sources, Walton understood the partnership's work and progress toward change. The quantitative findings enhanced the qualitative data and helped create a more comprehensive and detailed case description than would have been possible using qualitative data alone (Räsänen & Hunt, 2014).

To Involve Participants in the Study

In some research projects, participants may need to be involved in shaping the study to bring about helpful change in their lives. Researchers would include participants in many phases of the research, from identifying the problem to using the results to make changes. Participants are engaged because their help is needed to understand the detailed nuances of the problem or to implement research findings that will impact people or communities (Räsänen & Hunt, 2014). In such cases, both quantitative and qualitative data are gathered to engage individuals best and bring about change. Greysen et al. (2012) presented data to participants in a study of the transition of care for homeless individuals from the hospital to a shelter and critical stakeholders in the community. The above-mentioned individuals became involved in discussing the accuracy of the findings and recommendations for hospitals and shelters. According to the authors, this feedback process was critical for shaping their interpretations and presentation of the data collected from study participants in the context of the community to which they belong (Greysen et al. 2012).

To Develop, Implement, and Evaluate a Program.

Researchers would need to link various studies to achieve an overall objective when conducting evaluation studies that span multiple years and have several components. The previous studies often require collecting both quantitative and qualitative data simultaneously or sequentially, making them multiphase or multi-project mixed methods studies (Mondal & Mondal, 2018). The above-mentioned projects frequently involve teams of researchers working together over several phases. For instance, McDonagh et al. (2008) conducted a three-phase mixed methods evaluation study to develop and test an intervention to promote behavioural change among people with chronic diseases.

The researchers began with a qualitative study in the first phase to comprehend the values and beliefs of the participants. Based on the results of the qualitative phase, they improved and evaluated the intervention in the second phase, followed by randomized controlled trials in the final stage to evaluate its efficacy. We agreed with Adhikari's (2022) research on Finland, which emphasized that integrating qualitative and quantitative methods enables researchers to understand participants' perspectives, explore complex social phenomena, and develop tailored intervention strategies. This discussion provides us with the foundation to understand the mixed methods approach and MMA is suitable in his gender study. Hsieh and Shannon (2005) and Guetterman et al. (2015) highlighted that it is essential to recognize that authors often cite multiple rationales for using mixed methods in their studies.

Advantages of Using Mixed Methods

The MMA is a way to overcome quantitative and qualitative research limitations by combining their respective strengths. It has been a well-established argument for over 30 years. Quantitative research is criticized for not understanding the context in which people live and failing to capture participants' voices directly. At the same time, the researcher's personal biases and interpretations are often unacknowledged. Qualitative research, however, is limited by the researcher's biases and difficulty in generalizing findings to a larger group due to a small number of participants. Combining the strengths of both methods, MMA can address the above-mentioned limitations and provide a

more comprehensive understanding of the research problem (Guetterman et al., 2015; Tashakkori & Teddlie, 2010).

MMA is superior to using only quantitative or qualitative methods as it allows researchers to use all available data collection tools rather than being limited to the techniques typically associated with each approach. MMA is beneficial for answering questions that cannot be answered through quantitative or qualitative methods alone (Curry et al., 2009). Such questions include whether participant views from interviews and standardized instruments converge or diverge, how qualitative interviews can explain quantitative results, and how a treatment can be adapted to work with a particular sample in an experiment. Using only quantitative or qualitative approaches would not be sufficient to answer the above-mentioned questions (Creswell & Plano Clark, 2017).

MMA provides a unique approach to studying research problems beyond the limitations of either quantitative or qualitative research alone. By combining both techniques, researchers can gain new insights that are more than just the sum of the two parts (Bryman, 2006). The MMA approach encourages collaboration and using multiple worldviews or paradigms rather than strictly adhering to certain quantitative or qualitative research paradigms. MMA is practical and aligns with how individuals naturally solve problems using both numbers and words (Creswell, 2014). It also allows for multiple written publications to come from a single study and helps researchers develop broader skillsets, including expertise in multiple research methods. It makes them better equipped to address research questions, become productive members of mixed methods teams, and teach using multiple methods (Creswell & Plano Clark, 2017).

Summary

When considering a mixed methods approach, the researcher must understand what a mixed methods study entails, which includes collecting and analyzing both qualitative and quantitative data, integrating the two types of data and their results, using a specific mixed methods approach, and framing the study within theory and philosophy. The researcher must also determine if mixed methods are appropriate for addressing the problem. Mixed methods can be used for a wide range of problems

when one type of data is insufficient, and it can offer more evidence for studying a problem than a single method. Using multiple data sources can also provide new insights and offset the weaknesses of one method with the strengths of another. Mixed methods are practical, intuitive, and well-suited for interdisciplinary research that brings together scholars from different fields of study.

Using mixed methods in research is not a straightforward process, as it requires researchers to have proficiency in various areas such as quantitative, qualitative, and mixed-methods research. Gathering extensive data from both sources takes time and resources. Additionally, researchers need to create awareness about the significance of mixed methods. As it is a relatively new approach to inquiry, it requires openness from others to use multiple perspectives in research. To educate stakeholders about mixed methods, researchers can refer to examples of successful mixed methods studies from literature.

The Foundations of MMA

Before embarking on a mixed methods study, researchers must do more than simply determine whether the MMA approach is appropriate for their research questions. They must also develop a comprehensive understanding of mixed methods, including their core characteristics and relevant works that have contributed to their development. The foundation of MMA involves familiarizing themselves with the history of mixed methods and the philosophical assumptions underlying it. Researchers often select a theory to guide their study, so it is essential to consider how a theory is incorporated into the project (Creswell & Plano Clark, 2017; Ivankova & Wingo, 2018).

Historical Foundations

To effectively plan an MMA study, researchers must understand the history and evolution of MMA and its current standing in the field of study. Along with a clear definition of mixed methods, a research plan should include references to relevant literature, a rationale for why mixed methods are appropriate, and evidence of their acceptance in the field. To achieve this, researchers need to know the historical roots of MMA, including its origin, influential authors, and recent advancements and controversies (Mondal & Mondal, 2018).

Paradigm Debate and Period

The paradigm debate occurred in the 1970s and 1980s, during which qualitative researchers argued that quantitative and qualitative data could not be combined due to their differing philosophical assumptions. It resulted in a debate about whether MMA was possible. Those researchers who believed paradigms could not be combined were called “purists.” The debate peaked in 1994, but different methods have been associated with different worldviews or philosophies. Situation lists adapted their methods to suit the situation (Creswell & Plano Clark, 2018).

During the paradigm debate period in the 1970s and 1980s, qualitative and quantitative researchers argued about the possibility of combining their data, leading to the emergence of “purists” who claimed that MMA was untenable. However, this debate has subsided, and today, researchers have recognized that different methods can be associated with different worldviews or philosophies. Pragmatists have also argued that multiple paradigms can be used to address research problems, and calls have been made to embrace pragmatism as a philosophical foundation for mixed-methods research. While reconciling paradigms is still an issue, it has become less relevant (Creswell & Plano Clark, 2018).

Philosophical Foundations of MMA

Researchers must be aware of the philosophical assumptions underlying their research. All research is based on certain assumptions about how knowledge is gained, and these assumptions shape the research process. Particular graduate students, should be able to identify and articulate the assumptions they make in their research. While philosophical assumptions may not always be explicitly stated in published journal articles, they form the foundation for research and often come up in conference presentations or graduate student committee meetings. Therefore, it is recommended that researchers not only be aware of their philosophical assumptions but also clearly state them in their projects (Curry & Nunez-Smith, 2015).

Philosophy and Worldviews

To properly incorporate philosophy into a mixed methods study, it is necessary to use a framework. Crotty’s (2019) framework can be used to place philosophy within a mixed methods study. According to Crotty, there are four critical

elements in developing a proposal or designing a study, starting with philosophical assumptions that inform the use of theoretical stances, which inform the methodology and methods used to gather and analyze data. MMA is informed by a worldview or set of beliefs and assumptions about knowledge that guide inquiries, which can also be referred to as a paradigm. Philosophical discussions are available for both qualitative and quantitative approaches, and numerous resources are available to explore many different worldviews in research. Researchers should be aware of and transparent about their study's philosophical assumptions (see Table 2).

Crotty's (1998) conceptualization is used to integrate philosophy into MMA. Philosophical assumptions are of the broadest level and include beliefs and assumptions about knowledge that inform the study. Adhikari (2022) agreed that researchers bring a worldview composed of beliefs and assumptions to their inquiry. He further highlights four worldviews can inform MMA, including positivism, which is associated with quantitative approaches, and constructivism, which is typically associated with qualitative methods. In his (2023) study on the impact of the dimension of E-learning on digital pedagogy in higher education in Nepal, positivism emphasizes determinism, reductionism, detailed observations, and testing of theories. In contrast, constructivism emphasizes understanding or meaning formed through participants subjective views shaped by social interaction and personal history, leading to research shaped from individual perspectives to broad understandings.

The way researchers approach their study can be informed by different philosophical worldviews or assumptions, which operate at a broad, abstract level. Creswell and Plano Clerk (2018) clearly mentioned that the above-mentioned assumptions are often associated with a researcher's understanding of knowledge and can inform the theoretical stance, methodology, and methods used in the study: positivism, constructivism, transformative, and pragmatism. Positivism, often associated with quantitative approaches, involves making claims for knowledge based on determinism, reductionism, detailed observations, and testing of theories. On the other hand, constructivism, typically associated

with qualitative approaches, works from the understanding that the meaning of phenomena is formed through participants and their subjective views, shaped by social interaction and personal histories. Constructivism approach shapes research "from the bottom up" based on individual perspectives to broad patterns and understandings (Hennink Hutter & Bailey, 2010; Lichtman, 2013). Transformative worldviews prioritize social justice and the pursuit of human rights, particularly for marginalized communities such as women, racial/ethnic groups, people with disabilities, and those economically disadvantaged. Researchers using this approach should collaborate respectfully and interact with these communities to address empowerment, marginalization, hegemony, and patriarchy issues. Transformative research aims to improve the social world and reduce marginalization. Pragmatism, on the other hand, is a philosophy commonly embraced by MMA and prioritizes the research consequences and the research question's importance over specific methods. Pragmatism encourages using multiple data collection methods to inform the research problem. This approach focuses on real-world practice and finding solutions that work (Creswell & Plano Clark, 2018) (see Table 2).

Different worldviews, which underlie research methodologies, are based on philosophical assumptions. The above-mentioned worldviews differ in their ontology (what is considered real), epistemology (how knowledge is gained), axiology (the role of values), methodology (the process of research), and rhetoric (the language of research). Positivism sees reality as singular and independent from the researcher, while constructivism sees it as multiple and seeks multiple perspectives. Transformative research assumes multiple realities constructed based on social and cultural positions, while pragmatism views reality as both singular and multiple. Methodological differences include working from the top down in postpositivism and bottom-up constructivism. Alternatively, collaboration with stakeholders in transformative research and combining deductive and inductive thinking are embedded in pragmatism (Cohen et al., 2018; Tashakkori & Teddlie, 2010) (see Table 2).

Table 2: *Different Worldviews are Applied in an MMA*

Postpositivist worldview	Constructivist worldview	Transformative worldview	Pragmatist worldview
Determination	Understanding	Political activist	Consequences of actions
Reductionism	Multiple participants meaning	Empowerment, human rights, and politically oriented	Problem solved
Empirical observation and measurement	Social and historical construction	Collaborate	Pluralistic
Theory verification	Theory generation	Change, emancipatory oriented	Real-world oriented

The Best Worldview of MMA

Many mixed-method research scholars have shifted their focus from the paradigm debate to identifying the worldview that best supports mixed-method research. Tashakkori and Teddlie (2003) have suggested that pragmatism is the optimal worldview for MMA, which draws on the ideas of employing diverse approaches and valuing both objective and subjective knowledge. They argue that the research question should be of primary importance. Further, the forced-choice dichotomy between positivism and constructivism should be abandoned (Mertens, 2003, 2009; Maxwell, 2005; Creamer, 2017; Sweetman, Badiie & Creswell, 2010; Mertens & Tarsilla, 2015).

Similarly, Mertens’ transformative paradigm recommends the adoption of an explicit goal for research to create a more just and democratic society that permeates the entire research process. The critical realist perspective is also being discussed as a potential contribution to MMA, as it validates and supports vital aspects of both quantitative and qualitative approaches. Critical realism integrates a realist ontology with a constructivist epistemology. It can facilitate collaboration between quantitative and qualitative researchers in mixed-methods research.

Literature Review

Crotty’s (1998) model distinguishes between worldview and theory, where theory is a general explanation of what the researcher expects to find in a study. In quantitative research, the theory is used deductively to make and evaluate predictions of the results. In contrast, qualitative research is often used inductively to explain what will be or was found in the study. In quantitative research, theory identifies key variables and is translated into hypotheses or questions, which are then evaluated with data to determine if the theory is supported or refuted (Cohen et al., 2007). It is known as a hypo-deductive approach. In qualitative research, the theory is often generated during the research process, positioned at the end of the study, or threaded throughout the study as

a general model or explanation (Lichtman, 2013). In some cases, the theory is initially presented as a preliminary framework but is then modified or reconfigured as data is analyzed. The use of theory in qualitative research is called the inductive interpretive approach (Creswell, 2014). This author’s methodological assumption is based on the concurrent parallel mixed methods design as the flowchart of the basic procedures in implementing a convergent MMA (see Figure 2).

Using theory in MMA can take two general forms: applying social science and emancipatory theories. In the first form, a social science theory is used to guide the direction of the study, shaping the questions that will be asked and answered. This theory can be presented in various ways, such as a literature review, conceptual model, or theory explaining what the researcher seeks to find. For example, in a study on chronic pain management, Kennett, O’Hagan, and Cezer (2008) used Rosenbaum’s model of self-control as a framework to combine quantitative measures of learned resourcefulness with qualitative analysis of patient interviews. They described their approach as taking a critical realist perspective. They aimed to characterize the processes involved in pain self-management for high- and low-resourceful clients following a multimodal treatment program (Creswell & Plano Clark, 2018).

Discussing an emancipatory theory in MMA involves taking a theoretical stance in favour of underrepresented or marginalized groups and advocating for change. The above-mentioned theories, such as feminist theory and critical race theory, operate inductively in a study and aim to improve the lives of marginalized individuals (Creswell, 2014). By incorporating an emancipatory theory into mixed methods research, the investigation corresponds with the objective of qualitative inquiry: confronting matters related to social equity and the fundamental human experience. Recent inquiries rooted in an emancipatory theory have delved into subjects such as the involvement of young

African American women in scientific fields and women’s comprehension of culturally specific misconceptions about rape. Furthermore, existing scholarly works include discussions on the methodology of connecting feminist standpoint epistemology with MMA(Creswell 2003).

Summary

When planning a mixed methods study, researchers should reference recent literature, explain their use of mixed methods, and understand how their study fits within the field. Mixed methods have evolved over the past 25 years due to the complexity of research problems, the need for more evidence, and the popularity of qualitative inquiry. The evolution of mixed methods can be divided into five phases (e.g.,a formative period, a paradigm debate period, and an expanded procedural development phase).

a study. Recent thinking suggests a connection between theory use and the type of mixed methods design. (Creswell & Piano Clark, 2018).

The Convergent Parallel Design

Creswell and Piano Clark (2018) highlighted that convergent design is a widely used approach in MMA, with origins dating back to the 1970s. Initially, it was referred to as a triangulation design, where two different methods are used to obtain triangulated results about a single topic. However, this design also became associated with MMA for other purposes. Despite the various names it has been given, the convergent parallel design is the MMA, where a researcher collects and analyzes two separate databases, one quantitative and one qualitative, and then combines the results for comparison or integration (see Figure 3).

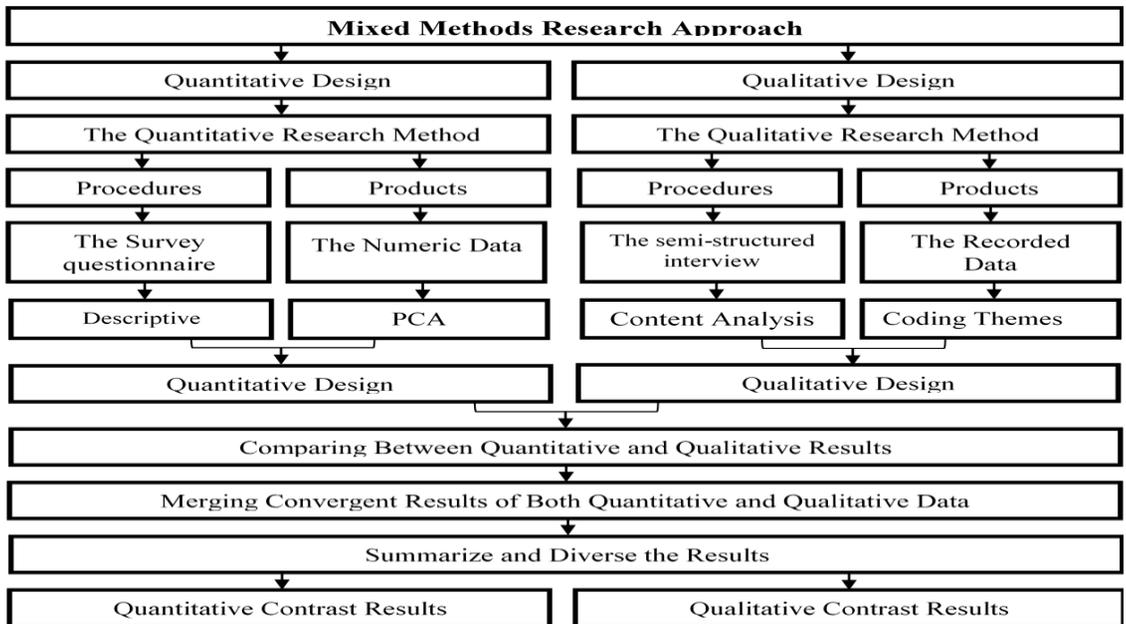


Figure 2: Design of Mixed Methods Data Collection and Analysis (Adhikari, 2022)

Researchers should be explicit about the philosophical worldview they bring to a study, which can be postpositivism, constructivism, transformative, or pragmatism. Researchers may also use several types of theory in their study, including social science or emancipatory theories. The use of theory can reflect a hypo-deductive testing framework or an inductive-interpretative approach, and it can inform research questions, procedures, and the call for action at the end of

Justification of the Convergent Parallel Design

The convergent parallel design aims to acquire different but complementary information on the same research topic to understand the problem at hand comprehensively. This design combines the strengths and limitations of quantitative and qualitative methods, such as the large sample size, objective measures, trends, and generalizability of quantitative methods, and the subjective interpretation, details, and depth of qualitative

methods (Adhikari, 2022). Convergent parallel design is employed when the researcher wants to compare statistical results obtained through quantitative methods with the qualitative findings to understand the research problem completely. Additionally, convergent parallel design can validate findings, present quantitative results with qualitative data, examine relationships between variables, and incorporate new variables based on transformed qualitative data into the relationships (Creswell & Piano Clark, 2018).

Reason for Choice of the Convergent Design

Besides its primary purpose, a reason for using the convergent design is time constraints, which require collecting quantitative and qualitative data in a single visit. There are four main situations in which convergent design is beneficial. The first scenario is when time constraints require both types of data to be collected during a single visit to the field; this method is suitable. The second situation is when the researcher needs quantitative and qualitative information from each participant; this approach is also suitable (Creswell & Piano Clark, 2018).

research (Curry & Nunez-Smith, 2015).

Philosophical Assumptions and Theories are Used in the Convergent Design of MMA

The convergent parallel design of MMA would give rise to philosophical concerns due to merging different data types and results. It is recommended that researchers adopt a paradigm, such as pragmatism, which provides a comprehensive world view for their study. Pragmatism is particularly suited for guiding the merging of quantitative and qualitative approaches into a more extensive understanding (Creswell & Piano Clerk, 2018; Curry et al., 2009). Alternatively, researchers who choose to mix paradigms, such as in a dialectical framework, can incorporate multiple philosophical perspectives in their study and report on the above-mentioned philosophies. When using a theory orientation, the theory can operate in the convergent design by providing a theoretical or conceptual model that informs both the quantitative and qualitative data collection and analysis and the researcher's approach to integrating the two sets of results (Creswell et al., 2003; Mondal & Mondal, 2018).

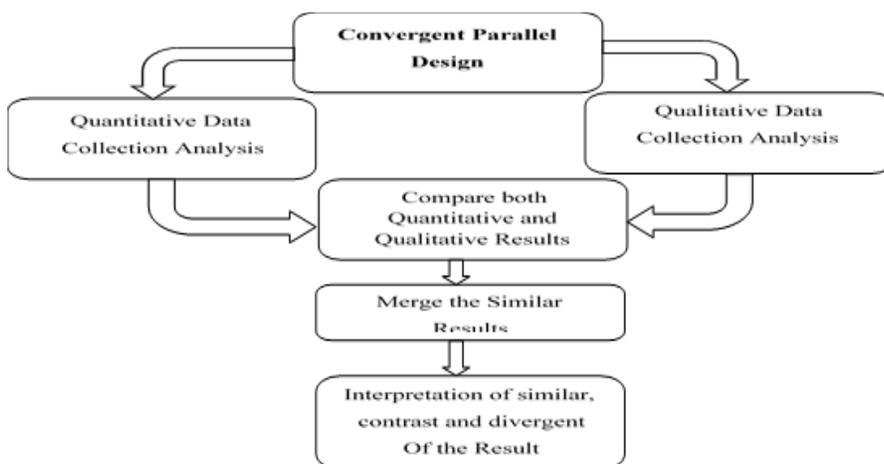


Figure 3: *Convergent Parallel Design*

The third instance is when the researcher has expertise in quantitative and qualitative research methods; it is a helpful design of a mixed methods approach. Lastly, the convergent design is suitable when the mixed methods team includes proficient members in both quantitative and qualitative

Convergent parallel design, previously known as the concurrent or parallel design, involves combining quantitative and qualitative data analysis results for comparison and integration. The main objective of convergent parallel design is to obtain a more comprehensive understanding of a problem by examining the two sets of findings

(Labrador & Alderite, 2020; Creswell & Piano Clark, 2018).

Table 4: *Flow Chart of MMA*

Steps	Steps of the flow chart of the mixed methods approach
Step 1	Qualitative Data Collection and Analysis: The first phase involves collecting qualitative data using interviews, focus groups, or content analysis. The collected qualitative data is then analyzed using qualitative analysis techniques, such as thematic or grounded theory.
Step 2	Quantitative Data Collection and Analysis: In the second phase, quantitative data is collected using surveys, experiments, or observations. The collected quantitative data is then analyzed using statistical techniques, such as descriptive statistics, inferential statistics, or regression analysis.
Step 3	Integration: The qualitative and quantitative findings are compared and integrated to identify patterns, correlations, discrepancies, or relationships between the two sets of data.
Step 4	Interpretation: The integrated findings are interpreted to provide a comprehensive understanding of the research problem. Researchers look for insights that emerge from combining qualitative and quantitative perspectives [Source: Creswell and Piano Clark (2018)].

This approach can be used to validate one set of findings using the assess whether participants respond similarly when providing quantitative data through predetermined scales and qualitative data through open-ended questions. Essentially, the two databases are combined. For instance, in applying the convergent parallel design, a researcher may survey high school students during one semester to gather quantitative data on their attitudes toward tobacco use while conducting focus group interviews on the same topic (Labrador & Alderite, 2020).

The researcher would then analyze the survey data using quantitative methods and the focus group data using qualitative methods and subsequently compare the results to identify areas of convergence and divergence regarding adolescent attitudes (Tashakkori & Teddlie, 1998).

The explanatory sequential design, also known as the explanatory design, consists of two interactive phases. Still, this author believes the first type of explanatory sequential design begins by gathering and analyzing quantitative data. Afterwards, qualitative data is collected and analyzed to further explain or elaborate the quantitative findings from the first phase. The study's qualitative phase is designed to build upon the results obtained in the quantitative phase (Creswell & Plano-Clark, 2018). The flow chart of the mixed methods design is presented to clarify the mixed methods design applied in most of the previous studies. The central part of the results combination is to follow the key four steps (see Table 4).

Integration in the Convergent Parallel Design

Integration within the convergent design involves merging or combining the quantitative and qualitative results.

One way to accomplish this is by using a joint display table, including the findings from both data sources. Alternatively, a joint graphical

display can be used, such as geocoding, where results are visually presented based on spatial location and linked to qualitative themes, codes, or quotes. Another approach is to organize the study results in passages organized by major topics, with the option of presenting quantitative results first, followed by qualitative results (or vice versa). When making these comparisons, the researcher should discuss the insights gained from the comparison, including similarities, differences, contradictions, and other relevant observations (Curry et al., 2009; Denscombe, 2008).

Data transformation may be employed to achieve integration, wherein qualitative results are converted into counts. The transformed qualitative database can then be merged with the quantitative database. For example, counts of codes or themes can be used to create new quantitative variables or measures based on the qualitative perspectives of participants. Integration occurs when these new transformed variables, derived from the qualitative results, are added to the quantitative database, and subjected to analysis. Regardless of the specific integration strategies employed, a convergent design necessitates a discussion of the researcher's conclusions or inferences based on the combined results (Denscombe, 2008).

Justification of Triangulation of Data

Triangulation Increases Validity and helps mitigate the limitations inherent in each source or method. We can identify commonalities and discrepancies by comparing findings from multiple sources, leading to more accurate and valid conclusions (Denscombe, 2008). It also enhances reliability because using multiple sets of data reduces the likelihood of errors, biases, or inaccuracies that could be presented in any single data set. If similar patterns or finding emerge across different datasets, it increases the confidence in the reliability of the research findings (Creswell & Piano

Clark, 2017). It also increases comprehensive understanding because it allows researchers to gain a more comprehensive understanding of the phenomenon being studied. Different data sources can provide different perspectives or aspects of the same phenomenon, leading to a more holistic view. Cross-validation, identifying outliers and anomalies, reduced bias, richer insights, increased methodological rigour, minimized subjectivity, and wider applicability because triangulation can enhance the generalizability of findings. If results are consistent across multiple sources or methods, it suggests that the conclusions are likely to apply to a broader context (Creswell & Plano Clark, 2017; Mondal & Mondal, 2018).

Reason for Using the Convergent Parallel Design in Ph.D. Dissertation

Convergent parallel design in mixed methods research offers several strengths and advantages. It is a design that is easy to comprehend and commonly chosen by many researchers. It has been discussed in literature since its introduction by Jick in 1979 and has gained popularity in mixed methods research. One of its key advantages is its efficiency, as both quantitative and qualitative data are collected concurrently during a single research phase (Creswell & Plano Clark, 2007). It allows for streamlined data collection and reduces the overall time required for the study. Another advantage is that each data type can be collected and analyzed independently using traditional quantitative and qualitative research techniques (Creswell, 2014). This feature makes the convergent design suitable for team research, where experts in both quantitative and qualitative methods can contribute to the analysis (Bryman, 2006).

Furthermore, the design enables a direct comparison between participants' perspectives gathered through open-ended questioning (e.g., semi-structured interviews) and the researcher's standpoint represented by close-ended questioning (e.g., survey responses), which allows researchers to not only report statistical trends but also give voice to the participants' experiences and viewpoints. In conclusion, the convergent design in the mixed methods approach offers simplicity, efficiency, flexibility for separate analysis, and the ability to compare participant perspectives with researcher-generated data (Cohen et al., 2007; Ivankova & Wingo, 2018).

Challenges of Using Convergent Parallel Design

Firstly, the issue of different sample sizes should

be considered, as the quantitative and qualitative data are often collected for different purposes. Strategies for dealing with varying sample sizes include collecting larger qualitative samples or using unequal sample sizes (Creswell & Plano Clark, 2018). Secondly, merging different data types, such as text and numeric databases, can be challenging. Researchers are advised to design their studies to allow the quantitative and qualitative data to address the same concepts to ensure meaningful integration, which facilitates the merging of data sets (Curry et al., 2009).

Techniques for designing discussions, creating joint displays, and using data transformation to merge diverse data types are further elaborated (Farquhar, Ewing & Booth, 2011). Lastly, researchers may encounter divergence or contradictions when comparing quantitative and qualitative results. These differences can offer valuable insights but can also be challenging to resolve. In such cases, additional data collection or reanalysis would be necessary, which guides collecting additional data or reexamining existing data to address the challenge (Creswell & Plano Clark, 2007). In conclusion, researchers must carefully consider sample size differences, data integration techniques, and strategies for addressing divergent findings when merging quantitative and qualitative data in mixed methods research.

Results and Discussion

This study aimed to analyze the application of MMA's appropriateness in educational research critically. MMA study applied the convergent parallel design of the mixed methods approach, underscoring the integration and synthesis of both qualitative and quantitative findings. This approach aims to capitalize on the strengths of both data types, enhancing the overall understanding of the research phenomenon. The results provide a comprehensive view of the complex research problem by comparing qualitative and quantitative results, which allows for a deeper exploration of the phenomenon of interest – in the case of the current author, gender discrimination in children's access to quality education. The convergent parallel design identifies discrepancies and commonalities between the two sets of data, shedding light on different aspects of the same issue.

Furthermore, the results indicate that the qualitative data explores the rich narratives and perceptions of the particular variables on the results, which narratives offer a nuanced understanding of

the lived experiences and emotions related to particular results. On the other hand, the quantitative data gathered through surveys offer a broader perspective by quantifying associations between research problems and questions. This duality of approaches enhances the validity and reliability of the study's findings. The results further indicate that the convergence of qualitative and quantitative data findings lends robustness to the study's conclusions. This study increases confidence in the outcomes by corroborating insights from different angles. For instance, qualitative analysis identifies main categories that encapsulate research problems. In contrast, the quantitative analysis reveals statistical association between dependent and independent variables. However, the study also acknowledges that this convergence parallel design might not always be perfect. Divergences or contradictions between the two types of data can occur due to the inherent differences in their nature, which provide opportunities for a deeper exploration of the research phenomenon, urging researchers to seek a more nuanced understanding and possibly identify moderate factors. The results highlight the value of the convergent parallel design in a mixed methods approach in educational research, which allows for the simultaneous consideration of qualitative and quantitative data, fostering a comprehensive and complicated understanding of the research phenomenon. Integrating these diverse data types strengthens the study's validity, enhances insights, and contributes to a richer comprehension of the research problem's complex dynamics. This paper also indicates that the mixed methods approach is unsuitable for every research problem and field.

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