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MIXED-METHODS RESEARCH: PARADIGMATIC CONTROVERSIES AND EMERGING CONFLUENCES

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Abstract

This study concentrates specifically on mixed-methods research (MMR) and covers its features, applications, and main categories. The study noted that mixed-method study design aids in expanding the scope and depth of an investigation. Equally, there are restrictions and difficulties associated with mixed-method research designs. Many of its difficulties have been brought to light by the study. Selecting the suitable mixed method for a given research endeavor is the first of these limits. Making this choice can be challenging for inexperienced researchers since it can be hard for them to understand how combining different approaches can affect how data is analyzed and outcomes are interpreted. Second, it could be difficult to strike a balance between the two research traditions because it's natural for researchers to lean more toward the one in which they feel most at ease. Thirdly, it could be difficult to integrate data from two methods particularly triangulating them in order to enhance and expand data analysis and interpretation. Finally, because each research method takes time, using a mixed-method is a drawn-out procedure. Conclusively, when addressing complicated research questions, a mixed-methods design is advantageous because it combines the philosophical frameworks of interpretivism and post-positivism. This allows for the meaningful explanation of research difficulties through the interweaving of qualitative and quantitative data. Additionally, it provides a sound foundation, methodological flexibility, and a thorough comprehension of more manageable problems.

Keyword: Mixed-Methods Research, Paradigm, Positivism, Interpretivists

Introduction

A research study is conventionally guided by a research paradigm(s) which refers to researchers' underlying philosophical views concerning the truth and reality in general and the research issue in particular. A research paradigm, therefore, is a philosophical position about the world or the nature of reality and how we approach it to understand it (Maxwell, 2005). It includes researchers' assumptions about ontology and epistemology that guide the research process. Ontology is concerned with the nature of truth, i.e., what is the nature of reality? Whereas epistemology refers to the nature and forms of human knowledge, i.e., how do we know what reality is (Cohen et al., 2007). A researcher, based on their purpose, may adapt different approaches to uncover the truth and/or knowledge. Mixed-methods research (MMR) is a research methodology that incorporates multiple methods to address research questions in an appropriate and principled manner (Bryman, 2012; Creswell, 2015; Creswell & Plano Clark, 2011), which involves collecting, analyzing, interpreting and reporting both qualitative and quantitative data.

An in-depth understanding of the research paradigms is essential for a researcher. When novice researchers encounter a social problem, they must know how best to approach it. For instance, they must understand the paradigms that guide their methodological decisions in collecting information (data), analyzing and interpreting

them, and reporting findings. In other words, new researchers must understand what research designs are there that can best address their research problems and guide them throughout the research process. With novice researchers in view, this article introduces the most prevalent research paradigms and the resultant research methods. It particularly focuses on the mixed-methods research (MMR) – its characteristics, reasons for using it, and its major types. The language and organization of the article are deliberately simple to assist researchers to understand what different types of MMR approaches there are, how to decide which type of MMR is appropriate for their research study, and what the key considerations are when choosing a mixed-method design.

Additionally, the study provides an understanding of practical considerations and the potential challenges a researcher is likely to experience when adopting a particular MMR design. What follows, then, is a brief discussion of major research paradigms followed by an introduction to mixed-methods research, its types, key considerations, and challenges.

Major Research Paradigms

There are a number of research paradigms, while some of them are complementary to each other, others are opposed. One of the most prevalent research paradigms is positivism which considers that only the knowledge confirmed by the senses is affirmed as knowledge (Bryman, 2012). It follows the objective route in research and advocates that the knowledge is gained through a gathering of objectively verifiable facts using quantitative means. Positivists differentiate between scientific and normative statements and they believe that normative statements cannot be confirmed by the senses; therefore, only the scientific statements are the true domain of the scientist (Bryman, 2012). Quantitative researchers are, by and large, guided by positivism and they use quantitative tools to get objective findings in their study. Historically, the main research method was guided by quantitative research design or the positivistic approach. Post-positivism, on the other hand, "is a milder form of positivism that follows the same principles but allows more interaction between the researcher and his/her research participants" (Taylor & Medina, 2011). While positivism focuses on the objectivity of the research process, post positivism has room for subjectivity as well. Therefore, it uses both quantitative (such as a survey) and qualitative methods (such as interviews and participant-observation).

Another paradigm, interpretivism, with a contrasting epistemology to positivism, believes in multiple realities. Therefore, the followers of this paradigm are critical of the application of the scientific (or positivist) model to the study (Bryman, 2012). The social scientists who are guided by this paradigm respect the subjective meaning of social action (Taylor & Medina, 2011). Interpretivists, as a consequence of that, understand social phenomena and interpret them further. Since the qualitative researchers use the tools such as interviews, focus groups, and participant observation to understand the situation and explain the indicative findings, they follow interpretivism as a research paradigm. The constructivism paradigm is different from positivism and interpretivism, and is based on the premise that reality is a product of human interaction with the real world. It is guided by the belief that active construction of knowledge takes place when there is human interaction with the real world. This means, knowledge is built up socially. It opposes the idea that there is a single methodology to generate knowledge and that knowledge must be approached through multiple perspectives. In a similar vein, the paradigm of criticalism approaches knowledge from a critical perspective and with a major focus on power imbalance in society.

Therefore, it posits that scientific investigation should be conducted with a noble goal of social change. The primary purpose of research is to identify and support resolve 'gross power imbalances' in society (Taylor & Medina, 2011). Thus, in this paradigm, "the researcher's role is one of advocate, a change agent, who argues for and leads the way towards a more equitable, fair and sustainable society" (Taylor &

Medina, 2011). To sum up, the two main paradigms, which are conventionally considered to be fundamentally opposed to each other, are positivism/post-positivism and constructivism/ interpretivism, the former relates to quantitative methodology whereas the latter drives qualitative research. The qualitative research emerged as the quantitative research alone could not address all the research questions.

The final paradigm discussed in this article is the paradigm of pragmatism which is not committed to any sort of philosophical stance (Creswell, 2007) but argues that the forced choices between positivism and interpretivism should be abandoned as it views reality as both singular and multiple. Pragmatism "is pluralistic and oriented towards 'what works' and practice" (Creswell & Plano Clark, 2011, p. 41). In other words, pragmatism uses multiple methods but the use of the methods should always be guided by research problems. It values both objective and subjective knowledge to meet research objectives. Researchers adopting a pragmatist position have the liberty to choose those research methods or strategies that can best answer their research questions (Creswell, 2007). According to Feilzer (2010, p.14), pragmatism brushes aside the quantitative/qualitative divide and ends the paradigm war by suggesting that the most important question is whether the research has helped to find out what the researcher wants to know. Tashakkori and Teddlie (1998) suggest that pragmatists study what interests them and are of value to them. They study research problems in different ways that they deem appropriate. Therefore, the main reason for adopting a pragmatist position in a study is to allow a researcher to have a pluralistic stance of gathering all sorts of data in order to best answer the research questions. In essence, a pragmatist employs a mixed-methods design to follow one or multiple combinations of some of the prevalent research paradigms mentioned above. In a mixed-methods research design, qualitative research approaches help understand the situation through indicative results by exploring through the tools like participant observation and interviews whereas quantitative approaches help derive objective findings by using the tools like a survey. A description of mixed methods as a research design is presented below.

Mixed Methods as a Research Methodology

A mixed-methods approach is a research methodology in its own right. As stated by Creswell and Plano Clark (2011), a mixed-methods research design is a research design that has its own philosophical assumptions and methods of inquiry. As a methodology, it includes philosophical assumptions to provide directions for the collection and analysis of data from multiple sources in a single study.

A mixed-methods design offers a number of benefits to approaching complex research issues as it integrates philosophical frameworks of both post-positivism and interpretivism (Fetters, 2016) interweaving qualitative and quantitative data in such a way that research issues are meaningfully explained. It also offers a logical ground, methodological flexibility and an in-depth understanding of smaller cases (Maxwell, 2016). In other words, the use of mixed-methods enables researchers to answer research questions with sufficient depth and breadth (Enosh, Tzafrir, & Stolovy, 2014) and helps generalise findings and implications of the researched issues to the whole population. For example, the quantitative approach helps a researcher to collect the data from a large number of participants; thus, increasing the possibility to generalise the findings to a wider population. The qualitative approach, on the other hand, provides a deeper understanding of the issue being investigated, honouring the voices of its participants. In other words, whereas quantitative data bring breadth to the study and qualitative data provides depth to it. Moreover, quantitative results can be triangulated with qualitative findings and vice versa. Triangulation, as a qualitative research strategy, is the use of multiple methods or data sources to develop a comprehensive understanding of a research problem or to test validity through the convergence of information from different sources (Carter et al., 2014). A mixed-methods design, therefore, offers the best chance of answering research questions by combining two sets of

strengths while compensating at the same time for the weaknesses of each method (Johnson & Onwuegbuzie, 2004). Consequently, "mixed-method research designs are becoming increasingly relevant to addressing impact research questions" (Saville, 2012).

There is a plethora of literature (Bryman, 2012; Creswell & Plano Clark, 2018; Johnson & Onwuegbuzie, 2004; Maxwell, 2016; Morgan, 2014; Tashakkori & Teddlie, 1998) around the theory of mixed-methods, and on the breadth and depth of this design. However, it seems that there is very limited literature on a mixed-methods research design that can effectively guide early career researchers through selecting a proper design for their study thereby enabling them to understand its rationale.

Despite its merits and popularity among researchers, some scholars might consider it as a design that can potentially cause a lot of troubles to a researcher when they plan to organize both qualitative and quantitative methods in a study as a researcher may not be equally capable of handling both methods. In the following sections, then, reasons for selecting mixed-methods for a study and their potential weaknesses are explained.

Why Mixed Methods?

Mixing two methods might be superior to a single method as it is likely to provide rich insights into the research phenomena that cannot be fully understood by using only qualitative or quantitative methods. A mixed-methods design can integrate and synergize multiple data sources which can assist to study complex problems (Poth & Munce, 2020). The application of MMR, as mentioned in the previous section, means purposeful data consolidation which allows researchers to seek a wide view of their study by enabling them to view a phenomenon from different perspectives and research lenses (Shorten & Smith, 2017).

There are six major justifications for combining quantitative and qualitative data in a research study. The first rationale of employing an MMR approach is the expansion of study. This means an MMR approach allows researchers widen their inquiry with sufficient depth and breadth. For instance, when a researcher wants to generalize the findings to a population and develop a detailed view of the meaning of a phenomenon or concept for individuals, the advantages of collecting both

Closed-ended quantitative data and open-ended qualitative data support understanding a research problem (Creswell, 2003).

Furthermore, qualitative data (such as interviews and focus groups) can provide depth in the research inquiry as the researcher can gain a deeper insight into the phenomenon from narratives. Then, a quantitative approach of data collection can bring breadth to the study by supporting the researcher with accumulating data about on different aspects of a phenomenon from different participants.

Another driving motive for combining the two methods is the belief that both kinds of research have values and that in some respects they are complementary, and therefore, there will be an added value in combining them. The researchers use both data sets to answer the same research question which can produce greater certainty and wider implication in the conclusion (Maxwell, 2016; Morgan, 2014). In other words, mixing two methods helps to produce a more complete picture and provides an opportunity for a greater assortment of divergent or complementary views; which are valuable as they not only lead to extra reflection and enrich our understanding of a phenomenon, but also open new avenues for future inquiries (Teddlie & Tashakkori, 2009). Additionally, findings from mixed-methods research offer a holistic view of a phenomenon and provide additional insights into different components of a phenomenon which might help for generating substantive theories (Ventakesh et al., 2013).

Third, an MMR approach helps "to overcome the epistemological differences between quantitative and qualitative paradigms and to provide a royal road to true knowledge" (Bergman, 2008, p. 4). Indeed, a

principled combination of the two methods supports researchers in developing an in-depth and comprehensive understanding of a research phenomenon (Lund, 2012). For example, while using a quantitative method, concepts can be operationalised in terms of well-defined indicators, tracing trends and relationships, making comparisons, and using large and perhaps representative samples, a qualitative method has the strengths of sensitivity to multiple meanings, logical ground, great methodological flexibility and in-depth study of smaller samples which helps to study the process and change.

Fourth, an MMR approach helps to obtain more rigorous conclusions by employing two methods in such a way that the strengths of the qualitative methods offset the weaknesses of the quantitative methods and vice versa (Plano Clark & Ivankova, 2016). This implies that a quantitative method can be strong in those areas where a qualitative method is weak and vice versa. Putting it in another way, one method is more suitable to answer one type of question and another method is more suitable for another type of question. Mixing the two methods, therefore, offers the possibility of combining two sets of strengths while compensating at the same time for the weaknesses of each method. Thus, the combination of quantitative and qualitative methods is often proposed on the grounds that a researcher can utilize the respective strengths, escape the respective weaknesses of the two approaches and produce a more accurate conclusion.

Another value of an MMR approach is its triangulation component. Data triangulation in a mixed-methods study is generally accepted as a strategy for validating results obtained with the individual method (Bergman, 2008). A researcher, for instance, aims to obtain a more valid picture about a research issue by directly comparing the findings drawn from one method (qualitative or quantitative) to those obtained from another (quantitative or qualitative) for convergence and/or divergence (Plano Clark & Ivankova, 2016). In other words, collecting diverse types of data offers greater insights on a phenomenon that the methods individually cannot offer, and therefore, provides more valid and stronger inferences than a single method does (Teddle & Tashakori, 2009). Thus, data triangulation leads to a well-validated conclusion and also promotes the credibility of inferences obtained from one approach (Ventakesh et al., 2013).

Finally, the sixth rationale for mixing the two methods is "to develop more effective and refined conclusions by using the results from one method (qualitative or quantitative) to inform or shape the use of another method (qualitative or quantitative)" (Plano Clark & Ivankova, 2016, p. 86). For instance, researchers who want to understand possible factors that cause obesity in children might argue for the need to quantitatively assess significant predictors and then they use the quantitative results to develop qualitative follow-up exploration (potentially through interviews, observation, and focus groups) to explore why certain factors were significant. This means the development of a new method based on the previous method is possible only in a (mixed-methods) sequential design. The following section elucidates fundamental considerations when developing a sequential (MMR) design.

Key Considerations

In a mixed-methods study, the selection of a proper design is not an easy task for most researchers. Careful consideration should be given to three major aspects while selecting an MMR design. The first decision is about the relative priority of the approaches. Priority refers to the relative importance of the qualitative and quantitative data for answering research questions (Plano Clark & Ivankova, 2016). The priority usually depends on the research questions or the goals of the research and its participants. A study can have three priority options: quantitative priority (i.e., more emphasis on the quantitative data collection and analysis), qualitative priority (i.e., more emphasis on the qualitative data collection and analysis), or equal priority (i.e., considering both data sets to be equally important to answer the research questions) (Plano Clark & Ivankova, 2016). A researcher, then, must weigh carefully the purpose of their research and the

data they need to address it before prioritizing research approaches. The second decision accentuates the level of interaction between the data sets. It refers to the extent to which qualitative and quantitative approaches "are kept independent or interact with each other" (Creswell & Plano Clark, 2011, p. 64). When they are independent, the researcher mixes the two approaches only at the final stage, i.e., after the analysis of the data. As one of the purposes of using mixed methods methodology in a study is to obtain different but complementary data on the same issue to best understand the research problems, the data can be collected separately, and the findings can be mixed before interpreting the results. Creswell and Plano Clark (2011) discuss four possible stages for mixing two data sets: at the level of design, during data collection, during data analysis, and during data interpretation.

The third decision concerns the timing of the qualitative and quantitative approaches. Timing refers to "the entire quantitative and qualitative strands, not just data collection" (Creswell & Plano Clark, 2011). The two methods can be combined either sequentially (i.e., findings from one approach inform the other) or concurrently (i.e., independent of each other). Ventakesh et al. (2013) state: In a concurrent design, qualitative and quantitative data are collected and analyzed in parallel and then merged for a complete understanding of a phenomenon or to compare individual results. In contrast, in a sequential mixed methods design, quantitative and qualitative data collection and analyses are implemented in different phases and each is integrated in a separate phase.

Regarding sequential combination, Achterberg (1988) suggests that a qualitative method should precede quantitative methods so that detailed information can be collected and more directed, specific quantitative procedures can be developed. However, the type of combination should be driven by research goals and context. In general, if the research goal is to understand the phenomenon as it happens, it seems that a concurrent approach will be better, but if the researcher expects that findings from a method (either qualitative or quantitative) will support the later (quantitative or qualitative) study, then a sequential approach should be used (Creswell, 2003).

In addition to the above key considerations, the sample size in a mixed methods research design can be different for qualitative and quantitative strands. The sample participating in a qualitative strand can be a subset of the participants who participate in the quantitative study. The researcher should also be aware of the issue that it will bring complexity in the merging process while analyzing and interpreting the data. And since one of the purposes is also to synthesize different results into a complementary picture of the issue being explored (Creswell & Plano Clark, 2018), the size differential should not be a big issue. Creswell and Plano Clark (2018) state that having a small size in qualitative component and larger size in quantitative component supports researchers to get in-depth qualitative exploration and rigorous quantitative examination of the issue.

If a researcher evaluates some or all of these criteria, they can decide if mixed-methods fits as a research design for their study. Once a researcher decides to use mixed-methods as a design, they need to delve deeper into deciding which mixed methods design is appropriate. The following section introduces core mixed-methods designs and lists the challenges of each design that can potentially help a researcher to select the most appropriate design for their study.

Which Mixed-Methods Design?

Timans et al. (2019) claim that "mixed-methods research (MMR) scholars seem to be committed to designing a standardized methodological framework for combining methods". They argue that although MMR must be separated from their native epistemology to work, it is necessary to be within a qualitative and quantitative research approach which will also be indicated by the data they use. While acknowledging merits in the Timans et al.'s views, this article is based on the premise that the research-novices need to treat

the mixing of methods as one research approach as keeping them epistemologically separate within MMR may create complications at the data integration and interpretation stage. This section, therefore, presents core common mixed-methods research types which are prevalent in the field of research. Several scholars (Plano Clark & Ivankova 2016; Terrell, 2012; Wilkinson & Staley, 2019) have listed various types of mixed methods research design. Creswell and Plano Clark (2018) consider these core designs as parsimonious and practical since they have the potential to make researchers understand the best possible options of mixed methods research designs. In this section some common types of mixed methods are presented. Attempts have been made to illustrate the MMR types with suitable examples.

Convergent Parallel Mixed-Methods Design

A convergent design that follows pragmatism as a theoretical assumption is an efficient and popular approach to mixing methods research (Creswell & Plano Clark, 2018). Two different approaches namely qualitative and quantitative methods are mixed to obtain the triangulated results in this design. At first, two types of data sets are collected concurrently, and secondly, they are analyzed independently using quantitative and qualitative analytical approaches (Schoonenboom & Johnson, 2017; Shorten & Smith, 2017; Creswell and Plano Clark, 2018; Wisdom & Creswell, 2013). In a convergent design, the integration of both data will help a researcher gain a complete understanding of the one provided by the quantitative or qualitative results alone. It is an approach in which two data sets are combined to get a complete picture of the issue being explored and to validate one set of findings with the other (Creswell and Plano Clark, 2018).

For instance, if a researcher is examining experiences of using digital technologies in education, s/he administers a survey and also conducts interviews with teachers and students to understand the issue. S/he collects quantitative data from a survey and qualitative data from interviews and examines if the findings obtained from these two different data sets converge or diverge. In case the results diverge, the researcher explains the finding by re-examining the results and collecting more data, or explaining the quality of the dataset.

"The intent of integration in a convergent design is to develop results and interpretations that expand understanding, are comprehensive and are validated and confirmed" (Creswell & Plano Clark,). Fàbregues et al. (2020) argue that convergent studies are apt designs for integration as both data results are available when interpretation is planned.

In the analysis phase, a researcher can always look for the common concepts across both sets of findings. Integration in convergent design can be done in two ways: a) by presenting findings of the qualitative study followed by the quantitative study or vice versa or b) by transforming the qualitative data into counts and integrating the transformed qualitative dataset into quantitative data (Creswell & Plano Clark, 2018). In the latter case, a researcher can count the identified codes or themes. Creswell and Plano Clark (2018) maintain that this design can be useful in certain conditions, such as, it can be adopted when a researcher has limited time; when s/he needs both qualitative and quantitative information from the participants and when s/he (or a team of researchers) has required skills to handle both quantitative and qualitative methods. They also list issues of different sample sizes, the need to merge a text and numeric database and the need to explain divergence when comparing results as the challenges of convergent design.

Firstly, in this design, a researcher needs to think of the possibility and outcomes of having different sample sizes when quantitative and qualitative data are collected for generalization and deeper understanding. Secondly, s/he might find it difficult to merge data based on texts with the data based on numbers to examine the same issue.

Thirdly, if the findings have divergent results, it might add an additional layer of complexity for them, and

they might find it difficult to address these differences. They might require collecting qualitative data or quantitative data or both again. The following is an example of a study that explains convergent parallel mixed-methods design. Example: Dawadi (2019) conducted a convergent parallel mixed-methods study to explore the impact of the Secondary Education Examination English Test on students (aged 15-16 years old) and their parents in Nepal. In the study, the data was collected through a longitudinal survey (*n*=247) with students, oral diaries recorded by six students intermittently for three months (*n*=72) and interviews with those six students and their parents (*n*=24). The study used concurrent timing meaning both quantitative and qualitative data were collected at the same time, but independent of each other. The author argues that this timing was used to ensure that there was no chance that one approach influenced another approach as in a sequential design. Therefore, both qualitative and quantitative data in the study were collected concurrently but analyzed separately, and the findings were mixed before interpreting the results. This means that the two data sets were combined during the data interpretation phase only. Dawadi argues, "If the quantitative data had been analyzed first, the qualitative findings might have been affected by the quantitative results, but the reverse was not possible" (p. 66). It is also worth pointing out that equal priority was given to both data sets considering the equal importance of both types of data in answering the research questions of the study. The two data sets complemented each other and also supported the author to triangulate her findings drawn from the qualitative methods with the results from quantitative methods, and vice versa.

Explanatory Sequential Design

Explanatory Sequential design occurs in two distinct interactive phases, the beginning with the collection and analysis of the quantitative data to expand the first phase quantitative results followed by the designing of the second, qualitative phase on the basis of the quantitative findings (Creswell & Plano Clark, 2018; Schoonenboom & Johnson, 2017; Shorten & Smith, 2017; Wisdom & Creswell, 2013). In this design, a researcher follows up on a specific quantitative finding and explains it with the qualitative data (Wisdom & Creswell, 2013). For example, once the significant predictors are identified through statistical measures, such as it is found that pandemic is one of the reasons that has made teachers and learners use digital technologies profusely, an interview is designed to delve deeper and explain this predictor. In this design, the qualitative design helps explain certain quantitative results that include unexpected findings in more detail (Terrell, 2012). Creswell and Plano Clark (2018) suggest that a researcher should shift from post positivist to constructivist theoretical assumption when this design is adopted in a study. The researcher follows the post positivist assumption to select instruments and moves to constructivist assumption as they value multiple perspectives and in-depth exploration (Creswell & Plano Clark, 2018). In this design, firstly, a quantitative strand is designed and implemented, and later the specific quantitative findings which will be explained is decided. Secondly, a qualitative strand is designed and developed to explain the quantitative findings. And finally, the quantitative results are summarized and interpreted. Creswell and Plano Clark (2018) argue that integration in this design takes place in two ways: a) by connecting the quantitative findings to the qualitative data collection and b) by drawing integrated findings after combining two sets of results after the qualitative phase is completed.

This design is useful when a researcher and research issue is more quantitatively oriented; when s/he has already identified a variable to measure; when s/he has an ability to access the participants to collect the qualitative data; when s/he has time to collect data in two phases; and when s/he is the sole investigator, collecting and analysing the data one at a time. Wilkinson and Staley (2019) in their study found that sampling was one of the problems associated with this design. They pointed out that the reviewers of the research papers, which they analyzed, were concerned with how well the sample for the qualitative component represented the phenomenon identified in data from a

larger sample of participants and analyzed in the quantitative portion of the study.

Creswell and Plano Clark (2018) enumerate the extended time needed for completion, the complexity in specifying the qualitative phase in advance, the compulsion for the identification of quantitative results to be followed up, and the need to specify the participants who can provide the explanation as challenges of this design. In this design, a researcher needs to spend too much time to implement two phases and a researcher might face difficulty to get approval from the institutional board since it will be challenging for a researcher to specify the qualitative phase beforehand. A researcher also needs to decide the quantitative results to be followed on, and they also need to decide who to study and what will be the criteria for sampling (Creswell & Plano Clark, 2018). The following is an example of the study that explains explanatory sequential design.

Example: McKim (2017) employed an explanatory sequential design to examine the perceived value of mixed methods research for graduate students. The study consisted of two phases "where the quantitative phase was dominant, meaning more weight was placed on the quantitative phase" (p. 204). In the first phase, a survey was conducted with 113 graduate students and the data was analyzed using SPSS. Then, in the second phase, focus group discussions were conducted with a small subsample of students (n=11) to explain quantitative results (i.e., for the purpose of complementarity). This means the focus group discussion questions/prompts were guided by the survey results. It is worth pointing out that the connection between the two data sets happened in two places:

The first connection of the quantitative and qualitative phase was the use of the quantitative results to create the focus group questions. The second connection was the mixing that happened after the qualitative data were collected and analyzed. The results were connected to gain a better understanding of the findings from both phases (McKim (2017). The above discussions indicate that the quantitative phase informed the qualitative phase and the qualitative phase provided further explanations to the quantitative results. Thus, the two data sets helped the authors to reflect on the research issues with sufficient breadth and depth.

Exploratory Sequential Design

Exploratory sequential design is a three-phase study in which a researcher works from the constructivist principle. During the first phase, a researcher explores an issue in-depth, and as they reach the second phase, they shift to the post-positivist principle to identify and measure the variable and statistical trend (Creswell & Plano Clark, 2018). In this design, at first, the qualitative data are gathered and analyzed, and later quantitative data are collected and tested (Schoonenboom & Johnson, 2017; Shorten & Smith, 2017). This design begins with the collection and analysis of qualitative data. Building from the qualitative findings, quantitative measures or instruments are developed (Terrell, 2012; Wisdom & Creswell, 2013), and finally, a researcher quantitatively tests the variable that they have identified and interprets in what ways the quantitative data generalizes and extends the qualitative findings (Creswell & Plano Clark, 2018). For example, once a researcher identifies variables that have a role in promoting the use of digital technologies in education, they design the research instruments to check if those variables are prevalent in a large mass as well. As far as the integration of this design is concerned, it begins when a quantitative measure is developed based on the qualitative results. Integration is also seen when a researcher integrates two sets of data after the quantitative phase is complete, and draws integrated conclusions that help to extend qualitative findings.

The exploratory sequential design is useful when a researcher and a research issue are more qualitatively oriented; when s/he has a required amount of time to conduct a three-phase study; when s/he is interested in the transferability or generalizability of the product; and when s/he finds an issue based on a small sample and

wants to test it with a large sample (Creswell & Plano Clark, 2018). They further claim that it is straightforward to implement and describe and it makes the qualitative result acceptable to quantitative-biased audiences since it combines the quantitative component. They argue that in this design, a researcher can develop a new instrument during the research process. They also list challenges as a compulsion to plan for an extended time to complete, a necessity to tentatively specify the quantitative phase in advance, a prospective requirement of the identification of two different samples, the necessity to determine the qualitative results to use, and the requirement of the skillful researcher.

This research design requires a lot of time for a researcher to complete a study and as in the explanatory sequential design, as s/he needs to decide tentatively quantitative phase for the institutional board review which is challenging. A researcher should use a small, purposeful sample in the first phase and a large sample in the second phase to have the extended finding which is difficult too. Next, s/he needs to decide the qualitative result which will be used to build the quantitative measure, and s/he must be skilled and proficient in qualitative, quantitative, mixed methods research and developing instruments. The following is an example of a study that employs the exploratory sequential design. Example: Munce et al. (2021) utilized an exploratory sequential design to demonstrate how this design can be used for complex intervention development in a self-management program for individuals with spinal cord injury. The study consisted of four phases. Phase I was a qualitative descriptive approach. Telephone interviews (n=26) of individuals were conducted to inform the development of a subsequent survey and intervention. In Phase II, the themes that emerged from Phase I were used to designing a survey, and the survey was administered. Phase III collected quantitative data via a survey with 99 participants, and both the quantitative and qualitative findings were merged (especially integrated) in the final phase. The authors argue that the design "provided the opportunity to identify complementarity, convergence, and/or divergence" Munce et al. (2021).

Challenges in Using a Mixed-Methods Design

Mixed-methods research may not always achieve its goal as mixing quantitative and qualitative methods can produce several threats. Researchers, such as David et al. (2018); Dawadi (2019); and Fauser (2018), have pointed out some practical difficulties associated with mixing qualitative and quantitative components which have been summarized here as five major challenges. First, data collection and analysis might be a very lengthy process. Therefore, it might be more expensive in terms of cost and time. Researchers usually struggle in designing their research within their estimated time and budgets (Fauser, 2018; Hauken et al., 2019). Some researchers indicate that the timeline of recruitment is demanding and the labor in data collection is intensive (David et al., 2018; Linnander et al., 2019).

Second, integrating qualitative and quantitative data is often difficult for many researchers (Wisdom & Creswell, 2013). For instance, Dawadi (2019) pointed out that she was not confident about her approach in bringing together quantitative (survey) and qualitative data (interviews and oral diaries). Casey et al. (2016) had a similar experience as they were unsure about a strategy to integrate their data sets. They also indicate that existing literature provides sparse guidance on how to merge data from different sources. Youngs and Piggot-Irvine (2012) raised a similar question in data analysis: ''When do you stop analyzing, comparing, and contrasting the data?'' Third, quantitative and qualitative methods are guided by different epistemological and philosophical frameworks. Therefore, the concerns in integrating them "include whether the assumptions in each paradigm get the same value or attention in the study and whether the data derived from the two methodologies are viewed as incommensurable" (Salehi & Golafshani, 2010, p.189). Similarly, Yu (2012) points out, "the difficulty associated with this design is the quantitative measures must be compatible with the qualitative findings, which requires distinct and accurate themes to be found in the

qualitative data''. Although researchers give equal priority/value and weight to both methods by considering that they complement each other, a big challenge may arise when the findings drawn from one method contradict those from the other method, questioning the reliability and validity of one method (Salehi & Golafshani, 2010). As pointed out by Plano Clark and Creswell (2018), most mixed-methods researchers obtain conflicting results from the qualitative and quantitative strands. There might also be frequent problems in relating two different kinds of information and drawing a conclusion from them (Hammersley, 2014). A researcher, therefore, needs to ensure that different methods are suitably combined so that there is no compromise on the robustness and reliability of the research. Therefore, a mixed-methods researcher needs to have a wider set of skills to conduct research rigorously. To reiterate, mixing methods is not a solution in itself, it might also create some problems.

The fourth challenge associated with the mixed-methods approach is that of choosing a proper design and maintaining quality in data integration. Sometimes, there might be a case that one method may influence data collection and interpretation of another method. For instance, in a sequential design, the findings drawn from the first method (e.g., survey data) may influence the second method (e.g., interview). A concurrent design might have similar issues. Leal et al. (2018) express their concern that ''the concurrent collection of both quantitative and qualitative in a single written survey from the sample participants could result in each data method unintentionally influencing the other''.
Fifth and the most important challenge for a mixed-method researcher is deciding which MMR design is appropriate for a particular study. Suitability of a design will largely depend upon the purpose of the study and perceived priority given to the qualitative and quantitative strand (i.e., whether the equal priority is given to both data sets and one is dominated by another).

As a consequence, early-career researchers may not have confidence to choose one from many designs especially when each one has its own drawbacks and potential challenges. To sum up, mixing data from different sources can sometimes lead a researcher nowhere. Creswell (2003) argues that triangulated research may run the risk of taking on too many unfocused questions all at once. Novice researchers, therefore, need to develop adequate skills both on qualitative and quantitative methods to cope with the demands of utilizing a mixed methods approach (Creswell & Plano Clark, 2011). Therefore, they need to undertake the challenging task of training and developing such skills before they employ an MMR research design.

Criticism of Mixed Methods Research

Researchers hold different views with regard to the use of both quantitative and qualitative methods within a single study. Hammersley (1996), for example, states that qualitative and quantitative research paradigms are "founded on incommensurable philosophical and/or political presuppositions". Indeed, a quantitative approach, which is guided by positivism, envisions the world mostly as static but for a qualitative approach, which is guided by interpretivism, the reality is multiple and dynamic. Therefore, incompatibilists argue that the two approaches are incompatible as they have different conceptions of reality, truth, the relationship between the researcher and object of investigation, and so forth. Guba (1987) claims, "The one [paradigm] precludes the other just as surely as belief in a round world precludes belief in a flat one". Smith (1983) further argues:

One approach takes a subject-object position on the relationship to subject matter; the other takes a subject position. One separates facts and values, while the other sees them inextricably mixed. One searches for laws, and the other seeks understanding. These positions do not seem to be compatible.

Having discussed the pitfalls of their mixed-methods research, Wilkinson and Staley (2019) argue that "in many cases, the data collected and the analyses conducted were not sufficient to warrant conclusions about the research questions". They further contend that

the lack of focus could be another pitfall of the approach as mixed methods researchers try to achieve a lot more in one manuscript handling both qualitative and quantitative methods, and also methodological handwringing as these researchers try to present a persuasive argument for their knowledge claims and lengthy justification for using mixed methods design in their study.

Despite the challenges, there has been a movement in favor of promoting 'mixed-methods' that combines qualitative and quantitative approaches (Hammersley, 2014). Bryman (2012) argues that research should avoid epistemological division between quantitative and qualitative methods as, for practical reasons, one type of method will usually be primary, but all research is enriched by the addition of other methods. Additionally, Lincoln and Guba (2003) note: various paradigms are beginning to 'interbreed' such that two theories previously thought to be in irreconcilable conflict may now appear, under a different theoretical rubric [eclecticism in this case], to be informing one another's arguments. Thus, the driving motive for combining the two approaches is the belief that both kinds of research have value, that in some respects they are complementary to each other, and that there are benefits of combining them together. As such, there are several rationales for using a mixed-methods approach.

Conclusions and implications

In other words, results from one method can inform or develop the findings from another. Furthermore, a mixed-method research design contributes to the complementarity of research which understands a research issue through the use of separate yet dialectically related approaches. Finally, a mixed-method research design helps extend the breadth and range of an inquiry. A mixed-method research design is not free from limitations or challenges. The assignment has pointed to a number of its challenges (challenges of using a mixed-method approach). The first of these limitations is deciding which mixed method (discussed in the section of 'which mixed-method study design?') is appropriate for a particular research project. The decision is often difficult for novice researchers because it may be difficult for them to realize how the mixing of methods can inform the data analysis and interpretation of results. Secondly, maintaining a balance between the two research traditions may be a challenge because it is easy for any researcher to focus more on one tradition they are more comfortable with. Thirdly, integrating data from two methods to complement and extend data analysis and interpretation, and specially triangulating them may be a challenge. Finally, using a mixed-method is a lengthy process as each of the research methods consumes time.

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