

## A Primer about Mixed Methods Research in an Educational Context

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**Abstract.** Changes in the academic enterprise, including the growth of large-scale team-based research, likely account for the growing presence of projects that are framed to involve mixed methods. This methodological essay provides a non-technical introduction to mixed method approaches. It is directed toward an audience motivated primarily by content area, rather than methodological, interests. Different methodological constructs are illustrated by using a single mixed methods study about promoting active play in school playground. A distinction is made between mixed and multi-method research, with the recommendation that the mixed method label is most appropriate when there is the intent to communicate that the interface between qualitative and quantitative strands is key to understanding the way the research was executed and the conclusions that are drawn.

**Keywords:** mixed method; visual methods

Changes in the academic enterprise likely account for the growing presence of projects that are framed in a way that involve mixed methods. Part of this may be related to the gradual reconfiguration of long-standing disciplinary boundaries and to an increase in interdisciplinary research that incorporates expertise from multiple content areas. It is also related to the ever-expanding role of external funding sources in shaping the agendas of research scientists. The growth in team-based research and the use of large data sets also can be linked to increasing interest in mixed methods research, as can be the higher expectation for repeated experiments and ever greater competition to secure access to publication space in the most the highly ranked journals. Technological innovations, such software that allows for the analysis of data generated from social media or that pinpoints geographical location, has also opened the door for the investigation of more multi-layered and innovative research questions about social phenomenon.

The purpose of this methodological essay is to provide a non-technical introduction to mixed methods approaches to research that is directed toward a broad cross-disciplinary audience motivated by content

area interests rather than methodological ones. My intent is to address an audience unfamiliar with mixed methods. I will provide a broad overview that distinguishes mixed method from multi-method research without itemizing the traditional set of mixed method data collection and sampling procedures and incorporating a lot of specialized jargon. The kind of overview provided by the article will make it useful as a reading assignment in a survey course designed to introduce a variety of methods or as background reading for a general audience interested in learning some of the basic methodological assumptions of mixed methods research.

After first considering evidence about the prevalence of mixed methods research across a variety of academic fields, the paper identifies different ways that mixed methods research has been defined and how it is distinguished from multi-method research. We then move to consider different ways that both qualitative and quantitative approaches can be used to create a more nuanced and comprehensive picture of a phenomenon. Next, I offer the architectural arch and keystone as a metaphor for mixed methods research and the types of inferences that are drawn from the integration of the qualitative and quantitative strands. Different ways that integration across phases can be accomplished are explored next. Throughout, different methodological constructs are illustrated by using a single mixed methods study about promoting active play in school playgrounds in Australia (Willenberg et al., 2010). These authors used multiple methods that integrated data from observational methods and a photo ordering technique to identify characteristics of school environments that promote physical activity.

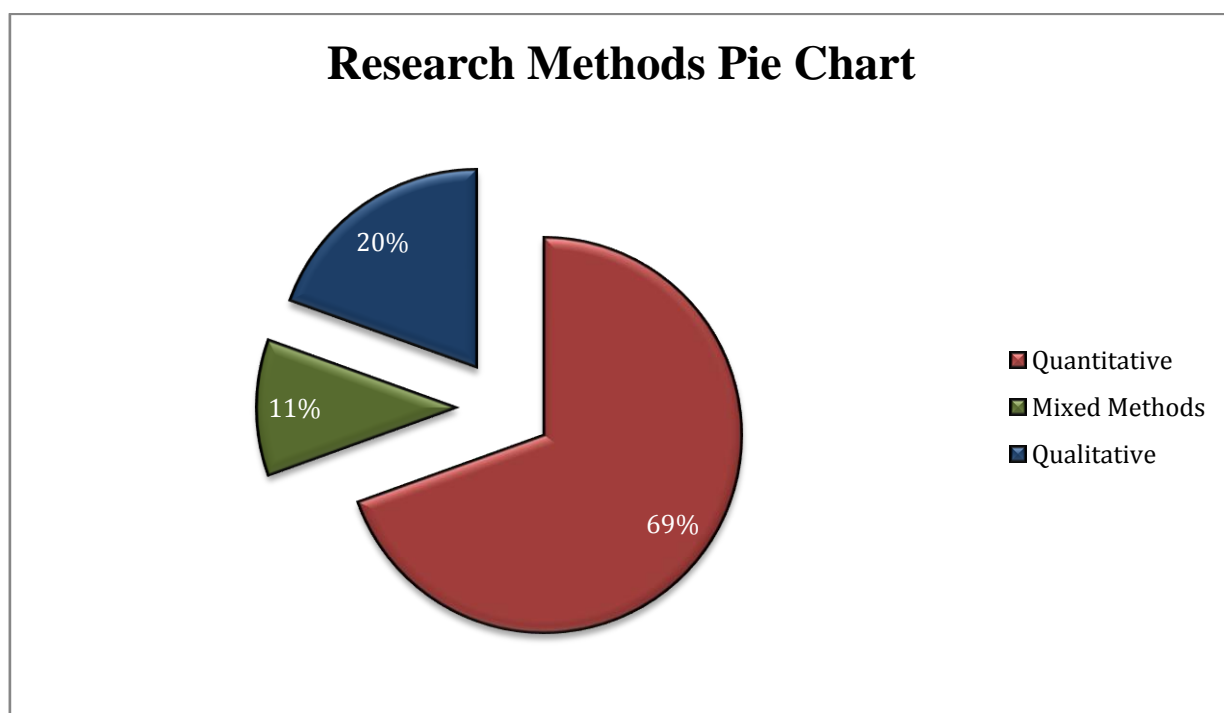
### **Prevalence of Mixed Methods Research Across Disciplines**

Available evidence does not entirely confirm the alarm that is occasionally voiced that mixed methods has become the "gold standard" or "best practice" in social and applied research. Content analyses of the characteristics of the mixed methods literature conducted in a variety of disciplinary contexts do not support the idea that there has been an explosive growth in articles reporting research in ways that are indicative of a mixed methods approach. What these analyses support, however, is that it is an approach more likely to be utilized in applied disciplines, like education and the health fields, that value the perceptions of patients or clients, than in "pure" fields that are more theoretically driven (Alise & Teddlie, 2010).

Accumulated knowledge from an ever-growing number of reviews of the literature provides conclusive evidence that while the label is used in many different ways, research bearing the mixed methods label appears in an astonishingly diverse array of academic fields. Multiple content analyses about the prevalence of the approach provide evidence

that is being used in academic fields as diverse as library science, business, marketing, education, health sciences, family science, school psychology, library science, counseling, construction engineering, and sports management.

A seminal piece by Alise and Teddlie (2010) convincingly documents that the dominant approach remains quantitative. Based on Alise's ambitious content analysis of 600 publications from 20 prestigious journals in applied (i.e. education and nursing) and non-applied disciplines (i.e. psychology and sociology), their analyses demonstrate that quantitative approaches retain the hold as the research approach used in the majority of publications (69.5%). Qualitative research is used second most frequently (19.5%), followed by mixed methods approaches (11%). Figure 1 uses a pie chart to summarize the prevalence of qualitative, quantitative, and mixed methods approaches reported by Alise and Teddlie.



**Figure 1: Research methods used by pure and applied disciplines as reported by Alise and Teddlie (2014)**

### Definitional Issues

Experts define mixed methods research in many different ways (Johnson, Onwuegbuzie, & Turner, 2007). The label was originally conceived to apply almost entirely to studies undertaken to enhance validity by triangulating results from more than one source of data for purposes of confirmation. In variations that might be used to study children's activities on school playgrounds, triangulating data collected

through self-reports of preferred activities and observational methods to confirm the types of equipment used would reflect the long-standing use of multiple sources of data to enhance validity.

A second common way to define mixed methods research is in terms of analytical procedures. This definition envisions mixed methods research as a combination of a qualitative or inductive approach to analysis with a quantitative, hypothesis testing or deductive approach. Yet others simplify the definition by focusing on the types of data collected. From this perspective, qualitative research is delimited to the collection of textual data or symbols, such as might be found in transcripts from individual or group interviews or by accessing entries in social media. A quantitative approach is simplified to the collection of data in the form of numbers.

In terms of definition, one can be sure that the term mixed methods is used to mean many different things. Where there is agreement, however, is that it involves a combination of qualitative and quantitative approaches to data collection and/or analysis.

### **Distinguishing Qualitative and Quantitative Approaches**

There are both qualitative and quantitative approaches to making sense of most phenomena that involve people. In research about playground equipment, for example, a qualitative approach to data collection and analysis is more likely than a quantitative one to yield information about contextual factors that mediate how and when children use equipment. Variations in weather, type of surface, presence or absence of other children, and supervision or participation of adults might all emerge as unexpected results with this type of approach. A quantitative approach, on the other hand, might pinpoint that the most active children are using loose equipment, like soccer balls, and that they almost always are using them in concert with other children.

Different strategies for coding photographs of children on playgrounds can be used to illustrate qualitative and quantitative approaches with visual methods. Figure 2 is a photograph that can be coded using both a qualitative and quantitative approach.



**Figure 2: Photograph to illustrate qualitative and quantitative ways to code (Used with permission from Cherie Edwards, Doctoral Student)**

Using the quantitative schema applied by Willengberg et al. (2010) to capture behavior at carefully timed intervals, the two boys in the photograph would be coded as active. In their schema, behaviors like sitting, lying, and standing but not moving, were coded as sedentary; walking or climbing were coded as moderately active; and children that were running, jumping, skipping, or hopping were coded as active.

A qualitative approach to coding the photograph showing the two boys with a soccer ball could consider both what is present and what is

missing, but might be expected, in the photograph. For example, codes might be developed to single out elements of the environment that might influence activity levels. For example, the presence of another child as well as the soft surface might encourage active play. Fitting with a qualitative mindset, our imaginary researcher coding this photograph might also take note of what is not present, but might be expected. This could include consideration of the absence of near-by adults in the photograph.

Our imaginary researcher now has both qualitatively and quantitatively derived data that are linked because one answers a descriptive "what" question and the other addresses the conceptual or "why" question. Linking of conclusions from the different strands of a study to create an explanatory framework is one way to integrate the qualitative and quantitative strands of a study. The same example can illustrate other ways that mixing is accomplished in mixed methods research.

### **Integrating the Qualitative and Quantitative Strands**

A principal characteristic that distinguishes mixed method from multi-method research is the extent that a conviction about the comingling of the different strands of the study is embedded in the methodological assumptions. The multi-method label is the more apt description when a study has more than one strand but the strands are only loosely linked. This is referred to in the literature as the concurrent or parallel design (Creswell & Plano-Clark, 2009). One ready way to distinguish this type of research is that different individuals often execute the different strands of the study and analysis is conducted separately. Another way to distinguish this type of research is that it is readily parsed into separate publications without any loss of explanatory power. This could occur, for example, when a team is divided up in to one group that is responsible for the qualitative phase of a project and a second that is taking the lead on quantitative data collection and analysis.

*Mixing at sampling.* The example of research about playground can also be used to envision classic ways that linkages occur between the qualitative and quantitative phases in mixed methods research. One of these is mixing through sampling. In this scenario, researchers often use quantitative markers to identify a sample for a second phase of analysis. In the example of the playground information, research might use quantitative data collection to identify the children that were consistently active and those that were consistently inactive across the time intervals studied to organize focus groups to interview the two groups of children. In this example, the two phases of data collection are quite distinct. It is a minimal type of mixing because while sampling strategy has a direct role

in the claims that can be made about generalizability, it does not have a direct impact on the explanatory framework that is produced.

*Mixing during analysis.* A second strategy that might be applied to the study of playgrounds is to mix during analysis. This is done by linking qualitatively and quantitatively derived variables in the analysis. This is the most instrumental type of mixing (Greene, 2007). Willenberg et al. (2010) mixed during analysis by using a statistical procedure to test for the relationship between loose and fixed equipment and activity levels. This generated the conclusion that the most active children were playing with loose equipment, like soccer balls, and that they preferred soft surfaces. Results derived from mixing during analysis are often displayed visually in manuscript through tables or figures (Plano-Clark, 2015). Because it plays such an instrumental role in constructing the final conclusions, this is the type of mixing that maximizes the value added of a mixed method approach.

*Mixing during the process of drawing conclusions.* Mixing most often occurs at the inference level (O'Cathain, Murphy, & Nicholl, 2008) where conclusions from the qualitative and quantitative strand are compared or linked. While common, this approach does not take advantage of the explanatory power that can be gained from a more creative interchange between the qualitative and quantitative strands of a study.

The interplay between the qualitative and quantitative strands has been depicted in a number of creative ways (Bazeley & Kemp, 2012). In a recently completed textbook (self cites omitted), I have found it useful to use the metaphor of an architectural arch to represent key features of a mixed methods approach.

### **Mixed Methods and the Metaphor of the Architectural Arch**

There are multiple parallels between the way an arch is constructed and the execution of a mixed methods study with one qualitative and one quantitative strand. In a perfect arch, each of the building blocks is wedge shaped and added one at a time, working from a base toward the apex where the final wedge is dropped into place. This is like the systematic, step-by-step process of executing a research procedure, such as occurs by using the constant comparative method to develop a grounded theory. The metaphor is probably most effective in capturing the end product of a research study as it is represented in published form than the actual process of conducting research about complex questions, which is inevitably far messier and more unpredictable than textbooks communicate.

Another direct connection between an ideal architectural arch and the essence of a fully integrated approach to mixed methods research where mixing occurs through multiple stages of the research process, lies with the keystone. In the metaphor, the keystone represents the meta-



inferences that are drawn by considering the results from the qualitative and quantitative analysis together. Camouflaged by artistic embellishments or visible to the naked eye, a keystone is the apex of an ideal arch. Figure 3 is a photograph of an arch with a keystone taken at the site of Roman ruins in Lyon, France.



**Figure 3: Roman arch in Lyon, France (photograph by author)**

Once the keystone is set in place, vertical and horizontal forces keep the structure erect. Each wedge shaped piece shares the load equally, which makes it a highly efficient structure. This is like "pure" mixed methods, where the qualitative and quantitative strands are given



equal priority (Johnson, Onwuegbuzie, & Turner, 2007). There are a myriad of examples of arches dating back thousand of years where the tension is so well distributed that it remains standing while the building it supported deteriorated over time.

### **Acknowledging Paradigmatic Challenges**

Mixed method researchers are most decidedly members of the community who are committed to the idea that empirical qualitative and quantitative approaches have distinct qualities, but share much in common. Unlike purists, members of this group take the position that qualitative and quantitative approaches are not driven by different paradigms that are inherently incompatible.

Researchers who proclaim pragmatism as their paradigmatic grounding account for much of the mixed methods research that is published. As a group, pragmatists are inclined to be interested first and foremost with what works for the setting and intended audience. Pragmatists argue that purpose always drives the selection of methods. They tend to be eclectic in the palette of methods they chose for different projects. They are driven to finds methods that match the purpose and context of their research project and inclined to leave arguments about the incompatibility of qualitative and quantitative approaches to those with a more philosophical bent.

Sidestepping the argument that qualitative and quantitative approaches are incompatible, Greene (2007) coined the expression "a mixed method way of thinking" to refer to a philosophical mindset that deliberately sets out to acknowledge complexity and to engage multiple viewpoints. In contrast to positivist who view reality as singular, a mixed method way of thinking reflects view of reality as inherently multiple. This is a perspective implicitly shared by researchers who pull together members of a team in order to integrate knowledge that emerges from diverse disciplinary approaches. An axiological or value-driven commitment to respecting diverse viewpoints is evident in Greene's position that: "A mixed methods way of thinking aspires to better understand complex social phenomenon by intentionally include multiple ways of knowing and valuing and by respectfully valuing differences" (2007, p. 17).

Greene's mixed method way thinking is highly compatible with a paradigmatic stance referred to as dialectical pluralism. The most important feature of this paradigmatic position is its de-emphasis on consensus and convergence and its emphasis on the knowledge and insight that can be gained by thinking dialectically and engaging multiple paradigms and mental models (Greene & Hall, 2010; Johnson & Schoonenboom, 2016). This can be achieved through negative and

extreme case sampling or by the intentional pursuit of what at first appears to be contradictory, unexpected, or inconsistent.

A dialectical approach readily could be mirrored in initial plan for sampling employed in a study of children's behavior on school playgrounds. For example, a study could be designed that purposefully set out to compare the behaviors and attitudes of the most and least active children in order to identify the type of equipment and environmental conditions that promote the highest activity levels.

### **Expectations for Methodological Transparency**

The choice to label one's research as mixed methods comes with an expectation for methodological transparency that is not applied to work that is satisfied with a multi-method label. This reflects the mandate to communicate the results of a study with enough precision and clarity to allow for reproducibility that is one of the defining features of science (Open Science Collaboration, 2015). Methodological transparency promotes replication by reporting details about the steps taken to complete data collection and data analysis, as well as in specifying which results came from the qualitative analysis and which came from the quantitative analysis.

The central role the documentation of methodological procedures plays in the ability to have confidence in the results of a study is evident in the most widely used evaluation framework for mixed methods research publications. That is a six-item set of evaluation criteria proposed by O'Cathain, Murphy, and Nicholl (2008) and referred to as the Good Reporting of a Mixed Methods Study (GRAMMS). The criteria identified in the GRAMMS specify dimensions of the methodological procedures that should be addressed.

The GRAMMS framework defines quality by stipulating explicit references in a publication to criteria related to different phases in the design and execution of a mixed method study. Two criteria are related to how a study is designed, one is related to sampling, one to an acknowledgment of limitations, and two to the process and product of mixing. The criteria in GRAMMS framework are paraphrased in Table 1.

**Table 1: Summary of the Criteria in the Good Reporting of a Mixed Methods Study (GRAMMS) Developed by O'Cathain, Murphy, and Nicholls (2008)**

Phase of the Research Process	GRAMMS Criterion
Design	Provides a justification or rationale for using a mixed methods approach.
	Specifies a mixed method design and identifies the timing of the qualitative and quantitative data collection and their priority.
Procedures	Describes the qualitative and quantitative methods for sampling, data collection, and analysis.
Mixing	Explains when and how mixing occurred.
	Explains the value-added of mixing.
Limitations	Describes the limitations of each method.

The GRAMMS offers a helpful set of guidelines for anyone trying to write up the results of a mixed methods study in a way that helps its readers understand how the results were derived and why they are significant. Its limitation is that the type of methodological transparency prescribed offers no assurance of the overall quality of the research and its results. It does not account, for example, for the very items that lead to why an article is cited by others. Most importantly, these include the innovative use of methods, the originality of the insight gained, or the potential of the results to make a significant contribution to what is known about a theory or phenomenon.

It is difficult to find a publication that simultaneously meets standards for transparency put forward by methodologists specializing in mixed methods research designs while demonstrating the type of innovation and originality that signals out the authors of a publication for unusual attention. The Willenberg et al. (2010) article about increasing physical activity on school playgrounds, for example, is innovative in its reporting about a mixed methods approach to visual methods and in providing research with such direct implications for practice. It would, however, score poorly on a rubric derived from an evaluation rubric, like the GRAMMS, that rests entirely on methodological transparency.

The discrepancy between the originality evident in the Willenberg et al. (2010) article and how poorly it would fare under an evaluation system that rests on mixed methods reporting standard can be attributed to its purposes and intended audience. Authors of the playground study had a content-oriented, rather than methodological purpose. All of the 29 items in the reference list are about playgrounds and children's activity

levels. They referenced no literature to support their methodological expertise, but nevertheless managed to demonstrate a creative and useful way to use a mixed methods approach that is well worth replicating.

The criteria in the GRAMMS mirror the authors' guidelines for the specialized, methodologically oriented *Journal of Mixed Methods Research*. Like the shared terminology, the guidelines provide a short hand for methodologically oriented readers to quickly pinpoint the contribution of an article. Manuscript writers targeting methodologically oriented journals or those writing with the purpose of highlighting innovative approaches using mixed methods, will extend the breadth of their audience by incorporating the expectations for methodological transparency evident in the GRAMMS.

### **Applying the Mixed Method Label**

The logic of mixing methods and types of data is inherent in many research approaches (Sandelowski, 2014) and, consequently, not a characteristic that is useful to identify them. Rather than to use it to signal the combination of multiple types of data when the multi-method label is most apt, affixing a mixed methods label to a publication is a way to declare that the logic of mixing is central to the purpose of the study and for understanding its conclusions. The mixed method label is helpful with the playground study because it communicates that mixing occurred through multiple stages of data collection and analysis and is essential to understanding the conclusions.

The intent to engage diverse viewpoints is consistent with Greene's (2007) mixed methods way of thinking and the paradigmatic assumptions of dialectical pluralism (Greene & Hall, 2010; Johnson & Schoonenboom, 2016). As noted above, dialectical pluralism is characterized by the belief that reality is multiple, constructed, and ever changing; a respect for diverse viewpoints and ways of knowing, and the motivation to pursue contradictory or unexpected results that is similar to an engagement with multiple, competing hypothesis that is so central to the scientific method. This affiliation negates the argument that a mixed methods approach involves a type of paradigm mixing that is intellectually dishonest. It also challenges the long standing framing of mixed methods as best understood simply as the combination of qualitative and quantitative approach.

Research methods and practice are ever changing (Hesse-Biber, 2010). Adopting the logic that mixed methods produces a synergy or a quality that is unique beyond its qualitative and quantitative components makes it possible to be open to new and innovative approaches to defining it. It creates an openness to the possibility of mixing two types of qualitative data, that is different from a mindset that, as Creswell (2011)

has suggested, a method like content analysis cannot be mixed methods because it begins with data that is entirely in the form of words. It also downplays the binary logic that questions the appropriateness of applying a mixed methods label to a report of a set of results that emerged unexpectedly. This kind of definitional adaptability is consistent with Guest's (2012) proposal that a mixed methods label may be a helpful way to understand a series of inter-linked publications from a larger research project, even when it is not reflected in an individual publication.

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