Leveraging an Integrated Visual Display for Case-Based Analysis in Mixed Method Research

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Abstract
A case-based visual display can serve as method for analysis in mixed method research. This methodological article builds an argument for the role that a matrix, diagram, table, or figure can play when used interactively to generate, elaborate, or confirm analytical insight in a case-based analysis in mixed methods research. The article provides an in-depth exploration of two visual methods: timelining and mapping. Timelining adds dimensionality through investigating a temporal sequence, while a mapping activity can do the same with the understanding of physical locations. Both types of visual displays can enhance validity by providing a way to engage qualitative and quantitative data iteratively and dialectically during analysis. The necessity to pursue dissonance that often arises from integrating qualitative and quantitative results is one signal of the complexity of the examples reviewed. The examples support the argument that a visual display that integrates data from different sources iteratively and dialectically is an analytical strategy unique to mixed methods.

Keywords
dissonance, mixed methods, mixed methods research, joint display, visual methods, timelining, mapping, case-based analysis, integration, mixed analytical procedures

Introduction
The use of visualizations is positioned as a critical step in the analytical process in both qualitative (Miles & Huberman, 1994) and mixed method research (Onwuegbuzie & Teddlie, 2003). A “is a visual format that presents information systematically, so the user can draw valid conclusions and take needed action” (Miles & Huberman, 1994, p. 91). Visual display is an inclusive term that includes all manner of images like photographs, diagrams, tables, and figures. Attention narrows in mixed methods to a type of visual display referred to as a joint display. Conventionally, a joint display has been defined as a figure or table that contains both qualitative and quantitative data (Guetterman et al., 2015). In conventional definitions, a joint display arrays and sometimes links qualitative and quantitative data about the same constructs, research question, or themes (Guetterman et al., 2015; McCrudden et al., 2015; Plano Clark & Sanders, 2015). The word “joint” in joint display narrows its purpose to quantitative and qualitative data. By contrast, I adapt the terminology an “integrated visual display” to tables and figures that are arranged in such a way as to promote dialectical engagement between two or more sources of data in ways that generate new hypotheses and insight. Like a joint display, it promotes purposeful interaction between data or findings from more than one analytical procedure. This more expansive definition embraces the idea that it is possible to integrate data from multiple qualitative or quantitative analytical procedures.

A visual display can contribute to developing as well as supporting the conclusions of a study (Maxwell, Chmiel, & Rogers, 2015). Buckley & Waring (2013) expand the discussion about visual displays by noting their multiple functions: “Diagrams, pictures, images, photographs,
conceptual maps, matrices, tables, and charts not only serve as visual representation of what is being discovered through analysis but also as generative/analytical techniques and communicative tools” (p.149). That means the visual display is not just a summative representation of what has been discovered but can also serve a formative purpose (E. G. Creamer, 2018; E. Creamer & Edwards, 2019) by providing a research tool that helps analysts to generate new analytical and theoretical insight (Buckley & Waring, 2013; Shannon-Baker & Edwards, 2018). As an example, the iterative process of constructing a visual can reveal elements that are key to theory development or refinement by providing information about the sequencing of events, relationships among constructs, connections between a social process and outcomes, and conditions in the environment that influence them (Weick, 1995). A summative display, on the other hand, might be a metaphorical display that depicts the product of that investigation through an analogy.

In mixed methods, case-based analysis provides an effective way to link qualitative and quantitative data in a narrative or visualization (Bazeley, 2018). Long a proponent for prioritizing integration as the feature that distinguishes mixed method research, Australian Pat Bazeley views case-based analysis as a lynchpin of integration. She writes: “Each case holds data from different sources and different types together, thus cases provide the lynchpin for integration of data” (2018, p. 26). A case-based visualization might, for example, include different types of data about an individual or group as might be done to understand the differences between those who benefited or failed to benefit from an intervention. Case-based analysis requires a larger sample size than is typical for case study research, where the sample size can be as small as one. Whether in a narrative or as a visual, the process of constructing a case by merging data from multiple sources helps the researcher move away from raw data, to view a phenomenon holistically, and to identify and confirm patterns that might be suggested through the cross-case comparison.

**Purpose**

The purpose of this methodological paper that uses secondary data is to explore examples of a visual display in the form of a matrix, diagram, figure or table that were used during analysis in conjunction with case-based analysis in a mixed method study. Each of the examples could be considered an intrinsic case in that they could well be one of a kind. They were purposefully selected and singled out for their originality. A secondary purpose is to build an argument for the role a visual display can serve in developing and/or elaborating analytical and conceptual insight by extending the view of core phenomenon in a multi-dimensional way (E. G. Creamer, 2021). Fielding describes this as analytic density Fielding (2009, 2012). It refers to the potential to build the type of multi-dimensional conceptual understanding of social phenomenon that is essential to the iterative process of building knowledge in a scientific way (Fielding, 2012). I explore the role of a visual display in the form of a procedural diagram (E. G. Creamer, 2020) or as a tool to warrant the conclusion of a study elsewhere (E. G. Creamer, 2021). The aim of this methodological commentary is to inspire other investigators to adapt visual displays to further analytic insight in their own projects.

**Organization of the Manuscript**

The article is organized in four sections. The first was the introduction. The second further fleshes out information about the use of visual displays to integrate qualitative and quantitative data, including through timelining and mapping. A table appears in this section that introduces eight examples of mixed methods studies that used a visual display with case-based analysis. The next two sections use examples to illustrate the use of timelining and mapping as procedures with case-based analysis. The final section summarizes the value added of these types of visual displays.

**Integrated Visual Displays That Advance Case-Based Analysis**

Visualizations are developed, analyzed, and/or disseminated to examine specific phenomenon in visual methods (Prosser, 2007). These can include photo, video, and other images, as well as a matrix, diagram, figure, or table used as tools in research. In writing about the use of visual methods with mixed methods, Shannon-Baker & Edwards (2018) conceptualized visuals in four different categories, depending on when and how they are used in the research: (a) when pre-existing visuals like an image, diagram, map or photo are used as data; (b) when visuals are created as a form of data to be used in analysis, (c) when visuals are created in the process of doing analysis, and (d) when visuals are created to report research findings. In practice, the categories overlap. This is the case, for example, when a visual like a timeline is used both to collect data and as the unit for a case-based analysis.

Two types of integrated visual displays that promote interactive engagement between different types of data have been used most widely in mixed methods research with a case-based approach to analysis: mapping and timelining. Both are often hand drawn initially. Each adds dimensionality to understanding of a core phenomenon. Mapping has been used with place-based research where there is a geographical/space dimension. “Maps provide a visual representation of the spatial dynamics of a social phenomenon or process” (Rucks-Ahidiana & Bierbaum, 2015, p. 99). They can also be used to trace a story line that has a temporal dimension (Birks & Mills, 2015). Timelining adds dimensionality by considering a time dimension. These can be completed with a participant at one or multiple points of time. A timeline can layer events from the past, present, and future. Although they serve other purposes...
as well, timelining and mapping are frequently used with a participatory approach to data collection that is particularly effective with groups of participants from marginalized populations. For example, Teixeira (2014) used a participatory photo mapping activity with youth to tour urban environments during data collection. Her goal was to explore the link between violence and abandoned properties.

Table 1 lists eight purposefully selected mixed method articles that are illustrative of different ways that a visual display has been used with case-based analysis. This is a specialized sub-set of a wider set of mixed method articles using a visual display during the analytical process. The joint displays used by Haynes-Brown & Fetters, 2021 are singular in that they not only juxtaposed a bar graph with text from observations, but that each case consisted of a cluster of examples. Regrettably, only three of the sets of authors (i.e., Catallo et al., 2012; Davis & Baulch, 2011; Haynes-Brown & Fetters, 2021) included an example of one of the integrated displays they constructed in their article.

Table 1 includes information about the authors, year of publication, academic disciplines, unit of analysis, type of visual display, and the analytical purpose it served. Five of these used a visual display as part of participatory data collection procedures. Information in the table shows the diversity of academic areas where visual displays were adapted as part of a mixed methods study. What the examples have in common is that the visual was instrumental to advancing analytical insight by providing a way to engage qualitative and quantitative data in ways that produced synergetic outcomes. Although adaptable to other settings, each visual display could be considered idiosyncratic in that it is the product of a unique research context.

The examples listed in Table 1 mirror the type of complexity sensitive mixed method research Poth explores Poth (2018, 2020). This complexity is reflected in five different ways. First, multi-dimensionality is embedded in the integrated visual display used in each of the examples listed in Table 1 because all set out to understand interconnectivity between contextual factors and individual behavior. Four of the eight articles used a unit of analysis that extends beyond the individual to consider wider community and societal contexts. A second indicator of complexity is that all but the final example that seemed to “force” a pre-existing theoretical framework, is that all directly engaged unexpected findings or gaps or silences in their data. A third indicator of the potential of these types of integrated displays related to complexity is that the integrated display contributed original insight. In two cases, the process of integration achieved through the integrated display revealed noteworthy limitations in the analysis of the data and the inferences drawn from them.

The next sections further explore ways that timelining and mapping activities can or have been used with case-based analysis in mixed methods research.

### Using Timelining to Construct an Integrated Visual Display

Timelines or lifelines are generally cast as a qualitative data collection method but are readily adaptable to an approach that integrates qualitative and quantitative data in a two-dimensional space. Timelining activities are used more widely with adults than other types of drawing and diagramming procedures (Chamberlain et al., 2011). Timelining...
can be used as a participatory graphic elicitation method that encourages the construction of rich, time-ordered narratives of peoples’ life and experiences that is accomplished through diagramming or sketching combined with an open-ended interview (Chamberlain et al., 2011). The act of creating the diagram and annotating it can shrink the emotional and physical distance between the researcher and participant (Chamberlain et al., 2011) in ways that enhance the quality of the data. These can be used with the life-course perspective or event analysis where the purpose is to identify key transition and turning points.

A timeline used during data collection or analysis can have both a vertical and a horizontal axis (Bravington & King, 2018). Data collection can occur at a single point of time or the timelines can be constructed over the course of several interactions that are designed to generate conversation about key transition points. When assembled over more than one sitting, they have the potential to generate insight about shifts in viewpoint that occur with time. Events in data collected through a timeline are often quantified for the presence or absence of key transitions. A more sophisticated use of a timeline is when it is constructed by a researcher who has the benefit of longitudinal qualitative data to trace changes in attitudes or behavior over time.

In the examples of using timelining as a visual with a case-based analysis, one reason that a visual display advanced analytical insight is that it promoted further exploration of dissonant or unexpected findings or gaps and silences in the data. A visual display exposed theoretically meaningful dissonance in two of the examples listed in Table 1 that used timelining (i.e., Davis & Baulch, 2011; Jones & Kafetsios, 2005). In the third case involving the study of partner violence, the authors turned to a timelining activity to explain dissonance they encountered between their qualitative observations and quantitative measures partner violence (i.e., Catallo et al., 2012). The refusal to disregard dissonance is one signal of the complexity of each of these three studies.

**An Example of a Visual Display That Used Timelining as the Basis of a Case-Based Analysis**

An international team of researchers involved in a large-scale, longitudinal study about changes in the poverty status in communities in rural Bangladesh (Davis & Baulch, 2011) created an innovative approach to timelining to reconcile their conviction that a long-standing quantitative index of poverty based on expenditures presented an overly optimistic indicator of poverty. The conventional index pointed to an improvement in economic status, while the investigators had confidence in their qualitative data that presented a more pessimistic conclusion.

Davis & Baulch (2011) constructed a case-based timeline for each participant to track the changing poverty status of participants over almost several decades. The figure included a graph line that traced the ups and downs of each participants poverty status at different points of time. The graph line was annotated with comments from interviews with participants to explain ups and downs in the graph line that revealed how fragile these lives were and how a single, unexpected event could propel a person living on the margins back into poverty. Analytical procedures that combined qualitative and quantitative indicators provided evidence to warrant the effectiveness of a more nuanced and multi-dimensional way to measure economic well-being.

Davis & Baulch (2011) further integrated their qualitative and quantitative data through an innovative approach to quantifying the trajectory of a timeline. These authors created a creative set of symbols to depict the overall path of the trajectory in each timeline. A negative trajectory was one where a family’s economic conditions was declining. Other trajectories included a relatively stable path, an uneven one that had its ups and downs, and a positive trajectory where family conditions improved. Symbols in the joint display reflect both the direction (declining, stable, improving) of the graph line, as well as if the progression was an even or uneven one. For example, different patterns in a negative trajectory included a fairly steep and steady decline over time, as compared to a more sudden decline that might have been precipitated by a single event like the death of the head of household.

Table 2 reproduces (with copyright permission) the joint display from Davis & Baulch (2011, Table 7, p. 126) that presents a system of symbols to embody what they refer to as common life trajectory patterns in their data. The number of cases in each category and the weight that was given to those cases in the quantitative analysis is also reported in the joint display. In subsequent analysis, the researchers tested multiple possible alternative explanations to come up with the measure of poverty that most accurately fit the trajectories.

The idea of creating a set of symbols to quantify the trajectory of a timeline could well be useful to others. A similar approach to quantifying timelines could be applied to graphs of other types of transitions that might be graphed across intervals of time, including activity level, key decision points in the choice of a career, development of a skill like with a musical instrument, or recovery from illness or addiction, to name only a few possibilities.

**An Example Where an Integrated Visual Display and Timelining Exposed Gaps or Silences**

The alignment of data from different sources on similar or related constructs in an integrated visual can, on occasion, expose gaps or silences in the data. This is evident, for example, in the work of a feminist geographer (i.e., Rocheleau, 1995) who sought to expose ways that conventional measures,
like land use patterns, conceals women’s labor. Gaps could refer to what participants do not explicitly articulate but that is revealed in other data. It could also be manifested during research using observation where a gap emerges between what a participant is observed doing and their response on a survey instrument. In other cases, the juxtaposition of data in an integrated visual display can supply enough data to support alternative conclusions than those reached by the researchers or point to limitations that might not otherwise be detectable.

In a longitudinal, mixed method study of the process of caregiving of the elderly among Mexican American families that used a life-course perspective, Evans et al. (2011a; Evans et al., 2016, 2011b; Evans et al., 2009) collected data from a caregiver with a timeline over four points of time. Their aim was both proactive and practical in that they hoped to pinpoint events that lead to nursing home admission and to more fully understand care-giver burden within a Mexican American cultural context.

Consulting the cluster of articles this team produced about the project that gave access to more data exposed limitations to the research that was not evident from the single article that explored the project as a mixed method one (E. G. Creamer et al., 2020). One article departed from their central theme of caregiving as a collective act by exploring exceptions to the trend of caregivers as female by delving into the case of two men who “violated a taboo” by serving as the primary caregiver to their elderly mother (i.e., Evans et al., 2011b). Despite its good intentions, a gap or silence in this research is the voice of the mother receiving caregiving, as well as the contribution of family members other than the primary caregiver.

In their exploration of two exceptions, Evans et al. (2011b) noted a gap between a participant’s quantitative scores on measures of burden, general well-being, and depression, among other things, and interview data. Speaking of one participant they referred to as Salvador, the authors noted the gap between the quantitative and qualitative data when they observed: “Remarkably, there is little interview evidence that strain or burden of care was an issue and the words themselves are never used” Evans et al. (2011b, p. 243). These authors suggest that cultural context and that expectation to care for family that is part of machismo might be part of the explanation in that the participant emphasized but they largely leave the task of explaining the gap to the reader. Other explanations are possible than those considered by the investigators, including that the wife and children were shouldering a big burden of care despite the protestations of the participant and the cheerful image he projected. The investigators acknowledged the authoritarianism implicit in some descriptions of events but seemed unaware of the participant’s over-riding self-congratulatory tone.

Evans et al. (2009, 2011a, 2011b, 2016) did not include an example of an integrated visual display in their articles. Figure 1 imagines an integrated visual display that could have been created for each caregiving unit. It plots scores on three of the five scales used and imagines the type of data that might have been collected at each point in time the timeline was constructed.

One big advantage of the integrated visual display shown in Figure 1 is that it provides a quick snapshot of the data in a way that exposes, rather than downplays, differences between the quantitative and qualitative data, as well as possibly

| Table 2. Quantifying Timeline Trajectories from Davis and Baulch (2011, p. 126). |
|---------------------------------|-----------------|-----------------|--------------------------|
| **Direction** | **Pattern** | **Depiction** | **Number of cases** | **Weighted percent of cases** |
| Stable | Smooth | | 8 | 1.47 |
| Improving | Smooth | | 3 | 1.43 |
| Declining | Smooth | | 2 | 0.36 |
| Stable | Saw-tooth | | 135 | 44.98 |
| Improving | Saw-tooth | | 76 | 26.15 |
| Declining | Saw-tooth | | 30 | 6.90 |
| Declining | Single-step | | 2 | 0.48 |
| Declining | Multi-step | | 37 | 18.22 |
| Total | | | 293 | 100 |

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limitations in the data or analysis. The display could generate new ideas for avenues to further explore the data. In this case, the proximity of the data from different sources in a visual display might have led the investigators to question their own conviction about this case as defying expectations for machismo.

**Integrated Visuals Displays Involving Different Types of Mapping Activities**

Maps extend the understanding of multi-dimensionality, including those associated with a physical location like a private or public space (e.g., library, public garden, or park). Like timelines, maps can be hand drawn by participants, by an investigator, or they can be constructed or co-constructed during data collection. Participatory photo mapping (PPM) is one type of graphic elicitation method. It integrates photography, community mapping, and walk-along interviews to learn about people’s experiences in a spatial context (Teixiera, 2014). Mixed methods photo elicitation has been used with the multi-dimensional scaling feature of qualitative software (e.g., Peroff et al., 2020). This type of data collection strategy joins other participatory approaches in setting out to promote authentic, culturally sensitive exchanges with youth, marginalized populations like the homeless or disabled, and/or with groups with limited verbal skills.

A key step to meaningfully integrate data in a mixed methods study involves the construction of a database,
spreadsheet, or matrix that merges different types of data on key constructs (Bazeley, 2018; Creswell & Plano, 2011). Two publications produced by Teixiera (2014, 2016) illustrate how this can be accomplished with qualitative software. Teixiera collected multiple types of data in participatory photo mapping activity that was designed to explore adolescents’ attitudes about urban neighborhoods where they lived. Teixiera created a multi-dimensional data base that included photos taken by youths, fi eld notes taken by the researcher during a walk-about, interview data, and geospatial coordinates that marked the location of each photograph. Adapting language from Knigge & Cope (2006) by referring to it as a grounded visualization, the database made it possible for her to generate themes or hypotheses about her data by toggling back and forth interactively between her many data points.

Figure 2 offers a hypothetical example to further illustrate how different types of data about a case can be arranged in a matrix in a way that seeds an active dialogue among different sources of data. The fi gure represents an example of how a researcher could use an integrated visual display that fi ts the second purpose identifi ed by Shannon-Baker & Edwards (2018). That is, it is a visual display that I created as a form of data matrix to launch a case-based analysis in a hypothetical research project comparing how public spaces in a college library are used by students to collaborate on team projects.

One of the qualities that is unusual about this visual display that is in the form of a matrix is that it aligns data in a way that generates ideas for further analysis. It includes three types of data: qualitative data consisting of fi ndings from the analysis of interviews with student users; visual images in the form of a blueprint of a floor of a library and a photograph of a space set aside in a library for students to work together; and quantitative data in the form of a student satisfaction score and a measure how often the space is occupied by study groups. Other quantitative indicators in this hypothetical example relate to accessibility (distance from an exit) and a measure of average sound level across different periods of time during the day and evening.

In the example of the study of space usage in a library, there are multiple ways analysis could be pursued once a data set had been assembled with qualitative, quantitative, and visual data from multiple locations. The juxtaposition of the data in a format that resembles a matrix invites the researcher to actively interrogate the data. This could be to explore hypothesis generated from an understanding of the literature or from fi ndings that emerge as the different types of data are juxtaposed. In the example in Figure 1, knowing that the topic of access and the issue of sound, trafﬁ c, and distractions appeared in the interview data, an investigator could use statistical procedures to test the link between the location of the collaborative unit and its nearness to the bathrooms, exits, or help desk. An abductive stance could be adapted where multiple such options are tested and only the most promising pursued.

**Value-Added of Visual Displays With Case-Based Analysis**

Some evidence of the value-added of visual displays to analytic density can be gleaned from the results and conclusions of the studies listed in Table 1. As noted in the right column in that table, fi ve of eight could be described as achieving “rupture theorizing” in that their results challenged widely used instruments or long-standing theoretical assumptions. Walsh (2014) characterized rupture theorizing as producing an explanatory framework by introducing new constructs or ones that have previously been understudied. For example, Jones & Kafetsios (2005) refuted the theoretical assumption that there is a linear relationship between the frequency of exposure to war-related bombings and trauma among adolescents. They introduced habituation as a theoretical construct to explain why this theoretical assumption did not hold up for the
adolescents they studied. Davis & Baulch (2011) challenged a long-standing measure that economists had relied on previously to calculate poverty status among rural poor that is based on a single indicator of expenditures. They tested multiple possible ways to calculate poverty status before settling on a new multi-dimensional measure that added consideration of land and livestock ownership. Each of these investigators adapted their research design to respond to the dissonance they encountered unexpectedly between their findings and the theoretical frameworks they were employing. All bring to the foreground that one of the benefits of mixed methods may be its flexibility in adapting to not only to complexity in the environment and between collaborators, but also to pursue paradoxical findings.

Discussion

It has been the goal of this article to explore ways that an integrated visual display can advance data collection and analysis in a case-based analysis that leverages a multi-dimensional approach to understand a core phenomenon or social process. I have opted to refer to these as integrated visuals displays, rather than joint displays, to be more inclusive of examples that incorporate more than two sources of data that could consist not only of words, numbers, and images, but also links to auditory and sensory data. An integrated display can provide a platform for a back and forth, dialectical exchange that moves between an exploratory, abductive, and confirmatory inquiry stance. The movement between exploration and confirmation during analysis is not unique to mixed methods, but common to all research approaches (Sandelowski, 2014). This approach to a visual display is far different than a joint display that simply features unprocessed raw data. Davis & Baulch (2011) epitomize the use of an integrated display for analysis. They synthesized interview data collected from many participants at multiple points of time into a summative timeline that they annotated to reveal key transitions in changing economic well-being that revealed new insight about how to understand poverty in rural settings in Bangladesh.

With a sample size that exceeds what is generally found in case study research, case-based analysis achieved through a joint display or an integrative visual display can advance analytical insight by encouraging researchers to frame their research in multi-dimensional ways that considers individual behavior or social processes within an inter-related set of contextual environments. Timelining adds multi-dimensionality by considering temporality. Different types of mapping activities add dimensionality by analyzing the interplay of individual behavior within the context of a defined space, like a public park or community garden.

Failure to address theoretically meaningful gaps, silences, or dissonance introduced by integrating data in a case-based visual display cripples the validity of findings. It is a way of avoiding complexity. Of this, Poth observed: “Many researchers remain constrained by their attempts to reduce, control, or simply ignore the effects of complexity rather than embodying complexity and embracing adaptive practices” (C. N. Poth, 2020, p. 29). Unexpected, contradictory, or even counter intuitive findings that inevitably emerge when different types of data about similar or overlapping constructs are integrated, may require additional resources, expertise, or time that is simply not available to the researcher.

Interpreting evidence that is both confirmatory and contradictory and the complexity it introduces is one of the major challenges of a dialectical approach to mixed methods (Cronenberg, 2020). The failure to recognize or pursue gaps in the data can raise questions about the validity of the conclusions drawn. This kind of oversight is evident in three of the articles used as examples in this article (i.e., Evans et al., 2011a; Haynes-Brown & Fetters, 2021; Teixeira, 2016; Walsh, 2014). Evans et al. (2011a) noted but offered no explanation for the gap between scores on quantitative indicators that suggested deleterious psychological and physical effects and the glowing remarks made by two male outliers praised for their willingness to provide care for their elderly mothers. Similarly, Haynes-Brown & Fetters, 2021 noted that teachers’ attitudes and behavior did not always coincide without offering any substantive explanation for when and why this was the case. This same avoidance of the complexity introduced by dissonance is evident in a single, telling sentence in a second article by Teixeira (2016). She acknowledged that her adolescent participants were uneasy with the negativity associated with the language of the “broken windows” theoretical framework that she adopted (p. 581). Possibly habituated to their urban environment, Teixeira acknowledged (2016) that her participants did not ascribe to the idea that there was a relationship between abandoned buildings and neighborhood violence. In all cases, avoiding the complexity introduced by dissonance between findings emerging from the analysis of different types of data can shake confidence in validity by introducing the suspicion that the author(s) is forcing a theoretical framework or preconceptions on the data.

Limitations

Several limitations should be noted in the way that integrated visual displays have been addressed in this paper. The discussion has concentrated on two types of displays—mapping and timelining—largely because I have been able to locate robust examples identified in the methodological literature that illustrate the type of dialectical engagement that is associated with a fully integrated mixed method design. The list of examples is a purposeful one in that it is limited to those that were used in service of a case-based analysis. Social network maps and concept maps are other types of visual displays that could be associated with case-based
analysis. As compared to other methodological analyses that synthesize information about joint display by cataloging features without the benefit of considering the wider context of the article, the observations presented here offer understanding of the wider context of the research project as presented in one or more articles.

**Conclusion**

I set out in the methodological commentary with the aim of encouraging the use of visual displays in creative, yet systematic ways that lead to original analytical insight. There are multiple ways an integrated visual display used as method of analysis might advance thinking from the simply descriptive to the more analytical and theoretical and to contribute to validity of its conclusions. Although these have not yet been tested through a systematic review of the literature, my suggestions about how an integrated display used interactively can advance analytical thinking include the following:

1. Abstract a large amount of data in a succinct format.
2. Promote multi-dimensional thinking.
3. Align data in a way that makes it possible to see patterns and relationships.
4. Reveal facets of a phenomenon not likely to be apparent to participants.
5. Provide a platform for abductive reasoning and the consideration of alternative explanations.
6. Expose gaps, silences, and limitations in the data.
7. Reveal dissonance between data sources.
8. Supply an explanation for group or cohort differences.
9. Generate an opportunity for substantive interaction among team members and encourage consideration of multiple perspectives, including from those unfamiliar with the data.
10. Offset confirmatory bias and forcing preconceptions on the data.

Discussion of integrated displays has become increasingly prominent in the methodological literature about mixed methods. The type of synergistic exchange that is possible when an integrated visual display is arrayed in such a way that it reveals new dimensions of a core phenomenon or social process is characteristic of more sophisticated mixed method research that is responsive to complex, multi-layered, and theoretical research questions. With increased attention, it seems likely that joint and integrated visual displays will gain increasing recognition, not just as a feature of reporting, but as a distinct mixed method analytical procedure.

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**References**

Bazeley, P. (2018). *Integrating analyses in mixed methods research*. SAGE.

Birks, M., & Mills, J. (2015). *Grounded theory: A practical guide* (2nd ed.). Sage.

Bravington, A., & King, N. (2018). Putting graphic elicitation into practice: Tools and typologies for the use of participant-led diagrams in qualitative research interviews. *Qualitative Research*, 19(5), 502–523.

Buckley, C. A., & Waring, M. J. (2013). Using diagrams to support the research process: Examples from grounded theory. *Qualitative Research*, 13(2), 148–172.

Carmona, M. (2015). Re-theorizing contemporary public space: A new narrative and a new normative. *Journal of Urbanism*, 8(4), 373–405.

Catallo, C., Ciliska, D., & MacMillan, H. L. (2012). Minimizing the risk of intrusion: A grounded theory of intimate partner violence disclosure in emergency departments. *Journal Of Creamer*, 69(6), 1366–1376.

Chamberlain, K., Cain, T., Sheridan, J., & Dupuis, A. (2011). Pluralism in qualitative research: From multiple methods to integrated methods. *Qualitative Research in Psychology*, 8(2), 151–169.

Creamer, E. G. (2018). *An introduction to fully integrated mixed method research*. Sage.

Creamer, E. G. (2020). Visualizing dynamic fully integrated mixed method designs. *International Journal of Multiple Research Approaches*, 12(1), 1–13.

Creamer, E. G. (2021). *Advancing grounded theory with mixed methods*. Routledge.

Creamer, E., & Edwards, C. (2019). Embedding the dialogic in mixed method approaches to theory development. *International Journal of Research & Method in Education*, 42(3), 239–251.

Creamer, E. G., Guetterman, T., Gova, I., & Fetters, M. (2020). Challenging procedures used in systematic reviews by promoting a case-based approach to the analysis of qualitative methods in nursing trials. *Nursing Inquiry*, 28(2), e12393.  
https://doi.org/10.1111/nin.12393.

Creswell, J. W., & Plano, C. V. (2011). *Designing and conducting mixed methods research* (3rd ed.). Sage.

Cronenberg, S. (2020). *Paradigm parley: A framework for the dialectic stance*. *Journal of Mixed Methods Research*, 14(10), 26–46.

Davis, P., & Baulch, B. (2011). Parallel realities: Exploring poverty dynamics using mixed methods in rural Bangladesh. *Journal of Development Studies*, 47(1), 118–142.
Evans, B. C., Belyea, M. J., & Ume, E. (2011b). Mexican American males providing personal care for their mothers. Hispanic Journal of Behavioral Sciences, 33(2), 234–260.

Evans, B. C., Coon, D. W., Belyea, M. J., & Ume, E. (2016). Collective care: Multiple caregivers and multiple care recipients in Mexican American families. Journal of Transcultural Nursing, 28(4), 398–407.

Evans, B. C., Coon, D. W., & Ume, E. (2011a). Use of theoretical frameworks as a pragmatic guide for mixed methods studies: A methodological necessity. Journal of Mixed Methods Research, 5(4), 276–292.

Evans, B. C., Crogan, N., Belyea, M., & Coon, D. (2009). Utility of the life course perspective in research with Mexican American caregivers with older adults. Journal of Transcultural Nursing, 20(1), 5–14.

Fielding, N. G. (2009). Going out on a limb: Postmodernism and multiple method research. Current Sociology, 57(3), 427–447.

Fielding, N. G. (2012). Triangulation and mixed methods designs: Data integration with new research technologies. Journal of Mixed Methods Research, 6(2), 124–136.

Guetterman, T. C., Fetters, M. D., & Creswell, J. W. (2015). Integrating quantitative and qualitative results in health science mixed method research through joint displays. Annals of Family Medicine, 13(6), 554–561.

Haynes-Brown, T. K., & Fetters, M. D. (2021). Using joint display as an analytic process: An illustration using bar graphs joint display from a mixed methods study of how beliefs shape secondary school teachers’ use of technology. International Journal of Qualitative Methods, 20(1), 1-14.

Jones, L., & Kafetsios, K. (2005). Exposure to political violence and psychological well-being in Bosnian adolescents: A mixed method approach. Clinical Child Psychology and Psychiatry, 10(2), 157–176.

Knigge, L., & Cope, M. (2006). Grounded visualization: Integrating the analysis of qualitative and quantitative data through grounded theory and visualizations. Environment and Planning, 38(11), 2021–2037.

Maxwell, J., Chmiel, M., & Rogers, S. E. (2015). Designing integration in multimethod and mixed methods research. In S. Hesse-Biber & R. B. Johnson (Eds.), The oxford handbook of multimethod and mixed methods research inquiry (pp. 223–239). Sage.

McCruden, M. T., Schraw, G., & Buckendahl, C. W. (2015). Use of visual displays in research and testing. Information Age Publishing.

Miles, M. B., & Huberman, A. M. (1994). An expanded sourcebook: Qualitative data analysis (2nd ed.). Sage.

Onwuegbuzie, A. J., & Teddlie, C. (2003). A framework for analyzing data in mixed methods research. In A. Tashakkori, & C. Teddlie (Eds.), Handbook of mixed methods in social and behavioral research (pp. 351–383). Sage.

Peroff, D. M., Morais, D. B., Seekamp, E., Sills, E., & Wallace, T. (2020). Assessing residents’ place attachment to the Guatemalan Maya landscape through mixed methods photo elicitation. Journal of Mixed Methods Research, 14(3), 379–402.

Plano Clark, V. L., & Sanders, K. (2015). The use of visual displays in mixed methods research: Strategies for effectively integrating quantitative and qualitative components of a study. In M. T. McCrudden, G. Schraw, & C. Buckendahl (Eds.), Use of visual displays in research and testing: Coding, interpreting, and reporting data (pp. 177–206). Information Age Publishing.

Poth, C. (2018). The curious case of complexity: Implications for mixed methods research practices. International Journal of Multiple Research Approaches, 10(1), 403–411.

Poth, C. N. (2020). Confronting complex problems with adaptive mixed methods research practices. Caribbean Journal of Mixed Methods Research, 1(1), 29–46.

Prosser, J. (2007). Visual methods and the visual culture of schools. Visual Studies, 22(1), 13–30.

Rochleau, D. (1995). Maps, numbers, text, and context: Mixing methods in feminist political ecology. The Professional Geographer, 47(4), 458–466.

Rucks-Ahidiana, Z., & Bierbaum, A. H. (2015). Qualitative spaces: Integrating spatial analysis for a mixed methods approach. International Journal of Qualitative Methods, 14(2), 92–103.

Sandelowski, M. (2014). Unmixing mixed-methods research. Research in Nursing & Health, 37(1), 3–8.

Shannon-Baker, P., & Edwards, C. (2018). The affordances and challenges to incorporating visuals methods in mixed methods research. American Behavioral Scientist, 62(7), 935–955.

Teixeira, S. (2014). It seems like no one care: Participatory photo mapping to understand youth perspectives on property vacancy. Journal of Adolescent Research, 30(3), 390–414.

Teixeira, S. (2016). Beyond broken windows: Youth perspectives on housing abandonment and its impact on individual and community well-being. Child Indicators of Research, 9(3), 582–607.

Walsh, I. (2014). A strategic path to study IT use through users’ IT culture and IT needs: A mixed-method grounded theory. The Journal of Strategic Information Systems, 23(2), 146–173.

Weick, K. E. (1995). What theory is not, theorizing is. Administrative Science Quarterly, 40(3), 290–385.