Diagrammatic Elicitation: Defining the Use of Diagrams in Data Collection

Muriah Umoquit
University Health Network, muriahp@gmail.ca

Peggy Tso
University of Toronto, peggy.t@gmail.com

Tünde Varga-Atkins
University of Liverpool, tva@liverpool.ca.uk

Mark O'Brien
University of Liverpool, mtobrien@liverpool.ac.uk

Johannes Wheeldon
Norwich University, jwheeldon@gmai.com

Diagrammatic Elicitation: Defining the Use of Diagrams in Data Collection

Abstract

The use of graphic representations of experience and the social environment in the data collection process is an emerging approach. The terms diagramming, mapping and drawing are often used interchangeably, with no common interdisciplinary understanding of what they mean. The lack of a unifying terminology has resulted in simultaneous but separate developments undermining a more coherent approach to this emergent method. By defining what a diagram is and examining where diagramming fits amongst other data collection approaches, this paper proposes the term diagrammatic elicitation to refer to the use of diagrams in the data collection process. Two subcategories of this approach include: (a) participant - led diagrammatic elicitation, where participants create original diagrams and (b) researcher - led diagrammatic elicitation, where the researcher draws the diagram during the data collection process for discussion or participants edit a researcher - prepared diagram. Establishing these terms will allow researchers to share best practice and developments across disciplines.

Keywords

Data Collection, Diagram, Drawings, Diagrammatic Elicitation, Concept Maps, Elicitation, Focus Groups, Interviews, Mind Maps, Qualitative Methodology, Tables, Visuals, Visual Methods

Creative Commons License

Diagrammatic Elicitation:
Defining the Use of Diagrams in Data Collection

Muriah Umoquit
University Health Network, Toronto, Ontario Canada

Peggy Tso
University of Toronto, Toronto, Ontario Canada

Tünde Varga-Atkins and Mark O'Brien
University of Liverpool, United Kingdom

Johannes Wheeldon
Norwich University, Vermont USA

The use of graphic representations of experience and the social environment in the data collection process is an emerging approach. The terms diagramming, mapping and drawing are often used interchangeably, with no common interdisciplinary understanding of what they mean. The lack of a unifying terminology has resulted in simultaneous but separate developments undermining a more coherent approach to this emergent method. By defining what a diagram is and examining where diagramming fits amongst other data collection approaches, this paper proposes the term diagrammatic elicitation to refer to the use of diagrams in the data collection process. Two subcategories of this approach include: (a) participant-led diagrammatic elicitation, where participants create original diagrams and (b) researcher-led diagrammatic elicitation, where the researcher draws the diagram during the data collection process for discussion or participants edit a researcher-prepared diagram. Establishing these terms will allow researchers to share best practice and developments across disciplines. Keywords: Data Collection, Diagram, Drawings, Diagrammatic Elicitation, Concept Maps, Elicitation, Focus Groups, Interviews, Mind Maps, Qualitative Methodology, Tables, Visuals, Visual Methods

Introduction

A recent extensive systematic review (Umoquit, Tso, Burchett, & Dobrow, 2011) found that over 80 published articles discussed some form of diagramming as a data collection approach, with the majority being published after 2000 and a significant rise after 2006. This finding is consistent with the work of Nesbit and Adescope (2006), whose review indicated a steady rise of concept and knowledge maps in the experimental and quasi-experimental studies looking at the use of diagrams for learning. In this article, we consider that *data collection* implies the process of gathering, co-creating data between the participant and researcher. We argue diagrams can be either the end product of the research (i.e., with no other kinds of data collected- or analyzed-only the diagram) or the subject of further discussion, for instance, in an interview (i.e., with the data being the interview transcript, and optionally, the diagram itself).

The use of diagrams in data collection has spanned many fields, including education, engineering, environmental science, geography, industrial design, psychology and others

within the social sciences (Wheeldon & Ahlberg, 2012). For example, Mers (2008) provided a collection of articles that demonstrate different ways in which diagramming has been used in the health and social sciences, where diagrams are a data collection tool but also play an important role in analysis and the construction of arguments. One challenge arising from this approach's development is that without clear boundaries of what it covers and a standard terminology, the development of this data collection approach has been isolated within disciplines.

As Shakespeare so eloquently pointed out, "a rose by any other name would smell as sweet" – making the claim that the way people experience this fragrant flower was constant, irrespective of the different names by which people may know it by. However, in the case of diagrams, it does matter both what it is and what it is called. Each type of graphic representation has its own strengths and weaknesses that may deem it more or less suitable for a given purpose. When Hopkins (2006) and Umoquit, Dobrow, Lemieux-Charles, Ritvo, Urbach, and Wodchis (2008) describe using participatory diagramming as a data collection approach, they are talking about two very different things. Hopkins' (2006) geography students worked in small groups to discuss the differences between being a child and an adult and their hopes and fears about university. Participants brainstormed on post-it notes and used prioritizing to create multiple tables or lists. While no actual diagram was constructed, this method was labeled participatory diagramming. By contrast, the health policy study by Umoquit et al. (2008) interviewed cancer care providers and senior cancer system administrators on clinical accountability relationships and had participants use pens and paper to draw out persons and organizations and their connecting relationships. This approach too was termed participatory diagramming but the process was different and the resulting end-product collected by researchers was diagrams.

Another approach is based on the educational work of Varga-Atkins and O'Brien (2009) who used a similar approach as Umoquit et al.'s (2008) participatory diagramming but called it a different term; graphic elicitation. They had senior school leaders and managers create diagrams of formal and informal networks of their schools within interviews. The diagrams then were used in the interview process to elicit verbal commentaries from participants. Complicating the terminology further, Crilly, Blackwell, and Clarkson (2006) used a completely different approach in their industrial design study but which they also termed graphic elicitation. In their study, they had designers edit researcher-prepared diagrams within interviews, rather than create their own diagrams. This is a snapshot of the confusing territory surrounding just a few of the terms used to describe the use of diagrams as a data collection approach: same terms but different visuals/outcomes and different terms but same visuals/outcomes.

The multi-disciplinary examples above may suggest the need for more cross-disciplinary dialogue to share what is known and not known regarding the use of diagrams in data collection in different fields and disciplines. Without a common terminology and understanding about how diagrams can be used, efforts to review and understand existing literature using diagrams may be confounded. More importantly, methodological efforts may be duplicated and improperly integrated into future applications. Or, as the study by Varga-Atkins and O'Brien (2009) emphasized, lack of sufficient understanding between the subcategories of visual elicitation methods (e.g., the boundaries between drawings and diagrams) can produce unwanted research results.

In this paper, we hope to establish a clear understanding of the boundaries of diagrams and the terminology of diagrammatic elicitation to describe the approach of using diagrams in data collection for multidisciplinary use. By provoking a discussion about the value of a common terminology for the use of diagrams as a data collection approach, the authors hope to begin a broader dialogue on its development and facilitate a sharing of best practices within

and across disciplines. In a sense, arriving at the terminology of diagrammatic elicitation is just a partial purpose of the paper. It is through engaging with the dialogue on terminology that we/researchers can get closer to a deeper understanding of diagrams as aids in the data collection process.

In the first section of this paper, a definition of a *diagram* is offered, by situating it firstly, amongst other types of graphic communications and secondly, along what has been called the *visual/verbal spectrum*. In the second section, diagramming as a method of elicitation is situated within existing data collection approaches with an attempt to build a common terminology for the use of diagrams in data collection based on the term *diagrammatic elicitation*. A key contribution, it is hoped, is the development and presentation of two subcategories of diagrammatic elicitation that can perhaps better clarify and differentiate diagrammatic data collection. This tentative definition is not a simple categorization: it is purposefully drawn up in such a way that it will provide a framework to distinguish diagrams from other graphic communications, while recognizing the needs of different researchers and complexities inherent in different research questions. Through defining what diagrammatic elicitation is, the authors share their learning about the technique: what it is and what it is not. Finally, in the last section, the additional challenges and concerns surrounding this proposed terminology that require further consideration and elaboration are discussed.

Situating diagrams in graphic communication

A major issue complicating knowledge translation regarding visual methods in the natural and social sciences is the different terminology used to describe diagrams (Umoquit et al., 2011). To establish an overarching "umbrella term" that groups the different uses of diagrams in the data collection process, the boundaries of the larger category of graphic communication and where the term *diagram* fits in must first be clarified. Graphic communications are generally created on a flat surface to express information (Engelhardt, 2002) and are usually made by pen or pencil or computer drawing software. This paper's definition of graphic communication excludes other non-verbal forms of elicitation, such as video files and photos, which are often temporal and require a medium to capture them, such as a video camera.

Table 1: Models of visual approaches

	Drawings	**Diagrams**	**Tables & Lists**
Purpose	Captures essence (a salient feature)	Ability to simplify complex ideas	Highly structured ideas and variables
Abstraction	Primarily abstract	Some level of abstraction	Concrete
Structure (internal)	Undirected in representation	More direct in terms of representation; structure inherent where pre-agreed notation is used	Most direct in terms of representation
Notation	No pre-set or agreed conventions or notations	May use pre-set or agreed conventions or notations	Uses pre-set or agreed conventions or notations
Spatial Meaning	Spatial arrangements may or may not carry meaning	Spatial arrangements of signs usually carries meaning	Spatial arrangements of signs carries meaning
Verbal/visual spectrum	Visual signs dominate over verbal	Composite of both visual and verbal	Verbal signs dominate over visual

Table adapted from Varga-Atkins and O'Brien (2009) and Engelhardt (2002)

Table 1 summarizes the differences and similarities between three categories of graphic communications used as qualitative data collection approaches: drawings, diagrams and tables and lists. While there may be overlap in the categories (i.e., the graphic artefact produced by the research can contain elements of all these types), these are discussed as distinct and mutually exclusive categories for the purposes of this study. Of particular interest for this study, diagrams are defined as a visual representation of information that uses both visual and language-based elements in a guided manner (i.e., pre-defined symbols or notation).

Further discussion of the categorization of different graphic artefacts using a visual-verbal spectrum will help to clarify to what a diagram in the context of this paper refers.

A visual-verbal spectrum

Bank in his book on *Visual Methods in Social Research* (2001) identified a spectrum of structural composition with regards to visual modes of representation. This spectrum is a useful framework for aiding the development of defining and distinguishing different categories of graphic communication. Banks places the linear flow of language - the verbal, such as text and speech - at one end of the spectrum, whilst placing more open-ended forms, such as visual images, at the other end of the spectrum. Developing this perspective on visual artifacts further, Varga-Atkins and O'Brien (2009), focusing on the kinds of graphic communication (e.g., drawings, diagrams, tables and lists), situated these along Banks' visual-verbal spectrum. Near the linear end of the spectrum would be tables and lists as they contain mainly verbal elements, whereas drawings would be near the open-ended side as they comprise mostly of visual images.

As Banks has identified (2001), diagrams would be positioned in the middle as they contain both visual and verbal elements. This visual-verbal spectrum, which is a verbal description in the book of Banks (2001), has been visualized by Varga-Atkins and O'Brien (2009; see Figure 1). Richards (2002) reinforces the placement of these categories of graphic communication on the spectrum, as he asserts that diagrams "occupy that hinterland between written text and the purely graphical. That is their strength, enabling, often through the use of graphic metaphor, the visual representation of the otherwise invisible" (p. 91).

Figure 1: Spectrum of structural composition: the visual-verbal spectrum of graphic communications
Spectrum identified by Banks (2001), and further developed in visual form by Varga-Atkins and O'Brien (2009).
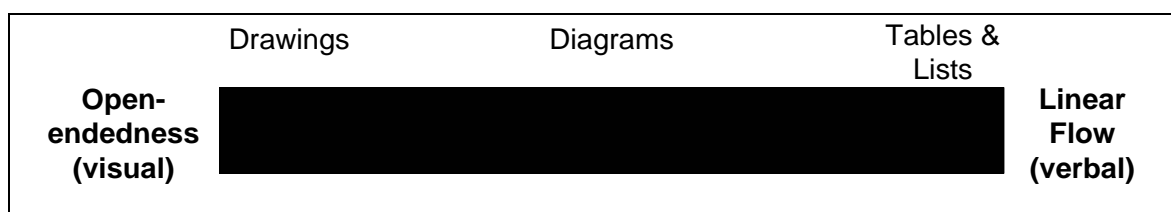
The placement of diagrams on this spectrum acknowledges the potential for overlaps between the various categories of graphic communication. For example, a diagram can contain a smaller unit of drawing in one of its elements (Engelhardt, 2002). In particular, it is difficult to distinguish a clear boundary of how much "visual" is needed to constitute a drawing versus how much notation is needed to constitute a diagram. However, these categories are useful for defining what a diagram is and is not. Using this spectrum to guide the classification of graphic communication in this paper, the main distinction between diagrams and drawings lies in the presence of notation. Notation, or as others call it, syntax, is

the grammar or rules of a graphic representation (Engelhardt, 2002) and comprises the objects, their relations to one another and the space in which they are organized.

As stated by Richards (2002), "what makes a diagram is the ability of users to recognize in it spatial relationships which in some way correspond to the relationships presented" (p. 87). Participants asked to create diagrams are guided in how to represent a given topic through specific symbols or notation, whereas they are relatively free of guidance in the case of drawings (Varga-Atkins & O'Brien, 2008, 2009). Tables and lists are often created by participants ranking and listing out elements and normally contains a hierarchical structure. While these tables and lists are sometimes created into diagrams at a later point in the research process by the researcher (see e.g., Hopkins, 2006), this paper's authors do not consider this as diagramming for data collection, as symbols and spatial relationships are no longer a direct expression of the participant.

Commonly used diagrams: Concept Maps and Mind Maps

There are many subcategories of diagrams. A common usage of diagrams in scholarly research in the past has been in the forms of concept maps and mind maps (Wheeldon & Ahlberg, 2012). Concept maps are connected to cognitive theories and have been used in education for decades to both help students learn (Novak & Gowin, 1984) and more recently, to explore the experience of adult students in higher education (Daley, 2004). Concept maps are a technique for individuals to visually represent their perceived relationships between various concepts, usually enclosed in circles or boxes (Novak, 1984). Hierarchical relationships are usually suggested using word links, directional arrows, or simple connectors (e.g., lines or overlapping circles; Åhlberg & Ahoranta, 2004).

Figure 2: Concept Maps and Mind Maps: Concept Map of Similarities and Differences (Wheeldon & Ahlberg, 2012, p. 30)
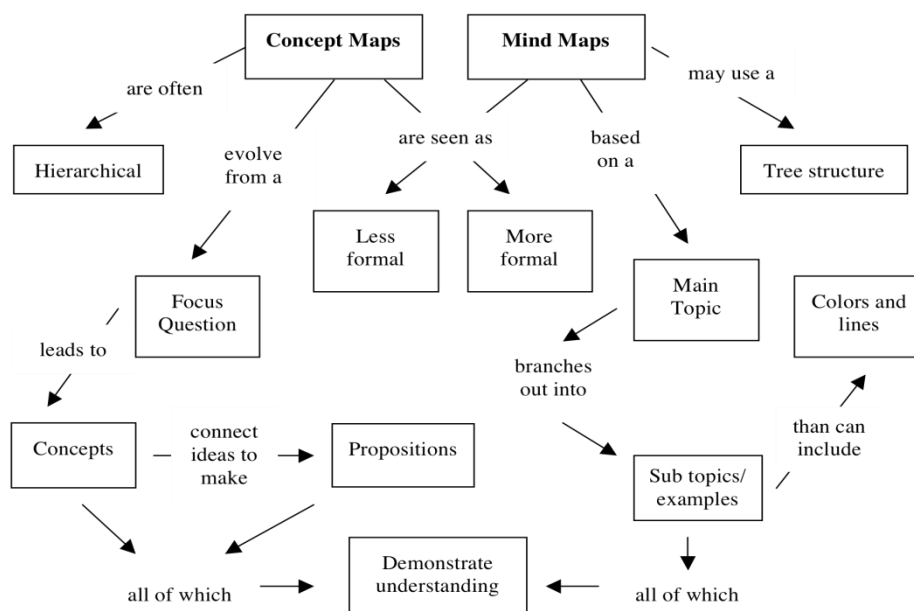
Other approaches have developed based on the use of mind maps in qualitative research (Wheeldon, 2011). More flexible than concept maps, mind maps are of increased interest in the field of nursing as a means to both gather data and assist researchers to make sense of the data they have (Tattersall & Vernon, 2007). Mind maps are diagrams used to represent words, themes ideas, and other concepts that radiate from a central idea or word

(Buzan, 1997). The reason why both concept maps and mind maps belong to the "family" of diagrams is that both include notation and structure, and the visual arrangement of signs (e.g., concepts) carry meaning. For instance, in concept maps, concepts are represented in a rectangle and arrows (qualified by a label) signify the relationship between the connected rectangles. Although similar in some respects, as outlined in the concept map in Figure 2, differences between concept maps and mind maps exist in terms of notation that carry meaning. For example:

> Concept maps provide a more structured approach to explore connections between and among concepts, using linking words to present clear propositions. By contrast, mind maps are more flexible tools in which a central governing construct is explored using groupings and/or branches. (Wheeldon & Ahlberg, 2012, p. 21)

The differences between mind maps and concept maps may be a useful way to explore quantitative versus qualitative data collection in the social sciences. However, as just one example of the complexity herein, while some diagrams are labeled with the term "maps", as in concept maps and mind maps, not all things labeled as "maps" are diagrams. For example, geographical maps include the usual notation of geographical elements and may also include personal elements of participants. They are similar to diagrams in that they contain spatial arrangements and graphics. However, linkages between elements within a geographical map refer to specific geographical space, rather than less abstract and/or participant-oriented data. It is the ability of diagrams to capture unique and open-ended participant-oriented data that may be of most interest to qualitative researchers.

Diagrammatic elicitation

Before proposing diagrammatic elicitation as a means to better conceive of qualitative visual data collection approaches in both the social and natural sciences, it may be useful to understand this contribution in light of other developments in qualitative data collections. Qualitative data collection methods include observational methods, in-depth interviews, and group-based approaches, such as focus groups. Interviews are one of the most common data collection methods in social research (Denzin, 2001). An interview, which is a verbal exchange between an interviewer and one or more interviewees (Varga-Atkins & O'Brien, 2009), can be conducted in a variety of ways, for example, with open or closed questions, in person or over the phone. While there are numerous variations of the application of an interview, there is a common understanding about what the data collection approach of "interviewing" generally refers to across research disciplines and even across laypersons. This is not the case when it comes to the data collection approach of using diagrams.

Collecting data with diagrams

The previous section defined what a diagram is (and is not) using the visual-verbal spectrum, distinguishing it from drawings, tables/lists and geographical maps. Establishing a clear and encompassing terminology for the use of diagrams in the data collection process is equally important. Wheeldon and Faubert (2009) argued for a broader definition, rather than a strict one-size-fits-all, in their discussion of the role of maps in social science research. It is argued that "…traditional definitions of concept mapping should be expanded to include more flexible approaches to the collection of graphic representations of experience" (Wheeldon & Faubert, 2009, p. 68) in order to promote a wider use of diagrams across fields. The same

reasoning has been applied here to define the data collection process in question, using a new name that has not been used thus far. The authors propose that the method using diagrams for data collection be called: *diagrammatic elicitation*. We define diagrammatic elicitation as approaches where a study participant physically creates and/or physically or verbally edits a diagram with the visual as the focus, encouraging participants to communicate through the use of a diagram rather than relying on verbal communication.

The term, elicitation, has been associated with the approach of relying on a range of strategies and techniques to supplement more conventional data collection approaches, such as interviews (Dick, 2006; Johnson & Weller, 2002). However, elicitation in this paper is used to describe the means through which data is collected both through and as diagrams. The use of diagrams in data collection can be viewed as the research data themselves and/or as the process of data collection, such as use of diagrams within an interview to enhance the quality of data gathered. Diagrams can be used as the primary data collection approach without researcher facilitation. For instance, after giving instructions on how to create the diagrams they sought, West, Pomeroy, Park, Gerstenberger, and Sandoval (2000) had research participants create original diagrams on their own and collected the diagrams for analysis with no other form of data collection or interaction with participants.

In another example, Haidet et al. (2008) used the process of having participants draw out diagrams and discuss them as a way to elicit rich data for transcription and analysis. While the diagrams were collected from participants, they were used more for triggering verbal responses from participants, rather than being directly central to their analysis. Both approaches to the use of diagrams in data collection can also be combined. Jafri, Lyons, and Clarkson (2008) had participants edit and add to a researcher-prepared diagram to refine its presentation and accuracy; participants also discussed the diagram in detail during the interview. The diagram both enhanced the data collection process of the interview and was used as data in the analysis. As can be seen from these three examples, "data collection" therefore can both encompass the "collecting of the diagram" as an end-product of the research for analysis, as well as the overall process of data collection (e.g., in an interview which partly comprises the creation of a diagram as well as verbal commentaries using the diagram for elicitation). To understand the essential differences between researcher-led and participant-led elicitation, we suggest there are two broad forms of diagrammatic elicitation.

### *Two forms of diagrammatic elicitation*

It is important when using diagrams for elicitation, to distinguish whose diagrams are the base of elicitation. Based on the results of a multidisciplinary systematic review of diagrams used for data collection (Umoquit et al., 2011), two subcategories of diagrammatic elicitation have been identified:

> *-participant-led diagrammatic elicitation,* where the participant creates a diagram as a technique of data collection, and
> *-researcher-led diagrammatic elicitation,* where the researcher draws the diagram during the data collection process (with the participant's active input)
> for discussion or the participant edits a researcher-prepared diagram.

As Figure 3 suggests, the two broad forms discussed in this paper view diagrammatic elicitation as data collection approaches and not a broader research methodology, as discussed further in our limitations section. As well, the data collection approach proposed here does not include approaches where the creation or editing of the diagram is created at later stages by

researcher(s) alone or through data collected by other data collection approaches (sorting, listing, ranking, interview, questionnaire) without active participant input.

Figure 3. Concept Map of Participant-led and Researcher-led diagrammatic elicitation
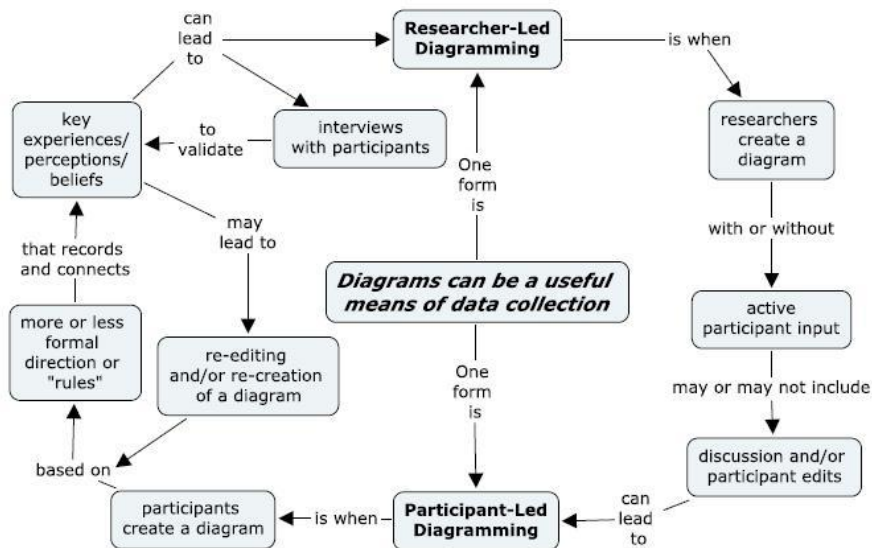
Despite the variances and distinctions, there are some common approaches to the use of diagramming in data collection. As visual forms of communication can go beyond language and overcome typical barriers to inter-subjective communications and growing specialization of terms and terminology (Wheeldon, 2011). However, more investigation will be required to understand how the dynamics of diagrammatic elicitation can animate multidisciplinary explorations of content, context, and narrative. Our hope is that this contribution provides one way to conceive of diagram-based data collection, and the distinction between participant- and researcher-led approaches.

Limitations

There are a variety of limitations that might be usefully acknowledged. While some may resist the use of the "umbrella term" and definition of "diagram" proposed in this paper, the goal is to offer a starting point from which more discussions can proceed. As discussed earlier, different disciplines have already established their own labels for approaches to the use of diagrams for data collection. In some cases, different labels have been applied to similar approaches and conversely, the same label has been applied to different approaches. Some may view the acceptance of the terms proposed in this paper as a threat to the knowledge and literature already created within their own disciplines; these concerns ought to be investigated and explicated. The value of the proposed conceptual approach must be tested and the term and justification validated, revised and refined.

In this paper, we have shown how a wide variety of approaches to diagram-based data collection can be understood through the lens of *diagrammatic elicitation*. However, by proposing the broad term *diagrammatic elicitation*, the authors do not discount any of these longstanding terms or contend that any one type of diagram is most suitable for all research questions; the type of diagram and indeed, the decision as to what is going to be considered the basis for analysis in the research (the diagram, the interview transcript etc.) should be chosen based on the needs of individual research projects. Guidance on this decision and the methodological issues of using different types of diagrams has not been articulated here but

deserves careful consideration by researchers during the study design phase. As Varga-Atkins and O'Brien (2009) have pointed out there can be a danger when using visual elicitation with participants that lack of awareness as to the different types of diagrams may cause a slippage between the research task's intention and the resulting visual artifact (in their case, drawings slipping into diagrams or vice versa).

There may also be concerns that this paper articulates not a data collection approach but a broader and more complex research methodology based on the term "participatory diagramming" used in anthropology, geography, and development studies. The term "participatory diagramming" refers to a participatory methodology encompassing a range of approaches that do not involve actual diagrams but instead sorting and/or ranking concepts and constructs (Langan-Fox, Code, & Langsfield-Smith, 2000). As expressed in this paper approaches based on interviewing and sorting, would not be included under the proposed definition of diagrammatic elicitation, nor would approaches where the creation or editing of the diagram is created at later stages by researcher(s) alone or through data collected by other data collection approaches without active participant input. The focus of this paper remains in data collection approaches using diagrams, rather than a research methodology.

Finally, there may be concern that by not explaining in detail "how" graphics can or should be used within data collection, this article fails to focus on the process of using diagrams in data collection and favours more conceptual models of expression. While it is the case that this paper attempts to coin a term, the goal is greater clarity and to engage in some methodological housekeeping to allow researchers in different disciplines to better communicate, collaborate and consider each other's contributions. Further explorations must better explicate how existing theoretical models can be used to root diagrammatic elicitation in ways that consider both the differences and similarities among various forms of graphic communication, diagram-based approaches to data collection, and models of diagram-based data analysis.

Conclusion

By proposing *diagrammatic elicitation* as an umbrella term to refer to the data collection technique of using diagrams, we hope this paper has taken the first step towards greater interdisciplinary dialogue. As indicated earlier, diagramming, mapping and drawing are often used interchangeably, with no common interdisciplinary understanding of what they mean. Proposing a well-defined terminology will assist the fragmented research community to connect with each other to share best practices and developments. A broader definition that includes various diagram types (e.g., process maps, concept maps, mind maps, organizational diagrams, etc.) will allow many disciplines to collaborate in further developing and refining the technique in its many forms and for various functions. Further dissemination and discussion is needed to establish the term's parameters and usefulness. While much work remains, this attempt at conceptual clarity is an important step towards better communication of two techniques for qualitative diagram-based data collection and contributes to the growing interest and literature surrounding the use of visual methods in qualitative research.

References

Åhlberg, M., & Ahoranta, V. (2004). *What do concept maps reveal about pupil's learning and thinking?* Paper presented at the Annual conference of National Association for Research in Science Teaching, Vancouver, Canada.

Banks, M. (2001). *Visual methods in social research*. London: Sage.

Buzan, T. (1997). *The mind map book.* London: BBC Books.

Crilly, N., Blackwell, A., & Clarkson, P. (2006). Graphic elicitation: Using research diagrams as interview stimuli. *Qualitative Research, 6,* 341-366.

Daley, B. J. (2004). Using concept maps with adult students in higher education. In A. J. Canas, J. D. Novak, & F. M. Gonzalex (Eds.), *Proceedings of the first international conference on concept mapping: Vol. 1. Concept maps: Theory, methodology, terminology* (pp. 183-190). Pamplona, Spain: Universidad Publica de Navvarra.

Denzin, N. K. (2001). The reflexive interview and a performative social science. *Qualitative Research, 1,* 23-46.

Dick, H. P. (2006). What to do with "I don't know:" Elicitation in ethnographic & survey interviews. *Qualitative Sociology, 29,* 87-102.

Engelhardt, J. (2002). *The language of graphics: A framework for the analysis of syntax and meaning in maps, charts and diagrams*. Amsterdam, The Netherlands: Universiteit van Amsterdam.

Haidet, P., Hatem, D. S., Fecile, M. L., Stein, H. F., Haley, H. A., Kimmel, B…. Inui, T. S. (2008). The role of relationships in the professional formation of physicians: Case report and illustration of an elicitation technique. *Patient Education and Counselling, 72*(3), 382-387.

Hopkins, P. (2006). Youth transitions and going to university: The perceptions of students attending a geography summer school access programme. *Area, 38,* 240-247.

Jafri, T., Lyons, M. N., & Clarkson, P. J. (2008). The supply of medicines in the NHS. In *Improving patient safety* (pp. 16-7-2008 to 18-7-2008). Cambridge, UK: Improving Patient Safety (IPS 2008).

Johnson, J. C., & Weller, S. C. (2002). Elicitation techniques for interviewing. *Handbook of interview research: Context and method* (pp. 491-514). Thousand Oaks, CA: Sage

Langan-Fox, J., Code, S., & Langsfield-Smith, K. (2000). Team mental models: Techniques, methods, and analytic approaches. *Human Factors, 4,* 242-271.

Mers, A. (2008). *Useful pictures*. Chicago, IL: White Walls.

Nesbit, J. C., & Adescope, O. (2006). Learning with concept and knowledge maps: A meta-analysis. *Review of Education Research, 76,* 413-448.

Novak, J. D., & Gowin, D. B. (1984). *Learning how to learn*. Cambridge, UK: Cambridge University Press.

Richards, C. (2002). The fundamental design variables of diagramming. In M. Anderson, B. Meye, & P. Olivier (Eds.), *Diagrammatic representation and reasoning* (pp. 85-102). London: Springer-Verlag London Limited.

Tattersall, C., & Vernon, S. (2007). Mind mapping as a tool in qualitative research. *Nursing Times.Net, 103,* 32-33.

Umoquit, M. J., Dobrow, M. J., Lemieux-Charles, L., Ritvo, P. G., Urbach, D. R., & Wodchis, W. P. (2008). The efficiency and effectiveness of utilizing diagrams in interviews: An assessment of participatory diagramming and graphic elicitation. *BMC Medical Research Methodology, 8*(53), 1-12.

Umoquit, M. J., Tso, P., Burchett, H. E. D., & Dobrow, M. J. (2011). A multidisciplinary systematic review of the use of diagrams as a means of collecting data from research

subjects: Application, benefits and recommendations. *BMC Medical Research Methodology, 11*(11), 1-10.

Varga-Atkins, T., & O'Brien, M. (2008). *Graphic elicitation as a research technique: Reflecting on drawings and diagrams as complementary methods*. Unpublished manuscript. University of Liverpool, United Kingdom.

Varga-Atkins, T., & O'Brien, M. (2009). From drawings to diagrams: Maintaining researcher control during graphic elicitation in qualitative interviews. *International Journal of Research & Methods in Education, 32,* 53-67.

West, D. C., Pomeroy, J. R., Park, J. K., Gerstenberger, E. A., & Sandoval, J. (2000). Critical thinking in graduate medical education: A role for concept mapping assessment? *Journal of the American Medical Association, 284,* 1105-1110.

Wheeldon, J. (2011). Is a picture worth a thousand words? Using mind maps to facilitate participant recall in qualitative research. *The Qualitative Report*, 16(2), 509-522. Retrieved from http://www.nova.edu/ssss/QR/QR16-2/wheeldon.pdf

Wheeldon, J., & Ahlberg, M. (2012). *Visualizing social science research: Maps, methods, and meaning*. Thousand Oaks, CA: Sage Publications.

Wheeldon, J., & Faubert, J. (2009). Framing experience: Concept maps, mind maps, and data collection in qualitative research. *International Journal of Qualitative Methods, 8,* 68-83.

Author Note

Muriah Umoquit, MA is a researcher at the Toronto General Research Institute, University Health Network. Her work focuses on the development and evaluation of guideline implementability tools, optimizing the reporting of qualitative research findings, and the use of visual methods in data collection.

Peggy Tso, MSc candidate is a consultant and researcher affiliated with the Department of Health Policy, Management and Evaluation, University of Toronto. Her work focuses the incorporation of scientific and colloquial evidence in complex health policy decisions and the use of visual methods of data collection. She may be contacted at peggy.t@gmail.com.

Tünde Varga-Atkins, MA, MSc is a Learning Technology Developer and researcher at the Centre for Lifelong Learning, University of Liverpool. Her research interests include how technology can enhance teaching & learning and research methods and multimodal/visual research. She may be contacted at tva@liverpool.ca.uk.

Mark O'Brien, PhD is a Senior Research Fellow at the Centre for Lifelong Learning, University of Liverpool. His work focuses on critical theory, cultural-historical activity theory and visual techniques in research. He may be contacted at mtobrien@liverpool.ac.uk.

Johannes Wheeldon, PhD is an Assistant Professor at Norwich University. He recently completed a Post Doctoral Research Fellowship at the Department of Criminal Justice, at Washington State University focused on visual methods, correctional education, inclusive and experiential learning. He may be contacted at jwheeldon@gmail.com.

The corresponding author is Muriah Umoquit and she can be contacted at University Health Network, 200 Elizabeth Street, Toronto, Ontario, Canada, M5G2C4; Phone: 416.340.4800; Fax: 416.340.4814; Email: muriahp@gmail.ca

Article Citation

Umoquit, M., Tso, P., Varga-Atkins, T., O'Brien, M., & Wheeldon, J. (2013). Diagrammatic elicitation: Defining the use of diagrams in data collection. *The Qualitative Report, 18*(60), 1-12. Retrieved from http://www.nova.edu/ssss/QR/QR18/umoquit60.pdf