

A Picture Is Worth a Thousand Words: The Case for Graphic Representations

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Research in psychology and communication shows a strong advantage for visual displays in comparison with typical language, and technological innovations in computer graphics and printing capabilities now make them cost-effective as well. It can be argued that the greater use of evidence-based visualization strategies can enhance communication occurring in the interactions among and between health service delivery counselors, clients, evaluators, administrators, and clinical supervisors. In this article we present conceptual, empirical, and practical reasons for increasing the use of node-link (box-line) graphic representations in psychological treatment systems. These general-purpose displays offer clinical advantages by clearly representing interrelationships among ideas, emotions, and actions that are often lost in verbal discourse.

Keywords: communication enhancement, visual displays, node-link representations, technology transfer, evidence based

People naturally use space to communicate. Index cards on bulletin boards, notes on white boards, or stacks of papers on tables share the consequence that where the “author” places information will influence the interpretation of that information (Shipman et al., 2001). This informal use of space speaks to its naturalness as a communication vehicle. However, it is limited by a lack of consistent “grammar” and the availability of physical space. As a consequence, more formal visual displays that can be

contained within a page or computer screen are becoming popular additions to the workplace, the classroom, and the counseling center.

We argue that the use of these displays can help facilitate clear, concise, and impactful communication at all levels of a treatment system, including multilevel interactions among and between counselors, clients, evaluators, administrators, and clinical supervisors (Simpson, 2004; Simpson & Dansereau, 2007). Effective social exchange is seen as the foundation for all modern organizations, and the incorporation of new communication technologies is viewed as critical in developing and maintaining a competitive advantage (Fulk & DeSanctis, 1999). Research in psychology and communication shows a strong advantage for visual displays in comparison with typical language in many circumstances, and technological innovations in computer graphics and printing capabilities now make them cost-effective as well. Because of these developments, visual displays (in particular, graphic representations) are becoming a predominant form of communication in business, military, and educational organizations (Nesbit & Adesope, 2006; Tergan & Keller, 2005).

As with other psychological practices, communication practices need to be evidence based. The importance of using treatments, techniques, and tools that emerge from established psychological principles and direct scientific evaluation is supported by the American Psychological Association Presidential Task Force on Evidence-Based Practice (2006) and has been the focus of many recent articles in professional psychology (e.g., Kendall & Beidas, 2007; Hunsley, 2007). Consequently, in this article we review the conceptual, empirical, and practical reasons for increasing the use of evidence-based graphic representations in health service delivery systems.

Although geographical maps, paintings, hieroglyphics, and drawings have existed throughout human history, more elaborate graphic representations and simulations have become popular only recently as communication tools (Tufte, 2006). One major barrier

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THIS WORK WAS FUNDED by National Institute on Drug Abuse Grant R37 DA13093. The interpretations and conclusions, however, do not necessarily represent the position of the National Institute on Drug Abuse or the U.S. Department of Health and Human Services.

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to the use of graphic representations and simulations has been the prohibitive costs of producing these representations for mass consumption. Recent technological advances have largely overcome these barriers and thus paved the way for the incorporation of graphics and simulations into modern culture. Graphic literacy has now become almost as important as verbal literacy in most professions (Felgenson & Sherwin, 2007).

Advantages of Graphic Representations

A major reason for the ascendancy of formal visual displays is that they have been shown to have important advantages over traditional language in the communication of complexity and emotion. Larkin and Simon (1987) and Winn (1991) argued that “visuals” are more computationally efficient than language (i.e., it is often easier to cognitively ingest and manipulate information presented in a visual display). It appears that humans are hardwired with neural processes for organizing visual displays according to gestalt principles such as similarity, proximity, continuation, symmetry, closure, and common boundary (Sternberg, 2006). These processes allow efficient recognition of important complex patterns that are difficult to comprehend via spoken and written language. Examples include chains of reasoning, feedback loops, parallel lines of thought and action, tangential issues, and conceptual symmetries. The development and recognition of such patterns have been seen as essential for creativity and intuition in psychotherapy and other disciplines (Welling, 2005).

Although language provides unparalleled richness and nuance, its limitations have long been recognized. While visual information encourages synthesis by the receiver, language typically requires analytic decomposition (Unnava & Burnkrant, 1991). In this regard, the processing of graphics is more in line with the holistic nature of affect (Larsen & Diener, 1987; Sojka & Giese, 2006). The affective system, like the visual system, evaluates the stimuli

as a whole and concludes, “I just don’t like it” (Cacioppo, Gardner, & Berntson, 1999) but, in the case of the visual system, concludes, “I see what you mean.” In addition to improving comprehension and affective understanding, graphic representations also have been shown to enhance memory and recall in comparison with spoken and written language (see Nesbit & Adesope, 2006). With regard to specific graphics, Tufte (2006), one of the foremost experts on visual representation, has strongly encouraged the use of node-link (box-line) graphics such as flow diagrams, organizational charts, and taxonomic displays rather than typical presentation approaches.

Types of Node-Link Graphic Representations

Because of their prevalence and the accumulation of evidence supporting their use, node-link displays serve as the focus of the present article. There are three basic types of node-link displays shown to have applications in health service delivery (Dansereau, 2005).

Information Maps

Information maps (see Figure 1 for an example) are typically created by experts to communicate information about specialized topics. These include representations of theoretical models (Simpson, 2004, 2006), knowledge structures (Hall, Dansereau, & Skaggs, 1992), and technical procedures (O’Donnell et al., 1990). They are used extensively in education, business, and research publications but also have therapeutic value in presenting critical information such as the prevention of AIDS and substance abuse relapse, as well as medication guidelines, to clients (Hill & Roslan, 2004; K. Knight, Simpson, & Dansereau, 1994). Effective information maps typically use gestalt (holistic) perceptual principles and schematic structures such as hierarchies, chains/loops, and clusters to communicate patterns

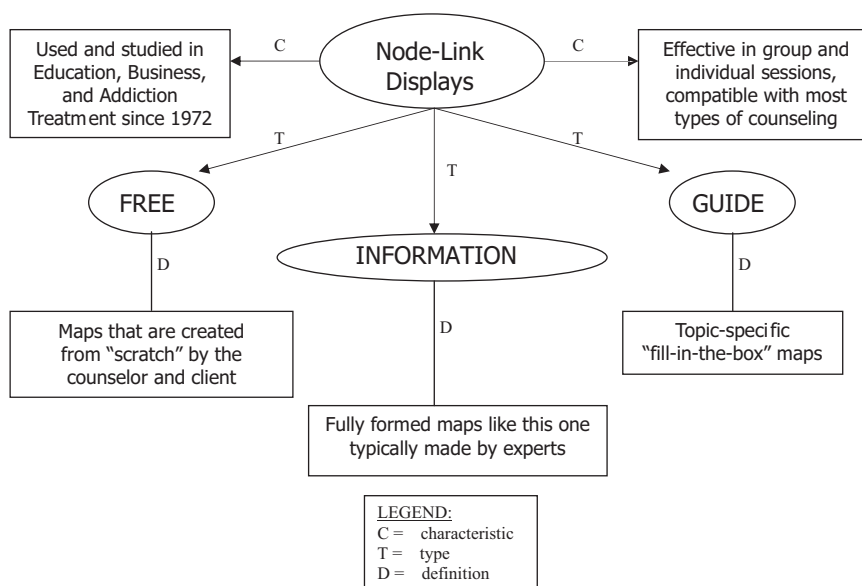


Figure 1. Example of an information map.

or interrelationships. Node-link cartographers also use node (box) shapes and colors to classify or highlight information (e.g., a diamond-shaped symbol is often used to indicate a decision) and use different link (line) types and labels to specify the nature of the relationships. A legend is usually included on the map as a decoding aid. The careful use of these signaling features has been shown to aid understanding and recall of map content (Moreland, Dansereau, & Chmielewski, 1997; Wallace, West, Ware, & Dansereau, 1998). Additional studies indicate that information maps should contain between 6 and 20 nodes, depending on the cognitive style and background knowledge of the receiver, and that hierarchies, chains, and compare/contrast structures should be organized vertically on the page (Hall et al., 1992; O'Donnell, 1994).

Guide Maps

Guide maps (see Figure 2 for an example) are fill-in-the-blank graphic tools that can be used to facilitate self-exploration, planning, decision making, problem solving, and assessment. The structure of the map and the questions within the nodes are developed by an expert (e.g., a therapist); the relevant information is then inserted into the nodes by a client, employee, or learner. Guide-map designs typically follow the same principles as those used in creating information maps.

Guide maps have been used to facilitate the exploration of science topics and drug and alcohol issues (Dees & Dansereau, 1993; Motes, Bahr, Atha-Weldon, & Dansereau, 2003). In health service delivery settings, guide maps have been shown to help clients and counselors in examining treatment-related issues (Dansereau & Dees, 2002; Newbern, Dansereau, Czuchry, & Simpson, 2005), and managers and staff in planning for organizational change (Simpson & Dansereau, 2007). Guide maps have also been incorporated into a series of effective modular interventions that cover specific counseling topics such as anger, motivation, communication, and relapse (Bartholomew, Hiller, Knight, Nucatola, & Simpson, 2000).

Freestyle Maps

Freestyle maps are produced "from scratch" by learners, clients, or employees as a note-taking technique or as a vehicle for expressing and organizing personal knowledge. These maps can be prepared collaboratively by teams of individuals (e.g., therapist and client). A variety of computer programs have been developed to facilitate freestyle mapping (e.g., smartdraw.com, thinkmap.com). The most extensive computer-based system, *concept mapping* (cmap.ihmc.us) has users across the world that can share and collaborate on maps in real time.

Freestyle mapping has been shown to be a more effective note-taking tool than are other methods typically used (Chang, Sung, & Chen, 2002) and has proven to be a powerful tool for general learning when done collaboratively (Basque & Lavoie, 2006). This latter finding is particularly important in light of the critical role of shared decision making in clinical practice (Elwyn et al., 2001). Interestingly, mapping training itself appears to produce positive cognitive transfer to other tasks, even when mapping is not used explicitly (Chmielewski & Dansereau, 1998).

Randomized studies of ethnically diverse adult clients and their counselors working collaboratively creating freestyle maps of personal issues provide evidence for the efficacy of this technique compared with typical counseling methods (see Czuchry & Dansereau, 2003, and Dansereau & Dees, 2002, for syntheses of these findings in community treatment settings and Czuchry & Dansereau, 2000, for a review of findings in criminal justice settings). These studies have shown that node-link mapping (a) leads to greater client readiness and motivation for treatment (Czuchry, Dansereau, Dees, & Simpson, 1995; Dansereau, Joe, Dees, & Simpson, 1996; Dansereau, Joe, & Simpson, 1995; Joe, Dansereau, & Simpson, 1994; Sia, Dansereau, & Czuchry, 2000), (b) improves the counselor-client therapeutic relationship and the perception of the quality of counseling sessions (Czuchry & Dansereau, 1999; Dansereau, Dees, Greener, & Simpson, 1995; Dansereau, Joe, & Simpson, 1993; Newbern et al., 2005), (c) enhances client self-perceptions (Czuchry & Dansereau, 1999; Dansereau et al., 1996; D. K. Knight, Dansereau, Joe, & Simpson, 1994; Newbern, Dansereau, & Pitre, 1999), and (d) reduces the number of missed counseling sessions and positive urinalyses (for illicit drugs) during and after treatment (Czuchry et al., 1995; Dansereau et al., 1993; Dansereau, Joe, et al., 1995; Dees, Dansereau, & Simpson, 1997; Joe, Dansereau, Pitre, & Simpson, 1997; Joe et al., 1994; Newbern et al., 2005).

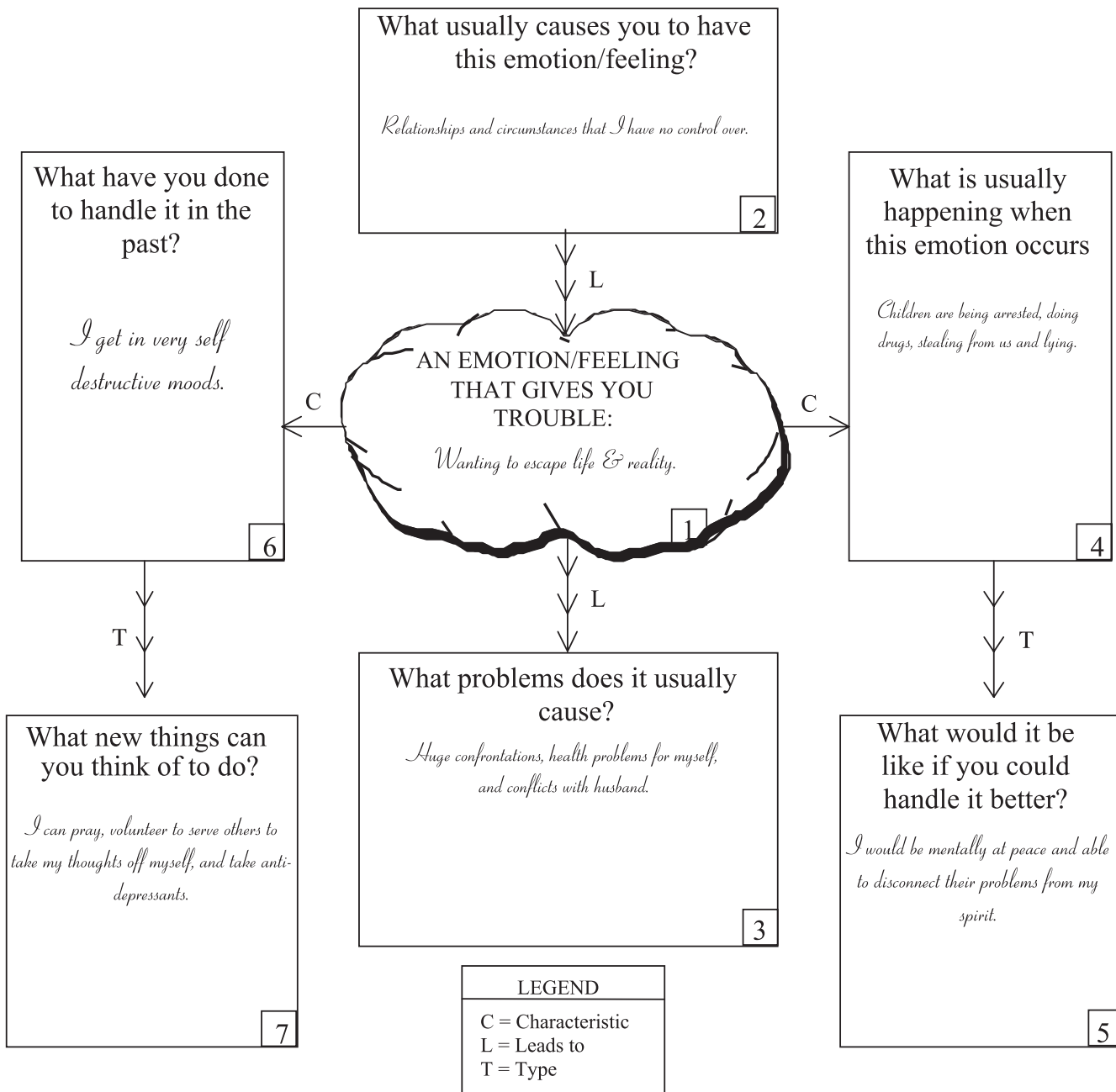
Research on the three types of maps has provided a substantial evidence base for node-link diagrams. In the next section we will provide more details on their use in therapeutic systems.

An Expanded Role for Node-Link Graphic Representations

Treatment can be viewed generically as a set of complex interrelationships among service delivery organizations, oversight agencies, researchers and other support providers, and associated treatment-related agencies. Within this system there are critical interactions that take place among and between managers, supervisors, counselors, and clients. Evidence suggests that node-link graphic representations can enhance communication among and between these elements. In particular, clinical research, counseling, supervision and training, and organizational functioning have been shown to benefit from graphics.

Clinical Research

Scientists are typically characterized as visual-spatial thinkers and communicators (Ferguson, 1977; West, 1991). In particular, clinical research has benefited from node-link diagrams such as path analysis depictions (Joe, Broome, Rowan-Szal, & Simpson, 2002), stage models (Rounsaville, Carroll, & Onken, 2001), contingency diagrams (Malott, 1992), and dynamic process models (Prochaska, DiClemente, & Norcross, 1992; Simpson, 2004). These diagrams summarize and integrate empirical results and provide frameworks for the development of new research hypotheses. In doing so they enhance the communication within and between scientific teams. Versions of these node-link diagrams are also used in technology transfer to facilitate communication with practitioners (Mattaini, 1993; Simpson & Flynn, 2007). The research on information maps suggests that the use of node-link graphics as research communication tools should be standardized



Note: The script in the boxes provides an example of guide map use. Naturally, counselor-client discussions would elaborate on these ideas.

Figure 2. Emotion map.

and expanded according to effective display design principles (e.g., principles articulated by Dansereau, 2005; Simpson & Dansereau, 2007; Tufte, 2005, 2006).

Counseling

Goldfried and Davila (2005) and Hill (2005) have argued for the importance of both technique and therapeutic relationships as

foundations for effective psychological counseling. In fact, it has been suggested that the technique of employing visual metaphors is a critical component of developing client–counselor rapport (Epstein, 1995). Indeed, graphic representations have been used in clinical practice by health service professionals for decades. However, their design and use have been typically tied to idiosyncratic counseling issues. These techniques include time lines (Quam & Abramson, 1991), social support mapping (Gaudin, 1988), geno-

grams (Magnuson & Shaw, 2003; Peluso, 2003), family mapping (Minuchin, 1974), and ecomaps (Mattaini, 1995). Mattaini (1993) provided an excellent description of many of these techniques. Although these graphic representations have been of value in targeting specific topics, Dansereau, Dees, and Simpson (1994) argued that a general-purpose node-link tool is necessary to take greater advantage of the effectiveness of graphic representation in enhancing communication across topics and situations. A mapping system that originally was developed and evaluated for educational and technical training purposes was modified for use in counseling (Dansereau, 2005). Although this method has some unique features (e.g., labeled links), it has much in common with other popular mapping approaches (i.e., concept, topic, and mind mapping), and consequently some of its therapeutic impacts could likely be achieved with other systems.

Czuchry and Dansereau (2003) have provided empirical evidence as to how mapping enhances key aspects of the counseling session (e.g., communication and attentional focus). Generally, counselors and clients collaborate on building a map from scratch or filling in a preformed map. In such a use, the maps provide concrete visual representations of issues and, due to their simple "grammar," have less word clutter than do typical verbal exchanges. These qualities appear to reduce barriers that can potentially distract or distort communication, especially for individuals who struggle with auditory learning. For example, node-link mapping has been shown to be particularly helpful for clients with less education (Pitre, Dansereau, & Joe, 1996) and for clients with ethnic backgrounds that are different from that of their counselors (Dansereau et al., 1996). Mapping also enhances clients' self-perceptions of their communication abilities (Newbern et al., 1999).

Mapping particularly benefits clients with attentional problems (Czuchry et al., 1995; Dansereau, Joe, et al., 1995) and increases client perceptions of group counseling to near the levels of individual counseling (D. K. Knight et al., 1994). Compared with unmapped sessions, node-link mapping helps clients and counselors generate a greater breadth and depth of ideas (Dansereau, Dees, et al., 1995; Newbern, Dansereau, & Dees, 1997). It also leads to greater counselor insights about gaps in a client's thinking (Dansereau et al., 1993).

Observations of mapping-enhanced counseling sessions and discussions with counselors suggest that this technique may create a sense of collaboration by taking the direct focus off the client and putting it on a graphic representation of therapeutic issues. For clients who are uncomfortable maintaining eye contact, node-link mapping provides a relevant, alternative visual stimulus and therefore can reduce anxiety. Maps "worked on" during a session can be given to the clients as reminders or as vehicles for homework between sessions. They may also be reintroduced by the counselor to evaluate changes and progress.

Although the findings generally support the use of mapping in counseling, feedback from counselors and observations of counseling sessions across the set of studies described above suggest that mapping, especially if overused, can sometimes disrupt therapeutic rapport (e.g., by slowing the pace of the session). It therefore is important for individual counselors to tailor their use of maps to fit both their own style and client needs.

Clinical Supervision and Training

The genogram, a node-link diagram that illustrates personal relationships, has been used as a clinical training tool (Braverman, 1997; Peluso, 2003) and in clinical supervision (Magnuson & Shaw, 2003). Node-link mapping has shown similar benefits in both arenas (Dansereau & Dees, 2002). That is, client maps can be shared by the counselor with supervisors and peers to gain additional perspectives on treatment options. On the basis of findings in business and education, it appears that sharing maps has advantages over exclusive written and/or verbal reports (see Dansereau, 2005, for a summary of this research). Clinical supervisors also can prepare maps to provide guidance to counselors.

Organizational Functioning

Organization charts and data flow diagrams (Bruza & van der Weide, 1989) have been used to improve formal and informal communication at all levels of organizational activity. Node-link context diagrams have been used to show relationships between treatment agencies and other systems (Rossi & Freeman, 1985), and function hierarchy diagrams have been used to illustrate the classes of therapeutic activities occurring within an agency (Barker, 1990). Node-link mapping approaches can provide a standard set of tools for the construction of these and other informational, problem-solving, and planning displays (Newbern & Dansereau, 1993).

Applications of node-link graphics also extend to the growing pressures for health service agencies to adopt evidence-based practices. Simpson and Dansereau (2007) have drawn parallels between the processes clients go through during treatment and the processes organizations must go through in order to make substantive changes. They have argued that the same types of visuals that facilitate client progress can be expected to facilitate the progress of organizations. Toward this end, they recommended the use of a set of guide maps, titled "Mapping Organizational Change" (Simpson & Dansereau, 2007), that can be used in conjunction with organizational assessments such as the Organizational Readiness for Change instrument (Lehman, Greener, & Simpson, 2002) to identify, stimulate, and track modifications in functioning (both available for free downloading at ibr.tcu.edu).

In conclusion, we have discussed the importance of improving communication in health service delivery systems and have offered the use of node-link graphic representations as a promising solution. Our work on mapping, particularly in the area of counselor-client interactions, is presented as an example of this approach. Although the node-link method we have used has been shown to be effective, other approaches such as concept mapping (Novak, 2002) and mind mapping (Buzan, 1974) would also be good candidates for use in health service delivery agencies.

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Received October 26, 2007

Revision received February 14, 2008

Accepted February 18, 2008 ■