

Extract one

History of graphic tools presenting concepts and propositions.

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Notes for teachers

Nowadays, a range of different types of graphic representation tools are widely available. These tools go under the guise of several different terms e.g. concept maps, mind maps, spider maps, spider diagrams, clustering etc. and often the same term is used to refer to a number of different methods or techniques. This is very confusing, if you have no expertise in this field. This paper presents the background for concept maps, mind maps and other similar graphic representation tools.

From the viewpoint of human evolution, it is clear that humans first learnt how to speak, then how to write and finally how to create graphical representations based on writing. For centuries those representations were made using pens and simple graphical tools. Nowadays there are also digital options which offers opportunities for revisable, non-linear and multi-modal representation.

The first known graphical presentation of concepts and their relationships is the tree of Porphyry, also known as arbor porphyriana or Porphyrian tree (Fig.1). It probably dates from the third century, because according to Emilsson (2005), Porphyry lived 234?–305? A.D.

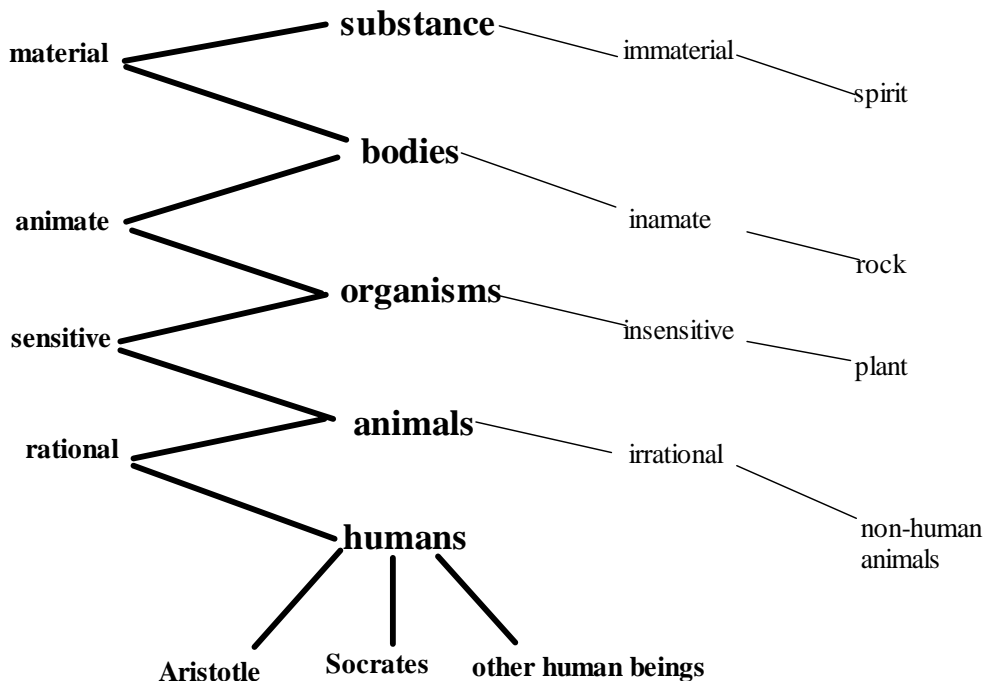


Fig. 1. The Tree of Porphyry
(redrawn and adapted from Reese 1980, Niiniluoto 1984 and Mason 2004).

Tracing the history of educational graphic knowledge representation methods since the Tree of Porphyry until the onset of digital technologies is unfortunately beyond the remit of this article. Comprehensive historical reviews can be found in Stewart (1976) from the linguistic perspective, and in Åhlberg (1990) from the viewpoint of educational research.

A tentative list of the most common educational graphic knowledge representation methods in the 21st century is as follows: mind maps, concept maps, “spider diagrams”, knowledge maps, clustering. A useful general, practical, comparative study is Haller (2002), although unfortunately only in German. A brief overview of the three lesser prevalent tools is presented here, leading to a fuller discussion on concept maps and mind maps.

Haller (2002) does not mention e.g. Rico (1983 and 2000) who is the main inventor of Writing the Natural Way, Cluster™. According to Rico (2007) clustering is a non-linear brainstorming process that makes interior, invisible associations visible on a page. Many people misleadingly confuse Rico’s clustering with mind mapping or concept mapping.

Knowledge mapping was created in the research group of Dansereau in the ‘70’s (Dansereau & al. 1979, Dansereau 1985, Gardner, Monaghan & Peel 1996, Lambiotte, Dansereau, Cross & Reynolds 1989) and originally called a network map (Dansereau & al. 1979, 11). Knowledge mapping is related to concept maps, but it has rigidly labelled links (e.g. Bahr & Dansereau 2004).

Nowadays, spider maps (spider diagrams) are very popular in the UK. The same term is used for many different types of graphic knowledge representation techniques, and the history of this term in educational research seems to have been forgotten. The earliest example is probably Hanf (1971, 228) who himself only uses the term ‘mapping’. Jones & al. (1989) also named their somewhat different technique spider mapping (1971).

Key graphic knowledge representation methods in education in the 21st century

We have not enough space to follow the history of educational graphic knowledge representation methods since the Tree of Porphyry. In main lines it has covered in Stewart (1976) linguistically, and Åhlberg (1990) from viewpoint of educational research. A tentative list of the most common educational graphic knowledge representation methods in the 21st century is as follows: mind maps, concept maps, “spider diagrams”, knowledge maps, clustering. There is a chaos in this field. I try to bring knowledge of the origins of main methods or techniques as far as it is possible in the short space allowed. A useful general practical comparative study is Haller (2002), although unfortunately only in German. Haller (2002) does not mention e.g. Rico (1983 and 2000) who is important inventor of Writing the Natural Way, Cluster™. According to Rico (2007) clustering is non-linear brainstorming process that makes interior, invisible associations visible on a page. Many people misleadingly call Rico’s registered clustering as mind mapping or concept mapping.

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Nowadays, spider maps (spider diagrams) are very popular in UK. The same term is used for many different types of graphic knowledge representation techniques. Forgotten seems to be the history of this term in educational research. The earliest example is probably Hanf (1971, 228) who himself uses only term ‘mapping’. Jones & al. (1989) named her technique as spider mapping as well, but they do not refer to Hanf (1971).

The two important names in this field are Tony Buzan and Joseph Novak who began to work with maps surprisingly early in the 1970s.

Mind mapping

Mind mapping was invented by Tony Buzan, who in 1974 published the first book on this theme. In Buzan (1974) he first used the term 'key words'. The idea, which was radical at the time, was to organise the key words into a radiant structure that looks like a tree seen from above. Buzan also (1974) made extensive use of colours and pictures in his mind maps.

In the 90's the Buzan Organisation Limited registered his type of mind maps as a trademark: Mind Map®. The latest publication on Mind Map® is by Buzan and Buzan (2006). Notably, the key words for this book are the same as the earlier editions: radiant thinking, brainstorming, personal knowledge construction and knowledge representation styles.

However, although the technique is very popular, there is little empirical research on mind maps. One of the few available research reports is written by Farrand, Hussain and Hennessy (2002). They found that mind mapping significantly helps factual recall and retention of factual information, but has no apparent impact on other types of learning. Indeed promoting recall or memory of facts is one of the central points of Buzan's original explanation and rationale (see also *interview with Buzan*).

The most recent innovation (Buzan Center 2007) is iMindmap™, which is a new digital tool to support the creation of Mind Maps®. As compared to earlier versions of Mind Maps®, and as demonstrated through the active example presented on the Buzan Center website the innovation lies in the use of verbs derived from the core word. This is unique in the world of Mind Maps®, although the use of verbs to link concepts is what concept maps are about. If you want to investigate further you will find the information on the web pages of Buzan Center (2007) that inform about a new digital tool (iMindmap™) and how to create Mind Maps®.

Concept mapping

Although there are some conflicting claims over the original development source of concept mapping, my study of published documents from the beginning of concept mapping research indicates that concept mapping was developed at Cornell University in the 1970s (Åhlberg 1993 and 2004). But the version that has spread all over the world, and is best known, was developed in the 1980's. This work of Novak and Gowin (1984) and Novak (1998) has been particularly influential in making the technique very popular among science educators. There are now literally hundreds of research reports on the usefulness and accuracy of concept maps in education (e.g. CMC 2004 and CMC 2006).

The latest guidelines to Novakian concept maps have been published as a technical report on the WWW by Novak and Cañas (2006). In this document concept maps are defined as follows:

“Concept maps are graphical tools for organizing and representing knowledge. They include concepts, usually enclosed in circles or boxes of some type, and relationships between concepts indicated by a connecting line linking two concepts. Words on the line, referred to as linking words or linking phrases, specify the relationship between the two concepts. The result of linking two concepts is a proposition Propositions are statements about some object or event Propositions contain two or more concepts

connected using linking words or phrases to form a meaningful statement.” Novak and Cañas (2006: 1)

The idea of importance of hierarchical knowledge originates from Novak’s firm belief in Ausubel’s (1963) theory of meaningful learning. The shapes of the Novakian maps are intended to imitate this structure. Novak and Canas describe this here:

Another characteristic of concept maps is that the concepts are represented in a hierarchical fashion with the most inclusive, most general concepts at the top of the map and the more specific, less general concepts arranged hierarchically below. The hierarchical structure for a particular domain of knowledge also depends on the context in which that knowledge is being applied or considered (2006:1)

The mapping of both Buzan and Novak are very prescriptive, because they focus on just one theory of how the mind works and try to emulate that visually. In the next extract from my talk I will explain the methods I have used to provide a more flexible approach.

The references I have quotes are in the much long bibliography which follows. This gives you some key texts if you want to go into the subject more thoroughly.

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