

## ***Additional information about maps***

Following, we will share with you some additional information about maps to integrate the description provide at page 16 of the Handbook.

### **Maps: flexible planning tools**

#### *What are maps?*

Maps are graphic representations of individual thought, knowledge and ideas about a specific topic. These elements and their relationships are showed in a simple and accessible way. For this reason, maps are effective tools to communicate, share and negotiate knowledge and ideas within and between work groups.

The conceptual net of a map is the result of naive and structured knowledge, memories and emotions related to them. So, different people might draw various maps on the same topic. In fact, the same issue can be seen by different points of view, also depending on the specific contexts. For this reason, there aren't "right" or "wrong" maps, but only different ones. In addition, since individual knowledge changes over time, maps, that are their graphic representation, might change with them.

In spite of the subjective nature of maps, some key criteria for their analysis and evaluation can be identified, as described below.

### **The Building Blocks of a Map**

*Nodes* and *links* are the fundamental elements of maps (Fig.1).

*Nodes* are the concepts and the ideas identified; they are synthesized by one or a few words (*concept-words*) inside circles or boxes.

*Links* represent the relations between concepts using arrows with labels (*link-words*) or association lines.

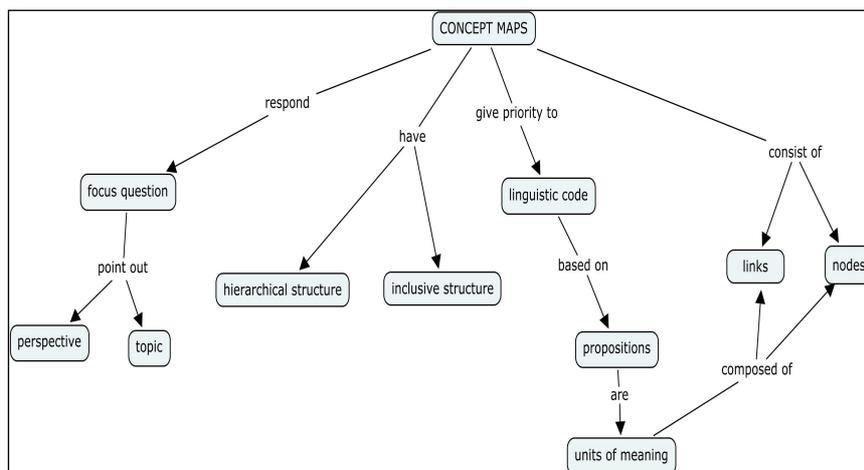


Fig 1 – A map with its building blocks

## Types of maps

There are several types of maps (mental, conceptual, cognitive, structural, etc.) with various goals, and different visual-logical compositions, that specifically define their structure and the characteristics of the links. Mind and concept maps are used within Sustain project.

### Mind Maps

Introduced by Buzan during the sixties, mind maps are diagrams used to visualize a sequence of ideas. They are built through logical-associative relationships, emerging from the subjectivity and creativity of the author.

They have two distinct features: a) they are created around a single main idea and b) they have a radiant structure, which links ideas using a non linear, intuitive, emotional and associative logic.

Starting from the central idea, which represents the topic you are going to explore, what is suggested by imagination is freely drawn in all directions, adding main branches which flow from the main idea. Then, each main branch can be explored by adding child branches.

The key idea, represented by branch is expressed by including keyword (one word for branch). The result is a map with a radiant structure.

Mind maps generally use images to represent ideas and different colors and/or fonts for branches (Fig.2). The cross-links between ideas can be clarify by text labels and might be represented by dashed lines.

A good way to stimulate mind maps is to provide an input as a starting point (a lesson, a text, a video) asking people to identify what comes to mind.

Mind maps are useful for brainstorming and to gather at a glance about what any learning experience has generated in the subjects involved.

*Mind maps* can be drawn by hand or using software such as *iMindMap* or *Edraw Max*.



Fig.2 A mental map ( from: <http://www.tonybuzan.com/about/mind-mapping/>)

## Concept maps

Concept maps (Fig.3) were developed during the seventies by Novak, who highlighted the close relationship between these tools and Ausebel's theory of meaningful learning. They are aimed at clarifying knowledge, models of explanation and reasoning that an individual has in relation to a given topic, therefore they can be effective tools for formative and summative assessment of students learning.

Concept maps usually start from a *focus question*, which defines the topic, indicates its limits and orients its perspective. A starting concept should stem out from the "focus question", as well as all the other concepts connected to (in relation to the perspective defined by the question itself). All the selected concepts are included in circles or boxes.

The structure of concept maps is inclusive, each concept of high level contains the lower level ones so that the result is a hierarchical and reticular geometry. The inclusive relationships between concepts are represented with arrows labelled with a *link word*. *Link words* are also used to draw cross-links between concepts related to different domains of knowledge.

What characterizes concept maps is the formulation of propositions (arising from each sequence composed of *concept-relationship-concept*), which have to be complete and self-sufficient. The most effective way to achieve this logical construction is to use verbs in the present tense as *link words*.

Concept maps can be continuously increased: every concept can be expanded through further relationships with new elements. For this reason concept maps are dynamic representations, they can be revised and increased at different times, in light of new acquisitions or new versions of the focus question.

Focus question: "What are the characteristics of concept maps?"

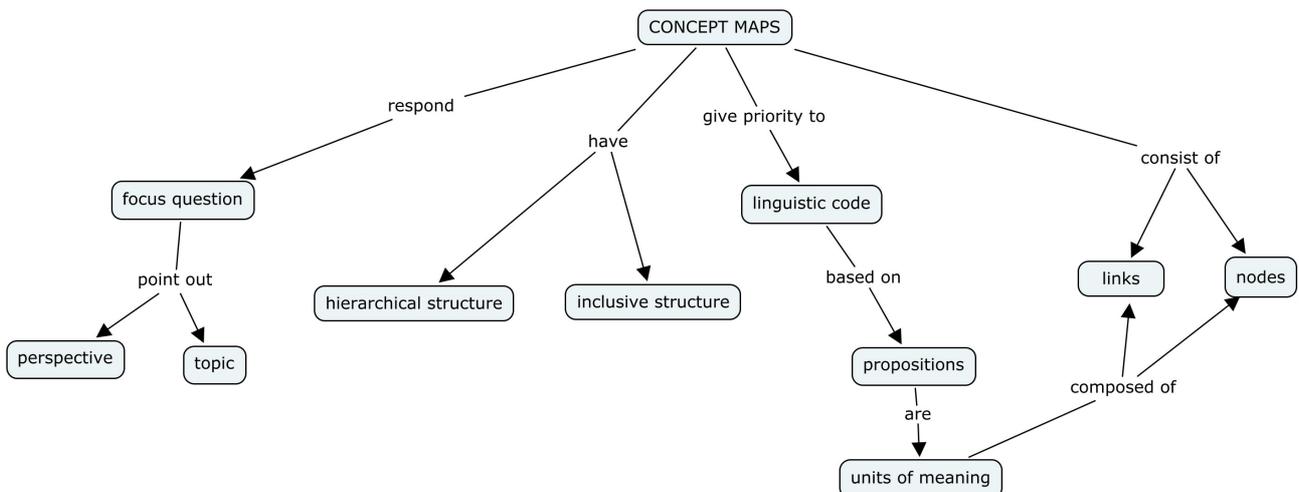


Fig.3 – A concept map

## ***Maps in Sustain project***

The use of maps was suggested by the challenge of developing the topic everyday objects through the life cycle approach and the perspective of education for sustainability.

How to deal with the complexity that emerges when the components of the life cycle (past, present and future) are connected with the dimensions of sustainability (environmental, economical and social)? And at the same time, how to avoid the loss of the whole picture of all those elements together?

These questions led to use maps both during the plan of class activities and for the assessment of students' learning.

*Conceptual maps* were used considering some of their specific characteristics. Their reticular geometry allows to simultaneously highlight all the possible relationships between the different issues dealt with, giving an overall view of the learning path developed. In addition, conceptual maps enable to approach the issues related to sustainability and the complexity that features real situations. Their reticular geometry allows to develop articulated paths, which can be carried out in a flexible and variable way, through the implementation of different parts of them, according to the characteristics of the learning context. Finally, because of being open and dynamic representations, concepts maps are flexible tools that can well incorporate at any time, new ideas or any changes in the initial design.

The choice of using *mind maps* for the formative assessment of students' learning, was suggested by their positive points in comparison with more traditional tools and approaches. Mind maps, for example, involve more different skills and cognitive styles than a verbal text. Furthermore they stimulate the students' knowledge building in a personal and original way, avoiding rote learning. In addition mind maps - as any other type of maps - are useful for cooperative work: drawing a map in group is easier than writing a text in group. Furthermore they can be easily shared among different working groups, through the available software, that enable a wide socialization on the Web.