

## SCIENTIFIC LITERACY: FOURTEEN YEARS OF TEACHING (2001–2015) WITH CMAPTOOLS

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**Abstract.** At the end of my first fourteen years of teaching, pupils of my classes built about 2000 concept maps (Cmaps). Cmaps were the tether of any proposed teaching–learning; moreover, they brought to a more effective way of teaching and, as it is showed by the surveys, they have favored the formation and the location of my former pupils. The following summing maps are the small example of the extensive learning path, done in a class with 18 pupils about 10–11 years old during 2002.03 school year. Our starting map shows the representation of a hypertext, realized through CmapTools. We start with the word Interaction, one of the five key–words (Object, property, material, interaction, system) of the pilot project by the Ministry of Education, called “Scientific Literacy”. The mentioned project has even developed in Bosnia. The schools which cooperate in the net in the town of Breza are actually 5 (2016).

### 1 Introduction

In our classes it was created a multidisciplinary educational path through CmapTools software (Cañas et al. 2004), with the aim to offer to the pupils the opportunity to elaborate any concept as widely and transverse as possible, going over the most stringent disciplinary subdivisions. This work was a challenge for us, teachers: we had to manage working together, putting on the field all our competences, to discover all the educational potential Educational software. It was a good way, for the pupils, to consolidate the capability to elaborate concept maps and improve computer skills. Pupils, through the use of the software, had the opportunity to document, link, display and summarize personal and cooperative learning paths. The work of each was a piece of the overall picture, and has grown in value because inserted in a broader context. The concept word Interaction, of the project Science offered the opportunity of multiple reflections and multidisciplinary and interdisciplinary links. Maps and connected hypertexts, inserted inside the main concepts, are the product of individual and cooperative work of pupils in all school years 2001–2015. The map which follows is the ‘Mother Map’ of the work of one school year.

### 2 Concepts and Maps

Pupils, first of all, understood the word interaction, in the science context, thanks to the previewed experimental activities, then they applied in other contexts. For example, there had been a research about interaction in human body, about Italian language, in Geography, with the interaction between man and environment, finally in History studying the effects produced by integration among populations.

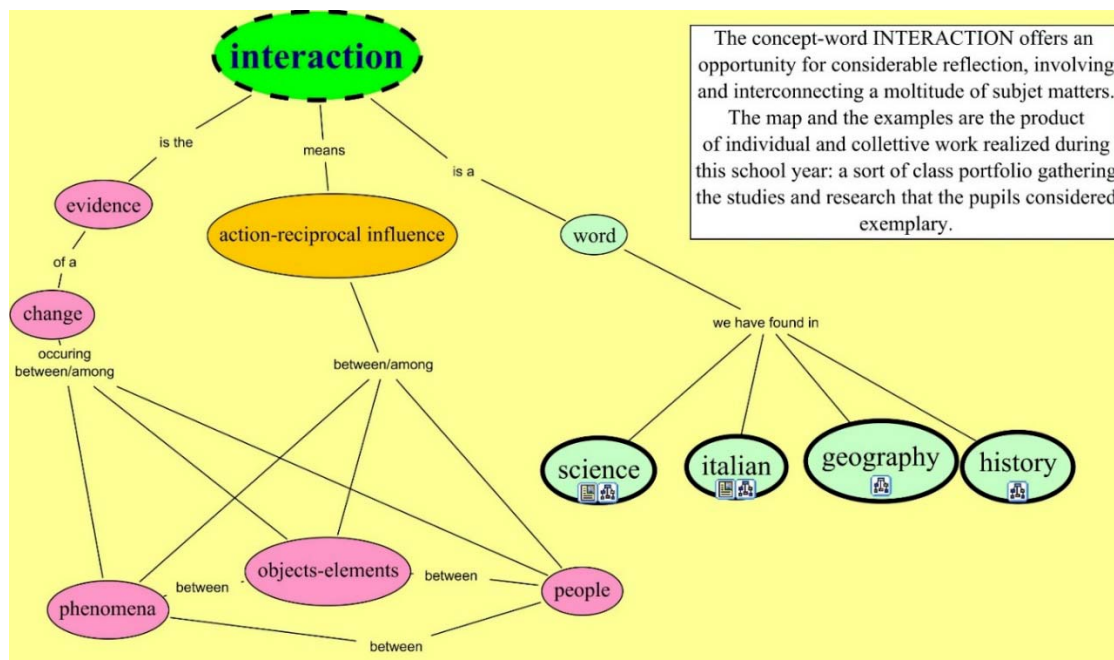
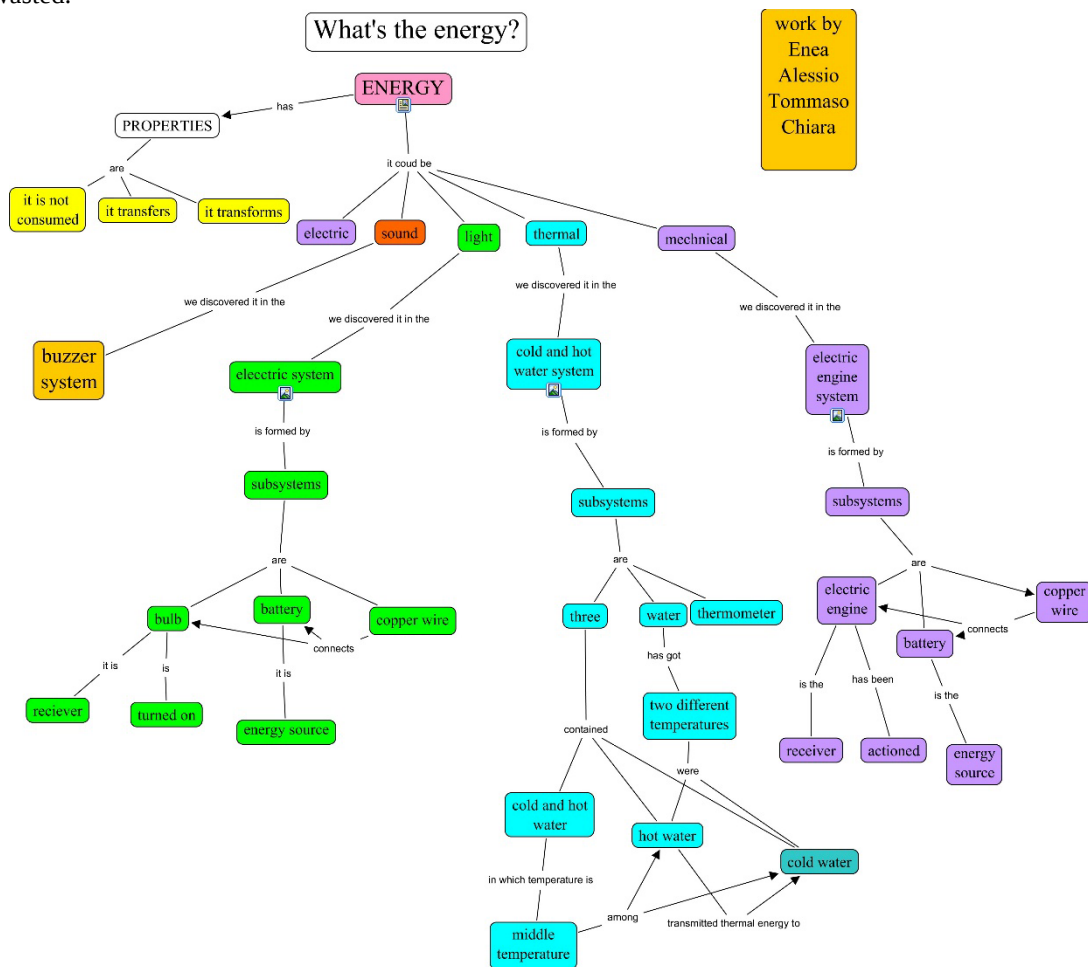


Figure 1. Mother Map from which the whole hypertext starts.

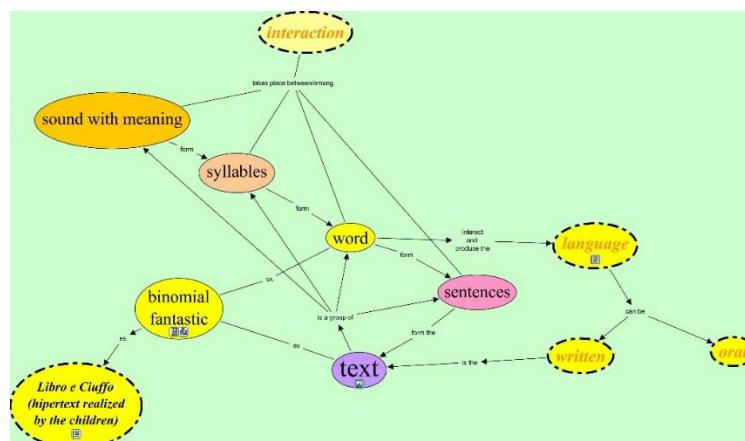
Thanks to CmapTools it is possible to recuperate, organize and reserve all the knowledge, so that it will be not wasted.



**Figure 2.** This is one of the 10 science Map in the Hypertext.

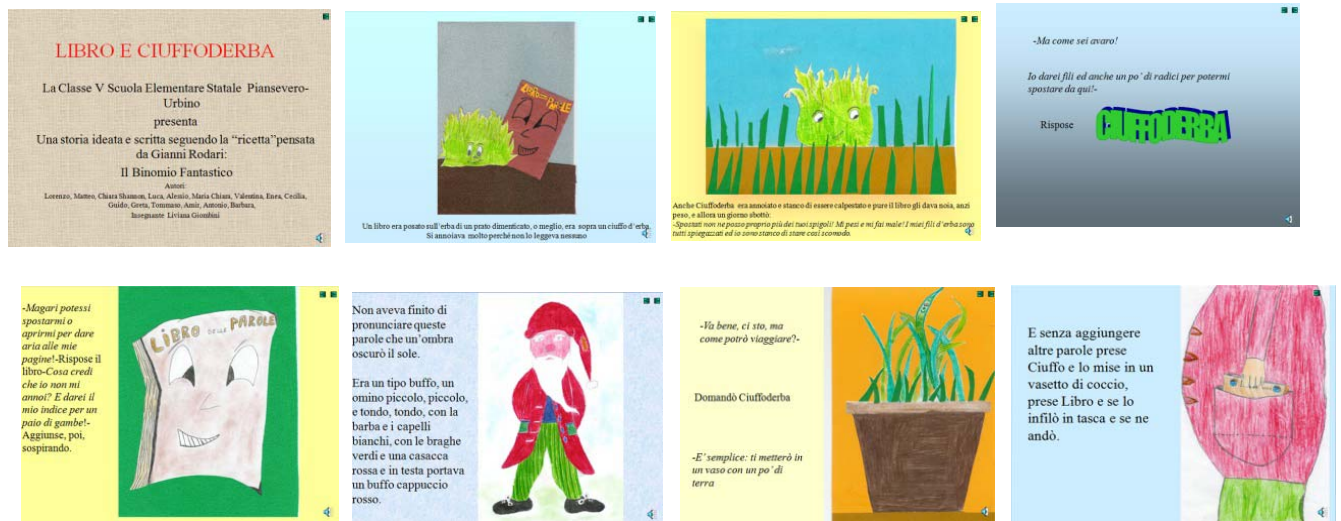
Another connected map tells the experiences that pupils had about Energy and about the use of the Concept word: **System**. the use of colours has a main importance since it makes immediately explicit the experiments done, which is possible to see by opening the referring connections. Thanks to the building of the concept map, pupils, in cooperative learning, could collect and share different experiences and then connect among them to reach the to reach the learning achievement of the complex concept of energy.

## 2.1 PowerPoint about Binomial Fantastic



**Figure 3.** This is the map, which explains the possible interaction in the language.

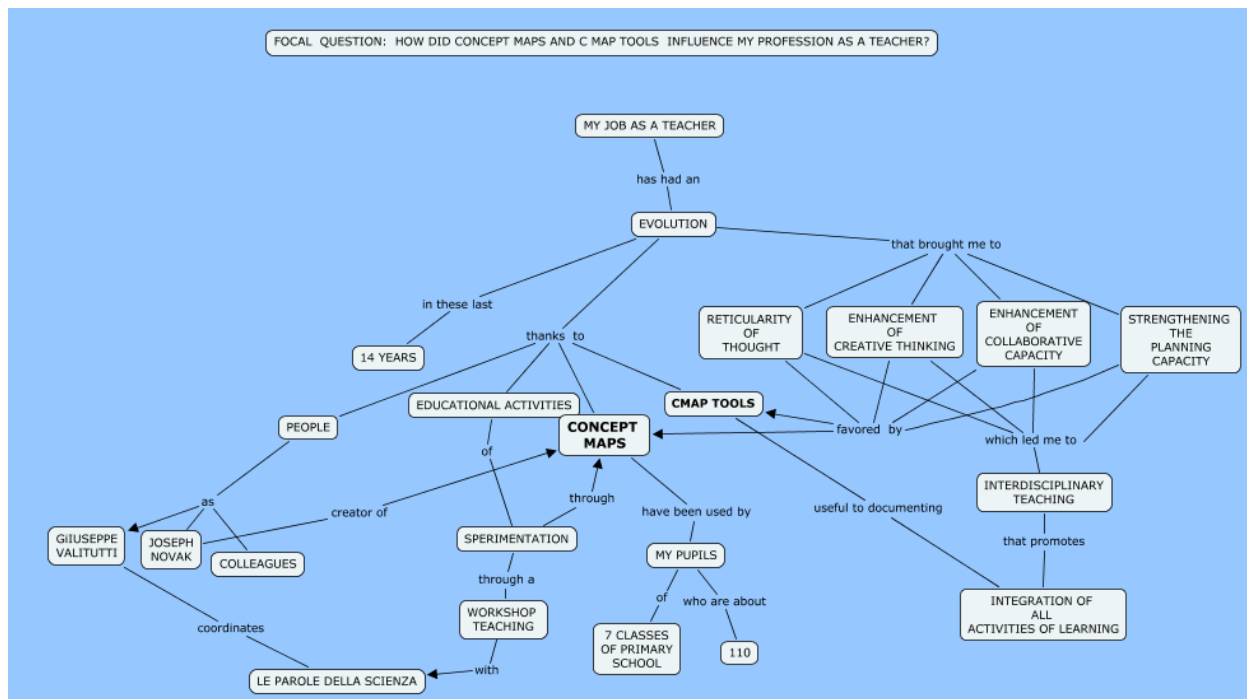
This picture shows, indeed, some sources connected to the concept map about interaction, applied to the Italian language teaching. A map explains the fantastic combination by the author Gianni Rodari, another one explains what the language is. Finally, there is a story invented by the pupils through the system Fantastic Combination presented by/through Power Point.



**Figure 4.** This story was born from the interaction between the words: Book and Tuft of Grass, following the Binomio Fantastico (Binomial Fantastic) Method. This is the only one of 30 resources in the hypertext.

## 2.2 Concept maps and CmapTools: towards a successful model

Realization of hypertexts as this one, which connect among themselves more concept maps and different made possible the conquest of a transversal thinking mode, a non-common capability at this age and which enriched with meaning and creativity throughout the learning path. After this hypertext many other hypertexts followed this first one (either made by the class and by single pupils) based on different disciplinary activities, all this promoted an active and stimulating learning environment.



**Figure 5.** This map summarizes how I changed my way to do school thanks to concept maps and CmapTools.

After a research I recently did on a sample (65%) of my former pupils, who are actually between 18 and 24 years old, have emerged significant data showing that the concept maps had a positive influence on their education and personal training.

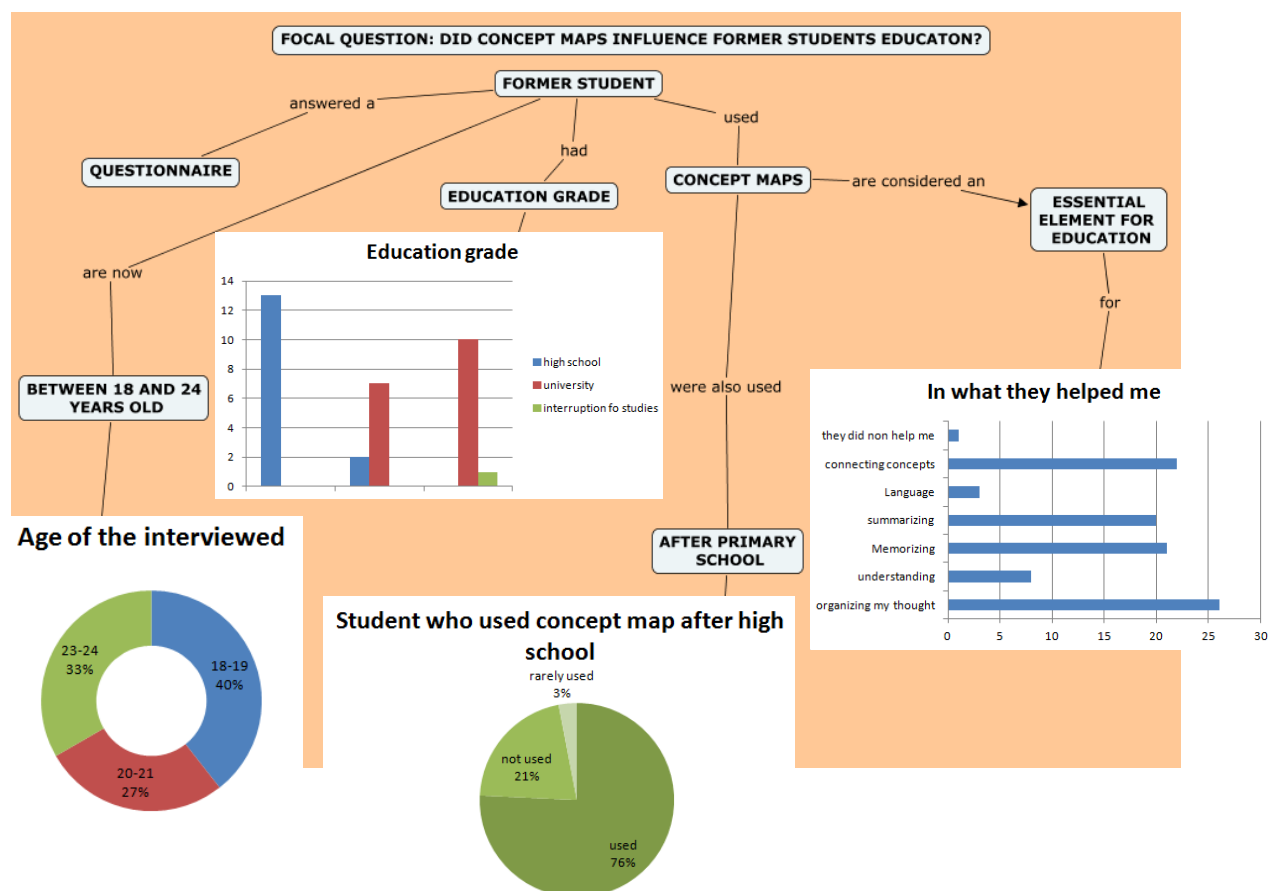


Figure 6. This map summarizes investigation results.

All the pupils, except one, continued their education after compulsory school. The 18–19 years old group is actually busy in the final exams, most of the others are attending University, some have already graduated. 76% went on choosing concept maps as a preferred learning tool “for more effective way of study” Tommaso; “To study and take notes” Chiara; “To organize a speech” Maria Chiara; “to address an amount of challenging study and complex concepts” Enea; “to organize my final thesis” Giuditta; “to develop projects” Francesco; “always build a map before a query” Francesca; “I start from the title to build a concept map so than it could summarize all the aspects and most important points of my research” Francesco; “to summarize and better fix all the concepts. It is useful to repeat and highlight any main topic” Luigi; “to summarize and highlight any study topic” Elisabetta; “they helped me a lot to reach a solid security and a deeper comprehension af all the topics” Annalaura.

According to my former pupils, concept maps are very important since these mainly allow to organize their thought, they help to memorize and connect all the concepts, then they can simplify the synthesis; a very few amount of them think that maps could help the strengthening of language. Even all those who do not use maps anymore think that, when these were used in the primary school, they have been useful for their training/learning process.

### 3 Summary

Concept Maps and the use of CmapTools have proved to be decisive in the conquest of an effettive model of teaching and learning.

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