

FROM THOUGHT TO CONCEPTUAL MAPS: CMAPTOOLS AS A WRITING SYSTEM

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Abstract. The experiences of *global writing*, widely moving through the various categories (music, video, poetry, cinema, theatre, etc.), produce new expression modes, however often excluding and limited to a circle who shares its interpretative keys. The turning point we are now experiencing is from *text to hypertext*. Usually, children learn to read, write, count and draw during the first year of the elementary school and they will do it automatically during their entire life. Many children, on the contrary, are not able to make these correspondences automatic. We now know that these disorders are of a neurobiological kind. According to Chomsky, we are provided with a certain number of typical faculties of the human species. It is the theory of knowledge, not of behaviour. As functional magnetic resonance enables us to see the confirmation – later – of the biological matrix of the Generative Grammar and Universal Grammar principles, *conceptual maps* are the most effective scientific tool to identify language acquisition processes, its conceptual development, and the instrumental abilities that ensure the comprehension of written texts for the whole life. For four years, we have been working on the design and implementation of an educational programme, which should continuously accompany children from the age of 3-4 to the age of 12-13: *from formulation of concepts, to the use of conceptual maps*. The corner-stone of this ideal educational process is the common awareness *that the base of any meaningful construction of learning and knowledge is the language, which is the ability of all human beings to conceptually represent the world for themselves, through giving names to it, and that every individual has the right to have appropriate tools to express its endless possibilities*. The purposes of the research, considered as a starting and arrival point, are the *pleasure of narrating* and the *pleasure of writing*, which are acquired from the very early childhood and are kept during the whole life, only if there are exercise and satisfaction opportunities. In this context, even for children who are 6 years old (who are able to use the software autonomously), **CmapTools** was an excellent support for what Roy Harris defines a **writing system**. In practice, it works like a narration system, which ensures a complex communication, using several linguistic codes simultaneously.

1 Introduction

In Urbino, some classes of the School I. C. “Paolo Volponi”, for four years, we have been working on the design and implementation of an educational programme, which should continuously accompany children from the age of 3-4 to the age of 12-13: from formulation of concepts, to the use of conceptual maps (coordinator of the project for the “area linguistic activities” Liviana Giombini; coordinator of the project for the “area scientific activities” Patrizia Gostoli; the primary teachers involved Andreina Canti, Caterina Piccici, Patrizia Penzo and the nursery teacher Dina Bertozzi).

The corner-stone of this ideal educational process is the common awareness that the base of any meaningful construction of learning and knowledge is the language, which is the ability of all human beings to conceptually represent the world for themselves, through giving names to it, and that every individual has the right to have appropriate tools to express its endless possibilities.

The purpose of our class work is to demonstrate that the *pleasure of narrating* and the *pleasure of writing*, which are acquired from the very early childhood and are kept during the whole life, only if there are exercise and satisfaction opportunities. A real preparation process to the positive children-writing interaction occurs when the conditions wished by Dewey are obtained: *having something to say*, and having *the instrumental capabilities to say it using the selected expression code*.

2 From Text to Hypertext

Normally, writing is only considered as a material action of communication of thoughts, through words and sentences. However, for some time cultural products completely different from books – the traditional support for the production of human thoughts - have been part of daily experience for millions of people.

For at least fifteen years, objects that are completely different from books – hypertextual and interactive objects – are available to children, often offered by parents as reading inducers.

They can be read on a computer screen, are amusing, offer labyrinth narration paths, allow completely different procedures than those offered by a printed book, with a linear and sequential structure.

The experiences of *global writing*, widely moving through the various categories (music, video, poetry, cinema, theatre, etc.), produce new expression modes

The turning point we are now experiencing is from *text to hypertext*.

In this context, even for children who are 6 years old (who are able to use the software autonomously), **CmapTools** was an excellent support for what Roy Harris (1986) defines a *writing system*.

In fact, it materially provides them with the tool to “continue writing” in the most natural way, considering that child’s natural writing is of a hypertextual type.

Writing (considering writing as the semiotic ability, controlling the creation of signs, which is “*la faculté linguistique par excellence*” for Saussure (1916) shows all its complexity in children: expression of sequential and linear thought, but also process and reticular thought. As a drawing is the expression of natural hypertextual writing, c-maps introduces and educates individuals to an expert hypertextual writing.

3 Formulation and Representation of a Concept

The following examples illustrate how children go through the step described by Piaget (1926), where words keep for a long time for children a *meaning that is not only affective but almost magic or at least related to special actions* (4 years old), to the first spontaneous conceptual narrations (5 years old), to the acquisition of composition rules of conceptual maps in parallel with the acquisition of writing (6 years old), up to the organization of real knowledge domains (10 years old).

From the very early childhood, children are able to formulate a concept through “touching” the world and giving names to it. Through the cognitive possession of names, the mind “appropriates” reality, almost to confirm what is described in the Genesis (II, 19; XI, 6-9): language is a metaphor of knowledge or exclusion.

Initially, child words are orders and wishes and do not express concepts; on the contrary, they fulfil much more complex functions than it initially appears

For children, who are in a situation of full, frenzied communication learning activities, words are “naturally” a meaning unit, through which they name and think of the surrounding world. They are meaning units they use to play just like they do with Lego bricks. They learn how to speak and then read and write, following the very simple understanding that words are groups of sounds with a meaning, phrases are groups of words with a meaning, and stories are groups of phrases with a meaning.

For children, representing their experiences through words, lines and drawings is a natural process.

3.1 Formulation and Representation of Concepts: age 4-5 years

The attached drawings illustrate what Piaget had already identified: words “keep for a long time for children a meaning that is not only affective but almost magic or at least related to special actions”. They have a communication value related more to a semiotic than semantic type structure.

These are *stories* from 4-5 year old children who were asked by their teachers to make drawings of “nice words, bad words”, “scary words” and “sweet words”. For “nice words”, Elisabetta - 5 years old – wrote her name, made a drawing of a flower, but also falling snow; as examples of “bad words”, a rocking-horse and a car (in the explanation, the teacher noted the comment of the author: rocking-horse causes a child falling; car sliding on ice and provoking an accident); the classification results from the association of negative experience-object. “Scary words”: ghost, wolf, bear, belong to the “literary” experience and are the exact correspondence between name and concept.



Figure: “Nice words – bad words”



Figure: “Scary words”

The following drawing was made by a five and a half year old boy, illustrating “sweet words”. We believe it is extremely important, because it is a full example of pre-writing and conceptual narration: facts, illustrated by concept-words, are told and arranged according to a directional order.



Figure: **“Words becoming sweet”**: (spontaneous narration of how an apple seed becomes jam)

It makes a picture of the spontaneous transition from a complex but “ungrammatical” “narration” – as children drawings are – to a linear, logical and sequential narration.

The child remembered and reformulates, in an autonomous and spontaneous way, an experience occurred at school approximately one year before. The space of the sheet of paper receives two different narrations: in the first, on the left, the “story” starts. From apple seeds sown in the garden, an apple tree grows, and many apples on it (it is interesting to notice how wishes and reality are exactly at the same level). In the second half of the sheet, there is a drawing of a table, on which there is a sugar box, a pot full of apples, which boil and become jam, and a jar full of jam. The title of the drawing given by the little boy is: “Sweet words that become very sweet”. It is interesting to notice the movement of the brown line at the bottom of the sheet: it goes from left to right, receives, guides and accompanies the writing of the story, almost “miming” the movement of a finger moving following that direction.

4 Writing and conceptual maps at 6 years of age

Usually, children learn to read, write, count and draw during the first year of the elementary school and they will do it automatically during their entire life.

During the very first school months, children make enormous efforts, they learn what we call the alphanumerical structure representing the writing system used, based on the sign-concept correspondence: sound – grapheme; figure – quantity.

Many children, on the contrary, are not able to make these correspondences automatic.

In that case, learning disorders appear, such as dyslexia, which are often associated with other learning disorders, such as dysorthography, dysgraphia, dyscalculia, difficulties in learning too often attributed to behavioural problems or, in the most serious cases, with intellectual deficits classified as “mental retardation”.

It is estimated that in Italy 3 to 5% of the population is affected, but 50% of these people are not aware of that, and practice shows that usually at least one child per class has one or more disorders related to this problem.

Through functional magnetic resonance we now know that the nature of these congenital disorders is neurobiological, and that the brain has enormous compensation capabilities; if a given brain area cannot do something, another area can learn how to do it.

When Noam Avram Chomsky, laid the foundations of his philosophical belief, according to which we are provided with a certain number of typical powers of human kind, playing a crucial role in language acquisition and knowledge that we know through Chomsky’s theories on Universal Grammar which “*may be considered as a theory of innate mechanisms, a background biological matrix providing a picture within which language is developed*” “*the system of principles, conditions, rules that are [...] the essence of human language*”(1979), there was no functional magnetic resonance. However, we now know exactly the links between a brain area and a function, and it is possible to “photograph” the neural paths of thoughts.

As functional magnetic resonance enables us to see the confirmation – later – of the biological matrix of the Generative Grammar and Universal Grammar principles, conceptual maps are the most effective scientific tool to identify language acquisition processes, its conceptual development, and the instrumental abilities that ensure the comprehension of written texts for the whole life.

Bühler(1934) and later Piaget acknowledge that the human language corresponds to three main living functions: communication of primary needs-desires (*expressive*), protection against dangers-calling (*signalling*), need for words as the tool to describe, i.e. communicate the thought (*representative*).

These are exactly the same functions that can be identified in the formation of written *words*, which is the intentional result of the combination of sound, sign and meaning. The same occurs in the formulation of a map where symbols play an expressive, signalling and representative role.

4.1 Previous maps and maps immediately after the acquisition of writing skills: age 6 years.

Images show some crucial steps of the acquisition of composition rules for conceptual maps, together with the acquisition of writing to the organization of actual knowledge domains, but they are also the demonstration of what may be defined as spontaneous hypertextual writing, and how children can, absolutely naturally, start using a sophisticated writing tool, such as CmapTools.

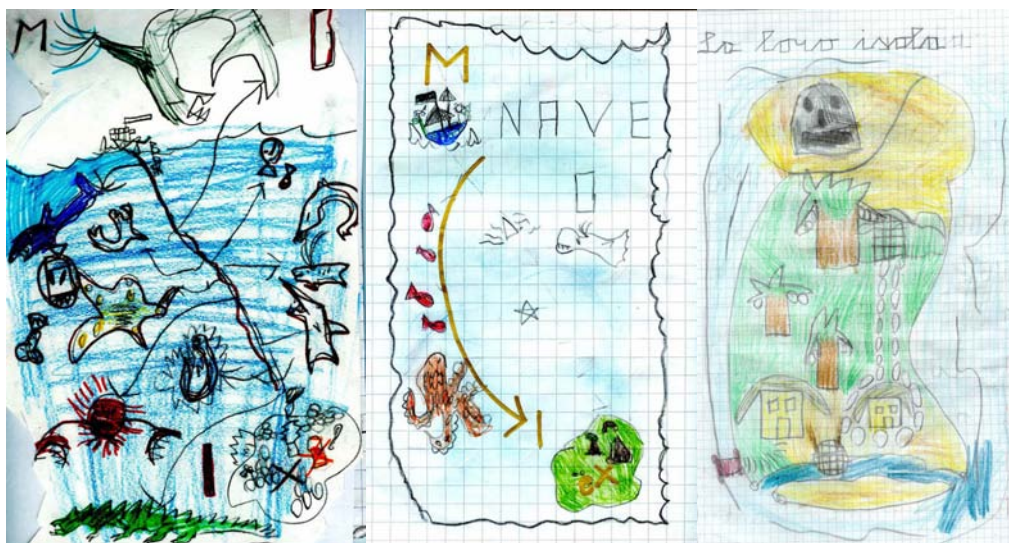


Fig.: Map of Treasure Island - Luigi, 6 years

The first drawing shows a Map of the Treasure Island.

The boy, Luigi, is 6 years old. During the first days of school, he does not know how to write all graphemes and he only uses two graphemes: M for map and O for gold (“oro” in Italian). Links and direction arrows appear; the path of the pirate ship, up to the island, is full of adventures (one image – one concept).

The second drawing, made after a few days, shows a full written word - NAVE (ship in Italian) – and the grapheme O for gold.

Once again, a direction line with an arrow connecting the ship with the island.

The third drawing, made a few weeks after the first two, shows a complete phrase: their island (of the pirates).

The following shows how from the map – an example of an organized narration in spite of the lack of writing abilities – there is a transition to writing of two concept words: MAP and hive; in this case, the link between the two concepts coincide with the flying bee. Finally, there is the transition to a first form of text: BEE LIVES IN THE HONEYCOMB AND THE HONEYCOMB IS IN THE HIVE.



Fig.: Conceptual map “bee”

Fig.: Map “hive”

Fig.: “Bee lives in the honeycomb and the honeycomb is in the hive”

It is possible to notice how words progressively take a full conceptual value and become knowledge units organized according to precise rules, units of meaning, which are useful to understand, reformulate and tell experiences and knowledge.

5 Conceptual maps: the story board to “sail” in the text

From a viewpoint of educational use, one of the purposes of map construction is to show the opportunity of creating relationships between concepts and realize our mental constructions.

The combination of a graphic-symbolic code with some words having a nodal signalling function (for example, the name of a town or a river) creates an effective communication within a very short time, as compared with the time required for a text describing the same information in a syntactically appropriate way. A map uses a system of signs, enabling the so-called cognitive reading. It is based on the immediate conceptual transposition of some information, which becomes the subject of interactions and correlations when they undergo our personal interpretative reading. Just think of which and how many ways we have to read a road map, a geographical map, or a star map... A map usually offers an empathic, extensible and focusable reading. There may be several and various reading levels: from immediately utilitarian levels to others starting from concrete data and stimulating our mind, so that a name or a line becomes associations of ideas, recalling of memories, sensations, desires...

It is not sufficient to ask children to create maps. To ensure this occurs with full knowledge, first we need to provide them with criteria clearly and certainly showing the operations to carry out and the related conditions, to determine their use and set the viewpoints from which maps may be considered.

The first useful indication is that maps are obviously and mostly used to be the borders of our own knowledge domains (usually treasure maps are very personal), to logically and consequentially clarify complex reasoning (very helpful to find mysterious and unknown islands), organize a story (I can tell all what I know about bees, even if I do not know how to write). Finally, they enable teachers to organize their lessons, starting from actual knowledge and curiosity of students.

Choosing to use the word MAP as a linguistic unit to learn the grapheme M, not only means giving this skill but also establishing a link between an unconscious and innate narration mode (spontaneous hypertextual) and a conscious mode: the formulation of maps whose purpose is telling a story (hypertextuality as a non-sequential organization).

As children learn that a word cannot be formed, if signs do not observe the rules of composition, also the map, a real graphical representation of thought, uses an expression code: *the concepts*, expressed under a summarized form (words-concept), are *contained within a geometrical image* (a plane figure), which corresponds to a junction point; they are *linked* between each other *by lines*, which narrate this relation through *link-words*.



Fig.: Map "LUMACONE"

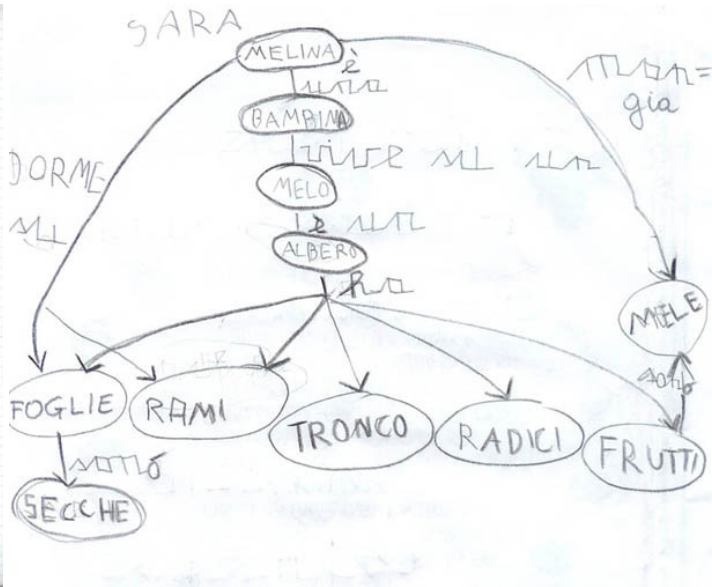


Fig.: Map "MELINA"

These two maps were formulated some time one after the other. These are examples to start understanding the structure of a text, and the formulation of maps is aimed at organizing verbal telling. Obviously, the transition to written text of a summary is almost simultaneous. Simultaneously, school children start using video-writing and c-maps. At the computer, they carry out activities, which strengthen and are complementary, and the instrumental abilities of learning how to read and write are strengthened. Complex abilities are acquired very early, as compared with the standard. Precociousness is not the main advantage; reading and writing map to tell stories, children are involved in both multidimensionality and unidimensionality of a text.

The map No. 1 was formulated at the beginning, when the child is starting to read and compose the first written words. There is only one word only: LUMACONE (snail), which is the name of the main character of the story, and drawings illustrating the narration sequences. The second map, "MELINA", shows how writing skills have developed (words written with different characters appear, which are used by the child not in a casual way: concept-words with block capital letters, within their node, link-words in small italic). Lines and arrows correctly tell the story.

Children understand that maps, like all forms of communication, need shared rules, "rituals" or "signs", which allow their reading.

The connections represented not only by lines and arrows but also link-words become very important to "read" the map. Children are able almost immediately to operate a clear distinction between concept-words and link-words; instinctively, they understand the function of syntactic and semantic rules, which control the formation of a phrase.

5.1 Acquisition of narration skills through conceptual maps: age 8-9 years

The graphical representation of a *conceptual map* is a full narration.

Usually, after all school children have had the opportunity to read their own map to the other children, synthesis is facilitated through the formulation of a shared map, at the blackboard, then children are invited to read it loudly. At that point, it becomes evident that, although there is only one map, the ways stories are told vary, according to the "path" selected to illustrate them (concept of hypertextuality of the narration path).

The transition from oral character to writing (also through very complex reasoning) is facilitated and children use, also when they are not explicitly requested, conceptual maps as tools to organize the structure of discourse. Learning how to organize their own thoughts is one of the most difficult and challenging activities children have to face.

Very often, these difficulties add up and become insuperable obstacles, organization difficulties, and children realize they have syntactic and grammar difficulties. The result can only be that these children are afraid of writing or speaking, especially in the presence of traditional teaching methodologies, based on the repetition and evaluation tests. The increasingly expert use of computer provides clear advantages for the acquisition of knowledge and skills: critical abilities are activated for the selection, and learning keeps and strengthens play and curiosity characteristics: "surfing" through the Internet is much more exciting than glancing through an Encyclopaedia...

These maps are note sheets. These are maps illustrating various subjects: history, Italian grammar and literature. They show how children, when they appropriate a tool they feel useful and facilitating in relation to their needs, they use it in an autonomous and systematic way. They only need one sheet, one pencil and some colour pens.

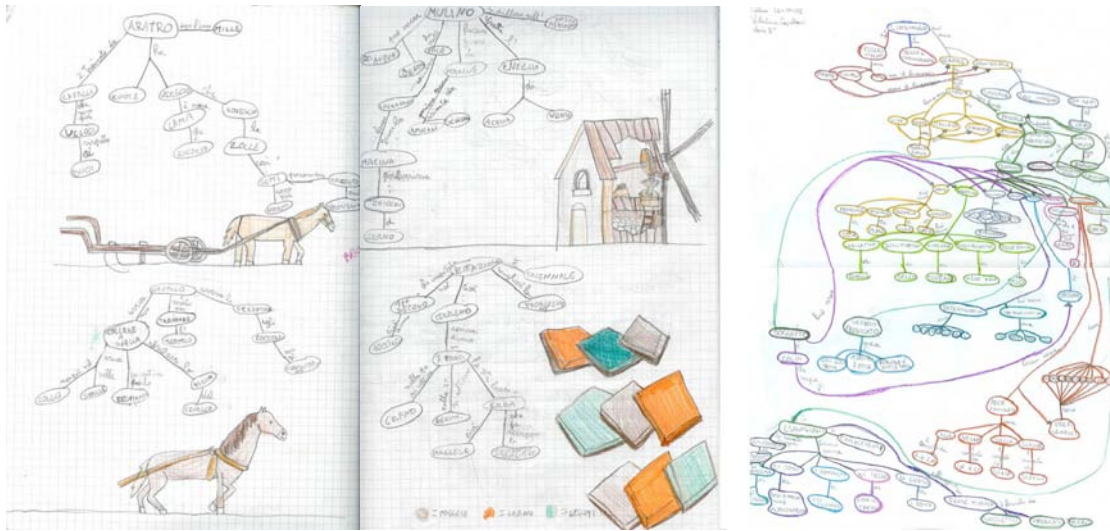


Fig. They only need one sheet, one pencil and some colour pens...

5.2 *Personal organization of knowledge domains; use of CmapTools for hypertextual narrations (the maps related to interaction are part of a collaborative hypertextual work produced by the children of the last elementary school year in June 2003): age 10.11 years.*

Autonomously, when they wish to communicate the result of their work, children use the CmapTools software, work on Local (something like a personal blackboard/portfolio), and upload it into Public, and then, through the servers provided by the IHMC for free, they have the opportunity to link concepts with web pages, and put their work directly on the Internet, to make it available to anybody.

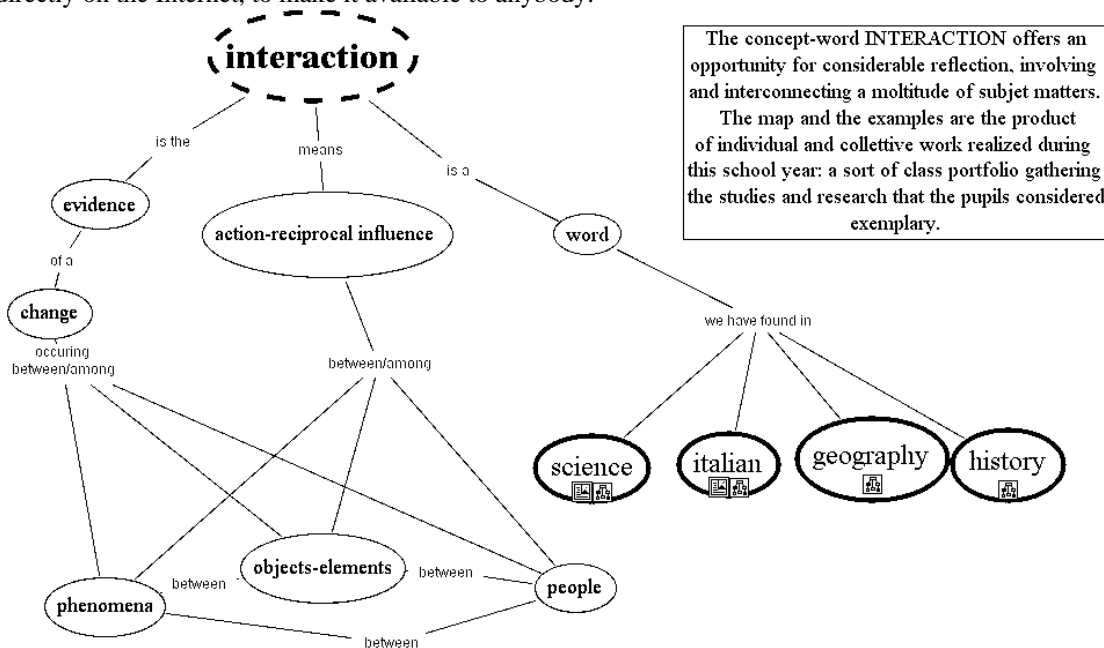


Fig. Home page of the hypertext "Interaction", designed by the students of the 5th year of the Elementary School "Piansevero", Urbino, Italy, published on the web site www.icvolponi.it

As the conclusion of an entire process, children (10 years old) have produced a complex hypertextual work, starting from word interaction, available on the site www.icvolponi.it

To document the word concept interaction, they have created connections, which start from the main map and illustrate the meaning in the various contexts. This is the example of how children, when they are ten years old, are able to design and develop a class cooperation work; they are able to organize their work into research

subgroups; they make the materials used and produced transdisciplinary; they are able to use different languages at the same time (visual, sound, written languages); they are interactive both as readers and writers; they are able to make available to all the best (according to the judgement of every child) they have personally done with a collaborative spirit, for other hypothetical surfers on cybernetic spaces.

6 Summary

Writing, considering writing as the ability controlling the creation of signs, shows all its complexity in children (4-12 years), expression of sequential and linear thought, but also process and reticular thought.

In this context, even for children who are 6 years old, **CmapTools** was a *writing system*. In practice, it works like a narration system, which ensures a complex communication, using several linguistic codes simultaneously.

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