What you see is what you have in mind: constructing mental models for formatted text processing

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Motivation

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- ...although the assimilation of selected foundational concepts of "true" informatics is considered, at least potentially, a desirable formative asset for students

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- teaching the models underneath a particular application (say, a WP), instead of relying on trial-and-error...
- ...leads to proficient use of software (*any* WP),
- but also introduces abstract concepts (e.g., information representation).

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Background: allosteric learning

- direct transmission of knowledge kept to a minimum
- letting pupils rework their conceptions so as to autonomously discover concepts

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Details:

- 8 hours in 4 non-consecutive days
- 25 pupils (9th–10th grade)
- extra-curricular activity

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   - discover how to encode formatted texts
4. C
   - realize that they need unambiguous descriptions
   - think about the optimization of a code

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Activity #1 – Basic text formatting

Ask students (in groups of 2 pupils) to

- conceive a formatted text (e.g. a poster or a flyer)
- realize it using a WYSIWYG word processor
- answer (in written form) to some questions: "Which type of formatting did you use?", "Why did you use it?", "Did you use more than one formatting for a same text passage?"

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Results: reflection about

- æstethic value of formatting
- formatting conveys information
- meaning = text + formatting

Activity #2 – Recording of meta-information

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Tools

- textual representation (without formatting) written on big sheets on the gym floor
- objects available in the gym (spoons, beakers, ropes)

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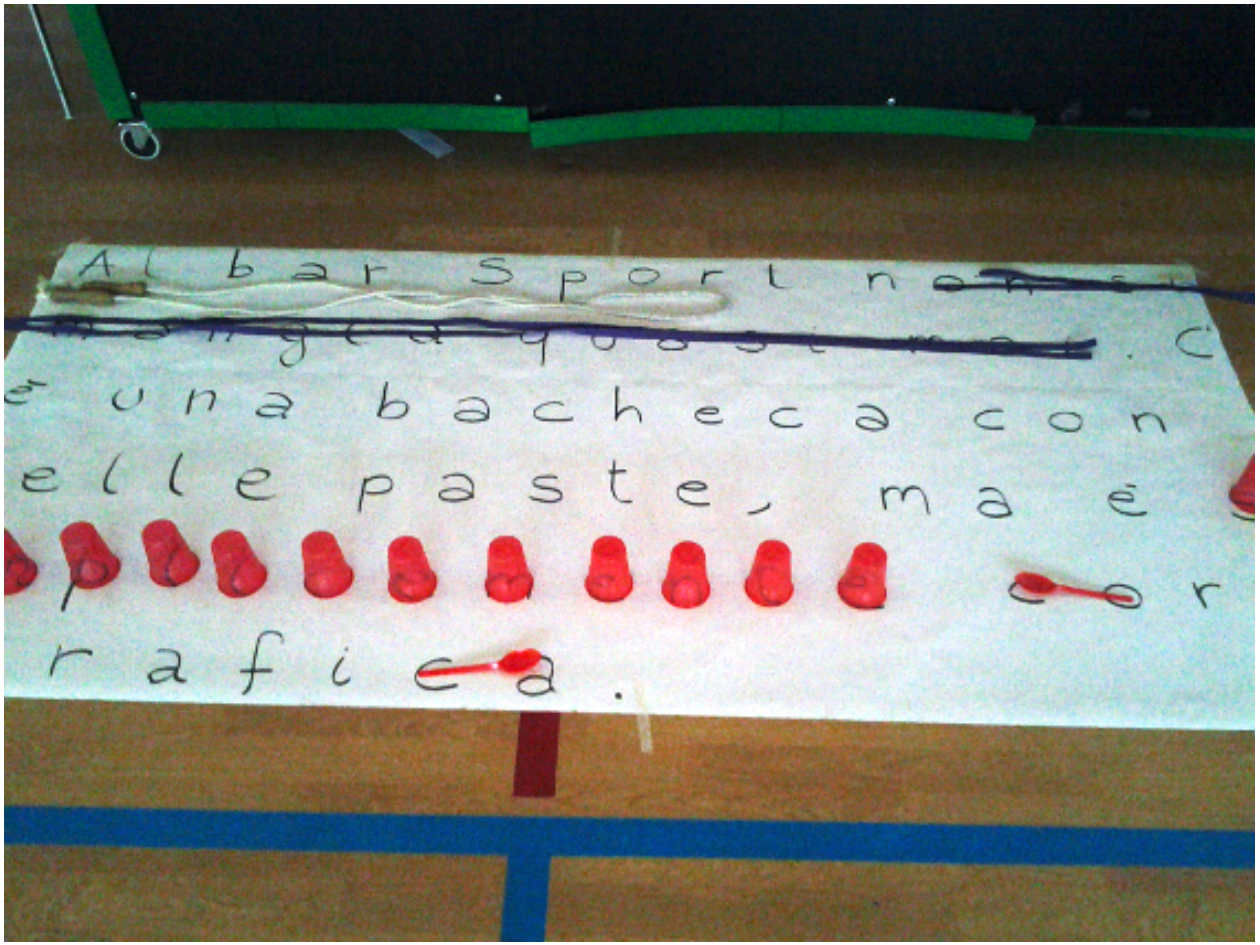

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Results

- Rules often turned out to be ambiguous
- objects used in order to “mimic” the visual formatting

Activity #3 – Discovering meta-language tricks

In order to promote the discovery of symbolic encodings, we proposed another game to groups of 4 pupils, still asking to reproduce a formatting (now using A4 sheets on the class desks)

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Target produce a valid formatting minimizing the cumulative cost of used objects

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Results

- autonomous discovery of markup techniques based on tags
- cost optimization related to the frequency of formatting styles
- use of positioning in order to maximize the exploitation of cheapest objects

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cost of used objects

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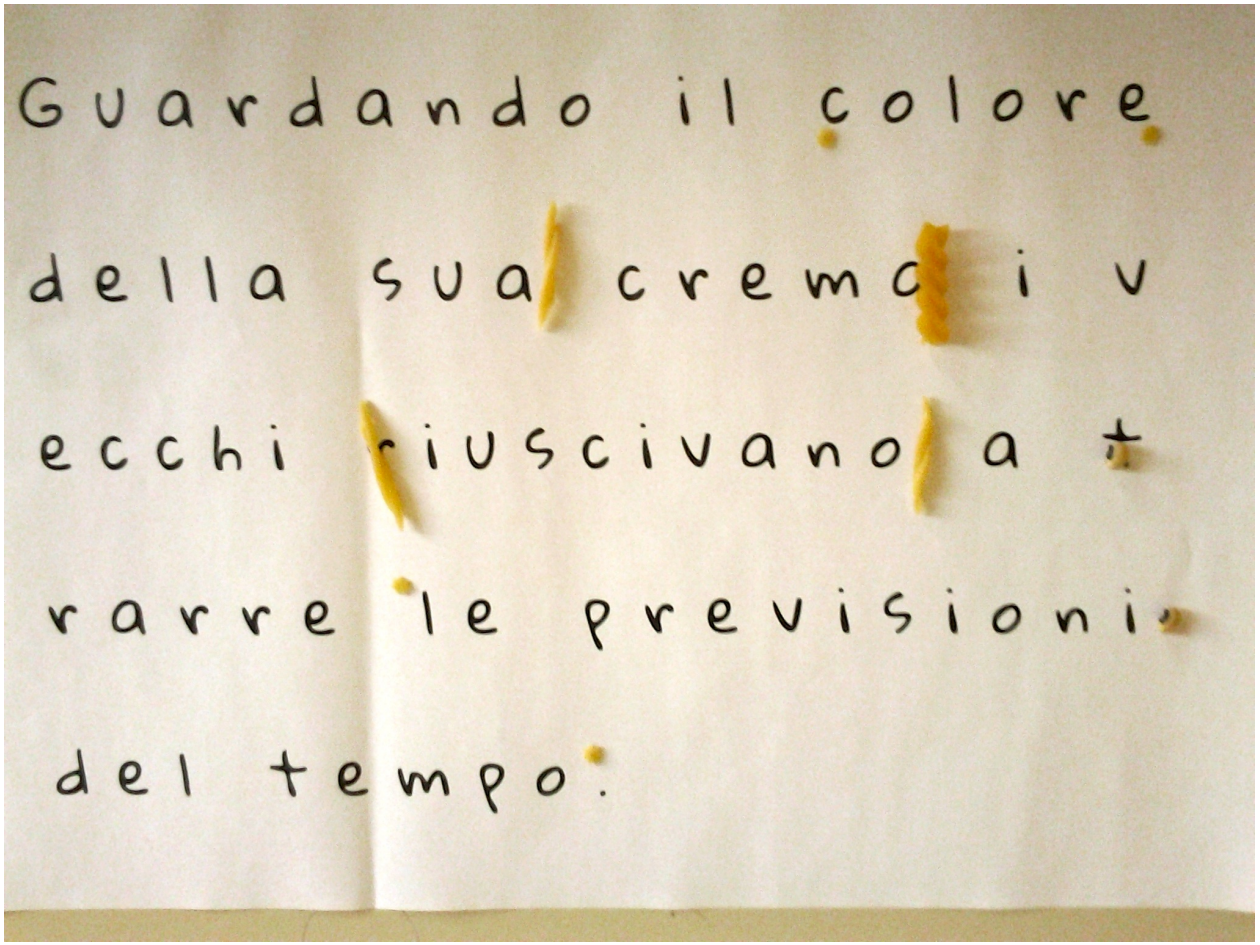

Activity #3 – Discovering meta-language tricks

As a final experiment, we proposed a second round of this formatting game, now using exclusively cards carrying letters and keyboard symbols:

- symbols and unused letters (*j*, *k*, *w*, *x*, *y*, not in the Italian alphabet) to convey meta-information
- suitable positioning in order to give a special meaning (e.g., q to denote a bold text)

Activity #4 – Rediscovering formatting tools

In a computer lab, students were asked to use a software tool developed by us which allowed to visualize and edit a formatted text simultaneously updating three views:

- standard representation *à la* WYSIWYG
- wiki syntax
- HTML-like syntax

The goal was to obtain a given result on the WYSIWYG view by updating the remaining two views.

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Results

Students had no difficulties in adopting these (formal) syntaxes. They immediately noticed the analogy between the wiki syntax and the rules they had discovered in previous activities.

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Pros

- At the end of the experience, students accepted as rather natural (even obvious) the idea of using the same alphabet in order to encode a language and a meta-language
- The link with technology was clear. We were also able to show that the same concepts are behind the scenes in other contexts, for instance when editing Wikipedia entries.
- In general, students declared to have learnt something while having fun.

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Cons

- The gym was not an ideal setting for the second activity (disastrous acoustic, location too dispersive), and indeed several participants considered this activity boring
- Some participants said that tasks were sometimes even too easy to perform.

Conclusions

- A set of activities for conveying abstract computing concepts to pupils of secondary schools
- The same activity was subsequently carried out autonomously by a math teacher in another school, but with younger students (6th grade), with good results.
- We are currently studying videos and reports of this new experiment with the help of colleagues working in the field of educational sciences
- This experience fostered the creation of 2-hours workshops specially conceived for 7-10th graders which are achieving a good success.