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DRAWING AS LEARNING ENABLING META-LANGUAGE. USING SKETCH-NOTING IN THE FIELD OF EDUCATION

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Abstract

The use of information technologies is widely and massively impacting on the educational systems. From the adoption of the interactive tools such as the LIM as a support of teaching activities; to the substitutions of paper due to the introduction of tablet and publishing in the so-called 2.0 classes. All the aspects of the ICT have a strong impacting not only the instrumental environment of the school, higher education and universities, but also the way in which people learn and participate in the educational process.

An increasing number of studies compare how people take notes and how the modality effects on the mental model and information retention to understand the impact of ICT on the school system.

On one hand, using digital supports means to transcribe with a text editor on a computer what they're listening. On the other, taking notes traditionally means writing on paper.

These researchers are demonstrating extensive differences in the cognitive answers in favor of the analogical practices.

Studies show that the process of writing activates much more cognitive activities and produce a stronger organization of concepts and notions presented during the oral presentation.

Besides this traditional way, a new approach to note taking – based on the drawing techniques – is emerging and spreading. Visual facilitation and sketch noting use visual language to engage the brain in understanding, organizing and memorizing information and to experience a "meaningful learning" according to Ausubel theory.

The activity of drawing in itself connects both the analogical experience of linking the movement of the hand with the synthesis operated by the brain while listening or reading in a sort of translated choreography of our thoughts. Moreover, to draw means to convert a verbal input in a visual output, a textual or oral presentation in a visual representation.

The paper is aimed to map and discuss this drawing practices applied to the educational field as an alternative learning method, according to the different perspectives proposed by authors such as Brandy Agerback, Mike Rohde.

Keywords: Drawing as a learning enabling meta-language, Using sketch noting in the field of education, drawing, sketch-noting, visual language, visual design.

1 DIGITAL TECHNOLOGIES IN EDUCATION

The pervasive impact of ITC also in the education sector is deeply changing the way we teach and learn [1, 2]. In recent years the Italian government has started to promote the use of digital tools and artifacts both in the class and in the everyday activities. LIM, tablet and digital books are among the main innovation introduced in the secondary and high school. [3]

On one hand, the MIUR aims to let technologies be an inclusive factor in the state educational system on the other; it's trying to innovate the way people are trained [4].

Adobe, one of the leading companies in the field of graphics and interactive software is conducting extensive research to understand the needs, expectations, and attitude both of the so-called Gen Z. considered *digital natives* [5 Ferri] and of the teachers, still considered digital migrants [6].

The on-going research has been covering mainly English-speaking countries such as Australia, United Kingdom, the United States and Germany. From 2011 to 2017 Adobe has involved 2.500 students and 1.000 teachers to understand the connections between learning processes, technologies, and the professional future of Generation-Z [7].

Although the debate on generation segmentations is still open –Baby Boomers, Gen X, Gen Y, Millennials and so on [6] – Gen-Z is represented by pupils born between 1995 and 2010, 11-15 years old.

The research points out some emerging elements and some common thoughts. Enthusiasm and worrying for an uncertain future are the transversal feelings. But they express an overall balance between creativity and technology, both considered part of the present and the next challenge.

According to the survey, 93% of teachers are aware and worried of the perspective opened by digital: they are training for jobs that don't even still exist. By contrast, 76% of students believe that creativity will shape their hereafter careers.

Some trends seem to emerge in this transitional context. Technologies will be an enabling factor; works will imply both practical and creative activities, an ambivalent reaction both of optimism and concern for an uncertain social evolution, and, in the end, creativity as a key to succeeding.

1.1 The elephant in the (class)room

Although digital technologies are widely and pervasively reshaping the physical and cognitive educational environment, it is still not so clear how they are affecting the teaching/learning processes.

We are migrating from the traditional class to the 2.0 or 4.0 version in which chalkboards have been replaced by LIM, books by tablet and ebooks, encyclopedia by Wikipedia.

 "The classroom will be no longer the place where notions are taught, but a place where participated work and discussions take place. A place to learn notions in a collaborative activities with peers and teachers" declares Ferri [3], one of the most well-known Italian experts of the relationship between students and technologies.

Furthermore, the law 133/2008 – promoted by the MIUR the Italian Ministry of School, University and Research [8] – explicitly requires to the educational system to encourage the adoption of hybrid books. That makes it compulsory – even if it's entirely unclear what hybrid means – that publishers have to distribute both the printed and digital version: online, ebook, apps whatever allows the book to be read on a digital device.

This introduces the first mutation in the teaching system, according to that many of the ready activities migrate from paper to bytes, from the book with a physical presence to an immaterial cognitive materiality. It is probably the first time in the human history – started with the invention of written notation – that the reading support is separated from the content and the book becomes the reading machine, as underline by Gino Roncaglia [10] in the essay about the fourth revolution of the ebook.

Together with all the other ITC innovation, this fulfillment turns the way students produce their mental models of the written content they are supposed to study on [11, 12].

1.2 Typing vs. writing in the learning process

in those days, a world in which technology seems to be pervasive in every human activity, does still make sense to use one of the ancient human inventions such as the handwriting?

Not only the ITC revolution but also some national educational system are questioning if the writing does still make sense. Minna Harmanen, the president of the Finish National Board of Education, has recently declared that "Nowadays students do not have enough time to learn how to quickly hand write (in italic!); therefore we think it' not useful for them. Furthermore, it's not easy both for teacher and students to read it.

But the debate is becoming more and more animated. Pam Mueller – psychologist, and director of a research project conducted by the Princeton University – has an opposite position [14]. She held an experiment involving a students' class. The group was divided in two. The first was asked to use paper and pens, and the other one was asked to use the laptop, then they have to listen to a TEDTalk taking notes. At the end of the conference, the researchers questioned students on the topics discussed in the meeting.

Questions based solely on memory have almost the same results, but the ones focused on concepts and information connections the amanuensis had considerably higher scores.

As stated by the author students using the computer were practically transcribing the lesson word for word. On the contrary, people taking handwritten notes, due to the slowness of the gesture, were more selective, including just crucial information, performing a better and more efficient learning strategy.

In a second experiment students using the computer were asked not to literally report the explained notions. Nevertheless, they find it was difficult to fulfill the task.

In a final assessment, Mueller asked both groups to study their notes to be examined in a week. She was expecting that the "digital" student would recover the gap thanks to the huge amount of data. Expectations have been disappointed: the researchers too were surprised that analogical people still perform better. Students using the computer were not able, from the beginning, to correctly and efficiently metabolize the notions.

That doesn't mean that there's a right answer, but people should be aware of the purpose they're taking notes, considering both the tool and the intent. Consequently, we should choose the way we take notes according to the use. If we need a deep learning strategy handwritten annotation, otherwise typing could be a right way to retain a waste amount of data. [15]

1.3   Meaningful learning and conceptual maps

The problem of how to perform an excellent way to learn and memorize information – that means to build a good knowledge and culture – was faced in the '60s by Asubel. In his studies on the psychology of education, he introduced a cognitive perspective, starting from a global approach [16] he then focused on the verbal side developing the concept of meaningful learning [17]. He then applies it also both to a learning method and a visualization model

Ausubel introduced the conceptual maps investigating the human learning and define them as a cognitive tool to and articulate content units; the maps also make evident the connections used to organize the units on hierarchy and pertinence criteria. Furthermore they make evident the key concepts and the prepositions linking the concepts; the maps use the visual communication channel to improve the learning and the retaining of the concepts. Verbal communication and the related verbal transcription are a sequential, linear process. The cognitive maps have a mesh-like and hierarchical structure, where the typical hierarchical structure of an hypertext is reproduced. The learning principle stated by Ausubel can be transferred also to the dynamical cognitive model for the learning the Website exploration: this is a continuous, dynamical and interactive process. as outlined in a previous search "The concept has been revised and developed by Novak and Gowin in the seventies; the proposed and developed the application in order to produce a graphical representation of the knowledge. As a geographical map allows to be directed inside an unknown land, in the same way a conceptual map allows the interpretation, the transmission and to revise the knowledge, the information and the data. The visualizations of the links between the different concepts makes evident the path of the possible reasoning." [18, 19] The cognitive maps then are: a graphical representation of concepts synthetically described (words, concepts) inside a geometrical form (a node) and linked together by lines showing the relations by means of words-links [20].

Cognitive maps allows the *multimodal representation* [21] of the information architecture highlighting the hierarchies, the nodes the physical (hypertextual) and conceptual connections between site contents. The interaction with the information is based on a generative dynamics of ryzomatic connections where the cognitive and perceptive richness Human User is evident, giving a more direct representation than the usual static structure tree [22].

Understanding is an active process in which we construct a model [23] of what we think and of the speaker's content: understanding means thus construct meaning by integrating new knowledge with those already in our acquired. According to Mayer [24] suggestions slides could be a valid support to oral presentation if they are a balanced mix between verbal and figural elements that convey and catch maintain the attention of the public/class if:

– words and images are presented and linked together;

– words and images are relevant and interrelated;

– words are presented orally and not only in the written form.

Moreover Clarks & Lyons [25] have proposed a taxonomy of psychological functions that graphics and images play in the learning process: support the focus;activate prior knowledge; minimize the cognitive load; build mental models, help the transfer of learning, support motivation.

"The maps indeed: produce a visual hierarchy simple and evident; allows the visualization of thematic nodes in the hypertext, and more mark up the logical and physical; connections, say the links; allows the visualization of many nesting levels of information at the same time in the same page; The solution based on the application of conceptual maps, as proposed by Novak and Gowin, overcomes the simple translation of contents to maps; a new interpretation of the method for setting up map is introduced, suggesting a critical approach to the structuring and to the navigation through knowledge." [26].

2 VISUAL THINKING AND LEARNING

The Ausubel model and the further improved by Novak and Gowin directly introduce to a spatial and visual approach to knowledge organization.

In recent time, Tony Buzan [27] has worked on the graphical side of the mind mapping proposing a standard approach and design pattern to use mapping as a conceptualization and cognitive tool. This tool has been confirmed as a learning method by Willis [28] in 2006 when Buzan launched his on software iMindMap [29] in the context of self-improvement educational courses.

If the digital technologies are becoming even more pervasive, on the other hand, we see a sort of reaction. Mental processes that need a slow time and a strong focus – opposed to multitasking and always on an experience of the IT devices – seem, then, to go back to the analogical environment in which representation skill, drawing abilities, and visual thinking are the discovery and learning drivers.

In this context, approaches that bring visual thinking and graphic language to the center are increasingly taking space. Dan Roam proposes a visual approach to problem-solving in his bestseller The Back of the Napkin: Solving Problems and Selling Ideas With Picture [30]. Brown claims the power of doodling as a way to free the create thought: colors pencils, pens, written patterns recurrent graphical mandala, coloring inside (or outside!) the outline of a printed figure methods to empower our creativity [31]. On the other side, Ellen Lupton proposes a structured use of the visual thinking supported by graphics methods to approach the analysis, ideation, conceptualization, and solution of a design problem [32].

The visual approach is an engaging way to understand, elaborate and connect concepts in a similar way to the *meaningful learning* activities explained by Ausubel. The challenge, then, is to bring these handwriting and drawing skills even to people who are not specifically trained in them [33]. The visual language, in fact, is and enabler both of knowledge and learning competences.

2.1 Visual sketch noting

A further step in this direction has been done by the visual practitioner's community. Personalities such as Agerbeck, Bird [34], Rodhe are actively raising and spreading a culture in which the graphic culture of colors, calligraphy, symbols, and signs is empowering people in understanding and remember notions and concepts. In particular, Brandy Agerbeck proposes the use of visual facilitation as a mediation tool, both in interpersonal or group dynamics and in complex communication systems. [35].

Mike Rodhe focus his research and dissemination work on sketch noting: it's not important how good you are in drawing, but how drawing can help you to visualize, remember and learn concepts, speeches and lessons. He helps people to learn how to use illustrative elements in note taking in a fast and effective way. The book *Sketchnote Handbook: The Illustrated Guide to Visual Note Taking* [36] is a practical and conceptual guide in practicing the visual and lettering language and how to use it as a powerful conceptual tool.

Figure 1. Visual recording: images by Erika Samsa & Letizia Bollini

This movement simplifies the visual representation culture to make it accessible to different public. The complexity of drawing language and techniques is reduced to basic and simplified geometrical shapes, arrows to connect concepts and frames to identify and divide issues and ideas. The initiative deserves attention and has the merit of opening the discipline also to those who are not specialists giving them an easy way to communicate.

This method not only activate a lot of connections among elements, as in the conceptual maps but uses a wider and richer graphical repertoire [37]. Colors, different lettering type and weight, a specific texture or conventional and hierarchical shapes, lines and link are a huge memorable glossary to express, categorize and, in the end, remember notions and data. Furthermore, drawing is both a physical and intellectual activity that implies a *learning by doing* experience [38]. If handwriting suggests a selection of information that already fixes concepts in the student memory, drawing create an additional effort to translate what's been heard in images or symbols.

2.2 Drawing as a language

"Drawing is at the same time an act of knowledge of the world around us and a creative one, embracing different project scales and design cultural branches. The visual-graphical level utilizes both the aspects" as underline during the last National congress of the Italian Drawing Union (Naples, 14-17 September 2017) "visual communication is, primarily, a form of representation. Therefore it shares the fundamental principles of the drawing language. As a prefigurative act of ideation, drawing moves its expressive repertoire draws on metrical, geometrical, proportional, spatial, and formal aspects of the whole composition as the first parameters to conceptualize and to communicate the message. […] The visual language of graphic design, therefore, has its particular vocabulary. Its syntax and grammar are based on color theory, spatial and organizational canons, typography history and culture and the whole expressive range of the speech-figured rhetoric [39]. The visual communication is, moreover, a transversal language able to cross cultural boundaries and design scales to become an expressive field to unite hybrid and multidisciplinary scenarios." [40]
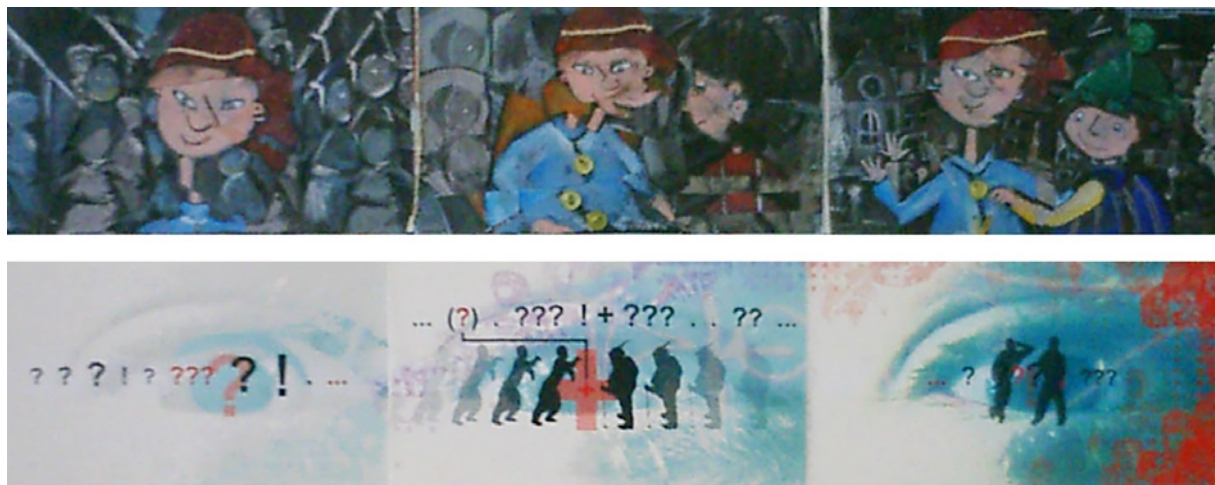

Figure 2. Style exercises: mages from the Graphic Design course, Psychosocial Communication Science Degree, University of Milano-Bicocca

3 CONCLUSIONS

Digital technologies are here to stay, and they are given a huge contribution to teaching methods and learning activities. Nevertheless, they fail when to try to substitute some basic cognitive processes such as understanding and information recording.

Analogical activities, handwriting above all, are helpful to synthesize, focalize and remember concepts and data. Besides, meaningful learning is based not only on a written note of ideas and connections organized in a spatial representation.

Drawing can foster this empowering role of visual in note-taking and learning activities, giving students a useful cognitive tool to understand and remember information.

The next challenge in educational system is to give also to non-design course students [41] a basic and practical knowledge of the graphic language to be used in transversal learning activities

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