Multimedia and image influences in education:
some epistemological aspects

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Abstract: - Image has a tremendous influence in educational process in different stages. Multimedia, the environment permanently surrounding us nowadays, augments image perception influence on text understanding, and suggests the emotional background. Short-term and long-term memory, are differently influenced by image, its understanding being sometimes completely marked by colour, style, impressionability. Tests, done on image retaining, show the impressing capacity to observe details influencing learning capacity. This paper makes an overview on recent papers in this field, underlining epistemological aspects in direct connection with the educational process.

Key-Words: - Image processing, multimedia, education, epistemology, cognitive sciences.

1 Introduction
Image has an incontestable influence in every stage of our life, in educational process especially, from the first years of life to adult evolution. Transforming the debate from «"Do media influence learning?" to "In what ways can we use the capabilities of media to influence learning for particular students, tasks, and situations?"» [1] helps us to advance and contribute to the improvement of teaching and learning.

Hypermedia (term first used by Theodor Nelson [2]) might be considered as one of the multimedia applications. Both multimedia and hypermedia have a pronounced effect on children development. Intelligence tests for children up to 7 years old [3], [4], [5] are intensively using image - this being in fact a very good way to highly effectively teach youngsters, from their childhood to student life [6]. Multimedia constitute the environment permanently surrounding us, augmenting image perception, influencing text understanding, suggesting the emotional background (the colour-emotion-text relation being an actual theme of research [7]).

“Knowledge and learning are the result of a reciprocal interaction between the learner's cognitive resources and aspects of the external environment.”[1].

Short-term and long-term memory, are differently influenced by image, its memorability and understanding being sometimes completely marked by colour, style, impressionability [7], [8].

Tests done on image retaining show the impressing capacity to observe details which is influencing the learning capacity [9].

This paper makes an overview on recent papers in this field, underlining epistemological aspects in direct connection with the educational process.

2 Mental Imaging
From studies referring to the impact of images on children’s learning in hypermedia environment [4] to recent studies of hypermedia and hypertext influence on student’s learning, more relevant issues are underlined. It is interesting to reveal (a) pedagogic implications of turn from text oriented educational materials to pictorial knowledge; (b) results obtained comparing the effects of static, animated, dynamic images, in children’s learning versus conventional methods; (c) problems that arise from electronic, media images intensive use; (d) memory capacity of students when first receiving hypermedia information (without or having knowledge background) [6].

Positive effects of hypermedia pictures on children’s reading were clearly stated. Implications of hyper and multi-media on human brain and education exist, efforts to systematically measure them are continuously made on short-term and long-term memory [8] ÷ [11].
Research demonstrated superiority of pictorial memory, large capacity and considerable duration of recognition and recall memory for pictures. “Dual coding theory” [12] tries to explain the superior capacity of retaining the dyads “word-picture”. More often we have verbal codes for an image, than reversely - an image for each word and “verbal and visual information presented together makes better learning” [13]. While classic books present visual and associated textual information in the same time, in hypermedia, they may be separately presented and knowledge is reinforced by additional elements, improving the recall abilities. It seems that mental images are always created as a basis for understanding [14].

From early theories like Sartre’s Psychology of Imagination [15] to new ones [16] taking into account electronic media [17], imagery and imagination continue to be a debate. Still discussing about the intentionality of mental imagery (which are not inner objects [15] but a stage in our long term memory) we state that accurate experimental psychology on the role of image in understanding and memorizing are still necessary to be done by the help of fMRI (functional Magnetic Resonance Imagery) methods which are rapidly developing. Even for healing these methods may bring new adds [18]. Revealing brain’s secretes on vision and mental images means starting from its imperfections (agnosia, prosopagnosia, daltonism, etc.) to almost perfect, astonishing eidetic memory [19], [20]. Russian research in this field is also covering hypnotic imagery [21].

Important juridical aspects are involved by the subtle influence of language nuances on recall memory, conducting to unreliable statements of visual witnesses [22], a forensic research domain.

3 Image in preschooler intelligence testing

It seems that “the most crucial time of development of a child is from pre-natal to the first nine months of life when growth and development of the brain is the fastest in high gear. The earlier the brain cells or neurons are stimulated, the more synapses are created -early neural synapses making us remember, learn, talk, think, count, and create better.” [23].

Wechsler Intelligence Scale for Children (WISC) proposed by Dr. David Wechsler [24] is based on tests for different ages, using text, signs and making intensive use of images. Further, some examples selected from this methodology (cited from [24]) are presented.

- “Information for picture items”: the child answers by choosing a picture from more response options.
- “Matrix reasoning” - in incomplete matrix the missing portion is selected from more options.
- “Vocabulary for picture items”, the child names pictures displayed in a stimulus list.
- “Picture concepts” - from two or three rows of pictures the child chooses one picture from each row to form a class with a common characteristic.
- “Coding” - the child copies symbols that are paired to simple geometric shape and using a key, the child draws each symbol in its corresponding shape.
- “Picture completion” - the child views a picture and then points to or names the missing part.
- "Receptive vocabulary” - the child looks at a group of pictures and points one which examiner names.
- “Picture naming” - the child names pictures that are displayed in a stimulus book.

The WPPSI (Wechsler Preschool and Primary Scale of Intelligence) is used for assessment of: general intellectual functioning, intellectual giftedness or cognitive delays and learning difficulties [24]. Other experimental measures very relevant for intellectual performances and cognitive development derive from mental chronometry - use of response time in perceptual-motor tasks to infer the content, temporal sequencing, duration of cognitive operations [25].

4 Relevant image features influencing emotional background of perception

Preponderant colors in images have a very pronounced effect on perception, yet depending on the viewer’s personality and story, on the text accompanying the image. For example red might be the color of passion, love, yet it might also express aggressiveness. Orange is a mobilizing color, being very often used in alimentation. Yellow is energizing, the color of the sun, yet in certain concentrations being stressful. Green is the color of hope, of fresh grass, sports, optimism. Light blue might suggest calm, serenity and melancholy in the same time depending on the nuances and darkness. Violet is a mix of red and blue, with indigo corresponding to the last two chakras, is a sad, yet meditative color. Black is elegant, full of sobriety, white is light and pure, etc. Every painter knows this, every child perceive it by the filter of his own personality. Sometimes text and sentiments inspire colors for example “I feel blue” or “I feel pink”, and actual automatic text illustration trials are using text labeling and color identification, together with word-net disambiguation in order to try to suggest appropriated images for texts, in situations where
this is a matter of time (journalism, television, or... why not? ... in custom-illustrated electronic texts). Color, positive emotions and music is a triad reinforcing perception background for learning and long term memory (extending “dual coding”).

Even if Kress argues [17] that usually in western societies “writing is serious and most highly valued and music is for the aesthetic development of the individual, as visual art is” [17], it is quite color and image, together with listening and practicing music, that reinforces connections between hemispheres, and the spatial-temporal abilities from very early ages [26]. Even if multi-media is trying to remediate this drawback, we agree that “critically viewing educational procedures, the prevalence of printed text and the marginalized role of pictures are quite noticeable” and “western cultures value most the importance of logical and mathematical abilities whereas spatial or musical abilities are considered inferior [4], [6], [27]”.

There is a logic implication: “music can help in developing human's spatial-temporal reasoning skill. Spatial-temporal reasoning enables to perceive the visual world accurately and form mental images of objects (mind ability to see in very detailed images and to recognize, compare and find relationships among the patterns and details on an object). The temporal element involves a child's ability to think ahead” [23]. If multimedia provides an environment of image, color, text and music all in the same context [28], these enriched notions are not automatically retained; they have a visible good influence when the background of knowledge exists already, hyper and multi-media reinforcing them. Systematic researches together with sporadic tests come to underline the necessity of concerted plans for studying the influence of hyper and multimedia on long term and short term memory. If this is stated when speaking about human abilities, from the very beginning of these studies [29] up to nowadays, this domain is also benefiting from the studies made for automatic scene identification as Antonio Torralba’s researches made at MIT, MA [30].

5. Epistemological aspects of hyper and multi-media image in education

In genetic epistemology, Jean Piaget [31] coordinated a naturalistic research program in order to understand child evolution. In his theory “the cognitive structures are patterns of physical or mental action that underlie specific acts of intelligence and correspond to stages of child development” [31].

Children are developing schemas by adaptation and assimilation processes.

Comparing new information to the patterns already developed, cognitive structures are changed by accommodation. Finally, equilibration is the force which drives the learning process. “Once the new information is acquired the process of assimilation with the new schema will continue until the next time we need to make an adjustment to it.” [31].

Extending this modality of learning, to a cognitive structure meant to be used by an automatic learning process, from the images displayed in the environment, once the objects delimited and selected [9], [30], a pattern-matching to the possible hypostasis of that object is realized. If the image database is large enough, and the image is “dually coded” - therefore it has relevant text associated, then it is possible to have a successful learning process. Acquired knowledge will extend the existing knowledgebase to form an extended, reinforced knowledge, automatically available. A large literature is treating the epistemological relation between image and knowledge [32], [33] this continuing to be of large debate (how do we know what we know?... by which means?... studies extended step by step with the development of the technology).

Short-term and long-term memory, are differently influenced by image, its understanding being sometimes completely marked by color, style, impressionability. Memorization is critical to creativity, “Creativity comes from a mind that knows and remembers a lot” says William Klemm [34], therefore e-learning programs have to take this into account for our children.

6 Conclusions

Hypermedia, multimedia and image influences in education is intensively studied in the last two decades, epistemological aspects arising in the evaluation of its effects. Knowledge and learning are in reciprocal interaction: learner's cognitive resources interact with aspects of the external environment and the design the process of education has to embed the use of complex media [33].

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