Multimodality and multisensoriality in the chromatic study of nature and in the creation of works of art by Monica Gorini

Monica Gorini
[2175] mg@monicagoriniartist.com

Monica Gorini (Artist, Group of Colour-Italian Association of Colour). – Presentation of the artistic research conducted in France (the landscape of Giverny and the water lilies observed en plein air at the garden of Latour Marliac) included in the volume: «Synthèse visuelle» written by the artist --- Multimodality and multisensoriality; approaches integrated in the chromatic study of nature --- The role of light and atmospheric conditions in the characterization of colour ranges --- The body, in addition to the mind, as an unavoidable means of knowledge --- The different connections between skills for a deep understanding of the natural subject --- Production: the weaving of artistic styles to create a synesthetic artistic experience --- The plurality of expressive means to captivate and reach a wider audience and to urge its active role in the process of transforming our act of seeing --- Beyond Aesthetics. Educational purposes of the art of Monica Gorini.

Keywords: colour, artistic education, aesthetics, multimodality and multisensoriality, artist

Introduction

I have not carried out any studies in engineering, mathematics, or physics, therefore in this paper I will not discuss theories on science of colour nor will concern myself with topics that would require any particular knowledge of these fields, even though, as an artist, basic knowledge of chemistry, physics and optics are necessary to experiment within the world of colour.
My way of approaching the chromatic study of a natural subject is directly linked to a few personal factors: my upbringing in an area immersed in nature, a holistic point of view based on the interconnection between skills, a manner of cross-modal perception with moments of synaesthesia, trandisciplinarity meant as a means of being, my artistic research and 10 year work with blind and visually impaired people, my experience as a teacher conducted parallelly to my artistic research with mutual exchanges and influences in both sectors.

My model of studying the chromatic phenomena linked to the landscape is first and foremost connected to observation and research and *direct experimentation*. For this reason, I fully agree with the contents of the website "the Colour Literacy Project" whose home page for "*Rethinking colour education*" reads "*In the end, learning the language of color is really about learning to see*" (Philip Ball, Bright Earth.Art and the Invention of Color). Here the emphasis is on learning to see. But what does this mean? At point 6, again on the CLP website, among the declared objectives is: "*Theoretical knowledge is helpful in explaining colour and colour phenomena, but a deeper understanding of colour requires the direct experience of perceiving, judging, comparing, using and appreciating colours and colour phenomena.*" Therefore, perceiving and experimenting. But what does perceiving colour mean? In this paper I will attempt to answer these questions by offering a summary of a few selected moments from my latest artistic research carried out en plein air in France, also important to understand how my works are not designed only with an aesthetic purpose, but rather aim to involve the audience, encouraging them to play an active role in the process of transforming their own vision.

Lastly, I will present two works made by my students, aged 10 and 13, in *Artistic Education,* following lessons with the theme: comprehending and elaborating the colour of the landscape through multisensorial and multimodal experiences.

My personal research

Artistic stay carried out in France, 2018-2019, from June to September for non-consecutive periods. Re-elaboration and results of the ongoing research.
Characteristics: study en plein air (outdoors) in different natural viewing conditions. Mixing of pigments or other types of physical colour without using instruments for colour detection or analysis. Use of photographic and video cameras for artistic and documentative work.
First volume published with sole author Monica Gorini. “Synthèse visuelle. The diary of a research” Vanillaedizioni. Preface by Dr. Lorella Giudici, critic, curator and art historian, professor at the Brera Academy of Fine Arts, Milan.
The critical framework within which I carried out my studies are the body of water created by the artist Claude Monet and the Latour Marliac Garden where the water lilies which were supplied to the great French artist at the end of the nineteenth century are kept. The study precisely aimed to investigate the features of chromatic variation of some of the species purchased by Monet, present in his works:
N.Atropurpurea, N Sulfurea Grandiflora, N.Arethusa, species still physically present today in the jardin d'eau. A first fact of interest is historical, chemical, and botanical. The texts confirm that 1894 was the year in which the first water lilies arrived in Giverny. Bory Latour-Marliac was able to develop the first coloured varieties cultivable in Europe. He did this by crossing the white *Hardy Nympheas* - suitable for the European climate - with the tropical species, characterized by vivid colours. He managed to create specimen with exceptional shades for his era such as orange, vermilion and intense yellow, immediately purchased by the Impressionists for their chromatic appeal.

Mode of research and examination The observation

The sensitivity and activity of the observer's eye and brain are just some of the elements for understanding colour in a natural landscape.
Our colour experience in an area is unique. Depending on our distance from the observed landscape, the time of day, the atmospheric conditions, and natural elements such as the presence of water, clouds, vegetation, physiological and physical reactions are elicited within us which help decipher unmatched and unique colour ranges.

Fig 1 Observation of the same water lilies, a few seconds elapsing between one picture and the next. Camera angles vary slightly.

The sense organs translate reality into a message of sensations and perceptions that go far beyond the visual experience. Colour can be made palpable by perceptual experiences; I'm talking about them based on personal involvement. My mode of perception features innate connections between the senses and moments of synaesthesia. Strictly speaking, this is different from the idea of synaesthesia. I cannot undergo tests on a weekly or monthly basis in which I associate grapheme -

colour, sound - colour. I have a perception of colour linked to combined sensory stimulations: air temperature, sounds, shapes, movements, scents. The freshness of the morning air, the warm breeze that barely marks the surface of the river, the whisper in the reeds of leaves trembling in the wind, the aroma of fragrant herbs, for example, create the perception of a colour which, from that moment, becomes almost substantial, physical. In the case of the jardin d'eau, this is the first phase in order to understand and then create a vast range of muddy greens seen above and through the water, later also studied as liquefied reflections of the vegetation. It is as if, in the moment of observation, neural connections, memories, theories, previous knowledge in different fields are activated and together contribute to the understanding of colour in the natural subject on which the observer's attention is focused. The act of understanding becomes the sum of different areas of knowledge that link together in an interdisciplinary vision. The perspective of Rolf G. Kuehni and Andreas Schwarz seems interesting to me. "*Although full understanding (of colour) continues to elude us, it seems clear that it will ultimately come from research in neurobiology, perception and consciousness.*" The body and mind support the moment of understanding of colour in its values and are decisive in the moment of mixing pigments to understand what proportions and modes are needed in the adding process to obtain the desired effects (hue, chroma, brightness, saturation...)

In the next pages I will present a collection of photographs in which I will try to make my way of perceiving understandable, as I cannot offer an immersive experience here. "First of all, light. There is light (radiation of a certain wavelength range) without causing colour, but there is no colour (except in our dreams and imagination) without light." Light is a radiation capable of rousing the human visual system, while colour is the sensation caused by light. (Robert Hirschler). "Newton had already understood that rays, in order to speak correctly, are not coloured. By this he meant that a colour is actually a sensation of the mind resulting from light, just as a sound is a sensation of the mind resulting from the physical vibrations of the air." (David Briggs)

Fig 2. Photoshoot along the Vernon River. The equipment was positioned at night, in an almost indistinct darkness. The moment filmed shows the moment in which the light appears, revealing, in a few moments, the colours, just before the sun rises.

Fig 3. Jardin d'eau of Giverny. Lighting conditions change rapidly, transforming the appearance of reality and revealing a huge variety of chromatic worlds.

As I mentioned, when we immerge ourselves in a landscape, light has a huge impact on how we perceive it, but it could be limiting to say that we only experience and connect with nature through the colours perceived by our mind. In Fig 4 I used photography to attempt to portray the chromatic aspects resulting from a combination of sensorial perceptions in which the body is also involved. "Thought", as Merleau Ponty, whose ideas are references for both philosophers of experience and scientists of perception, had well understood, "*is not an abstract entity but a group of processes that are physically formed in the body.*" So, exploration can begin through physical involvement which will, in turn, influence the way we perceive and understand.

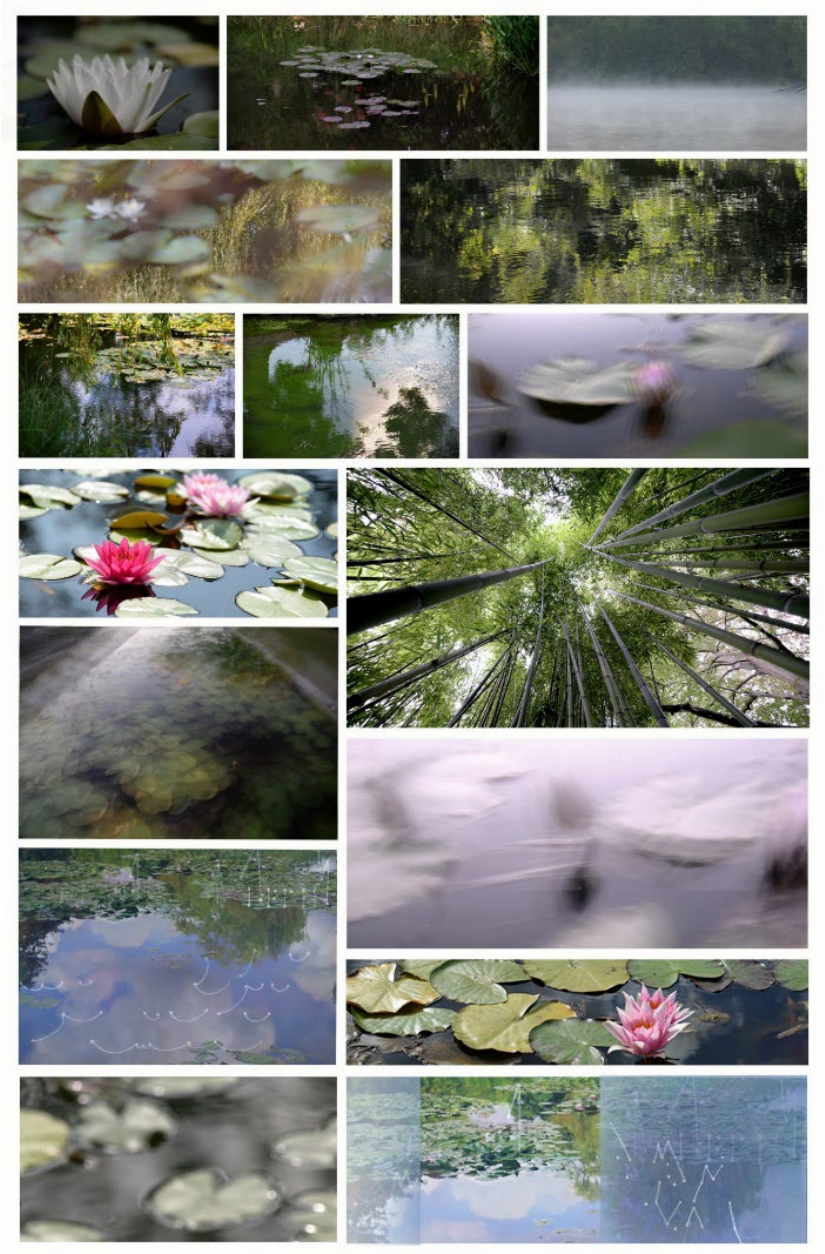

Fig 4 Sensory aspects (photographs taken in Giverny and Latour Marliac)

Images 13 and 16 show cross-modal perceptual notes. They do not contain musical notations with indications for instruments (I am not a composer) but signs with directions and shapes referring to chromatic-musical chords, intervals, pauses, silences.
It is a graphic transcription of visual and musical elements perceived simultaneously within the symphonies played by nature and made understandable to anyone who possesses their own listening instructions.
For example, the swelling of the clouds with a succession of circular and expanding movements has a different musicality compared to the horizontal, static nature of the green archipelagos on which the high-pitched and colourful sounds of the water lilies stand out. The intelligence of nature, clear even in mathematical ratios, manifests itself more explicitly in a deep chromatic harmony that can be perceived by anyone even unconsciously.

In this regard, one can refer to the well-known physiological response to colour, according to which visibly harmonious natural colours tend to make people feel better and comfort them more.

Observation in outdoor spaces requires knowledge of physical and optical phenomena. Let's examine the effect that Leonardo da Vinci called Aerial Perspective between 1400 and 1500, the optical effect whereby colours at a distance undergo significant changes despite the transparency of the air.

Fig 5 The nature of shadows and the reflections of a natural subject on the surface of the water. The dimension of chroma.

The tendency to consider colour as a property of objects, regardless of their illumination and other factors is wrong. Each body, however, has certain properties of reflection, absorption and transmission of light which must be considered in a broader context. Studying the interaction between colours is essential especially when factors such as shadows and reflective surfaces (water) come into play in the observed scene.

My personal Pantonature of nature

Working en plein air means realizing that the landscape is actually an aggregate of chromatic qualities integrated into a complex structure. Nature has much to teach to students of colour science. In the case considered, although the chromatic experience of a subject (the water lily) changes drastically in a few seconds, each change generates a universe of ever-changing variations in which the fixed points are always the orders of harmony (contrasts, agreements, proportions, values). Since the observations took place in natural viewing conditions and not through digital photography or systems in which the use of the screen is decisive and do not involve artificial light sources, I will not talk about colour measurement systems linked to physics, chemistry, mathematics, optics.

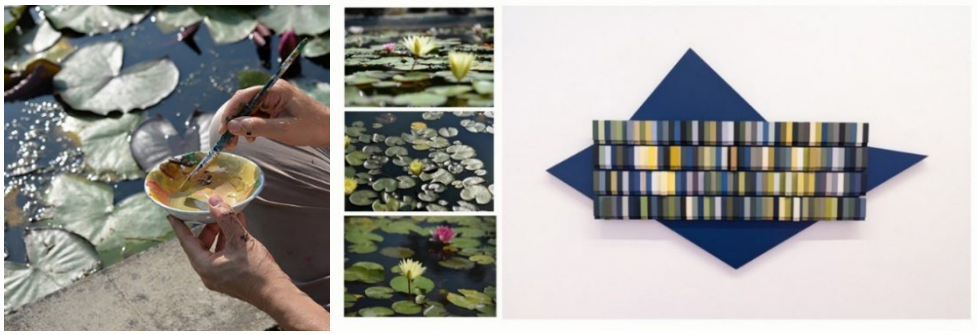

Fig 6 Fig 7

Fig 6. Study of the N.Sulfurea Grandiflora in 3 days with different lighting conditions. Fig 7 Disposition of the chromatic tiles in a composition entitled: Essenses chromatique #2 Nymphéa Sulfurea Grandiflora. Material: wood, acrylics, softy touch paint finish cm 78 x 134 x 4. Year 2023

My choice was to work with particularly opaque acrylic colours spread on wooden supports previously painted with 2 coats of a white base. The hues are flat. Working without the use of colour detection instruments, it is as if eye-brain-mind-hand worked in combination and quickly, interrelating a series of already acquired skills regarding the dimensions of colour on values such as saturation, brightness (Monica Gorini). Years of practice are necessary to understand the true

principles of physical colour mixing and take certain factors for granted. Shorter wavelength colours like the blues of the water tanks are difficult to modulate. Then the greens, regardless of which primaries are chosen (provided that it makes sense for an artist to talk about primary colours), it is impossible to obtain certain brightness values from their combination. If one were to produce very opaque and dull greens (greens resulting from the darkness of the shadows or the dark bottom of the water tanks) it would be best to mix cyan and yellow together to make a basic green to which one could add different proportions of other colours rather than starting from a green pigment, which would be too bright.

Fig 8

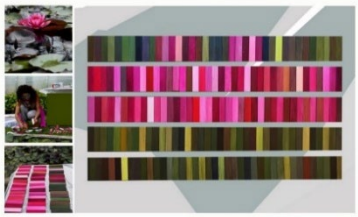

Fig 9

Fig 8-9 Study of N. Atropurpurea in its chromatic variations from 10:00 to 17:00. Arrangement of tiles in a composition entitled: “Un jour. Perceptions des couleurs. Nymphéa Atropurpurea. Material: wood, acrylics, soft touch paint finish. Rendering. Year 2022

The aspects of knowledge and re-elaboration described in the previous sections of the paper (multimodality- multisensoriality) led me to the creation of deep, complex shades, adhering to the "real" values recognized through the parameters present in my mind of brightness, chroma, saturation but above all filled with a unique immersive experience and poetic qualities. I would like to underline the difference between my colour and the homogeneity of the plain colour produced by modern society, often linked to tastes, fashions and the needs of serial production. As Falcinelli suggests, if it is acceptable for the colour of some objects to be evaluated using compact tiles - the red Lego brick corresponding to a Pantone number, which in a few words exhausts much of its essence - we are placed in a different position with respect to the artefacts of art because the Pantone code does not restore the real richness of the artistic experience. It is with this perspective that one should observe my tiles.

Fig 10 (above) is the study of the view of the Jardin d’eau of Giverny in the afternoon, then assembled in a composition entitled: “Synthèse visuelle. Nymphèas, pysage d’eau, les nuages, 2019.
Materials: wood, acrylics, softy touch paint finish. Cm 190x240x31.

The study shown in the images above allows me to make the transformation that has occurred in my art thanks to the work carried out with blind people clear. To translate the haziness of the clouds reflected on the surface of the bassin, the spatial relationships of solidity and emptiness, the correlation of colours in the field of vision and the other perceptions suggested by the setting, I

understood that I had to overcome the flat surface of the two-dimensional work and create the idea of movement through a combination of tiles with different heights. Thus, the entire work was transformed into a series of keys like those of a piano. The chords, designed in two, three, four colours to be read on multiple rows, allow the gaze only to understand the fluidity and musicality of a scene similar to a symphony. Instinct leads to the direct movement of placing both hands on the work to play adjacent colours or colours in multiple rows. In that case, a velvety colour is felt when touched due to a softy touch finishing paint, specifically chosen for the relationship between colour and surface, guaranteeing an emotional-perceptual interaction. This paint maintains the desired opacity even if it causes a slight reduction in saturation, but on the other hand does not create reflections and guarantees perceptive stability of the colour even at a certain distance, in a frontal observation position.

Research outcomes

One of the purposes of my work is to involve and reach an audience made up not only of professionals and to stimulate an active role of the spectator in the process of transforming their own vision. It is because of this that I experiment with different materials. The palettes, simple alphabets of shape and light, almost chromatic codes of nature, interact with mirrors, coloured and backlit plexiglass, steel, LEDs. Light, in addition to generating an emotional response, can involve the viewer from a physical point of view, producing new perceptive dimensions. A sculpture, when lit, becomes an element for creating space even without many elements and colours;

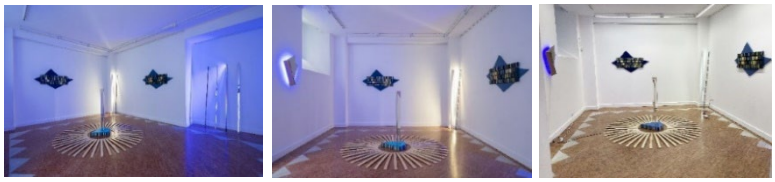

Fig 11a Fig 11b Fig 11c

Fig 11 shows three images taken from the latest personal exhibition at the Gilda Contemporary art gallery in Milan, May 2023. The installation is conceived as a jardin d'eau with chromatic narrations of the Ninfea Sulfurea Grandiflora portrayed during the daytime hours (works hanging on the walls). The same water lily is depicted in the early morning, at the "blue hour" represented by the central work on the ground. The phenomenon of metamerism is used precisely to show the viewer the variation in colour perception when light is modified, supporting the idea of a nature in continuous change and as a profound source of study. Ph Vincenzo Pagliuca

Education. Comprehending and elaborating the colour of the scenery through a multisensory experience

Work: Surprise. Tiger in a storm, tropical. Henri Rousseau. Oil painting on canvas. 1891.
LOWER SECONDARY SCHOOL. Milan. Artistic Ed. Students 10 years of age. Task: construction of a palette of the work, with independent observation, starting from an image from the book of History of Art. Technique: coloured pencils present in the stationary case.
Fig 1 Note the emotional response to the scene rather than a physiological response to the colour: black- fear of the dark, yellow- fear of thunder, red- fear of the tiger.

Fig 1 Fig 2 Fig 3 Fig 4

Multisensory experience with blindfolded students. Auditory: natural sounds present in the work: different types of rain, strong and gusty winds through the trees, thunderstorms, thunder. Tactile: The tactility of different types of wet plants, branches, leaves. Cold air fan. Olfactory: aromatic, broken, and wet plants.
Fig 2. Autonomous processing after sensory stimuli: shape-colour connection for the recognition of different botanical varieties translated into different colours and tones. Attempts to translate the sensations of rain (use of correction fluid, rubber). Vision of colours and differences through the use of synaesthesia. The emotional aspect is set aside for the technical aspect of colour.
Fig 3 Completion of the palettes after the experience. Same pencils available, now overlapping in semi-transparent, intersecting layers. The colour is "seen". Dominance of the green range,
(Rethinking colour education- In the end, learning the language of colour is really about learning to see)
Fig 4. The pencil use framework highlights the need for exercises on colour formation and the importance of introducing concepts such as: hue, brightness, saturation.
The senses acted as an intermediary, leading to vision. With eyes closed.

Multimodal experience

LOWER SECONDARY SCHOOL. Milan. Artistic Ed. Student Pietro Vinci: 13 years old. Task: None.
Program Used: Scratch. Application: Turbowarp. Scratch is a visual and graphic programming language and website, developed by the Massachusetts Institute of Technology, useful for entering the world of computational thinking and problem solving. The Program was introduced in elementary schools by the mathematics teacher. Pietro begins to experiment in order to invent games independently. Almost at the end of his lower secondary school education, he begins to give purpose to his works by creating games dedicated to works of art. The student combines the passion for programming with the Artistic Ed subject, interconnecting the different types of intelligence with which he is endowed. The work was NOT requested.

Fig 1 Starting point: my studies on visual perception and a photograph, both contained in the volume Synthèse visuelle.

pietro vinci\Palette_Sfondo viola.png (1)\Synthèse Visuelle-NEW.html

Phase 1. The student divides the image into 36 equal rectangles. After choosing the predominant colour in each photographic panel, he colours each "palette" with it.

Step 2. He establishes a background tint taken from each of the tiles and changes it every few seconds. Each slide describes different moments of vision since chromatic and luminous factors come into play in the natural scene, which make it always appear different despite the subject remaining the same.

Phase 3 Studies on colour-sound pairings.
Student's considerations. The graphics are not shown for copyright reasons. **Colour is related to frequency.**
Sound and colour waves are characterized by: -Amplitude; -Wavelength; -Frequency.
The program identifies each colour with a code made up of three numbers indicating: Colour; Brightness; Saturation. Sound is identified according to the criteria of Intensity, Duration, Pitch.
The student feels the need to find parameters to relate the two systems: Below is his table and some of his considerations. (I omitted much of the research for reasons of space)

Colour is made up of **three elements**: - The colour itself (green, yellow…); - Saturation; - Brightness.	A sound (for example a note of a piano) is made up of **three elements**: - The note itself (C, D, E…); - Duration; - Intensity (the volume of sound).

Colour is related to intensity.
The human eye is capable of perceiving light colours more (yellow, green), while it perceives dark colours less (purple, red) (see study reported in graph 1).
Likewise, the ear is capable of perceiving sounds depending on their intensity. Therefore, the colour of the lighter tiles corresponds to a sound with greater intensity and vice versa. To find the intensity corresponding to a colour, I associated a number from 1 to 100 with each colour and shade (as suggested by the program). The intensity of the corresponding sound is determined by two simple linear equations differentiated in relation to the colour perception scale. In particular, the maximum visibility of the colour (light green, see graph) corresponds to the number 35, and this point corresponds to the maximum value of the sound intensity. For colour values less than 35 the sound and intensity are reduced proportionally until they reach zero. The same thing happens for values above 35.
Phase 4 Addition of background music suitable for the context, the tiles move randomly but recreating the idea of a piano.
Phase 5 Variation of the relationship parameters. Spectator interaction: You can play a melody by pressing the tiles (the piano keys) since each key emits a note according to the established attributions, becoming a kind of chromatic keyboard.
The program allows you to replicate the pattern with other musical instruments by modifying the timbre. The research was carried out without any particular musical knowledge and continues to this day.
Technical reflections: the use of computers and other electronic devices is common even in children. Explanations are needed to describe the difference between the RYB colour system and the RGB one which is more suitable for describing the human perception of colours (the cones of the human retina respond to these colours of light). Introducing the difference between RBG and CMYK…supporting a scientific approach to the study of colour, an approach still not utilized in

schools. The interesting note, however, is the student's attitude. Regardless of the acceptability of his considerations, the pleasure of research and experimentation goes far beyond scholastic requirements. Nature and colour sparked the interest of a student who, using a simple program for designing games, plunged into a multimodal investigation of which we can already imagine the positive outcomes for the future.

Conclusion

In this paper, artistic research, an educational task, and experimentation from the audience have in common the natural subject and its chromatic universe. To learn to read the samples exhibited by nature, it can be useful to have multisensory experiences that "give substance" and enrich the perception of colour. Expanding our way of knowing also requires an interdisciplinary attitude and the interconnection between different types of knowledge: scientific, aesthetic, philosophical, mathematical, and physical are complementary and not opposite aspects of knowledge. The dialogue between them can accompany us in the attempt to understand such a complex phenomenon as the interpretation of reality. Finally, it is the variety of points of view that opens our gaze on the world by truly teaching us what "learning to see" means. The en plein air study of a natural subject raises questions about the substantial role that light plays in the perception of colour. When we are immersed in a landscape the chromatic dimensions affect us regardless of our awareness or preparation, but it is the study and the process of understanding that enrich our experience of colour. At this point the scene in which we are immersed leads to a fullness of experience, brings about a completeness of vision, making us aware of the potential for knowledge contained in it.
Some aspects of reflection as a teacher of Art History and Artistic Ed. concern: the importance of divulgation, respect for the multiple intelligences of students to whom models and systems can be offered, but above all enthusiasm and passion for research and experimentation. Old programs and teaching aids with incorrect information contribute to misinformation and do not respect the needs of students immersed in a society whose demand is for trained teachers who are in step with the times.

References

Bolpagni, Paolo, Musica visiva / colori immateriali. Tentazioni sinestesiche e prospettive intermediali negli anni Sessanta-Settanta, “Medea”, I, 1, 2015, DOI: http://dx.doi.org/10.13125/medea-1818
Brigss. D. The dimension of colours. http://www.huevaluechroma.com/015.php
De Lucas Tron A. Aerial perspective: Alteration of colour due to the interposition of air. Universidad Nacional Autónoma de México
Falcinelli Riccardo. *Cromorama. Come il colore ha cambiato il nostro sguardo.*Einaudi. 2017.
FEM. Future Education Modena. Centro per l’innovazione https://fem.digital/news/ date of consultation 18/08/2023
FES Acatlán, Città del Messico, Messico 109849
Gardner H. Formae mentis. Saggio sulla pluralità dell’Intelligenza, Universale economica Feltrinelli, 2013
Gorini Monica. *Synthèse visuelle. Il diario di una ricerca.* Vanillaedizioni. 2021
Hirschler R, Csillag P, Manyé P, Neder M. How much colour science is not too much? Color Res Appl. 2018;43:977–992. https:// doi.org/10.1002/col.22275
Hirschler R Team. Special issue on contributions by the Colour Literacy Project. https://colourliteracy.org/ date of conultation: 05/08/2023
Kuehni, Rolf G., and Andreas Schwarz, *Color Ordered: A Survey of Color Order Systems from Antiquity to the Present* (New York, 2008; online edn, Oxford Academic, 22 Mar. 2012), https://doi.org/10.1093/acprof:oso/9780195189681.001.0001, accessed 5 Aug. 2023
Latourl Marliac B**.** documents present in the archives and library. August 2020. Vivaio Le Temple Sur Lot.

Merleau-Ponty, Phénoménologie de la perception. Paris: Gallimard. 1976
Julia Simner , Catherine Mulvenna, Noam Sagiv, Elias Tsakanikos, Sarah A Witherby, Christine Fraser, Kirsten Scott, Jamie Ward. Synaesthesia: The Prevalence of Atypical Cross-Modal Experiences. February 2006 Perception 35(8):1024-33 DOI:10.1068/p5469
Tedeschi Francesco, Bolpagni Paolo. Visioni musicali. Rapporti tra musica e arti visive nel Novecento.Atti del convegno, Milano,Università Cattolica, 12 maggio 2006. Stampa Vita e Pensiero 2009.ISBN 978-88-343-1861-4
Umut Eldem. Junction Between the Senses: Synaesthesia and cross-modality in music. Source**:** FORUM+, Volume 26, Issue 2,Jun 2019, p. 44 - 50**DOI:** https://doi.org/10.5117/FORUM2019.2.ELDE