

Case report

Lab Colour Sense: Visual and dermo-optical perception on colour magenta

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Lab Colour Sense project aims to summarise and discuss the process that occurs in human perception: sensory impressions, the organising process, and the interpretative process of visual perception and dermo-optical perception (DOP). During the 4th Arts and Technology Forum of the Education College of the University of Coimbra (ESEC), Art and Design students were invited to analyse their cognitive process during the contact with the colour magenta with the intent to investigate the dialogues between body and colour during the painting practice, through self-experience and self-analysis. This class project attempts to abstract oneself from their own experience, wherein the methodological process is to investigate how participants create their methods which lead to their actions/experiences with colour. The writings of the participants are very critical to see what 'colour thoughts' might be in their insights in attempts to understand something more of the substance and nature of colour.

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Introduction

This project emerges from a set of reflections that have been developed along my practice in artistic painting and pedagogical practice in the last twenty-five years. Colour is generally the most immediately visible aspect of painting and thus an essential aesthetic concern for many artists. The fascination with the dynamics of cause/effect, repulsion/attraction that exerts colour, led us to an inevitable reflection on the dialogue between body and colour in which the painting will be the medium of production of knowledge. The awareness of interactive behaviour implies the production of knowledge, self-knowledge, development of reflective processes, to understand what lies beyond the interaction between the body and the colour through cognitive sensitivity. This project is based on a collective painting practice process and introspection about the colour in which the union body/mind/spirit is the fundamental basis of this experiment.

The dynamic that colour arouses in the human being raises more questions about the relationship between body, mind and spirit, which we believe is not only a colour reflection as a stimulant element in the translation of emotions based on cultural memories and facts but also in neurophysiologic and DOP processes that may trigger certain cognitive perceptions. The value of knowledge of this raw material used in painting, as in another form of art expressions, is crucial for a real understanding of the true greatness that colour has for everyone that is exposed to it.

There are many discussions about training critical and participative students, but we cannot forget that it is important to create spaces for reflection, freedom and autonomy in the practice of art education for this to happen. This study aims to promote a reflective individual understanding of the role of colour in a system of interaction and dialogue with the body during the creative process. The project is focused on a cyclical process of action-reflection-action and aims to promote consideration of educational alternatives in the field of fine arts. In this perspective, one can build heterogeneous knowledge, turning the school into a space that goes beyond simply transmitting knowledge [1 p.21]. Therefore, schools must recognise their students' right to their own experiences and perceptions. Freire [2 p.42] asserts that "what is needed is to enable that, turning on itself, through reflection on practice, the naive curiosity, perceiving themselves as such, ultimately become critical". Only through a reflexive activity in the process of training and learning, the educator is allowed to build their knowledge, crossing theoretical and practical experiences. Schön [3 p.33] proposes a reflection in action, defining it as the process by which teachers learn from the analysis and interpretation of their activity, where the practice of reflection becomes a tool for the development and action of thought. The focus of this investigation is the basic principle of reflective learning as a critical role of emerging challenges to the act of knowing in action.

Perception

In the 19th century, perception was studied as passive stamping done by outside stimuli on the retina. It would then reach the visual cortex, the zone of the occipital cortex that receives stimuli generated in the retina, resulting in an identical image (isomorphic) as the primary stimulus. Modern psychology refutes this notion and views perception as an active process that involves the search for corresponding information, the differentiation of essential aspects of an image, the comparison of these aspects with each other, the formulation of appropriate hypotheses and the comparison of these hypotheses with the original data [4]. Telford [5] differentiated sensation from perception in that the first comprises a pure conscience of the dimensions of experience, while perception implies the sensation and the meanings that are attributed to the experience. Theories about perception tend to emphasise the role of either sensory data or knowledge in the process. Some theorists have adopted a data-driven or bottom-up stance, or synthetic approach, according to which perception is direct: visual data was immediately structured in the optical array before any selectivity on the part proposed by Hering [6], Gestalt theories, and Gibson [7]. Others adopt a constructivist, top-down or analytical approach emphasising the importance of prior knowledge and hypotheses, defended by Berkeley [8], Helmholtz [9], Bruce, Green and Georgeson [10]. The human brain has been studied in many details, and one way of organising the study of different functions of the brain was to divide it into areas. Processes of Primitive Vision considered bottom-up by neuroscientists, which are processes that do not require previous knowledge and are not determined by learning or experience, are the perceptions of movement, depth, form and colour vision. Findings in neuroscience have mapped the visual pathways [11] and have determined that perception occurs through a neural cascade, activating areas of the brain that are often very far apart.

Perception does not occur through isolated processes in the brain; our eyes perceive only a limited part of the electromagnetic spectrum which, in daylight, reveals to us the colours and shapes of our environment.

The skin is sensitive to a broader range of this spectrum, as shown by tanning due to the ultraviolet radiation of the solar spectrum or the sensation of the accompanying heat due to infrared radiation. However, even if invisible, this radiation surrounds us entirely, and it would be surprising if it did not influence our actions. Electroencephalographic recordings have proved that DOP is not located in the vision centre of the cortex in the rear part of the brain but in the centres of tactile and thermal sensation. They also showed that every subject had the same electroencephalographic results, which confirms that DOP is inherent to every human being [12]. The word "dermal" does not mean tactile in the sense of directly touching a surface, as the coloured surface can cause reactions even if it is under a transparent or opaque screen and the subject is a certain distance from it. It is indeed necessary to distinguish unconscious dermo-optical effects from their conscious perception by differential, but not perfect, subjective impressions.

LcS methodology

This study focuses on the interaction between the physiological and cognitive processes that originate the determination of emotions. With such a framework, applied to colour, the participants were asked in this workshop to deal with colour and appreciate different cognitive processes, with the intent to understand perception as an active process of creating meaning by selecting, organising and interpreting emotions. Working as an artist and as a researcher in both, painting and artistic education, the research attitude towards this study comes down only as a mediator and researcher in the action of this dialogic process of interaction with perception, concepts, and materials. In this process, the methodology, as an individual creation, is not replaceable or teachable. Instead, it consists of procedures that generate a methodology. This fact is well exploited by Weber & Mitchell [13] and quoted by Hernández [14 pp.85-108]. This workshop is a path necessary for building and articulation of our cognition relational procedures with colour during the act of painting. The analysis of the reflexive process and artistic expression reveals private self-aspects and puts us in full connection with our emotions. That is a multisensory response that gives rise to learning at the level of the senses. In this direction, questioning the accuracy required for scientific investigations when applied to education, it is possible to consider that principles and procedures of artistic activity may transform educational practices.

The processes of interaction/observation/recording of the phenomenological analysis of perception related to colour in this painting practice context were recorded with no other ambition than to describe these processes as accurately as possible, based on both the participant's linguistic analysis and their descriptive texts. All sessions were photographed, and video recorded. This action research workshop attempts to abstract oneself from their experience, wherein the methodological process was to investigate how participants create their methodology which led to their actions/experiences with colour. This process gets us to a multisensory response that gives rise to learning at the level of the senses.

The first phase implied technical evaluations using instruments and objective parameters, to assess the emotions and cognitive symptoms of the participants during painting practice (Figure 1). This analysis was mainly based on observation of the dynamic between participants and colour performance, through the following instruments:

- Watercolour paper (21 × 30 cm), tempera ink on “magenta” basic colour, brushes
- Questionnaire
- Video and photo cameras

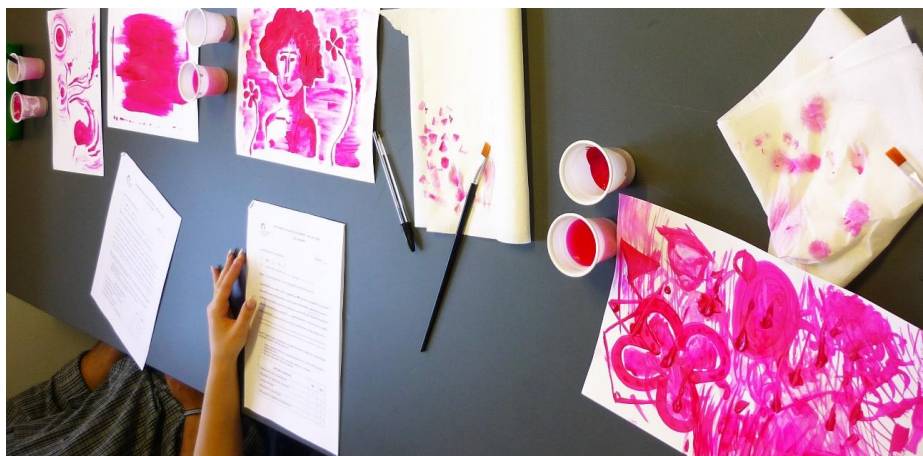


Figure 1: Lab Colour Sense - detail process. Copyright 2024 by Susana Ribeiro.

This case was aimed at collecting reports about the cognitive perception of the participants during painting practice and after. In particular, the study comprised:

- A colour-based survey: an experimental visual stimulation where sixteen participants (10% male and 90% woman), with an average age of 22 years old, were asked questions about visual and DOP, the last one under indirect observation.
- A multimedia-based survey: an experimental survey based on videos and photographs. The results of the experiment were analysed and used to gather:
- To understand the correlation between emotions expressed and cognitive symptoms with colour magenta.
- Dermo-optical subjective impressions; participants were invited to participate in this experience to investigate DOP in contrast with the Visual Perception; they were asked to close their eyes for ten minutes in this experience (Figure 2).
- Critical insights based on the social experience of colour perception during painting practice for optimising and improving other ways of feeling and seeing colour.



Figure 2: Lab Colour Sense – DOP process. Copyright 2024 by Susana Ribeiro.

Results and discussion

The data presented shows that the sensations we get from colour are changeable. Dermo-optical perception (DOP) was fundamental to this conclusion, although there were already indications of this mutability based on Lerner's studies analysing the epidermis using magnetic resonance imaging. In addition to the results obtained in the LcS, which was created to study the different forms of colour perception, we can also infer the validity of this research based on the studies of scientists Larissa Vilenskaia and Yvonne Duplessis. It is worth emphasising that this data makes it possible to understand that there are other receptors besides those for visual perception. This research is understood primarily as a way of gathering information, but not as a definitive level of knowledge. Experience can also be understood as a shared reality that tests one's own perception [15].

The final considerations are not intended to be systematised, just as objective as possible within the laboratory context in which they are inserted. This phase does not offer qualified theories on colour, but creates a space for future discussions and interpretations, in the same way that Goethe in 1820 advanced the characterisation of colour as a sensation that is transformed into perception, despite having roundly failed in his theory on the indivisibility of white light in a visible spectrum, he opened up space for the analysis of colour under the influence of other elements of study, such as physics, chemistry, philosophy and psychology.

The LcS also allowed us to see that colour can be understood or received through the body in the absence of sight. However, not all the participants received it in the same way, which lends credence to the position that a colour that is said to be cold can promote other sensations such as a warm colour. The DOP highlights yet another perceptual register and at the same time demonstrates that visual perception is not the only receptor of colour [16-17].

The writings of the participants are very critical to see what 'colour thoughts' might be in their insights in attempts to understand something more of the substance and nature of colour. The most important for them was to examine that painting practice with a particular focus on colour, which can add to self-knowledge. Some examples of how participants on Lab Colour Sense defined "magenta" colour in the Visual Perception and DOP experience:

Student A

Visual Perception:

"It's a warm colour, it attracts a lot of attention. It represents strong feelings such as anger and passion, it's a high-vibration colour. It's the colour of life."

Dermo-Optical Perception:

"The grey table seemed warmer than the paper with the magenta ink. When we ran our hands over the drawing it felt 'cooler'."

Student B

Visual Perception:

"I relate this colour to strong emotions, love, parenting and sex. However, I also relate it to feelings of comfort and tenderness."

Dermo-Optical Perception:

"When I brought my hand close to the colour magenta, after a few minutes I felt cold and a little numb. I felt calm while my hand was close to the colour, but when I opened my eyes I felt some anxiety. When I moved from the magenta area to the grey table, my hand felt warmer."

Student C

Visual Perception:

"The colour magenta conveys strength, joy, warmth, empowerment, the feminine, presence and concentration."

Dermo-Optical Perception:

"After the DOP experience, I felt that the magenta colour was colder, and my hands felt cold, while on the table my hands felt warm. Then I tried it on a white sheet of paper, and it was even colder. When I was feeling the magenta colour, my hands were much more static than on the table, I felt a chill."

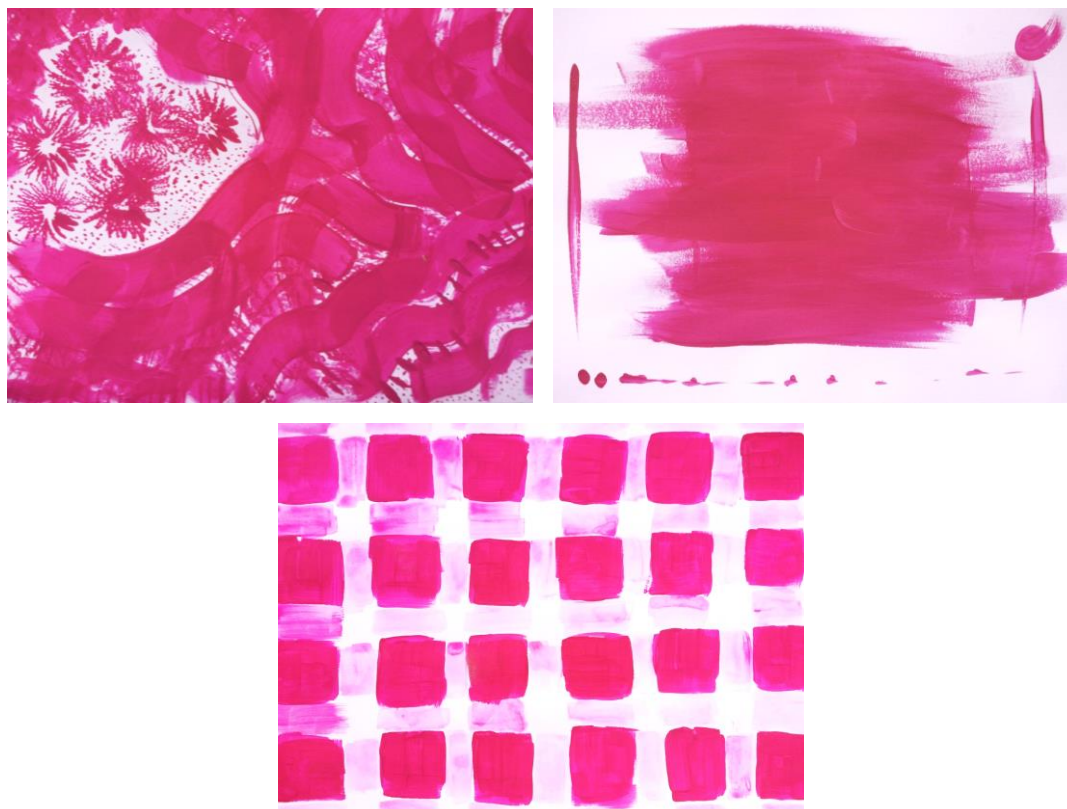


Figure 3: Lab Colour Sense - painting experience of Students A (top left), B (top right) and C (bottom). Copyright 2024 by Susana Ribeiro.

Conclusions

The study was useful in deriving an overview of global human perception of colour during painting practice. Generally, colours are perceived only by visual perception. This combined with all the literature related to colour that students consume, gives them a perspective of what they should feel in the presence of a certain colour. In this regard, we explore other ways of seeing and feeling colour. The unexpected and unconventional experiences of perception were perceived as enriching and animated the painting practice. After these experiences, students have a stronger relationship with colour. They found in this experiment a contradictory place, sometimes they felt it was pleasant and interesting, and occasionally, they were uncomfortable with this sensorial and innovative experience. On the other hand, the possible discovery of a new and personal feeling of colour produced a lack of identity between the students and the colour.

There is a collision of understanding about, with knowledge of the workings of light waves sitting uncomfortably alongside the perception of colour by variable physiologies, and the propensity to interpret colour concerning external objects and emotions. The exploration will be of whether this is a challenge or unsolvable debate, or a space of creative engagement in which both sides can benefit, and which provides a basis for intrigue and fascination, which might lead to a reconciliation of the subjective and objective positions that have traditionally characterised the approaches to art and science.

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