

# THE LANGUAGE OF COLOURS

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$2b \neq 2b?$



$E=mc^2$



## Scientix Learning ScEnario

### Title

The Language of Colours

### Author(s)

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### Summary

This LS was designed with a 15-18 year old student group in mind but can also be easily adapted for .younger students (11-14 years old)

### Keywords

Science, biology, Physics, Chemistry of colours – poems, arts and symbolic meaning

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### Overview

<i>Subject(s)</i>	Art history - literature - science - physics
<i>Topic(s)</i>	Science - Biology - Chemistry - Physics - What we mean by the term 'colour', what a colour is, why and how we see colours. Difference between artificial and natural dyes, dyes for food use, Literature - Art History What and why are the symbolic values attributed to colours in our culture?
<i>Age of students</i>	14-17 y.o.
<i>Preparation time</i>	History or Art – 3 h Letteratura – 3 h Scienze – 5 h Fisica – 2 h
<i>Teaching time</i>	History or Art – 6 h Letteratura – 6 h Scienze – 10h (Biologia 7h - Fisica – 3 h)
<i>Online teaching material</i>	Google Classroom, Wikihow,you tube
<i>Offline teaching material</i>	Fruit, Vegetables, Food Waste
<i>Resources used</i>	<a href="https://alleyoop.ilsole24ore.com/2018/04/27/quanto-e-importante-conoscere-la-storia-dei-colori-conversazione-con-michel-pastoureau/">https://alleyoop.ilsole24ore.com/2018/04/27/quanto-e-importante-conoscere-la-storia-dei-colori-conversazione-con-michel-pastoureau/</a> <a href="https://www.presepio.it/la-simbologia-dei-colori/">https://www.presepio.it/la-simbologia-dei-colori/</a> <a href="https://www.youtube.com/watch?v=RQI4P1o-aOg">https://www.youtube.com/watch?v=RQI4P1o-aOg</a> <a href="https://www.didatticarte.it/Blog/?p=3210">https://www.didatticarte.it/Blog/?p=3210</a>

<https://www.globusmag.it/levento/la-fisica-dei-colori/>  
<https://www.colorazonedigitale.it/2020/06/24/come-vedi-il-colore-teoria-del-colore-e-fisica-della-luce/>  
<https://www.colorazonedigitale.it/2020/06/24/come-vedi-il-colore-teoria-del-colore-e-fisica-della-luce/>  
<https://www.colorazonedigitale.it/2020/06/24/come-vedi-il-colore-teoria-del-colore-e-fisica-della-luce/>  
<https://www.youtube.com/watch?v=0MBaWcvFSFA>  
<https://www.youtube.com/watch?v=Ccz-48wpTyU>  
<https://www.focusjunior.it/scienza/i-trucchi-del-mestiere-crea-i-tuoi-colori-con-componenti-naturali/>

### Aim of the lesson

**Iconological-iconographic analysis**, colors and their symbolism in art and literature;  
**Science** - mechanisms of color perception; How we create our colors - notions of **chemistry and biology**

### Trends

stem Learning – Peer Learning – Collaborative Learning

### 21<sup>st</sup> century skills

adoption and practice of a **shared working method**. The student is offered the opportunity to get used to working in a team by **sharing problems and solutions according to the provisions of the C4S**;

**Interdisciplinary strategy**, in order to learn from disciplinary contexts and paths made interdependent including the preparation within interdisciplinary teachers group  
 Immediate **application and practical confirmation** of what has been learned theoretically  
 Experimentation as a **problem solving** method and approach with indications relating to **Lean Thinking**

**Feedback of protocols and production-industrial realities**

### STEM Strategy Criteria

- In addition to the notional aspect, the theoretical learning activity presented here offers opportunities for comparison with applied learning in professional STEM/STEAM workplaces. Students have the opportunity to understand the importance of STEM/STEAM skills in their practical application.
- Connections with industry: This LS provides classes with the opportunity to visit a paint factory, observing the production process and exchanging views with technicians and professionals
- Interdisciplinary instruction: in this Learning Scenario, we will examine and implement a variety of activities in a wide spectrum of subjects, ranging from History and Literature (non-STEM) to biology, Physics, chemistry (STEM).

Elements and criteria	How is this criterion addressed in the learning scenario
<b>Instruction</b>	
Personalization of learning	I percorsi didattici vengono "sartorializzati" sulla base delle singole e specifiche esigenze dello studente tenendo

Elements and criteria	How is this criterion addressed in the learning scenario
	conto del suo background culturale (conoscenze pregresse, curriculum scolastico ed extrascolastico etc.)
Problem and project-based learning (PBL)	students have to present a solution to a clearly defined authentic problem (i.e. How to make colours using food waste products)
Inquiry-Based Science Education (IBSE)	Through discussion and teamwork, questions and actions are formulated to solve problems and understand phenomena.
<b>Curriculum implementation</b>	
Emphasis on STEM topics and competencies	<ul style="list-style-type: none"> <li>• Biochemistry.</li> <li>• Biology.</li> <li>• Chemical engineering.</li> </ul>
Interdisciplinary instruction	Understand how the development of production techniques and strategies are intended to influence not only the practical aspects of production and consumption but, in a mutually dependent relationship, contribute to the creation and renewal of new cultural/symbolic meanings
Contextualization of STEM teaching	developing organised knowledge around the fundamental ideas of science, which allows for rapid retrieval of relevant knowledge in a particular context, enabling students and future citizens to effectively apply the acquired knowledge to the challenges of everyday life and to future challenges ('use knowledge')
<b>Assessment</b>	
Continuous assessment	Assessment must be continuous throughout the course and must be the result of the teacher's assessment and the student's self-assessment. For this reason it is planned to distribute a small self-assessment questionnaire both at team and individual level.
Personalized assessment	the final assessment process will definitely take into account the initial level and the particularities of the individual student
<b>Professionalization of staff</b>	
Highly qualified professionals	food scientists, physicists and chemists, as well as science
Existence of supporting (pedagogical) staff	Existing professional figures within the institute will be involved in order to ensure more effective management of group dynamics and better harmonise its different 'souls'.
Professional development	Developing possible new techniques for the sustainable production of dyes
<b>School leadership and culture</b>	
School leadership	
High level of cooperation among staff	Being able to share this type of educational planning with fellow teachers will help develop a stronger sense of collaboration and team spirit
Inclusive culture	Emphasising the importance of each individual team member's contribution will foster inclusion among team members
<b>Connections</b>	

Elements and criteria	How is this criterion addressed in the learning scenario
With industry	Students in the penultimate year (17 years old) will have the opportunity to learn about modern production processes thanks to the collaboration and involvement of manufacturing companies in our area
With parents/guardians	Families may be called upon to participate at the presentation of the papers or final reports
With other schools and/or educational platforms	
With universities and/or research centers	
With local communities	
<b>School infrastructure</b>	
Access to technology and equipment	Le attività di laboratorio metteranno gli studenti in grado di acquisire una esperienza pratica con le strumentazioni e il software Arduino
High quality instruction classroom materials	<p>Materials and tools</p> <p>Laboratory equipment, chromospectographs</p> <ul style="list-style-type: none"> <li>- Graduated rail</li> <li>- 127 mm focal length lens</li> <li>- Diffraction graticule with 600 lines per millimetre</li> <li>- White screen with graph paper</li> <li>- RGB LED</li> <li>- Arduino UNO board to control the LED</li> </ul>

## Lesson Plan

Name of activity	Procedure	Duration
<b>Text and Iconological Search</b>	An iconological reading of a work of art that has already been previously studied from an iconographic point of view and therefore already known to the students is proposed. Likewise, an examination of a specific poetic composition will be undertaken, isolating and historically contextualising the symbolic meaning attributed to the colours. In this phase, the symbolic function of colours, their semantic value and their cultural historical context will be examined. A limited palette of colours will be chosen and the production processes in vogue at the time examined will be clarified.	12 (6+6h)
<b>Physics</b>	LAB Study of the functioning of electromagnetic waves and their connection with colour perception – EXPERIMENT: Analysis of the diffraction pattern produced by a grating illuminated by an LED source	
<b>Biology</b>	LAB How much knowledge about the perception of colours by animals - and how animals and plants 'use' colours - can tell us about the physiology of animals and their habits, behaviour and evolution.	

<b>Chimica</b>	PRACTICAL PROCEDURES and theoretical instruction will analyse what dyes are, how an artificial dye is created and what differentiates it from a dye intended for human consumption.	

### Assessment

Open Answer i.e. (history of Art-Literature) What are the symbolic values of the colour blue

Which symbolic aspects have impressed you most and why?

Which symbolic element has impressed you most and why?.

### Student feedback

Google Classroom – Social

### Teachers' remarks

Add here your comments and evaluation **AFTER** the implementation of this lesson, if any.

### About Scientix

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### Annex(es)

Add here any annex(es) for the Learning Scenario, if needed.