

Europeana Learning Scenario

(Museum Educators)

Title

Enlightenment: World of Colors

Author(s)

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Abstract

Light is the most powerful entity in this world of senses having a major role in various topics as Physics, Religion, History, Biology, and others. In this lesson we are joining in activities exploring light and especially colors through our eyes. The proposed LS includes 3 sessions of 45 minutes each separated by asynchronous research at home and forming a flipped classroom model. In the first part we explore color light mixing, we analyze Newton's contribution to Opticks and we combine basic colors light to produce different light colors. In the second part we explore painting color mixing we examine Goya paintings as a deaf person and combine painting colors to produce different colors. During the last session, we examine human visual limitations, and we form an Animal painter workshop where we visualize through VR glasses animal-vision of paintings and try to paint through having Dogs' or Bees' vision. In this Integrated STEM LS we combine educational material of Golabz platform along with Europeana platform and Deaf Museum of Thessaloniki activities in order to integrate cultural and disability communities heritage to science lessons. Furthermore, we update technological literacy of our participants in a cultural activity where they have to impersonate the Imaginary painter Beensent Man Dogh while they paint "Starry Night" through animals' vision.

Keywords

Integrated STEAM, Science history, eye, light, painting.

Table of summary

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Subject	History, Science, Physics – Biology -Chemistry, Art, ICT, Social sciences
Topic	Enlightening the world of colors
Age of participants	11-15
Suitable setting for implementation	The LS can be implemented in several educational environments. I recommend a combination of formal and informal educational settings. In detail, first two sessions are proposed to be implemented in formal environment such as a school class either on face to face or online approach. Third session can be implemented at museum exhibition rooms integrating museum thematic collections by observing local exhibits through

	<p>VR glasses. Even though the above collaboration between teachers and museum educators is recommended, the LS could be also implemented in total at the museum. Through this approach, first two sessions can be implemented face to face in museum auditorium or online through video conference system, in addition exploration through VR glasses can be implemented at museum exhibition rooms observing local museum exhibits.</p>
Activity time	3 x 45 minutes (+ 45 min for painting activity)
Online educational material	<ul style="list-style-type: none"> • Francisco Goya https://en.wikipedia.org/wiki/Francisco_Goya • Isaak Newton https://en.wikipedia.org/wiki/Isaac_Newton • Museum Activities site: http://users.sch.gr/tsiastoudis/openhub/?page_id=362 • GOLABz https://www.golabz.eu/lab/color-vision • Deaf and hearing children: a comparison of peripheral vision development https://www.researchgate.net/publication/51221865_Deaf_and_hearing_children_A_comparison_of_peripheral_vision_development • Jelenet a spanyol függetlenségi háborúból https://fundaciongoyaenaragon.es/obra/escena-de-bandidos/541 (National Museum of Fine Arts, Argentina) • Ceán Bermúdez feleségének képmása https://www.wga.hu/frames-e.html?/html/g/goya/index.html (Szépművészeti Múzeum, Budapest) • Online tool for sharing information, ideas (e.g. Google Docs, Padlet, etc.) • Online tool for presentations (e.g., Mentimeter, Google slides, Prezi etc.)
Offline educational material	Fingerpaints, Mobile phones, VR Glasses, Newton.ppt, Goya.ppt
Europeana resources used	<p>Participants searching: Newton and Goya Biographies https://www.europeana.eu</p> <p>Educators' presentations (available in Annex)</p> <ul style="list-style-type: none"> • Galileo Galilei. Galileo Galilei. Europeana (Wellcome Collection)

- Retrato de Newton
https://classic.europeana.eu/portal/el/record/418/BVMDefensa_bi_b_BMDB20150224965.html (Hispana)
- Philosophiae Naturalis Principia Mathematica
https://classic.europeana.eu/portal/el/record/368/item_VGW2NYM_MVJM42KFTR4X4EQ2ZOAVUCZB5.html?q=Newton#dcId=1615551117137&p=1 (Deutsche Digitale Bibliothek)
- Opticks
https://classic.europeana.eu/portal/el/record/358/item_5UVXE4EK_CTHS3XQCSXMKYHPGKBQ6OYRJ.html?q=Newton#dcId=1615551117137&p=1 (Deutsche Digitale Bibliothek)
- Disque de Newton
https://www.europeana.eu/el/item/2020801/dmglib_handler_mcd_sc_2917025
(Digital Mechanism and Gear Library - www.dmg-lib.org)
- Portrait de Goya (d'après Vicente Lopez)
https://classic.europeana.eu/portal/en/record/9200495/yoolib_inh_a_3714.html?q=goya+portrait#dcId=1616702251918&p=1
(Bibliothèque de l'INHA)
- Titelblad til "Los Proverbios" ("Los Disparates").
https://classic.europeana.eu/portal/en/record/2020903/KKSgb8867_1.html?q=goya#dcId=1615551095706&p=1 (Statens Museum for Kunst)
- Dåre (Efter lasten kommer utugten); Bobalicón
https://classic.europeana.eu/portal/en/record/2020903/KKSgb8867_5.html?q=goya#dcId=1615551095706&p=1 (Statens Museum for Kunst)

Art and Enlightenment

<https://www.europeana.eu/en/exhibitions/baroque-and-enlightenment/art-and-enlightenment>

Starry Night: Plansch, skolplansch, Nuit Étoilée (Stjärnenatt)

https://www.europeana.eu/el/item/91658/MM_objekt_1080436 (Malmö museer)

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Integration into the curriculum

Enlightenment is part of the History curriculum, theory of light and colors is part of Physics, the topic of eye function is part of Biology. Painting is part of Arts, and disability communities are part of Social Science.

Aim of the educational activity

The aim of the activity for the students is to investigate the colors of paintings through the science of light, to get to know a painter through a review of his work, to understand the influence of Enlightenment in Art and the impact of colors on emotions, to explore their sense of vision under a scientific background and explore its limits.

Outcome of the educational activity

1. *Fingerpainting of Starry Night through dogs' eyes.*
2. *Fingerpainting of Starry Night through bees' eyes.*
3. *Fingerpainting of Starry Night through cows' eyes.*
4. *"Andy Warhol Starry Night" Combination.*

21st century skills

- Creativity
- Collaboration
- Communication
- Social skills
- ICT literacy

Activities

Name of activity	Procedure	Time
Session 1	Mixing color lights	
Activity 1.1: Asynchronous at home	<u>Flipped Classroom activity:</u> Participants, working individually explore Europeana portal, get information about Enlightenment period and explore evidence of the biography of Isaac Newton. They share their research outcomes and comment on two of their colleagues using an online tool for this reason. For example, they fill up a Padlet activity like this one provided here . Educator will review their posts and comment on contributions facilitating the conversation.	15'

Activity 1.2: Light colors mixing	<p>Educator uses the previous padlet activity to introduce Enlightenment period characteristics and invite students to present elements of Isaac Newton's life, while he/she also presents his/her resources.</p> <p>The educator shows a presentation (available in Annex), talking about Newton's work. First, he/she presents a portrait of Galileo, talking about science during middle ages and especially in 16th century and next a portrait of Newton, talking about Enlightenment in 17th century. He/ She presents the famous <i>Principia Mathematica</i> with Newton's Laws and concludes with his manuscript "Opticks" and Newton's Disk. Finally, he explains Newton's position that sunlight includes all colors and that objects do not produce colors but just moderate the incoming light.</p>	15'
Activity 1.3: Light colors mixing exploration	<p>Participants are divided into teams of 3, exploring the Additive light color mixing GO LAB</p> <p>https://www.golabz.eu/lab/color-mixing-additive-subtractive</p> <p>Students are mixing different amounts of basic colored light Red-Green-Blue monitoring the produced color.</p>	15'
Activity 1.4: Light colors mixing production	<p>Participants' teams are assigned to explore color production through</p> <p>Openhub activity: Session 1 RGB Bulbs</p> <p>Teams must investigate color mixing and produce the color of an orange.</p>	15'
Session 2	Mixing color paints	
Activity 2.1: Asynchronous at home	<p><u>Flipped Classroom activity:</u> Participants, working individually, explore the biography of Francisco Goya from wiki and connect with artefacts in Europeana portal. They submit their findings in the same Padlet which was used for Newton's Biography. They comment on other students' posts, mentioning similarities and differences of both personalities.</p> <p>Educator will review their posts and comments, facilitating the conversations.</p>	15'
Activity 2.2: Painting colors mixing,	<p>Educator presents Goya's biography using the Padlet and his/her presentation (available in Annex), emphasizing on his deafness and participants contribute with their thoughts on the vision of the deaf.</p> <p>Educator points the dark colors that are used at Goya paintings and explains the color of objects through the concept of reflection of specific color of light. He/ She also uses an applet to present the color production of an object. Selecting a single bulb and choosing white color light, he/she tests different color filters and provides the color that reaches the eye.</p> <p>Openhub activity: Session 2 Single Bulb</p>	15'

Activity 2.3 Painting colors mixing exploration	<p>Teams explore the mixing of painting colors through Go Lab.</p> <p>Subtractive light color mixing GO LAB</p> <p>https://www.golabz.eu/lab/color-mixing-additive-subtractive</p> <p>Participants are mixing different amounts of basic color paints Cyan-Magenta-Yellow monitoring the produced color.</p> <p>Teams must investigate color mixing and produce the color of an orange.</p>	15'
Activity 2.4 Discussion	<p>Teams discuss and introduce an explanation of the different color combinations that produce the orange color, as explored in the above activities.</p>	15'
Session 3	Vision Limitation and Differences	
Activity 3.1 Asynchronous part at home	<p>Educator starts a conversation about the difference in vision between humans. He/ She mentions the acute peripheral vision of deaf people and presents research findings. Participants comment on the subject.</p>	5'
Activity 3.2	<p>Educator presents humans' limitations on visible light spectrum and sunlight using black body spectrum applet. In this applet we can change the source of light and monitor the different amounts of color light produced. We can also observe that only a part of it can be perceived by human eyes. This part of light describes the visible light spectrum.</p> <p>Openhub activity : Session 3 - black body spectrum .</p>	10'
Activity 3.3	<p>Participants download the app "Animal vision" on their phones attach them to VR-Glasses. Educator guides students in a museum tour where they observe museum exhibits through different animal views. In this tour educator can also provide information about these exhibits, promoting museum goals.</p>	30'
Activity 3.4	<p>The last part of the third session can be implemented in museum auditorium. Students observe Van Gogh's "Starry Night" through Dog's , Bee's and Cow's eyes. They are using VR-glasses in Dog mode, Bee mode or Cow mode to choose fingerpaints and paint Van Gogh's "Starry Night" as can be seen by animals. Combining their paintings, they produce an "Andy Warhol like" painting while their visions indicate the creator Beensent Man Dogh.</p>	45'



Participants' feedback

Add here the method with which participants will be able to give you feedback and discuss the activity, if any is foreseen .

Educator's remarks

*Add here your comments and evaluation **AFTER** the implementation of this activity. You can always use a rubric for self-assessment.*

About the Europeana DSI-4 project

[Europeana](#) is Europe's digital platform for cultural heritage, providing free online access to over 53 million digitised items drawn from Europe's museums, archives, libraries and galleries. The Europeana DSI-4 project continues the work of the previous three Europeana Digital Service Infrastructures (DSIs). It is the fourth iteration with a proven record of accomplishment in creating access, interoperability, visibility and use of European cultural heritage in the five target markets outlined: European Citizens, Education, Research, Creative Industries and Cultural Heritage Institutions.

[European Schoolnet](#) (EUN) is the network of 34 European Ministries of Education, based in Brussels. As a not-for-profit organisation, EUN aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners. European Schoolnet's task in the Europeana DSI-4 project is to continue and expand the Europeana Education Community.

Annex

Goya presentation: <https://files.eun.org/SciEduDept/Europeana-DSI-4-Enlightenment-Goya-PPT.pptx>

Newton presentation: <https://files.eun.org/SciEduDept/Europeana-DSI-4-Enlightenment-Newton-PPT.pptx>