

# Europeana Learning Scenario

## Title

Sensium: Helen Keller – 3D Printing in a Friction Lab

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## Abstract

Friction as a basic characteristic of surfaces enables one of our senses, touch. It also plays a major role in all movements around us. The way we walk, we drive cars in different circumstances is often defined by friction. This LS applies to various topics such as Physics, Social sciences, History, Biology, Art and others. In this LS, we are joining in activities exploring friction through our hands. The proposed LS include 3 parts of 45 minutes each separated by asynchronous research at home forming a flipped classroom model. In the first part, we explore friction as a factor of sensory perception. We explore the extraordinary biography of a deafblind woman in the early 19<sup>th</sup> century, Mrs Helen Keller. We experience different surfaces through a gamified activity, and we try to communicate as deaf-blinds. In the second part, we analyze friction as a force in movements. During the last part we 3D print following instructions wheels with different tyre treads, we examine their driving behaviour, and we speak about driving safety. In this Integrated STEM LS we combine educational material of the Golabz platform along with Europeana platform and Deaf Museum of Thessaloniki activities in order to integrate cultural and disability communities heritage into science lessons. Furthermore, we update the technological literacy of our students in a 3D design and printing activity.

## Keywords

collaboration, creativity, disabled heritage, friction, integrated STEAM, painting, science history

## Table of summary

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<b>Subject</b>	Art, Biology History, Chemistry Science, ICT, Physics, Social sciences
<b>Topic</b>	Friction
<b>Age of students</b>	6-18
<b>Preparation time</b>	15 minutes
<b>Teaching time</b>	3 x 45 minutes (+ 5 min for feedback activity)
<b>Online teaching material</b>	Helen Keller biography Wiki: <a href="https://en.wikipedia.org/wiki/Helen_Keller">https://en.wikipedia.org/wiki/Helen_Keller</a>  GoLab: <a href="https://www.seilias.gr/go-lab/html5/inclinePlane.plain.html">https://www.seilias.gr/go-lab/html5/inclinePlane.plain.html</a>



	<p>Friction  <a href="https://phet.colorado.edu/en/simulation/friction">https://phet.colorado.edu/en/simulation/friction</a></p> <p>Forces and Motion  <a href="https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html">https://phet.colorado.edu/sims/html/forces-and-motion-basics/latest/forces-and-motion-basics_en.html</a></p> <p>Ramp Forces and Motion  <a href="https://phet.colorado.edu/sims/cheerpi/motion-series/latest/motion-series.html?simulation=ramp-forces-and-motion">https://phet.colorado.edu/sims/cheerpi/motion-series/latest/motion-series.html?simulation=ramp-forces-and-motion</a></p> <p>Openhub  <a href="#">Tinkercad Tutorials in Greek</a>  <a href="#">Prototype wheels</a></p> <p>Padlet  <a href="https://padlet.com/">https://padlet.com/</a></p> <p><a href="#">The Miracle Worker (Helen Keller biographic Full Movie)</a></p> <p><a href="#">A new braking system: ABS</a></p>
<p><b>Offline teaching material</b></p>	<p>A3 paper, glue, clay, different textures fabric            Or            3d printer</p>
<p><b>Europeana resources used</b></p>	<p>Hellen Keller Biography materials for presentation:</p> <ul style="list-style-type: none"> <li>• Resource 1 - <a href="#">Mark Twain</a></li> <li>• Resource 2 – <a href="#">Rose Helen Keller</a></li> </ul> <p>Linked Europeana materials</p> <ul style="list-style-type: none"> <li>• Resource 3 – <a href="#">The Deaf Dump and Blind Monkeys</a></li> <li>• Resource 4 - <a href="#">Alps relief map</a></li> <li>• Resource 5 – <a href="#">Blind activities in School</a></li> </ul> <p>Other resources:</p> <ul style="list-style-type: none"> <li>• <a href="#">Braille typewriter</a></li> <li>• <a href="#">Making fire by friction</a></li> <li>• <a href="#">Road safety lessons for young children by a police puppet show</a></li> </ul>

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## Integration into the curriculum

Texture and sculpture is part of Art, touching through objects, heat transition and friction are part of physics, hand and the neuronal system is part of biology and disability communities part of Social Science.

## Aim of the lesson

The aim of the lesson for the students is to learn the achievements of blind and deafblind persons in history.

- To recognize their ability on feeling the characteristics of objects through touching.
- To get in touch with the blind community through a review of the blind education history through ages. To explore the Braille system.
- To understand the affection of enlightenment in societies and specific in blind communities of Europe.
- To understand their sense of touching under a scientific background and explore their limits.
- To explore friction as force and its relation with surface and vertical force.

## Outcome of the lesson

1. A collage of Helen Keller professional achievements.
2. Different sets of 3D printed wheels.

## Trends

- Flipped Learning,
- Project-Based Learning,
- Collaborative Learning,
- Learning in groups,
- Combination of lecture and workshop issues,
- Visual Search & Learning.

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

During the lesson students develop:

- Collaboration - Students work in groups of 3 to accomplish a goal and share responsibility for collaborative work (designing appropriate wheels),
- Communication - Students presents their ideas, listen effectively,
- Creativity and Innovation - Students explore friction using ICT tools and work creatively with others to innovate through 3D designing,
- Critical Thinking and Problem Solving - Students analyse problems and propose solutions,

- ICT Literacy - ICT tools are used to research, organise, communicate, and evaluate information, and create new ideas.

## Activities

Name of activity	Procedure	Time
<b>Phase 1</b>		
<b>Friction as a sensory perception factor</b>		
<b>Activity 1.1:</b> <b>Asynchronous at home</b>	<u>Flipped Classroom activity</u> : Students working individually explore <a href="#">Europeana</a> portal, to collect info for the biography of Hellen Keller. They fill up a <a href="#">Padlet</a> on their research outcomes and comment on two of their colleagues. The teacher will review their edits comment on selected contributions.	30'
<b>Activity 1.2:</b> <b>Exploration of Braille system</b>	The teacher presents Helen Keller biography using parts of the students <a href="#">Padlet</a> . Also presents few words in sign language and a word written in braille. Student teams must recognize words in braille using the <a href="#">Braille System</a> and present them to the class. The teacher facilitates an introductory discussion on the sense of touch and the difficulties that a deaf-blind person face trying to communicate.	15'
<b>Activity 1.3:</b> <b>Gamification of touch</b>	The teacher present 6 bags that include secret small objects with different textures (ex. Dice, eraser, fabric flower, marble ball, origami craft, a small piece of wood). Students are divided into teams of 3 exploring the bags with their hands. The assessment involves an analytical description of the characteristics they define as also naming the secret object.	15'
<b>Activity 1.4:</b> <b>Light colours mixing production</b>	The teacher present 6 different fabrics and students must explore the feeling of touching them. Students teams must visit <a href="#">Phet Friction applet</a> and argue on which fabrics we choose for winter clothes and why.	15'
<b>Phase 2</b>		
<b>Friction as a force</b>		
<b>Activity 2.1:</b> <b>Asynchronous at home</b>	<u>Flipped Classroom activity</u> : Students working individually explore the hovercraft technic through the <a href="#">Europeana portal</a> . They submit funny videos about friction in Padlet. They comment on each other posts.  The teacher will review their edits and comments selectively.	30'
<b>Activity 2.2:</b> <b>Investigation: Friction-Weight</b>	The teacher presents <a href="#">Phet applet on Motion and Forces</a> .  Students investigate how maze affect friction and how friction affects movement.  They write down their findings and a representer disseminates them into a round table.	15'

<b>Activity 2.3</b> <b>Investigation:</b> <b>Friction-</b> <b>Incline</b>	Students teams explore the preparation applet for the final activity : <a href="#">Ramp:</a> <a href="#">Forces and Motions.</a>  Teams must investigate forces in incline and the relationship of angle and friction.	15'
<b>Activity 2.4</b> <b>Preparation</b>	The teacher presents the task of the last part which should be prepared in the meantime. A car is going to park at a downhill road and activates the parking brake. The road is a bit slippery during a rainy day and he will succeed it only if it has the proper texture tyres. Students teams must redesign the given prototype tyres to maximize friction and succeed in the parking procedure.	15'
<b>Phase 3</b>	<b>Final Activity - Discussion</b>	
<b>Activity 3.1</b> <b>Asynchronous</b> <b>part at home</b>	Students collaborate to redesign the <a href="#">prototype wheel</a> and submit their team's proposal. Teacher 3d prints their designs and uploads the procedure. Teams comments on padlet each other design.	30'
<b>Activity 3.2</b>	Every team has to argue on the effectiveness of their design and make a prediction on their success.  Students attach the wheels on the prototype vehicles and check their ability to park in the incline platform. Students measure the maximum angle for successful parking. They discuss positive and negative factors that affect wheels slippage.	15'
<b>Activity 3.3</b>	The teacher presents the car safety video from old times through <a href="#">Europeana</a> the invention of <a href="#">ABS</a> and the best design of students.	15'
<b>Activity 3.4</b>	Students closing their eyes giving hands in pairs of a transmitter and a receiver, trying to communicate through their palms the secret words "heat", "weight", "friction".	15'

**Assessment**

\*\*\*\*\* AFTER IMPLEMENTATION \*\*\*\*\*

**Student feedback**

After the implementation of this lesson, during discussions, students concluded that there are no disabled persons but disability environments. Only a few had heard about Helen Keller, and they were not familiar with the details of her professional life.

### Teacher's remarks

Students were pleasantly surprised by the different point of view of friction as a sensory factor as also by 3d printing integration in educational procedures. They creatively paralyzed the obstacles that provide friction to movement with the obstacles that provide societies accessibility. Europeana seems to be a fruitful repository for supporting STEAM lessons and increase the motivation of students of different orientation to science disciplines and also to enrich science lessons with social humanities subjects.

### 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.

