

## We are the makers – IoT: Learning Scenario – Chainmail (by Edumotiva Team)

<b>1. Title of the Scenario</b>	<i>Chainmail Structures in 3D printing</i>
<b>2. Target group</b>	Secondary school and vocational school students between 14-17 years old
<b>3. Duration</b>	This scenario can be divided in 2 different sessions each lasting 3 teaching hours.
<b>4. Learning needs</b>	Chainmail structure, chainmail applications, 3D designing, try and error projects, support problems in 3D printing
<b>5. Expected learning outcomes</b>	<ul style="list-style-type: none"> <li>• Understanding the concept of chainmail structure.</li> <li>• Understanding the properties of a chainmail object</li> <li>• Learn the different forms chain links.</li> <li>• Identify the several applications of a chainmail structure in every day life.</li> <li>• Learn the basic parameters that have to be considered in order to design a chainmail structure.</li> <li>• Execute connections in order to produce a successful 3d design.</li> <li>• Create unique 3D designs.</li> <li>• Understand the limitations of the materials and forms used for the final 3D print.</li> <li>• Learn to identify the errors after the first print and understand the changes that have to be made to lead to a successful print.</li> </ul>
<b>6. Methodologies</b>	Lesson 1: Presentation of chainmail structure (given) from the teacher. Learning by doing, design a chain link Learning by doing, design a chain links' basic connections Lesson 2: Learning by doing, 3D designing and printing a whole chainmail structure
<b>7. Place / Environment</b>	3D printing Laboratory
<b>8. Tools / Materials / Resources</b>	Projector, Audio system, computer systems with cad designing programs, Papers, pencils. Digital Material: presentation "Chainmail"

<b>9. Step by step description of the activity / content</b>	<p>Lesson 1: Presentation of chainmail structure (given).</p> <ul style="list-style-type: none"> <li>i. The teacher have to explain the concept of chainmail and the current applications in every day life .</li> <li>ii. Afterwards , the chainmail structure can be explained as it is made from a basic chain link.</li> <li>iii. At the point that different chain links and chainmail structures systems are presented, the students could find different ways of connections in order to produce a different output. They can design their ideas in a piece of paper.</li> <li>iv. The concept of connection points will be analyzed.</li> <li>v. The concept of support and how it can affect the final printing will be analyzed.</li> <li>vi. The students can start designed their own chainmail model using:                     <ul style="list-style-type: none"> <li>a. Chain links that are given by the teacher (provided in the folder "Chain Links").</li> <li>b. Chain links found in the Internet.</li> <li>c. Chain links designed by the student.</li> </ul> </li> </ul> <p>Lesson 2: 3D designing and printing</p> <ul style="list-style-type: none"> <li>i. The students will finalize their designs and then they will print their chainmail structure.</li> <li>ii. The unnecessary support will be removed.</li> <li>iii. The structure will have to be tested to identify:                     <ul style="list-style-type: none"> <li>a. Flexibility</li> <li>b. No broken points (all linked)</li> <li>c. Robustness</li> <li>d. Support issues (if any) that can destroy our structure.</li> </ul> </li> <li>iv. The teacher will help the students to identify the errors of their designs (if any) and point out the parameters that have to be changed for a better final print.</li> <li>v. The students will print again (if needed)</li> </ul>
<b>10. Feedback</b>	<p>Lesson 1: the first exercise is a feedback exercise to determine if our students have understand the concept of connection points in a chainmail structure. It also points out their understanding of different chain links and the final output they produce. The designing of their own chainmail provides a clear view of the chainmail concept understanding.</p> <p>Lesson 2: after the test of the first printed chainmail model, we can discuss with them, about what went wrong and how they can fix it. This is a way to figure out if our students have acknowledge of their projects.</p>
<b>11. Assessment &amp; Evaluation</b>	<p>Lesson 1: observation in the classroom. We can assess our students understanding about complex 3D projects. We can evaluate their ability to understand a design and perform complex connections.</p> <p>Lesson 2: Assessment of the final printed project. We can evaluate how our students can improve their designs based on their ability to identify errors. Are they willing to try again?</p>