

# STEAM4ALL

2020-1-DE03-KA201-077538

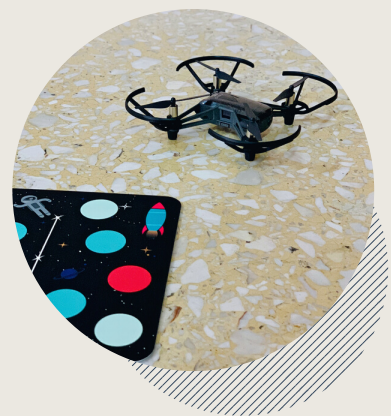
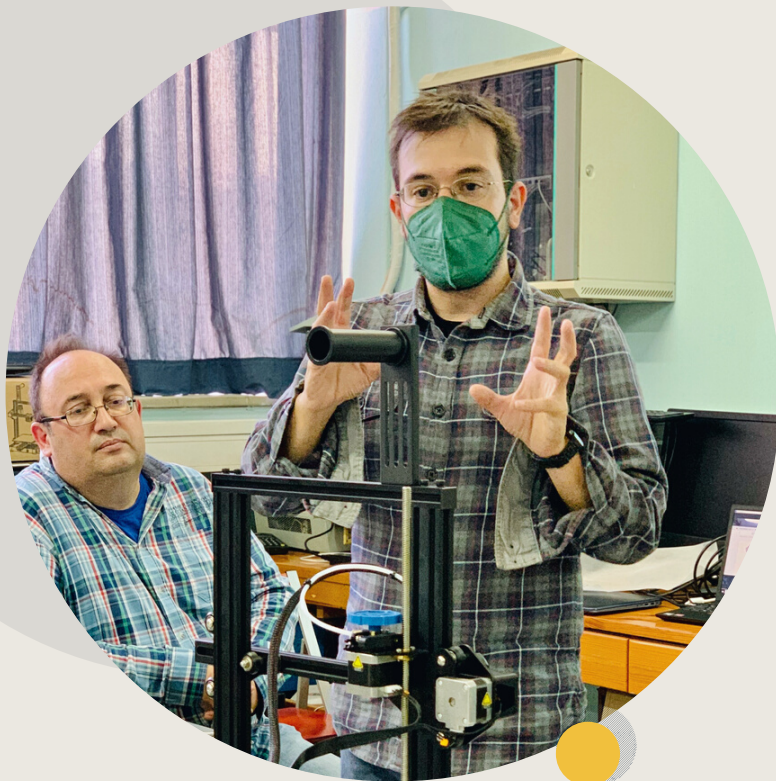
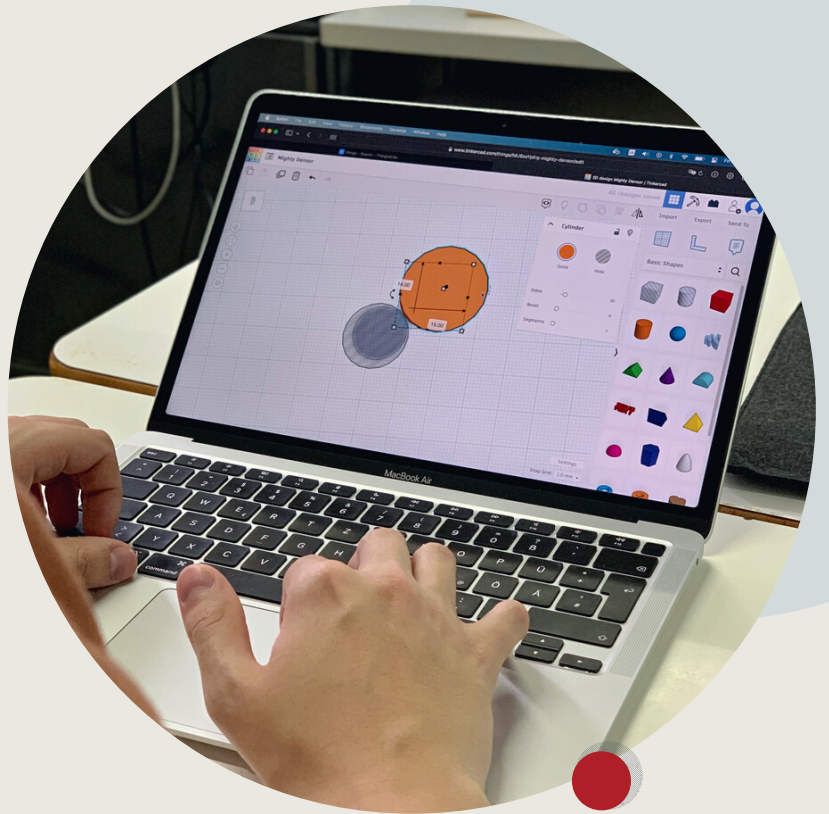


## IO2-A3: STEAM4ALL ECO-SYSTEM FOR THE IMPLEMENTATION AND USE OF THE OPEN BADGES



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**STEAM4ALL:** Supporting the Digital Inclusion of all Students  
Through an Inter-Disciplinary Programme for a Sustainable  
Future



IO3-A3: THE ECO-SYSTEM FOR THE IMPLEMENTATION AND USE OF THE OPEN BADGES

Organisation: CGE Erfurt e.V.

## Contents

<b>Open Badges: Introduction</b> .....	3
What are Open Badges? .....	3
What Open Badges consist of? .....	4
How Open Badges work? .....	6
What are the benefits of Open Badges in Erasmus+ projects? .....	8
<b>Open Badges: STEAM4ALL project</b> .....	10
Why Open Badges for STEAM education?.....	10
STEAM4ALL Open Badges Ecosystem.....	11
Open Badges Integration to STEAM4ALL e-Learning Platform .....	19
Awarding process.....	21
<b>References</b> .....	23

## Open Badges: Introduction

### What are Open Badges?

Open Badges serve as digital representations of various accomplishments, including skills, learning outcomes, achievements, and experiences. They encompass both hard skills, such as knowledge and competences, and soft skills like critical thinking and communication. These badges validate participation, community involvement, official certification, and authorization.

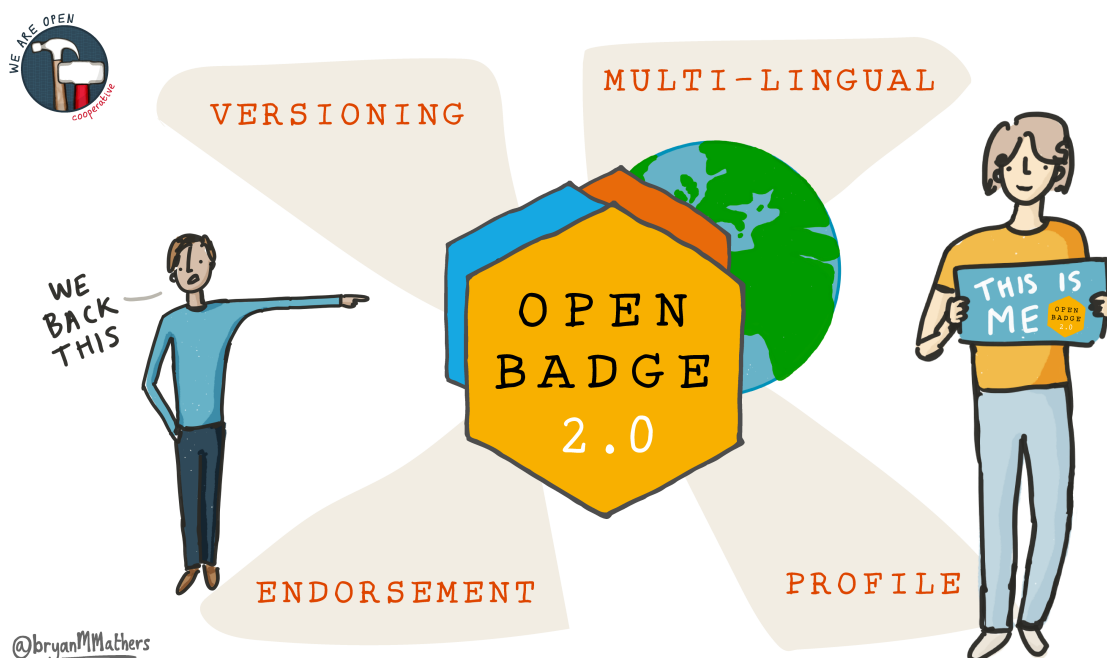


Figure 1. Open Badges 2.0 by [@bryanMMathers](#) is licenced under CC-BY-ND.

Originally developed in the United States, Open Badges have gained worldwide recognition as an *innovative system for validating and acknowledging learning*. They function as open educational resources, promoting accessibility and engagement among all stakeholders involved in the badge process. This includes learners-earners, issuers (such as schools, stakeholders, enterprises, and NGOs, including trainers and volunteers), and badge

consumers (such as formal education institutions, public authorities, official bodies, and potential employers). Through these collaborations, the Open Badges system fosters the creation of synergies and ensures the transparent, transferable, and credible validation of skills and knowledge associated with a specific set of competences.

The inclusive nature of the Open Badges system allows anyone to actively participate in designing, testing, implementing, and promoting learning outcomes and achievements. This aligns with the principles advocated in major European documents on Recognition and the Erasmus+ program. Emphasizing *transparency and recognition of skills and qualifications*, Erasmus+ prioritizes actions that promote permeability across education, training, and youth domains, while simplifying and rationalizing tools for transparency, validation, and recognition of learning outcomes. This includes endorsing innovative solutions for recognizing and validating competences acquired through informal, non-formal, digital, and open learning.

### What Open Badges consist of?

The concept of Open Badges draws inspiration from the badges awarded to scouts for their acquired skills or participation in activities, which are proudly displayed on their uniforms or backpacks. Similarly, an Open Badge serves as visually verified evidence of achievement. In addition to the visual design, an Open Badge includes the following key elements:

1. **BADGE IMAGE:** An Open Badge features a visual representation, typically in the form of an image or icon. The badge image serves as a recognizable symbol of the achievement or skill being recognized.
2. **METADATA:** Open Badges contain metadata, which provides additional information about the badge and its recipient. This metadata is embedded within the badge image or stored separately and includes details such as the issuer's name, the date of issuance, a description of the badge, and relevant links or evidence.
3. **STANDARDIZED DATA FIELDS:** Open Badges adhere to standardized data fields to ensure consistency and interoperability. These fields may include the badge name, issuer's information, criteria for earning the badge, evidence requirements, a connection to a specific competence framework, and other relevant information.
4. **UNIQUE IDENTIFIER:** Each Open Badge is assigned a unique identifier to distinguish it from other badges. This identifier enables verification and tracking of the badge's authenticity and ensures that it can be associated with the correct recipient and issuer.





Figure 2. Open Badge Digital Certification by [WEBIWANT](#).

5. **EVIDENCE OF ACHIEVEMENT:** Open Badges may include links to evidence supporting the recipient's claim to the badge. This evidence could be in the form of portfolios, projects, assessments, or other relevant artifacts that demonstrate the skills or achievements associated with the badge.
6. **VERIFICATION MECHANISM:** Open Badges typically incorporate a verification mechanism, such as a digital signature or cryptographic code. This allows the badge to be independently verified, ensuring that it has not been tampered with and that it originates from the designated issuer.
7. **ISSUER INFORMATION:** Open Badges include information about the entity or organization that issued the badge. This information helps establish the credibility and authority of the badge and allows recipients and viewers to identify the issuing institution.
8. **DISPLAY REQUIREMENTS:** Open Badges may have specific display requirements, such as size, format, or placement of the badge image and associated metadata. These requirements ensure consistent and meaningful presentation of the badge across different platforms and contexts.
9. **EXPIRATION OR RENEWAL DATE** (if applicable): Some Open Badges may have an expiration or renewal date, indicating the period of validity for the badge. This can be relevant for

badges that require ongoing professional development or demonstrate currency in a rapidly changing field.

These elements collectively contribute to the transparency, integrity, and transferability of Open Badges, enabling individuals to showcase their achievements, while allowing viewers to verify their authenticity and understand the context and significance of the badge.

### How Open Badges work?

The process of acquiring an Open Badges goes is of three folds:

#### EARNING – STORING – SHARING

Open Badges could be granted by organizations (such as educational institutions, online learning platforms, businesses or NGOs) involved in providing training or seeking to acknowledge individuals' skills, competencies, or accomplishments.

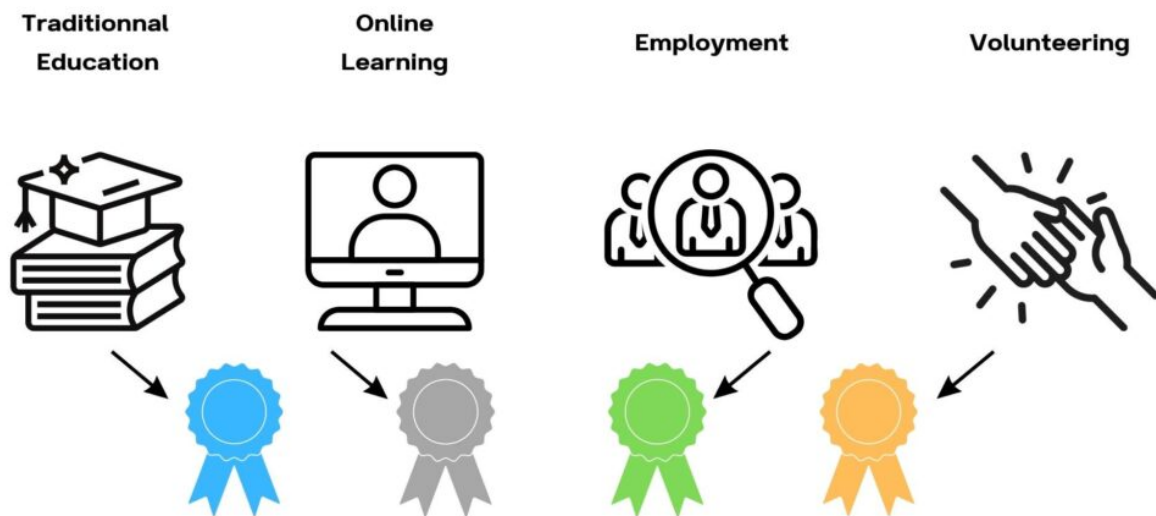


Figure 3. Open Badge Earning Process by [WEBIWANT](#).





Figure 4. Open Badge Storing Process by [WEBIWANT](#).

Open badges are transferable. In other words, badge holders own a record of skills, competencies, and achievements. For this purpose, Open Badge earners use a centralized online application with can work as a “backpack”. This can be compared to a badge's digital bank account.



Figure 5. Open Badge Sharing Process by [WEBIWANT](#).

Individuals who have earned Open Badges have the option to publicly showcase and exhibit their badges on various platforms, including social media platforms like LinkedIn, Facebook, Twitter, as well as e-portfolios or CVs. By doing so, badge earners have control over which badges they choose to display, enabling them to construct their own personalized ecosystem that highlights their skills, competencies, and achievements.

## What are the benefits of Open Badges in Erasmus+ projects?



Figure 6. STEAM4ALL consortium during the C1 training activity in Piraeus, Greece.

Using Open Badges for international learning mobilities under the Erasmus+ program offers several benefits:

**ENHANCED RECOGNITION:** Open Badges provide a transparent and credible way to recognize and validate the skills and competences acquired during international youth mobilities. By issuing digital badges that adhere to standardized data fields, the achievements of participants become more visible and easily verifiable.

**INCREASED MOBILITY OPPORTUNITIES:** Open Badges facilitate the recognition of skills and qualifications across borders. When participants earn badges for their learning outcomes and achievements during international youth mobilities, these badges can be shared and accessed globally, expanding their mobility opportunities and increasing their employability prospects.

**PROMOTING LIFELONG LEARNING:** Open Badges encourage a culture of lifelong learning by recognizing and acknowledging informal and non-formal learning experiences. Participants can earn badges for various activities, such as workshops, seminars, language courses, and intercultural experiences, contributing to their personal and professional development.

**SKILLS VALIDATION:** Open Badges serve as concrete evidence of specific skills and competences acquired during international youth mobilities. This helps participants showcase their abilities to potential employers, educational institutions, and other stakeholders, providing a tangible demonstration of their capabilities beyond traditional credentials.

**ACCESSIBLE AND INCLUSIVE VALIDATION:** Open Badges offer an inclusive solution that enables all participants to actively engage in the design, testing, implementation, and promotion of learning outcomes and achievements. This promotes a sense of ownership and empowerment, as participants can shape and showcase their unique learning journeys.

**SIMPLIFIED DOCUMENTATION:** By utilizing Open Badges, the process of documenting and validating international youth mobilities becomes more streamlined. Instead of relying solely on paper-based certificates and transcripts, participants can present their digital badges, which contain metadata and links to evidence supporting their achievements, reducing administrative burdens and enhancing efficiency.

**PROMOTING INNOVATION:** Open Badges align with the principles of innovation and digitalization in education and training. By adopting this technology, Erasmus+ encourages the use of innovative solutions for recognizing and validating competences acquired through digital and open learning, reflecting the evolving needs of the modern workforce.

Overall, Open Badges provide a comprehensive and flexible framework for recognizing, validating, and promoting the outcomes of international youth mobilities under the Erasmus+ program, contributing to the personal, academic, and professional growth of participants.

## Open Badges: STEAM4ALL project

### Why Open Badges for STEAM education?

The project consortium has strategically selected using Open Badges for STEAM (Science, Technology, Engineering, Arts, and Mathematics) education, as it brings several benefits:

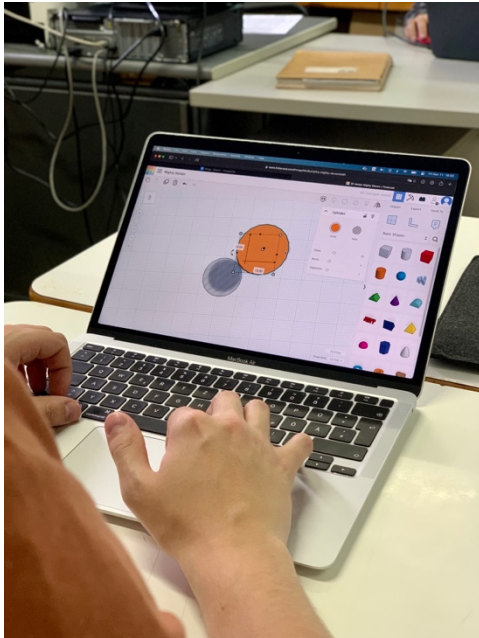


Figure 7. The course testing at the STEAM4ALL C1 training activity in Piraeus, Greece. Photo: Maryna Bykova

**SKILL RECOGNITION:** Open Badges provide a tangible and standardized way to recognize and validate the skills acquired in STEAM disciplines. By issuing digital badges for specific achievements, such as coding proficiency, problem-solving, scientific research, or artistic creativity, students' skills become visible and easily shareable.

**MOTIVATION AND ENGAGEMENT:** Open Badges serve as a form of gamification, motivating students to actively participate and excel in STEAM education. The prospect of earning badges for their accomplishments can increase engagement, encourage healthy competition, and foster a sense of pride and accomplishment.

**DIFFERENTIATED LEARNING:** Open Badges allow for personalized and differentiated learning experiences. Students can earn badges at different levels of proficiency, indicating their mastery of specific STEAM skills or concepts. This promotes individualized learning paths, catering to students' unique strengths and interests.

**PORTFOLIO BUILDING:** Open Badges create a digital portfolio of students' achievements and skills in STEAM disciplines. These portfolios can be easily shared with educators, parents, and potential employers, providing a comprehensive view of a student's abilities, projects, and learning journey.

**COLLABORATION AND PEER RECOGNITION:** Open Badges promote collaboration and peer recognition within STEAM education. Students can earn badges for collaborative projects, teamwork, and effective communication, fostering a culture of cooperation and acknowledging the importance of interpersonal skills in STEAM fields.

**CAREER READINESS:** Open Badges help students develop a competitive edge in the job market. By earning badges for specific STEAM skills, students can showcase their abilities to potential employers, demonstrating their practical experience and knowledge in relevant areas.

**LIFELONG LEARNING:** Open Badges encourage a lifelong learning mindset in STEAM education. As new technologies and advancements emerge, students can continue earning badges to showcase their adaptability, ongoing professional development, and commitment to staying updated in the rapidly evolving STEAM fields.

**COMMUNITY ENGAGEMENT:** Open Badges facilitate community engagement and recognition in STEAM education. Students can earn badges for participating in science fairs, art exhibitions, robotics competitions, or community-based projects, encouraging involvement beyond the classroom and fostering a sense of belonging and civic responsibility.

**INTEGRATION OF ARTS AND CREATIVITY:** Open Badges recognize and celebrate artistic and creative skills within STEAM education. By issuing badges for artistic expression, design thinking, or innovation, the interdisciplinary nature of STEAM is highlighted, promoting a holistic approach that encompasses both technical and creative aspects.

Overall, Open Badges provide a comprehensive framework for recognizing, validating, and promoting the diverse skills and achievements in STEAM education. They inspire student motivation, support individualized learning, showcase abilities, and prepare students for future career opportunities in STEAM-related fields.

## STEAM4ALL Open Badges Ecosystem

The consortium has designed the ecosystem to promote accessible, quality, digital youth work. With the help of the Open Badges, digital validation certificates are issued for the completion of certain modules and tasks, and the chosen competences are improved.

The STEAM4ALL Open Badges Ecosystem is based on the **STEAM4ALL COMPETENCE FRAMEWORK** (IO1-A5) and connected to the **STEAM4ALL INTER-DISCIPLINARY EDUCATIONAL TOOL KIT** (IO2-A2) with two modules:

- Module 1: Drone Piloting & Programming
- Module 2: 3D Design & 3DPrinting

Each module features three levels, and one badge is considered per level (see Table 1):

Level 1 – **STARTERS LEVEL**, Level 2 – **MOVERS LEVEL**, and Level 3 – **EXPERTS LEVEL**.



# STEAM4ALL Open Badges Ecosystem



## MODULE 1: 3D Design and 3D Printing

### 3D STARTERS LEVEL

<p><b>Badge Description</b></p>	<p>The badge earners are introduced to basic principles of 3D design and 3D printing.</p>
<p><b>Learning Outcomes</b></p>	<p><b>Students have learned to:</b></p> <ul style="list-style-type: none"> <li>- Learn the features of a 3D printer/ safety issues</li> <li>- Learn the menu of a 3D printer</li> <li>- Introduction to 3D printing/Design with real life examples/sustainability design</li> <li>- Learn how to print a ready 3D project</li> </ul>
<p><b>Knowledge</b></p>	<p><b>Students are aware of:</b></p> <ul style="list-style-type: none"> <li>- Basic principles of 3D printing</li> <li>- How a 3D printer operates</li> <li>- Design techniques</li> <li>- Existing design software</li> </ul>
<p><b>Skills</b></p>	<p><b>Students are able to:</b></p> <ul style="list-style-type: none"> <li>- Get familiar with the features and menu of a 3D printer</li> <li>- Handle a 3D printer</li> <li>- Imagine and draw a design</li> </ul>
<p><b>Soft Skills</b></p>	<p><b>Students have acquired competences in:</b></p> <ul style="list-style-type: none"> <li>- Creativity</li> <li>- Team work</li> <li>- Collaboration</li> <li>- Communication</li> <li>- Idea Exchange</li> <li>- Experimenting</li> </ul>





## MODULE 1: 3D Design and 3D Printing

### 3D MOVERS LEVEL

#### **Badge Description**

The badge earners are introduced to basic principles of 3D design and 3D printing.

#### **Learning Outcomes**

##### **Students have learned to:**

- Create simple 3D designs (hand drawings or technical)
- Learn the basic features of a 3D design software
- Transfer their 3D designs to a free online software (e.g. TinkerCad)

#### **Knowledge**

##### **Students are aware of:**

- Design a simple object
- Use a design software

#### **Skills**

##### **Students are able to:**

- Imagine and draw a design
- Transfer the design into a 3D module
- Draw a 3D design in a cad software

#### **Soft Skills**

##### **Students have acquired competences in:**

- Creativity
- Design
- Team work
- Collaboration
- Communication
- Idea Exchange
- Experimenting



## MODULE 1: 3D Design and 3D Printing

### 3D EXPERTS LEVEL

#### **Badge Description**

The badge earners are introduced to advanced features of 3D Design and 3D printing.

#### **Learning Outcomes**

##### **Students have learned to:**

- Create specific/more complex 3D designs
- Create Functional designs (i.e puzzles, practical objects, environmental issues)
- Transfer the 3D designs to a free online software
- Transform the 3D design to a 3D project
- Use a 3D printer to its full extend

#### **Knowledge**

##### **Students are aware of:**

- Design and draw 3D designs
- Advanced use of a 3D cad software
- Advanced use and settings of a 3D printer
- Advance slicer software settings
- Correct orientation of a model, identification of overhangs and enable support structures
- Print speed limitations of FDM printers and operational temperatures
- Simple printing problem and search for possible solutions

#### **Skills**

##### **Students are able to:**

- Create their own 3D printing design and projects of various subjects
- Print and present their designs
- Create a multiplex structure, design and print the 3D parts

**Soft Skills****Students have acquired competences in:**

- Creativity and design thinking
- Team work
- Collaboration
- Communication
- Idea Exchange
- Experimenting
- Project management
- Coordination
- Observation
- Time management
- Planning/Scheduling
- Listening
- Problem Solving
- Decision making
- Focus
- Goal setting
- Memory
- Presentation



## MODULE 2: Drone Piloting and programming

## DRONE STARTERS LEVEL

**Badge  
Description**

The badge earners are introduced to basic Drone Piloting and programming.

**Learning  
Outcomes**
**Students have learned to:**

- Introduction to drones – TELLO Drone
- Types of Drones, components, features
- Drone EU safety regulations (Lessons, License and diplomas)
- Use of Drones (i.e used in agriculture, deliveries – medical etc)

**Knowledge**
**Students are aware of:**

- Drone features
- Drone abilities

**Skills**
**Students are able to:**

- Recognize a drone
- Perform simple piloting of a drone

**Soft Skills**
**Students have acquired competences in:**

- Creativity
- Idea Exchange
- Experimenting
- Team work
- Focus
- Goal setting
- Memory
- Presentation



## MODULE 2: Drone Piloting and programming

## DRONE MOVERS LEVEL

**Badge  
Description**

The badge earners are introduced to Drone Piloting and programming.

**Learning  
Outcomes**
**Students have learned to:**

- Introduction to drone piloting
- Basic programming (Block-based coding)
- Visual drone programming

**Knowledge**
**Students are aware of:**

- Simple programming of a drone
- Visual Programming

**Skills**
**Students are able to:**

- Create a simple program
- Simple programming of a drone

**Soft Skills**
**Students have acquired competences in:**

- Creativity
- Idea Exchange
- Experimenting
- Team work
- Focus
- Goal setting
- Memory
- Presentation



## MODULE 2: Drone Piloting and programming

## DRONE EXPERTS LEVEL

**Badge  
Description**

The badge earners are introduced to advanced features of Drone Piloting and programming.

**Learning  
Outcomes**
**Students have learned to:**

- Perform a full drone flight
- Basic principles of coding with Python
- Setup Python IDE, SDK
- Advanced programming (Python)

**Knowledge**
**Students are aware of:**

- Advanced drone features and uses
- Advanced programming
- Advanced drone programming

**Skills**
**Students are able to:**

- Pilot a drone through obstacles
- Create a program
- Program and perform a programmed flight with a drone

**Soft Skills**
**Students have acquired competences in:**

- Creativity and design thinking
- Team work
- Collaboration
- Communication
- Idea Exchange
- Experimenting
- Project management
- Presentation skills
- Time management
- Planning/Scheduling
- Listening
- Problem Solving
- Decision making
- Goal setting



## Open Badges Integration to STEAM4ALL e-Learning Platform

The STEAM4ALL Open Badges Ecosystem is live and fully integrated into the STEAM4ALL e-learning platform, which is based on the Moodle Learning Management System (see Figure 9). Moodle's flexibility and extensibility make it suitable for integrating Open Badges seamlessly into the learning experience, and, hence, suit the project aim very well.

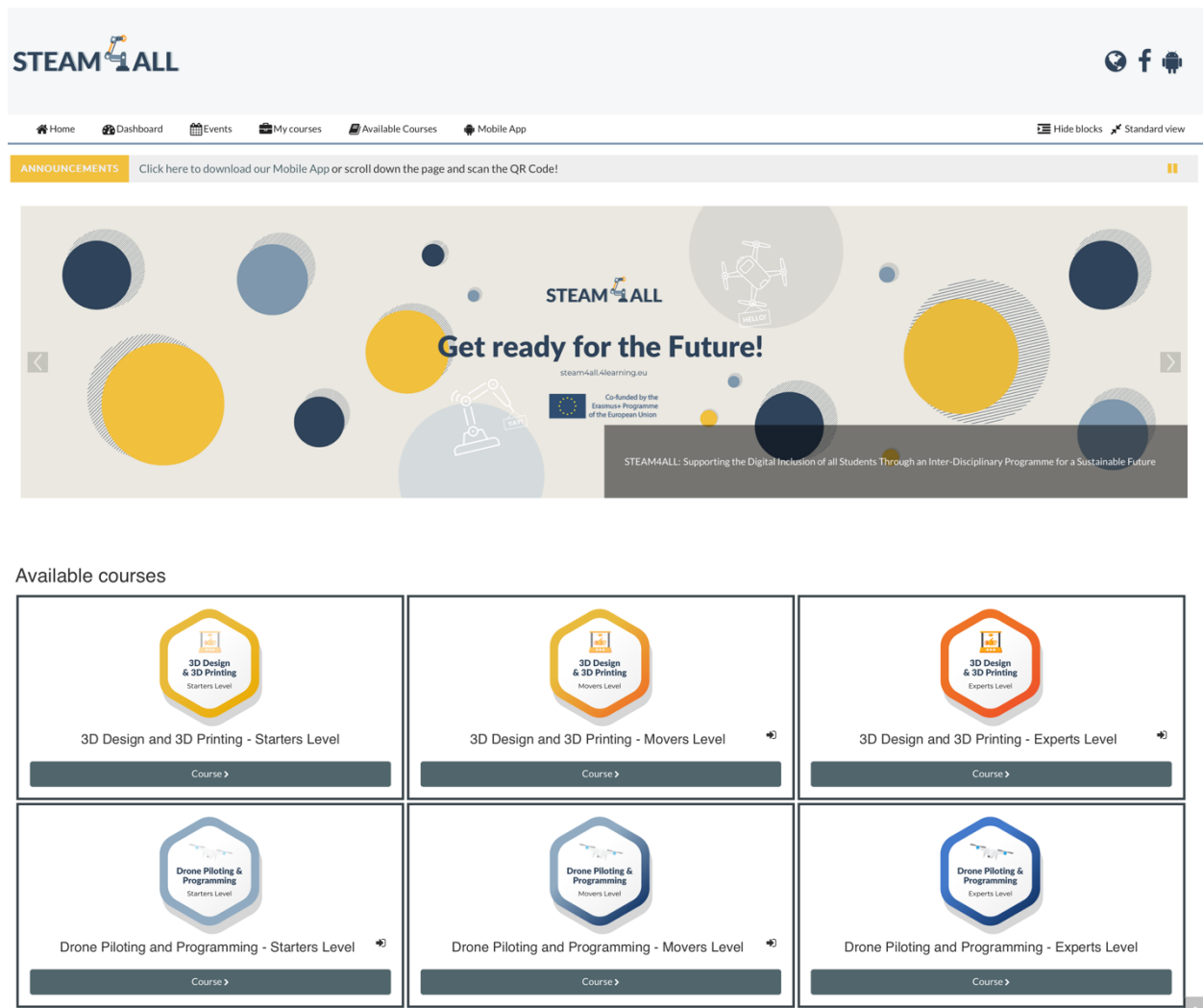


Figure 9. STEAM4ALL e-learning space. Weblink: [steam4all.iit.demokritos.gr](http://steam4all.iit.demokritos.gr).

Moodle has built-in support for Open Badges, allowing organizations and educators to issue and manage badges within the Moodle platform.

The key points regarding the STEAM4ALL Open Badges integration:

1. **BADGE CREATION AND ISSUANCE:** Moodle enables the creation of badges directly within the platform. Educators or administrators can define badge criteria, descriptions, and visual designs using Moodle's badge creation tools. In case of STEAM4ALL, the badges content and designed has been uploaded to the LMS manually. Badges can be awarded based on various achievements or completion of specific activities. For the STEAM4ALL developed modules, however, the process is manual and described later.
2. **BADGE BACKPACK INTEGRATION:** Moodle supports the integration of Open Badges Backpacks, such as Mozilla Backpack or other compatible badge backpack services. This integration allows learners to collect and store their earned badges in a centralized backpack, which they can showcase across different platforms. This is especially relevant for the consortium, as the partners aim to increase the visibility of their students' acquired skills.
3. **BADGE DISPLAY AND MANAGEMENT:** Within Moodle, learners can view and manage their earned badges. They can display badges on their user profile, course pages, or other designated areas. Learners have control over which badges they choose to display publicly, depending on their preferences.
4. **BADGE VERIFICATION:** Moodle incorporates badge verification mechanisms, ensuring the authenticity and validity of issued badges. Badge recipients or interested parties can verify badges by checking the associated metadata and verifying the badge issuer's credibility.
5. **BADGE CRITERIA ALIGNMENT:** Moodle allows badges to be aligned with specific course objectives or competencies. This alignment enhances the connection between earned badges and the skills or achievements they represent, providing a clear indication of the learner's proficiency or accomplishments. For STEAM4ALL courses this connection is explicitly shown by adding the picture of a badge to each section of the module.
6. **BADGE REPORTS AND ANALYTICS:** Moodle provides reporting and analytics features for badges, allowing educators and administrators to track badge issuance, learner progress, and overall badge performance. These insights help monitor learner engagement and identify areas for improvement.

As described in previous chapters, STEAM4ALL Open Badges on the Moodle platform also contain key elements (Figure 10), such as:

- Details about the organisation issuing the badge,
- What the individual has done to earn the badge,
- The criteria that the badge has been assessed against,
- That the badge was issued to the expected recipient,

- The badge earner's unique evidence,
- When the badge was issued and whether it expires.

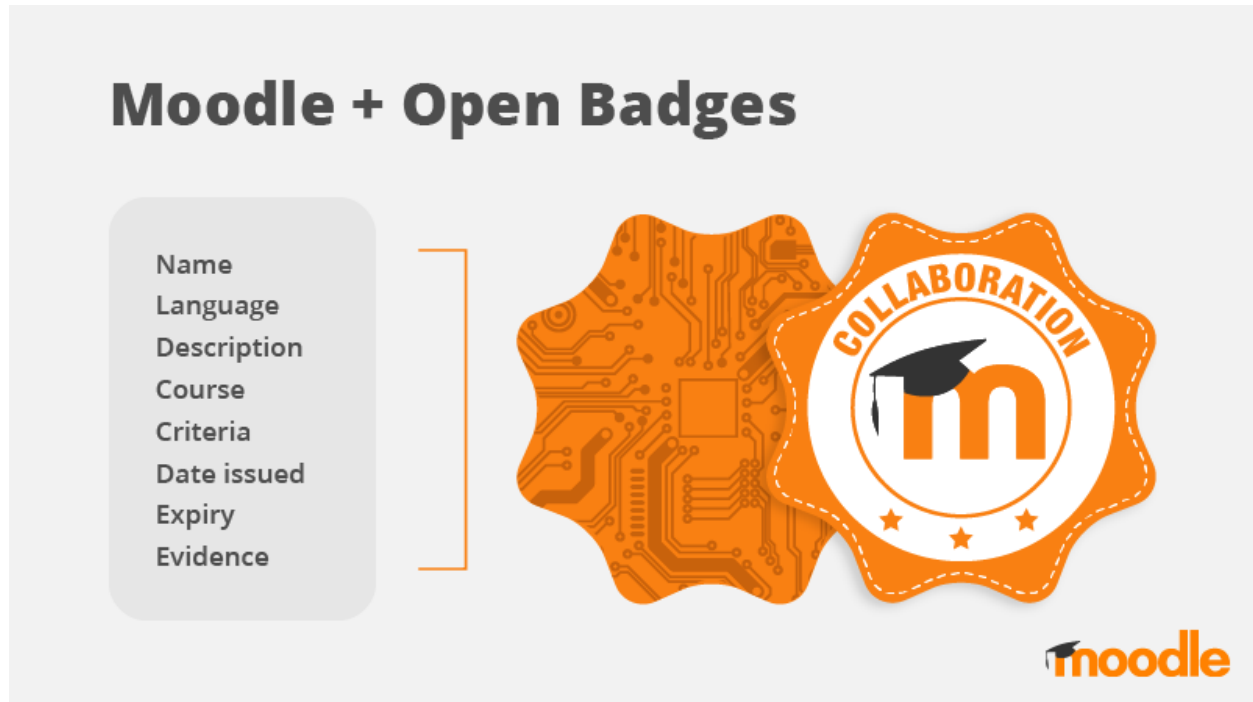


Figure 10. An Open Badge issued with [Moodle](#).

### Awarding process

The STEAM4ALL platform features the process of manually awarding an Open Badge by a teacher, which was a deliberate and intentional decision of the partner consortium. This manual approach signifies a purposeful involvement of the teacher in the assessment and recognition process.

The decision to adopt a manual awarding process holds certain advantages within an academic setting. Firstly, it allows for a **PERSONALIZED AND NUANCED EVALUATION OF LEARNERS' ACHIEVEMENTS AND COMPETENCIES**. The teacher, being intimately familiar with the learners' progress and performance, can employ their professional judgment to assess the attainment of specific skills or accomplishments accurately.

Secondly, the manual awarding process promotes a **DEEPER UNDERSTANDING OF LEARNERS' INDIVIDUAL LEARNING JOURNEYS**. By actively engaging in the assessment and recognition process, teachers gain insights into the learners' strengths, areas for improvement, and overall development. This deeper understanding facilitates targeted feedback and tailored instructional approaches, thereby enhancing the effectiveness of the teaching and learning process.

Moreover, the manual awarding process fosters a **MEANINGFUL TEACHER-LEARNER RELATIONSHIP**. It provides an opportunity for direct interaction and dialogue between the teacher and the learners, allowing for personalized feedback, guidance, and recognition. Such interpersonal engagement promotes a supportive learning environment, contributing to learners' motivation, self-efficacy, and a sense of belonging.

Lastly, the manual awarding process aligns with the pedagogical values of **REFLECTIVE AND PARTICIPATORY ASSESSMENT PRACTICES**. Through the teacher's active involvement in the badge awarding process, there is a deliberate focus on thoughtful evaluation, which can encompass formative feedback, dialogue, and collaborative reflection with the learners. This approach fosters a culture of continuous improvement and encourages learners to take ownership of their learning outcomes.

In summary, the manual awarding of Open Badges by teachers on the STEAM4ALL Moodle platform exemplifies a purposeful, personalized, and reflective approach to assessment and recognition. It allows for a nuanced evaluation of learners' achievements, promotes a deeper understanding of their learning journeys, facilitates meaningful teacher-learner relationships, and aligns with pedagogical values of reflective and participatory assessment practices.

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# STEAM4ALL

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## Download STEAM4ALL App



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