Biomimicry Design for Sustainability Skills in VET

KA220-VET-00620D4B

KA220-VET - Cooperation Partnerships in Vocational Education and Training

D2.2 Biomimicry Platform Design

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Authors	Ancuța Florentina Gheorghe, Advanced Technology Systems Ioana Andreea Ștefan, Advanced Technology Systems Antoniu Șefan, Advanced Technology Systems Olivier Heidmann, University of Thessaly
Reviewers	Hariklia Tsalapatas, University of Thessaly

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Contributors

Konstantina Vlachoutsou, University of Thessaly

Christina Taka, University of Thessaly

Dimitris Ziogas, University of Thessaly

Konstantinos Katsimentes, University of Thessaly

Sotiris Evaggelou, University of Thessaly

Apostolos Fotopoulos, University of Thessaly

Carlos Vaz the Carvalho, Virtual Campus

Laura Trevisan, Infodef

Stella Regoli, Etudes Et Chantiers Corsica

Ahu Sismek, Yakacik Mesleki Ve Teknik Anadolu Lisesiu Sismek

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Contents

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1. Introduction

Biomimicry has emerged and been consolidated as a viable approach that could inspire creative minds and drive human innovation. Biomimicry designs are constructed considering both sustainability goals and cost-efficiency solutions. Equipping students with the skill sets that would enable them to draw on natural organisms and processes to fuel innovation effectively has become a priority in education.

The LET'S MIMIC Project invests in developing skills that would enable future generations to create sustainable designs that mimic nature's efficient use of resources, reduce waste, and lower environmental impact. The LET'S MIMIC Collaborative Platform implements the biomimicry design process and enables VET learners to enhance their sustainability skills through gamified microlearning units, collaborative activities, and self-regulated learning experiences.

At a more granular level, the Platform will implement the Biomimicry Process Design methodology to allow VET learners to experience the six steps of the Biomimicry Design Process (DEFINE; BIOLOGIZE; DISCOVER; ABSTRACT; EMULATE and EVALUATE); provide a collaborative space to experiment Problem-based Learning methods such as constructivism and social learning via gamified, Self-Regulated Learning Paths (SRL-P); develop microlearning resources and provide stand-alone units of study that can be configured as SRL-P to support active, customised learning processes and better accommodate the learning needs of VET students; integrate gamification mechanics to boost engagement and motivation; provide mechanisms to evaluate achievements and monitor progress.

This deliverable reflects the work carried out under Work Package 2: Biomimicry Process Design for Sustainability Skills. It describes the key functionalities of the LET'S MIMIC Collaborative Platform, which implements the Biomimicry Design Process and can be experimented with through collaborative working areas and a self-regulated learning kit.

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The platform design specifications present the platform architecture diagram, the design specifications for the mentor and student interfaces, and the detailed functionalities for the frontend and backend modules: microlearning management, SRL-P, collaborative learning, gamification, and assessment.

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2. LET's MIMIC platform architecture development

The Biomimicry Collaborative Platform implements the Biomimicry Process Design methodology and integrates the following components:

- **The Microlearning module** manages bite-sized units of content that promote the development of Sustainability Skills of VET students, with focused and specific learning outcomes. The module manages the development and allocation of the training units to students through the following components:
    - *My workspace – MENTORS (private)* – the module is dedicated to the management of the training units:
        - Mentors' private collections are created based on the 6 steps of the Biomimicry Design Process, which is implemented as a pipeline for controlling digital assets.
        - Mentors' private resources.
    - *Repository – MENTORS & STUDENTS (public)* – the module is dedicated to public Collections and Resources (bite-sized units).
- **The Self-Regulated Learning module** enables students to opt for the learning units they want to study. It allows VET students to control their learning, take responsibility and complete their training at a time and place of their choice. The content is delivered as SRL-P, constructed based on individual goals, self-evaluation, and gamified challenges.
    - *Microlessons – STUDENTS* – the module provides the option to list Collections and Resources from the Repository that users mark as favourites.
- **The Teamwork module** manages a collaborative space, enabling mentors to create digital spaces to share with VET students for collaborative work. The collaborative space can be constructed based on the collection pipeline, the six stages of the Biomimicry Design Process, or another micro-unit made available in the Repository of microunits.

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- *My classes - MENTORS & STUDENTS* - the module is dedicated to mentors and students for individual or collaborative work:
  - Mentors can create a private space designed as a class for collaborative work, which they can share with a group of students.
  - A student can enrol in a class for individual work based on a code provided by the mentor.

- **The Gamification module** for students provides features like a point system, badges, and leaderboards paired with SRL-P challenges and quizzes. The module is integrated within the pipeline of the six stages of the Biomimicry Design Process or a micro-unit.
- **The Assessment module** manages the mentors and the student dashboards and provides feedback on student evolution, which is used to improve student performance.

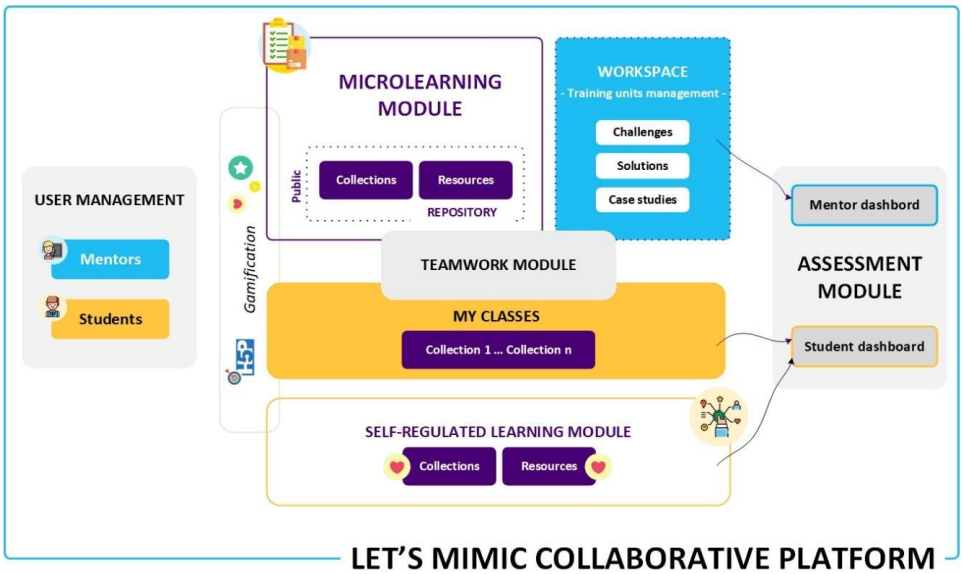

Figure 1. LET'S MIMIC collaborative platform architecture.

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3. Authentication: Register and Login

The Authentication module is standard for all types of users, namely Mentors and Students, and is divided into two components: logging in and registering.

- **The Register interface** allows Mentors and Students to create a new account. The register is divided into two steps. In the first step, the user is requested to choose the type of user – Mentor or Student. In the second step, the user is asked to enter the First and Last name (optional but strongly recommended), the username (mandatory), the password to confirm it (compulsory), and to accept the Privacy Policy. No email address will be required or stored in the servers to comply with the general GDPR directives.

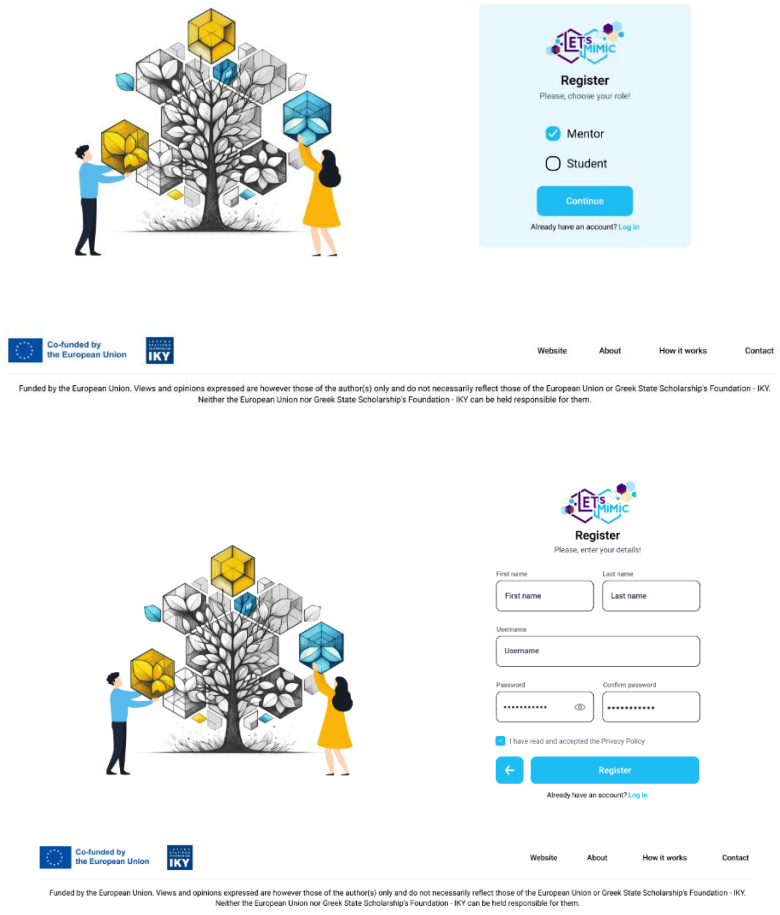

Figure 2. Register interface.

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- **The Login interface** allows Mentors and Students to log in to the platform by providing the username and password, with the possibility of recovering the password if the user does not remember it. The interface includes an additional functionality: "Remember Me," which allows users to access all the data from the same machine even after the session expires.

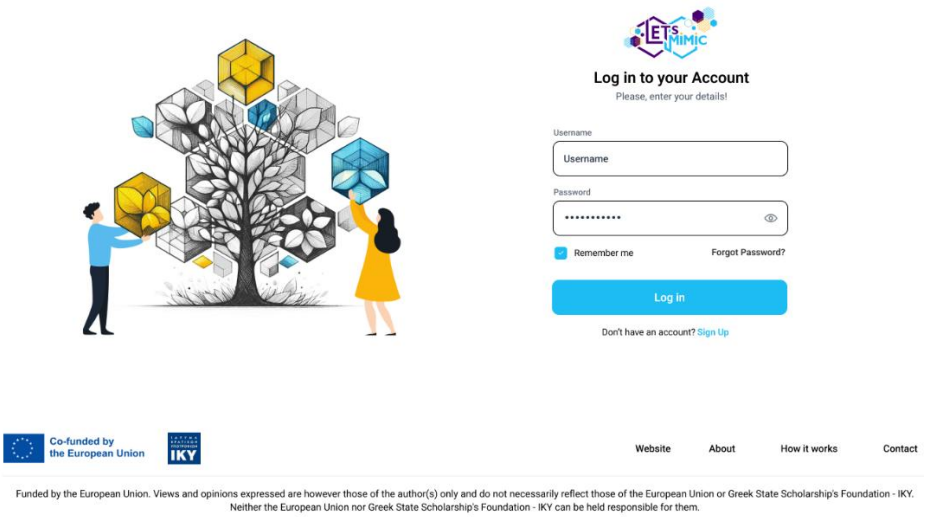

Figure 3. Log in interface.

4. Interface design specifications: Mentors

The Mentor User Interface follows an aesthetic layout. It provides a seamless and user-friendly experience by offering firsthand an overview of all the critical components of the platform. The interface is divided into four sections:

- **The menu**: The menu is configured according to the access level:
    - *Level 1 – before login:* includes the options to log into the platform or create an account to access the platform.
    - *Level 2 – after login:* includes all the critical components of the LET'S MIMIC Platform: Repository, My Workspace, My Classes, Profile, Chat and Language. The main menu is displayed at each level of interaction with the platform.
- **The main section**: This section briefly describes the LET'S MIMIC Platform, the options for accessing the project website, and the platform manual.
- **The content section**: It includes the latest collections or resources on the platform. These can be accessed only after logging in.
- **The footer and disclaimer**: They include the logo of the EU and Greek National Agency (IKY), a quick menu for accessing relevant information about the project and the acknowledgement. This section is displayed at each level of interaction with the platform.

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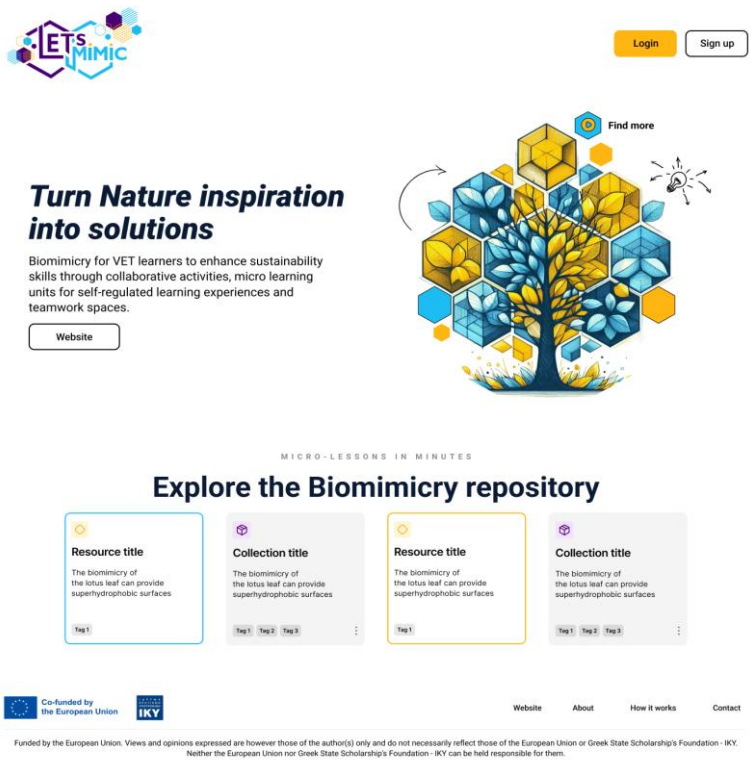

Figure 4. Mentor UI before login.

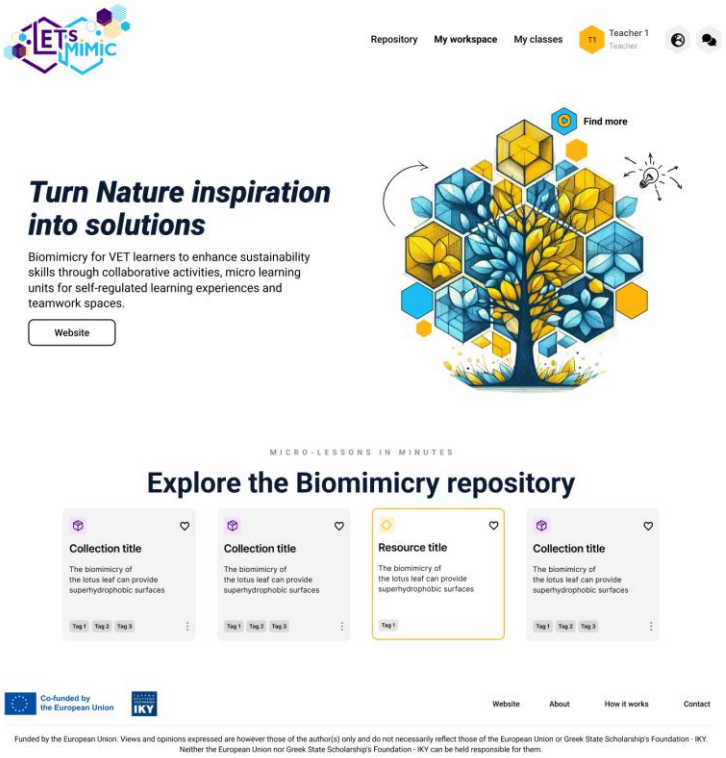

Figure 5. Mentor UI after login.

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4.1. Repository (content bank)

The Repository provides mentors access to a list of all Collections and Resources made public and created via the **Microlearning module**. The interface allows mentors to:

- Search the content, including Collections or Resources, by title.
- Filter the content by type, namely Collections or Resources.
- Edit/delete own Collections or Resources.
- Share Collections or Resources with other mentors and students.

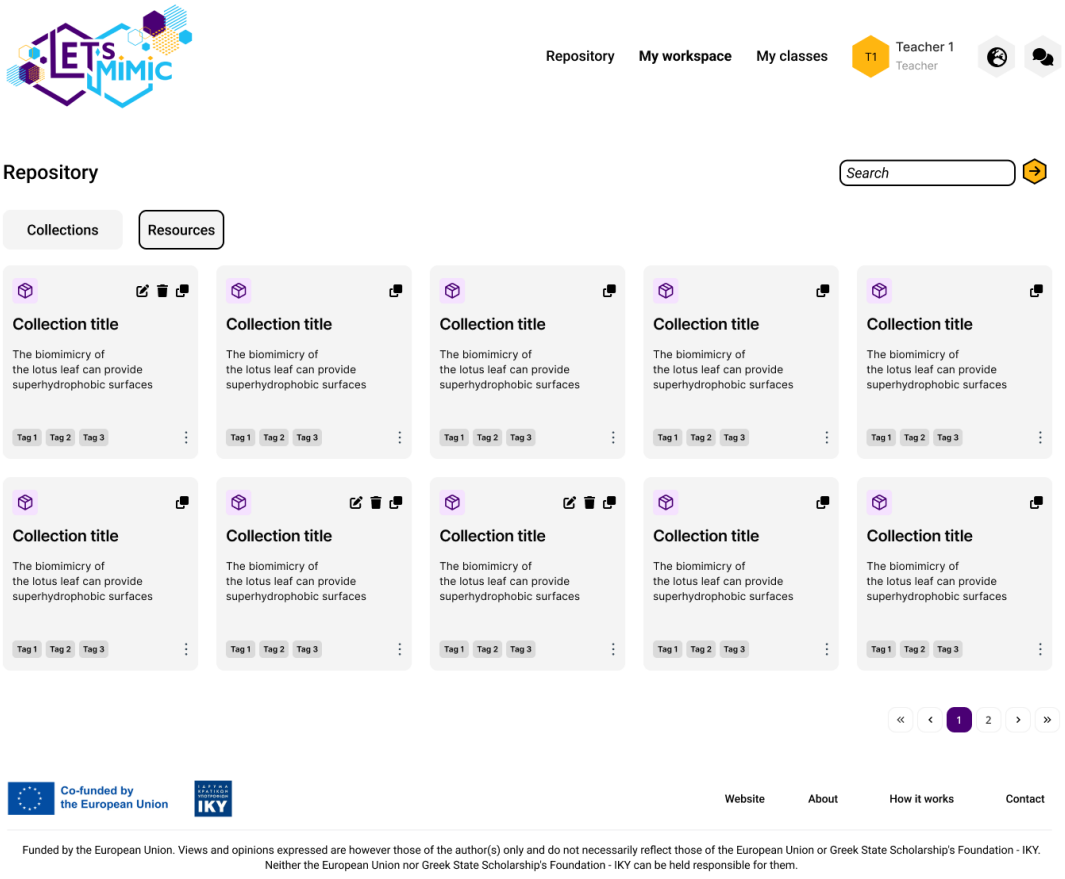

Figure 6. Repository for Collections.

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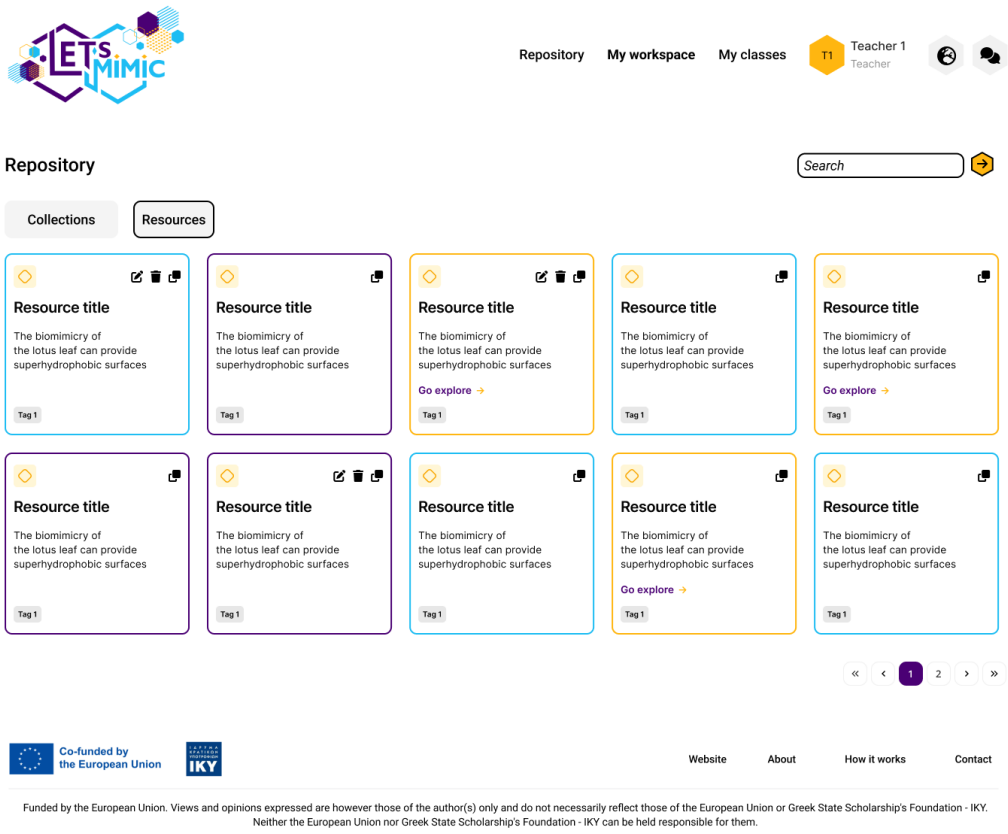

Figure 7. Repository for Resources.

4.2. My Workspace

The My Workspace section manages the mentors' private collections and/or resources created using the six steps of the Biomimicry Design Process.

The interface is designed as blocks of content filtered by type of content, namely Collection or Resource. It allows mentors to control various digital assets: text, documents, images, videos, H5P, and collaborative spaces as canvas, embedded in each stage of the Biomimicry Design Process.

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4.2.1. Collections

The Collections section is autogenerated and is designed as a pipeline, allowing mentors to define, edit, delete and make public a collection.

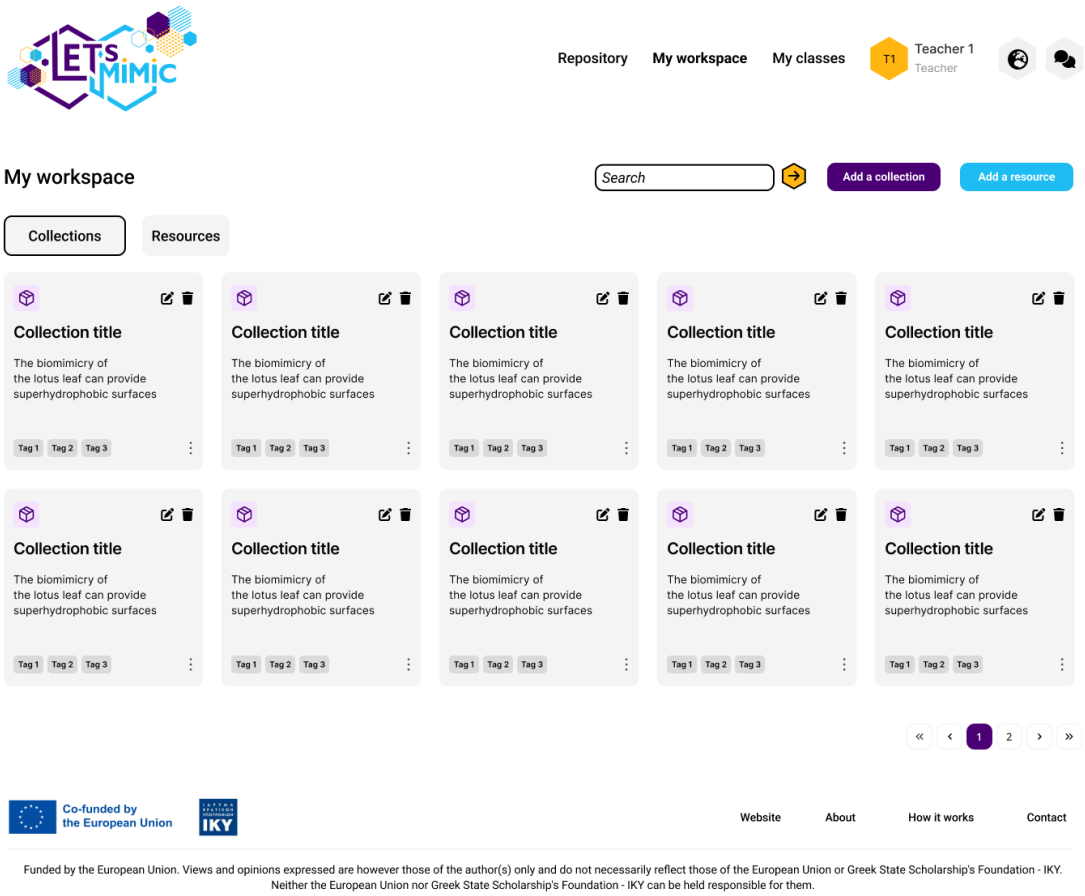

Figure 8. List of private Collections.

A collection is structured based on the six steps of the Biomimicry Design Process and their respective resources:

- **Step 1—Define**: This step allows students to clearly articulate the impact the design must have on the world (i.e., the challenge the user wants to solve) and the criteria and constraints determining success.

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- **Step 2—Biologize**: This step allows students to analyse the essential functions and context the design solutions must address. In this step, the solutions can be reframed in biological terms so that students can "ask nature" for advice.
- **Step 3—Discover**: This step allows students to look for natural models (organisms and ecosystems) that must address the same functions and context as the design solution. The strategies used to support their survival and success can be identified in this step.
- **Step 4—Abstract**: This step allows students to carefully study the essential features or mechanisms that make biological strategies successful. In this step, the students can State them in non-biological terms as "design strategies."
- **Step 5—Emulate**: This step allows students to look for patterns and relationships among the strategies found and focus on the key lessons that should inform the solution. The students can then develop design concepts based on these elements.
- **Step 6—Evaluate**: This step allows students to assess the design concept(s) for how well they meet the criteria and constraints of the design challenge and fit into Earth's systems. Students can consider the feasibility of technical and business models. Refine and revisit previous steps as needed to produce a viable solution.

The Collection interface contains the following components:

- **Step 2—The Beginnings**: This is the interface with collection details. Mentors can define and view the collection's title, description, and tags.

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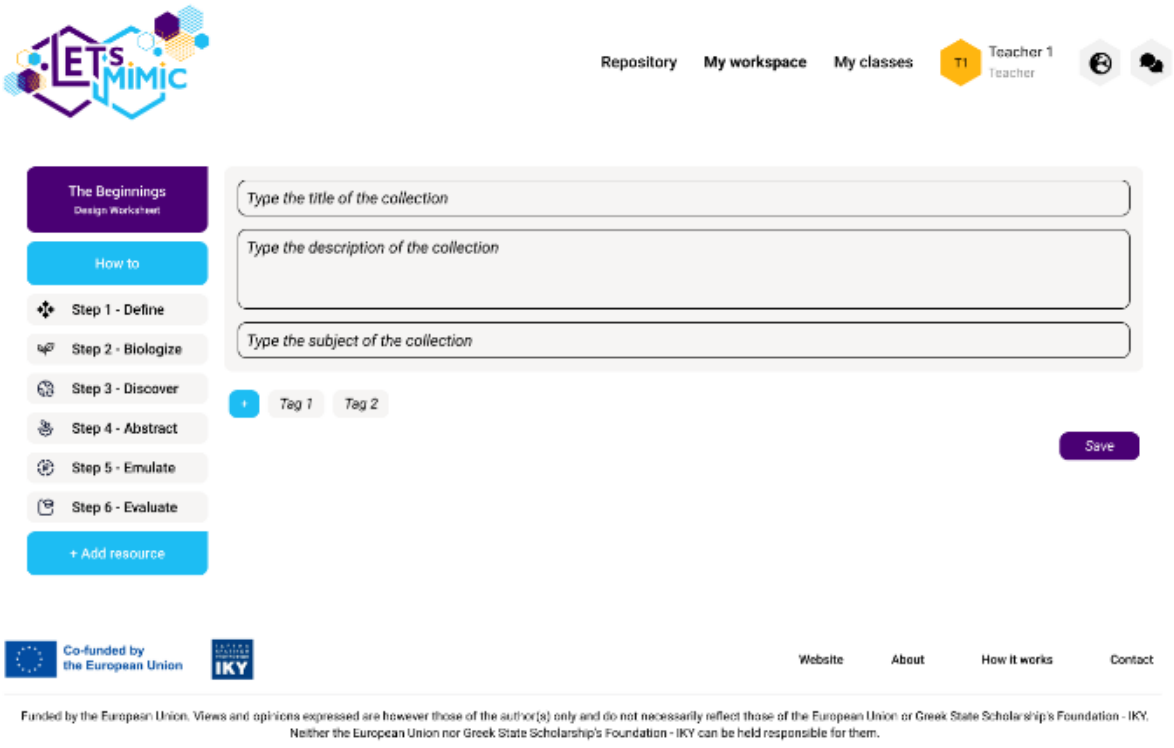

Figure 9. Add collection.

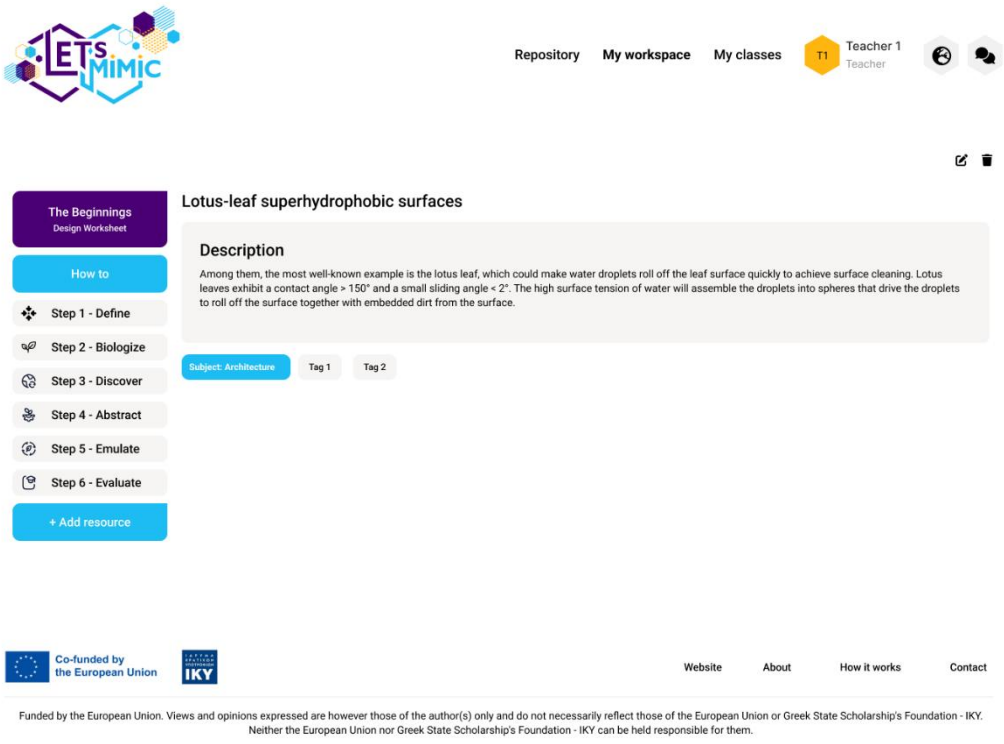

Figure 10. View description of collection.

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- **How to (Help)**: This auto-generated interface displays relevant information for mentors on how to construct the collection.

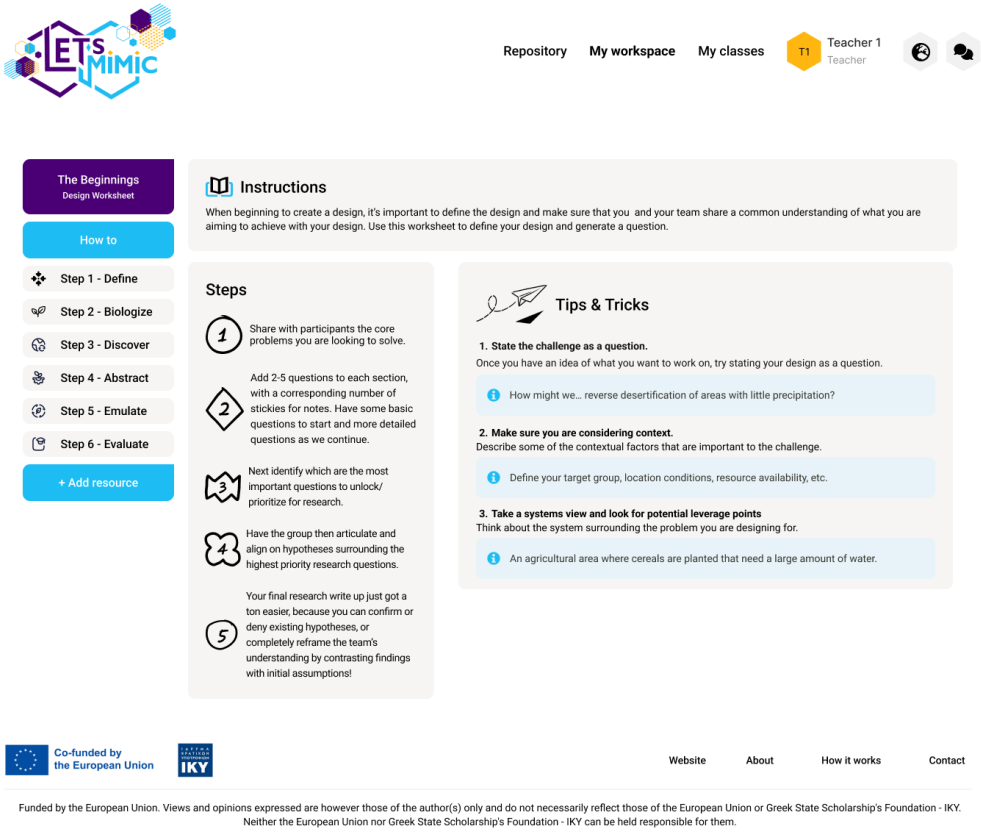

Figure 11. View instructions.

- **Stages of the Biomimicry Design Process**: This is a predefined interface with information related to each step. Mentors can view specific information related to each stage.

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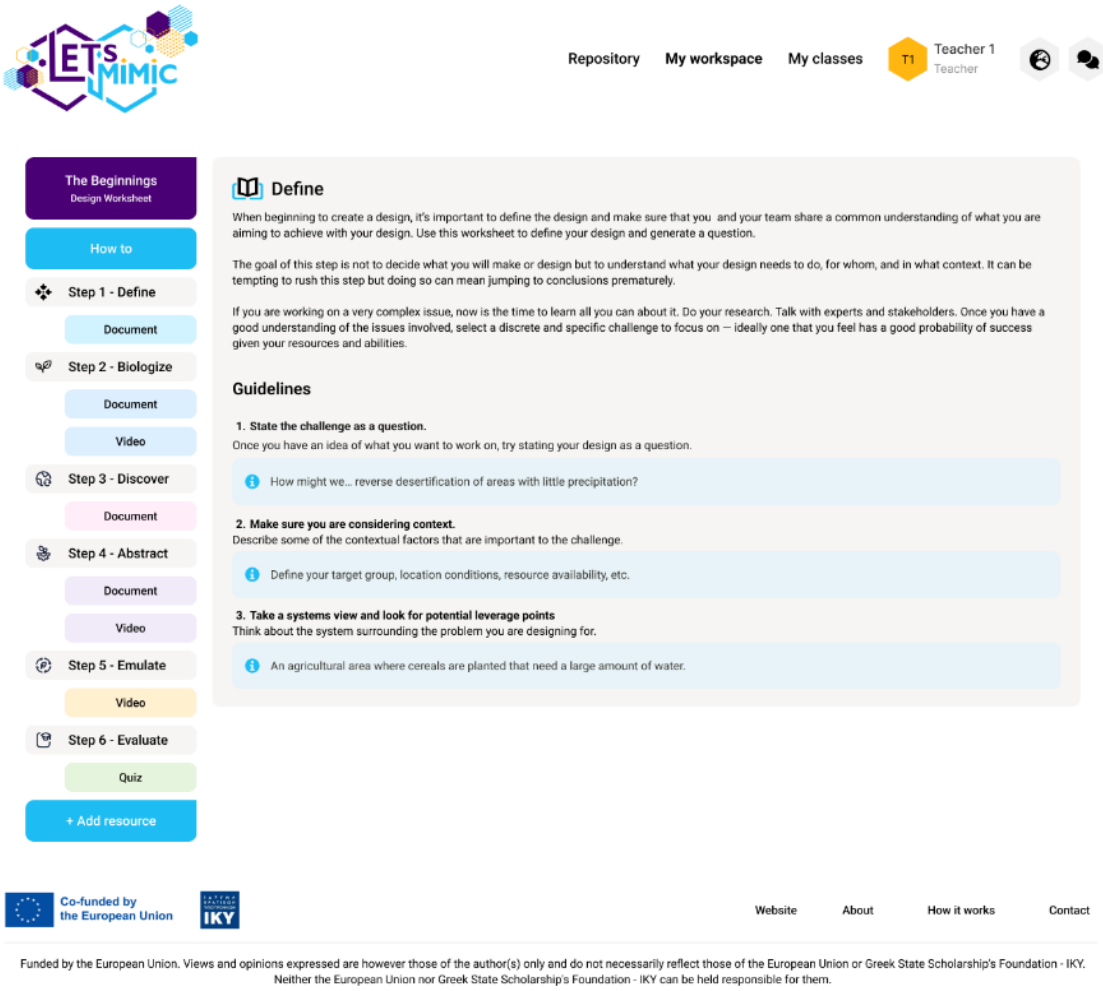

Figure 12. View information on a step of the Biomimicry Design Process.

- **Content addition to the Biomimicry Design Process**: The platform allows inserting different types of resources, which can be allocated by drag-and-drop action in each Biomimicry Design Process. The resources include documents, images, videos, H5P, and collaborative spaces. The documents, images, videos, and H5P units are integrated into the platform via a URL.

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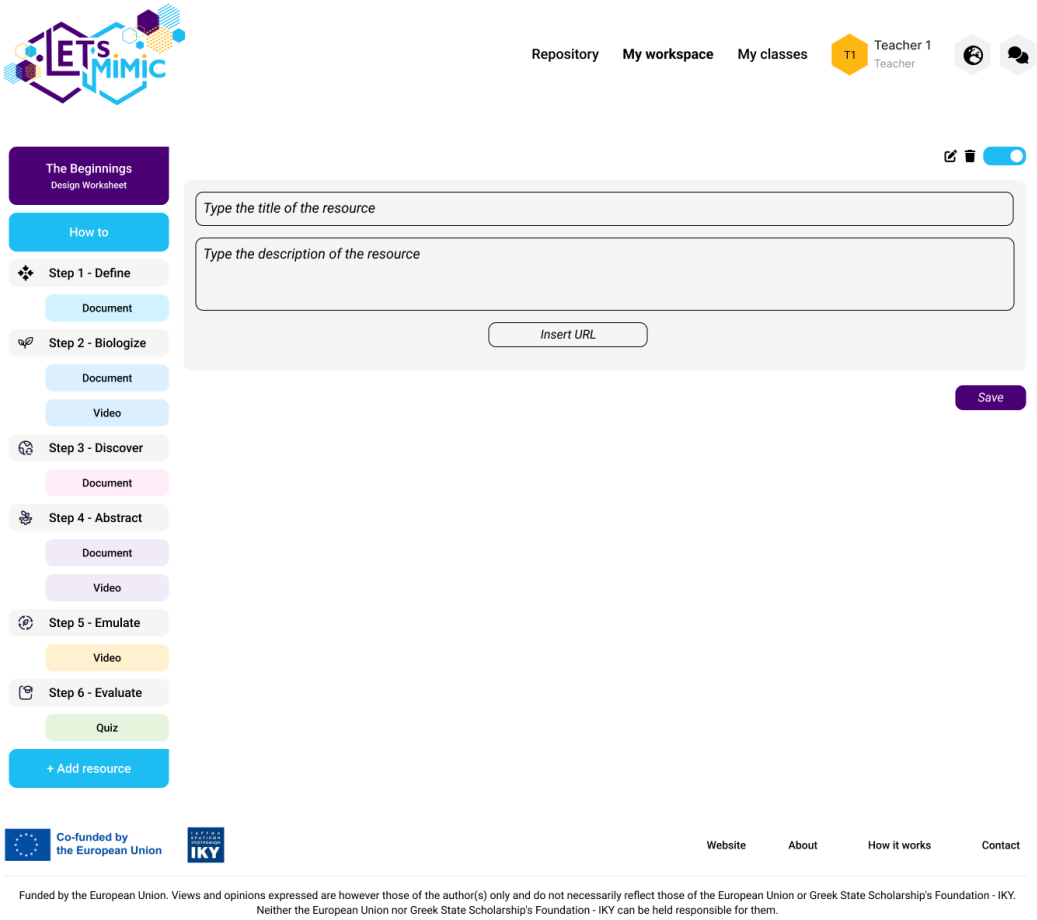

Figure 13. Add resource - Document type.

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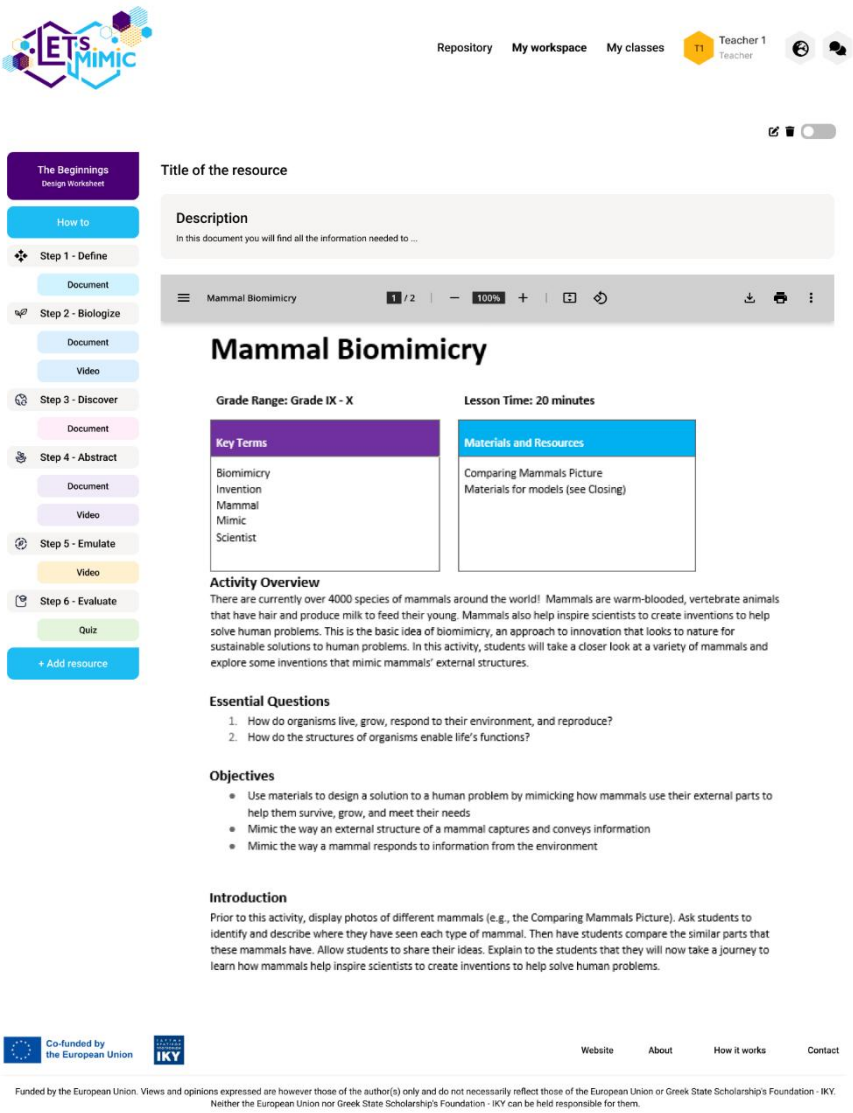

Figure 14. View resource in Define stage - Document type.

4.2.2. Resources

Mentors can create microlearning units and save them as individual resources that can be private or public at the platform level. Resources follow the same structure as a Collection, but they can be tagged and associated with one of the steps of the Biomimicry Design Process to be identified more easily.

Platform users can mark resources as favourites to support the self-regulated learning approach.

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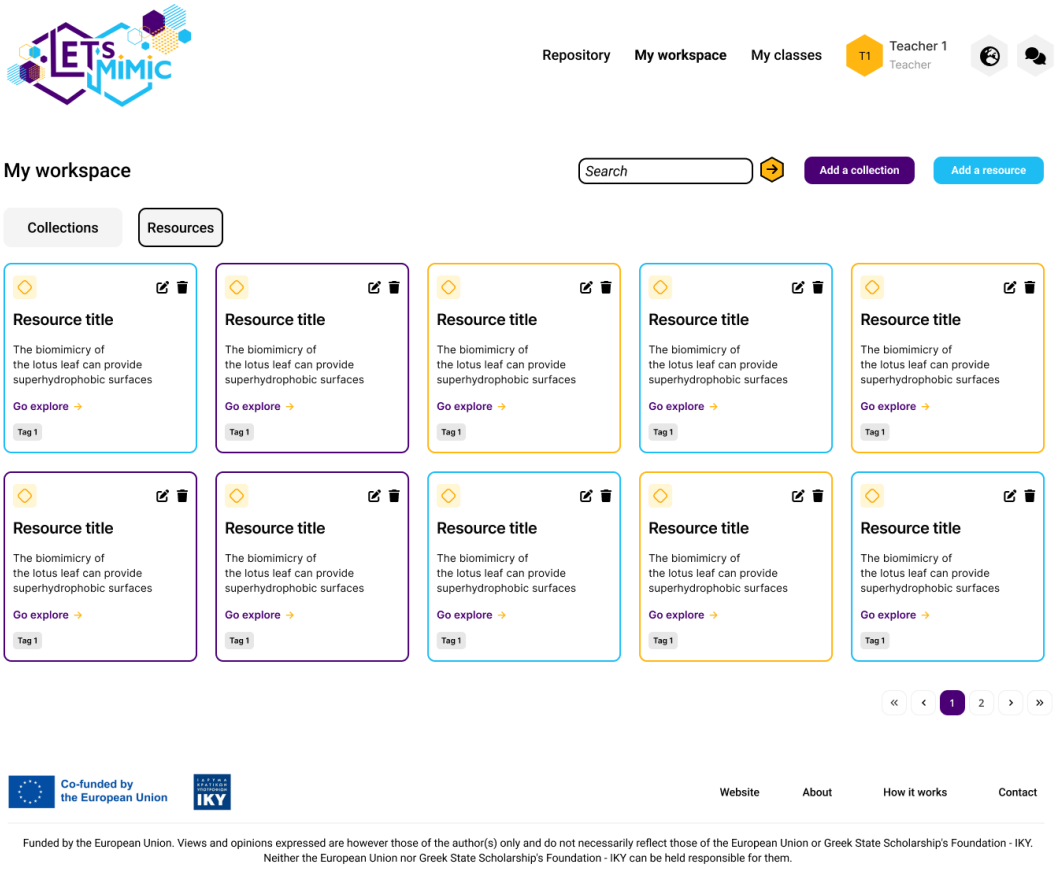

Figure 15. List of Private Resources.

4.3. My Classes

The My Classes interface is dedicated to mentors' private classes, which can include one or more Micro learning units (Collections or Resources). The interface allows mentors to:

The interface will enable mentors:

- To search a class by title.
- To add a new class.
- To edit/delete existing classes.
- To share a Class with a student or a group of students.

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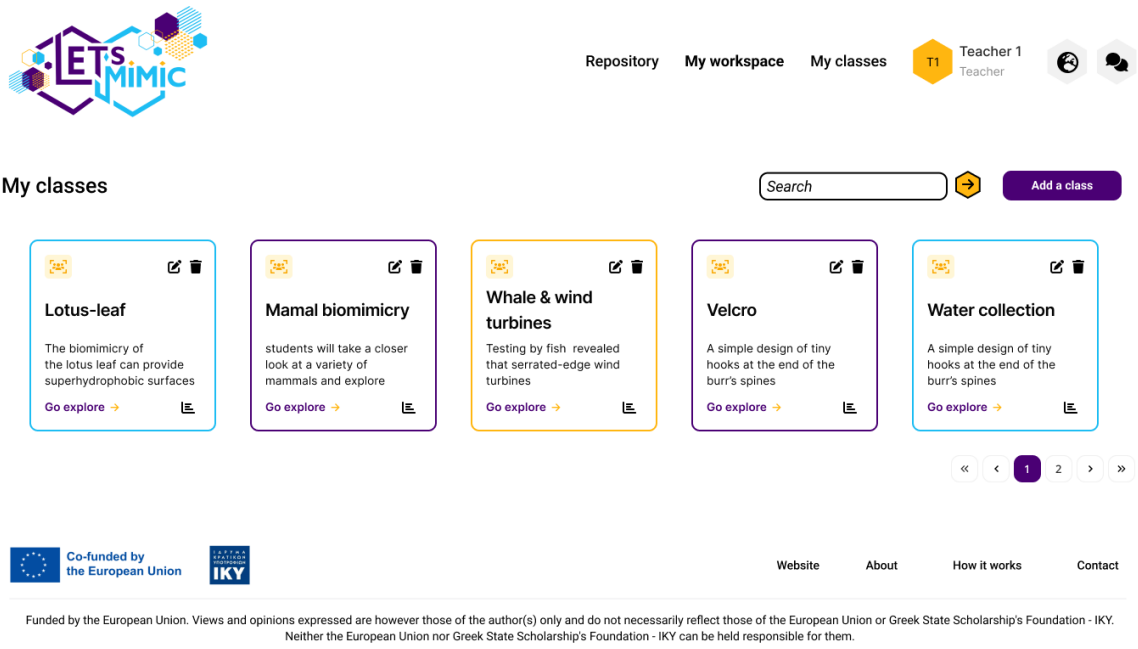

Figure 16. List of classes created by a mentor.

A class has a double purpose, as follows:

- It can include one or more microlearning units and be shared with one student for individual work to promote self-regulated learning, in which the enrolment is made via a unique code.
- It can include one or more microlearning units and be shared with a group of students to promote collaborative work, in which the enrolment is made via a unique code.

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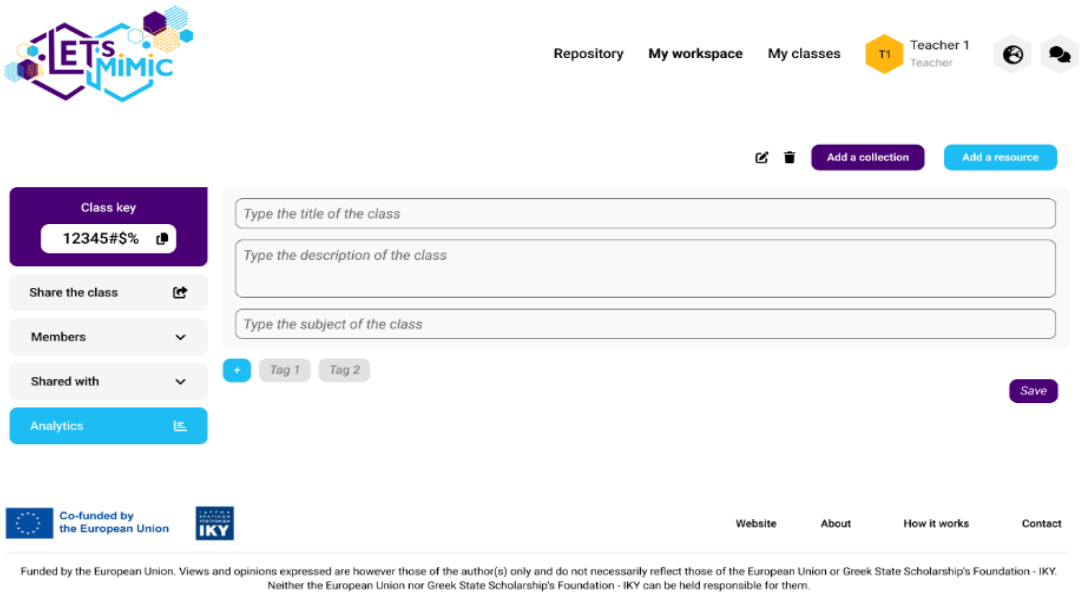

Figure 17. Form for adding a class.

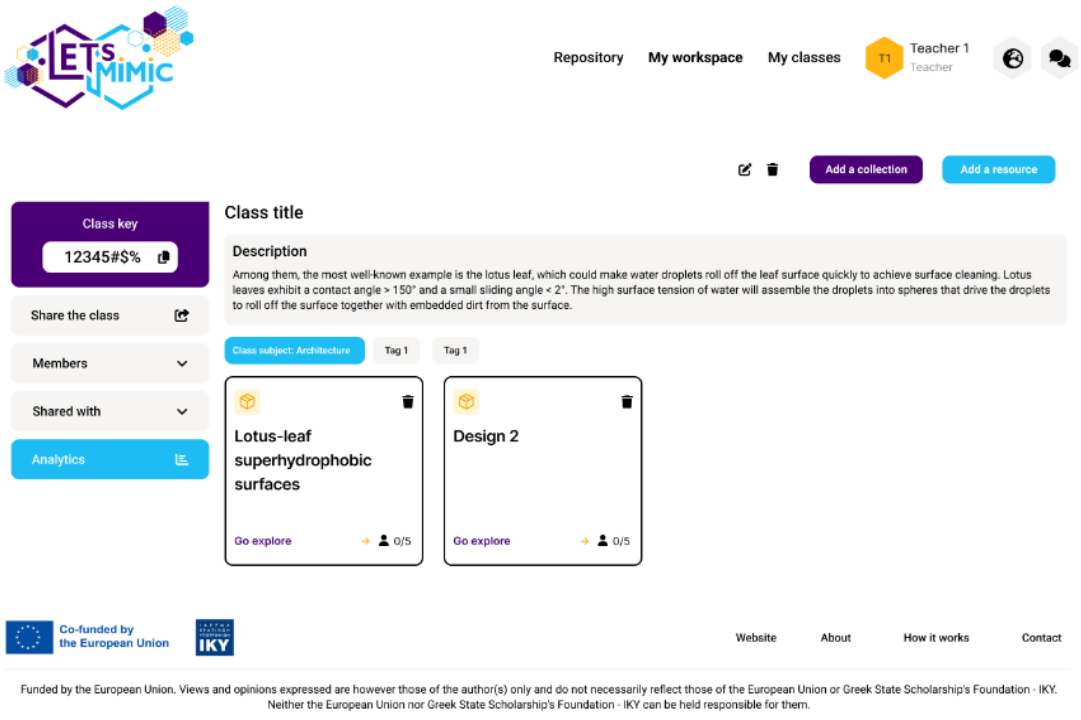

Figure 18. Class with Microlessons included.

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4.4. Assessment Module

The module provides feedback on student evolution, which is used to improve students' performance. It manages the mentor and the student dashboards.

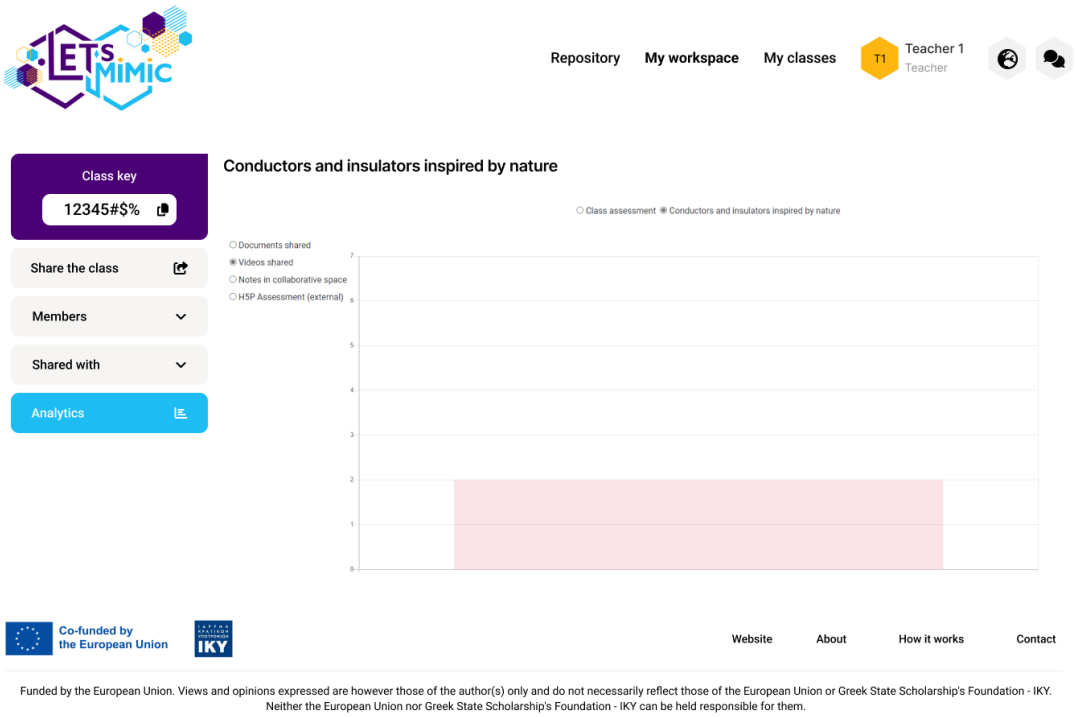

Figure 19. Assessment of a Collection in a class.

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5. Interface design specifications: Students

The Student User Interface follows an aesthetic layout. It provides a seamless and user-friendly experience by offering firsthand an overview of all the critical components of the platform. The interface is divided into four sections:

- **The menu**: The menu is configured according to the access level:
    - *Level 1* – before login: includes the options to log into the platform or create an account to access the platform.
    - *Level 2* – after login: includes all the critical components of the LET's MIMIC Platform: Repository, Microlessons, My Classes, Profile, Chat and Language. The main menu is displayed at each level of interaction with the platform.
- **The main section**: This section briefly describes the LET's MIMIC platform and options to access the project website, join a class, and access the platform's manual.
- **The content section**: This section includes the latest collections or resources on the platform. They can be accessed only after logging in.
- **The footer and disclaimer**: The footer includes the logo of the EU and Greek National Agency (IKY), a quick menu for accessing relevant information about the project and the acknowledgement. This section is displayed at each level of interaction with the platform.

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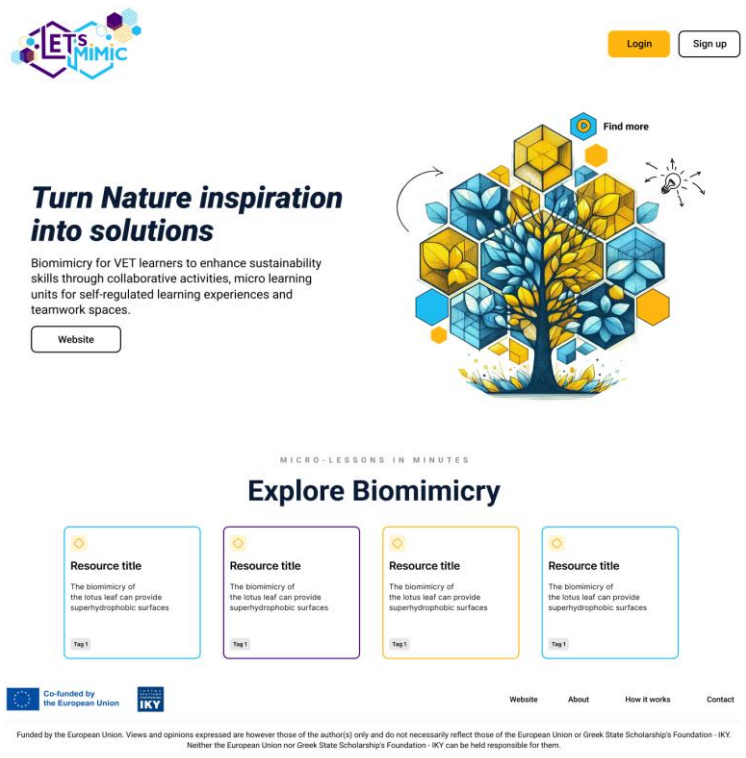

Figure 20. Student UI before login.

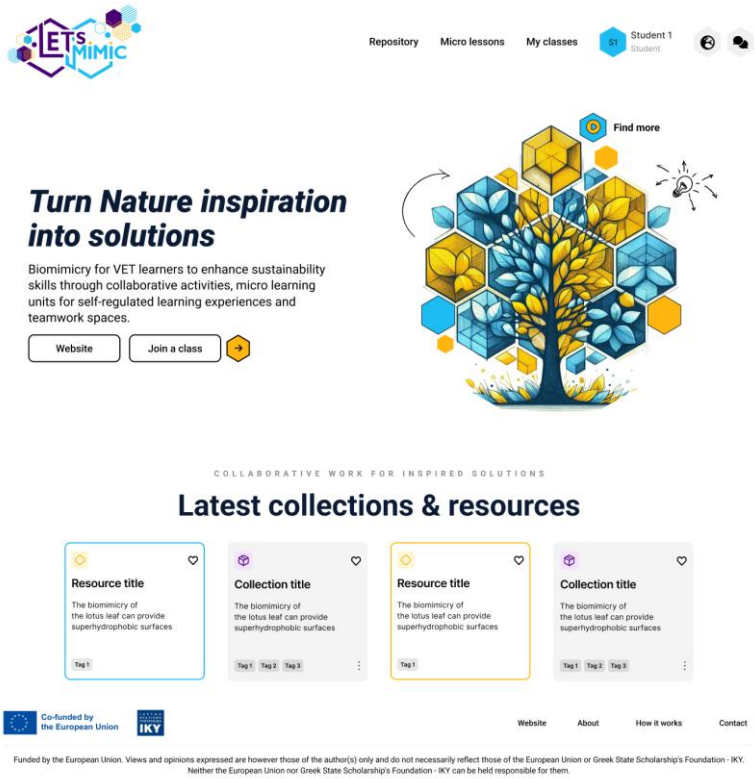

Figure 21. Student UI after login.

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5.1. Repository

The Repository intersection face provides users with a list of all Collections and Resources made public by the mentors.

The interface allows users to:

- Search the content, including Collections or Resources, by title.
- Filter the content by type, namely Collections or Resources.
- Access a Collection or Resource.
- Mark as a favourite a Collection or Resource and transfer it to the Microlesson component.

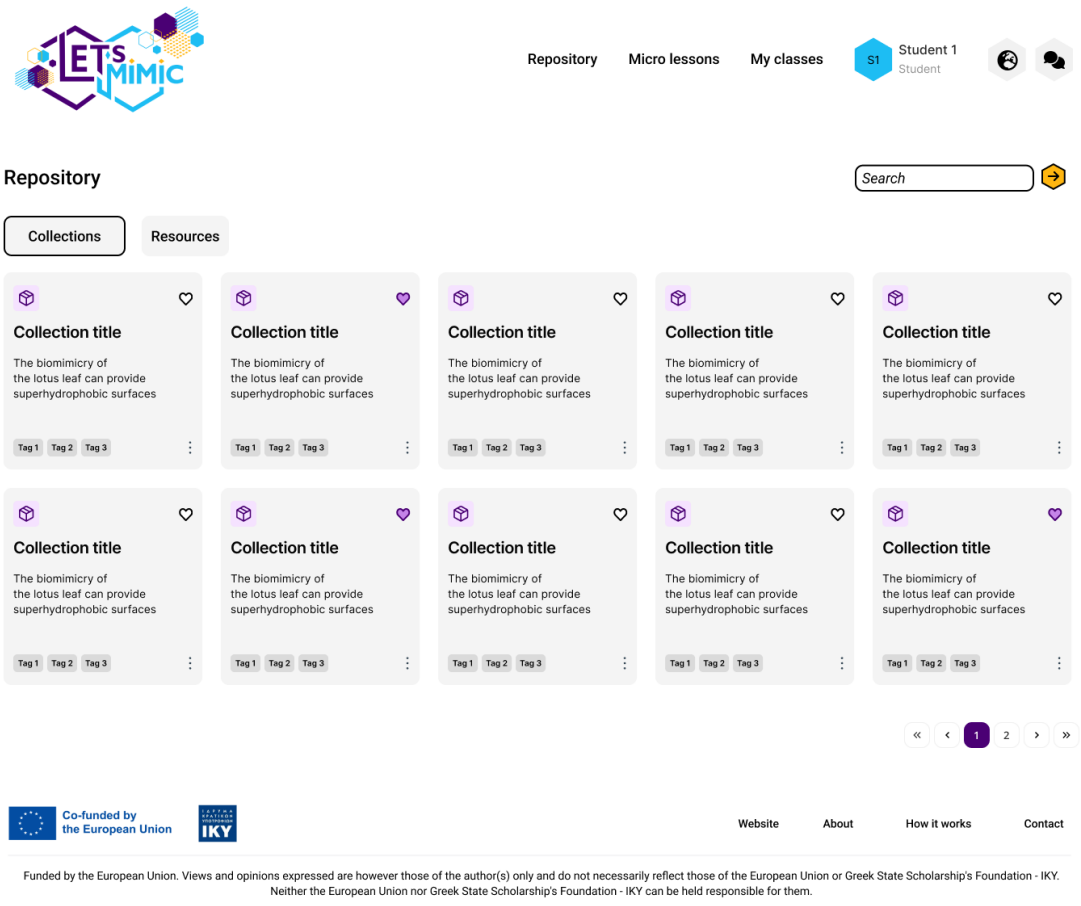

Figure 22. Repository of public Collections available for students.

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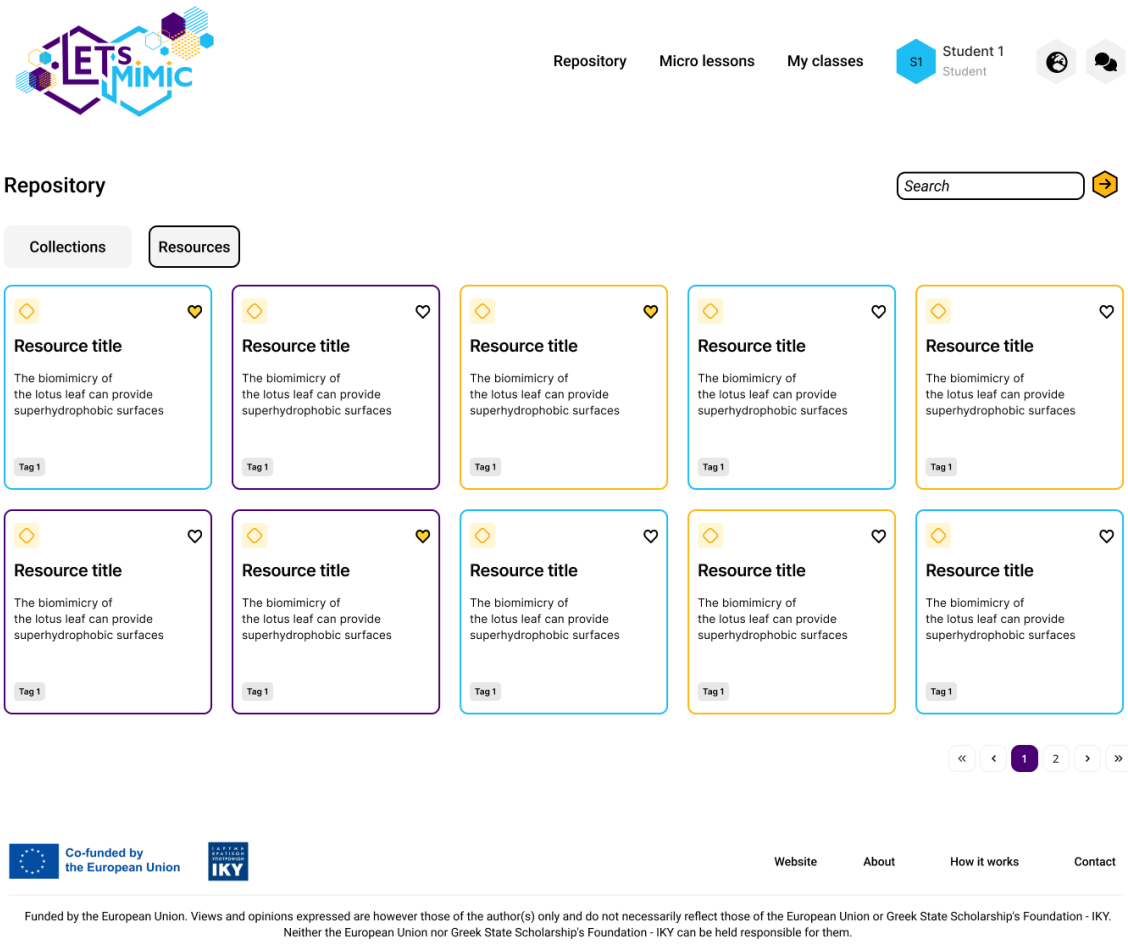

Figure 23. Repository of public Resources available for students.

5.2. Microlessons

The Microlessons section allows students to mark a Collection or a Resource from the Repository as a favourite and include it in the SRL-P.

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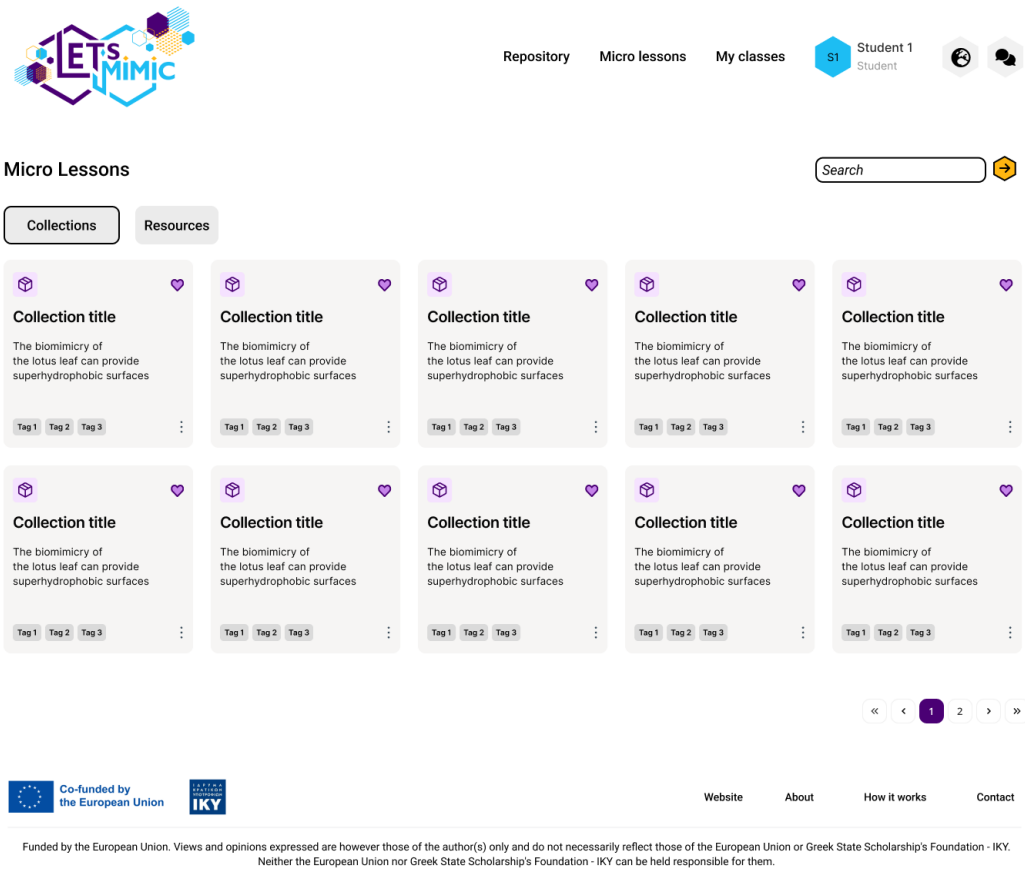

Figure 24. List of public Collection or Resources.

Figure 25. View Collection by self-enrolment

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5.3. My Classes

The My Classes section allows students to access a Class using a unique code based on the invitation received from a mentor.

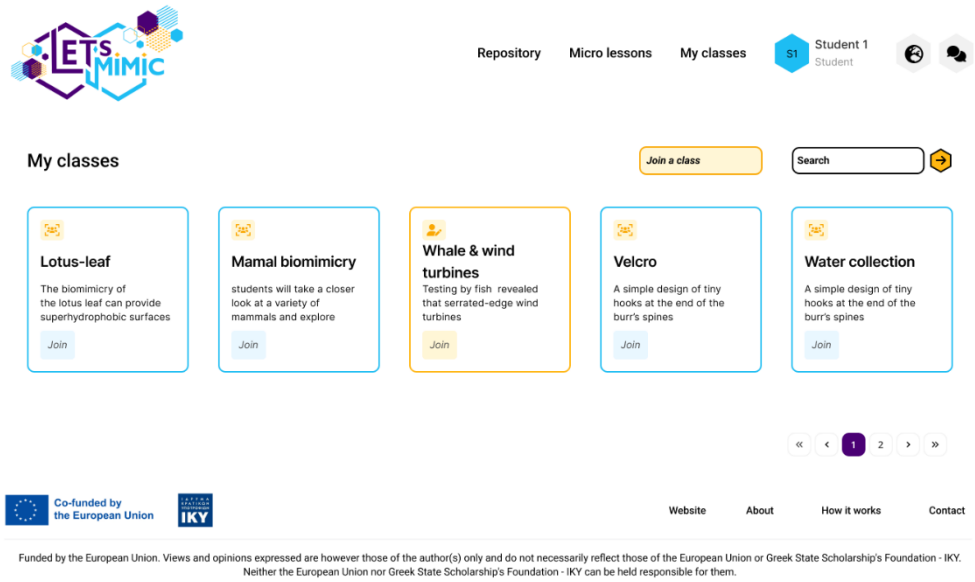

Figure 26. List of classes shared by mentor.

A class has a double purpose, as follows:

- A student can work individually in a class shared by the mentor.
- A student can work collaboratively in a class shared by the mentor.

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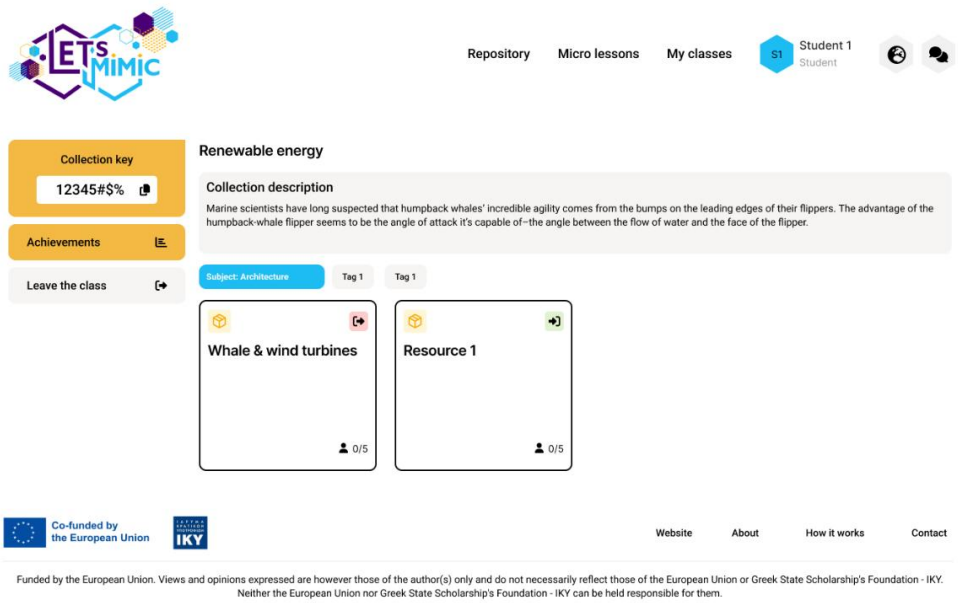

Figure 27. View class as individual work.

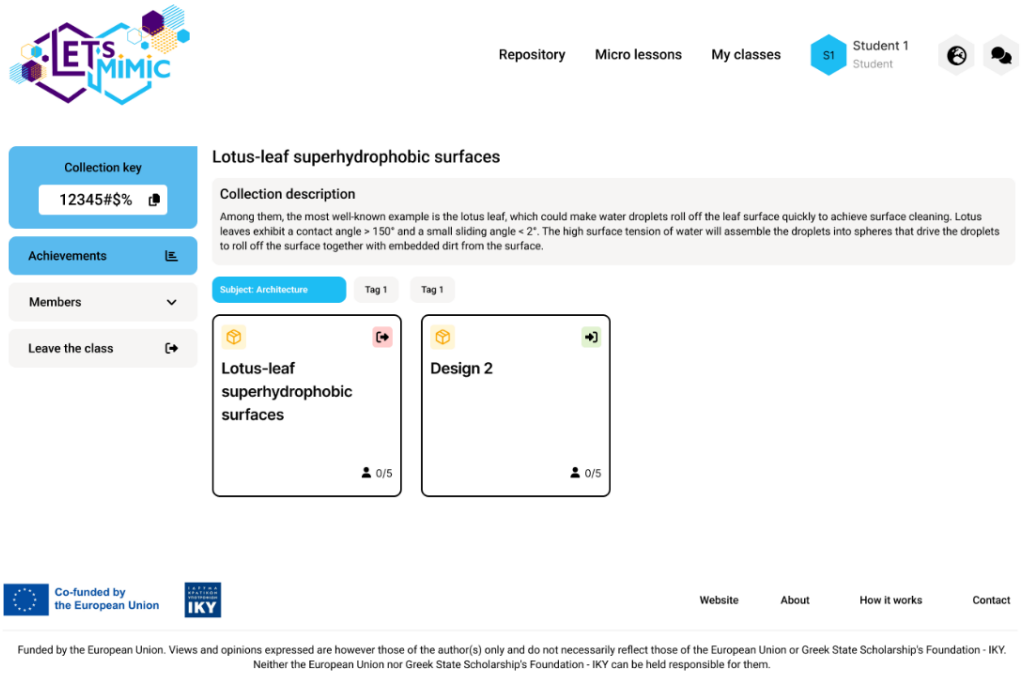

Figure 28. View class as collaborative work

5.4. Gamification Module

It provides features such as a point system, badges, and leaderboards paired with H5P resources, which can support gamification.

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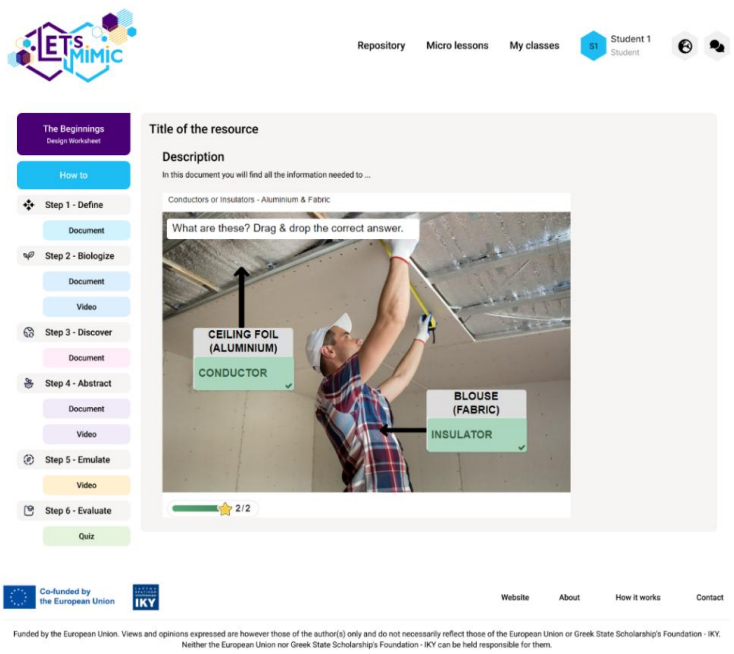

Figure 29. Gamification of H5P unit.

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6. Conclusions

The Biomimicry Collaborative Platform was designed to enable mentors to create resources that enable students to experiment with the Biomimicry Design Process. This deliverable describes the main sections and features of the mentor and the student interfaces, focusing on presenting the key components of the platform and the users' experience, ensuring that the interfaces have elements that are easy to access, understand, and use to facilitate those actions.

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