Project Number: 101006468

Project Acronym: PAFSE

Project title: Partnerships for Science Education

D2.2 WEB-BASED EDUCATIONAL RESOURCE REPOSITORY

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006468.

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List of abbreviations

PAFSE	Partnerships for Science Education
ERR	Educational Resource Repository
STEM	Science, Technology, Engineering, Mathematics
SaaS	Software as a Service
IEEE-LOM	Institute of Electrical and Electronics Engineers - Learning Object Metadata
OAI-PMH	Open Archives Initiative Protocol for Metadata Harvesting

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1. Introduction

The Partnerships for Science Education (PAFSE) project focuses on establishing partnerships between schools, universities, research centers, laboratories, enterprises, associations, and civil society representatives, with the goal of enriching education in STEM disciplines and public health science.

Towards this end, the goal of Work Package 2 is to design and develop educational tools and materials that will be used for the purposes of the project, including educational resources, educational scenarios, and learning research data collection instruments, as well as to provide two web-based environments: namely (a) a web-based collaborative platform to support networking, collaboration, and communication of the learning and teaching communities, and (b) a multilingual digital educational repository for hosting, organizing and delivering digital educational resources for Public Health Education.

Deliverable 2.2 is part of the *Task 2.1.2 "Configuration of a Web-based Educational Resource Repository and provision of user support"* of *WP2 "Design and Development of Digital Educational Environment, Educational Resources, Educational Scenarios, and Surveys*". It concerns the design and development of a web-based digital Educational Resource Repository (ERR) for hosting, organizing, systematically classifying, documenting, disseminating, and sharing STEM digital learning resources and educational scenarios that will be developed or identified in the context of the project or afterwards.

The PAFSE ERR will initially host all learning resources for Health Education that will be developed or identified/customized in the context of the project; after the completion of the project, the repository will serve as a European Repository of K12 learning resources addressing health literacy and education. All resources will be freely available under the Creative Commons Attribution – Non-Commercial – Share Alike license.

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2. Summary

In the context of Task 2.1.2 “Configuration of a Web-based Educational Resource Repository and provision of user support” of WP2 “Design and Development of Digital Educational Environment, Educational Resources, Educational Scenarios”, partner CTI has undertaken the task to design and configure the PAFSE Educational Resource Repository (ERR).

The “Photodentro LOR” Greek National Learning Object Repository for primary and secondary education (photodentro.edu.gr/lor) was used as a basis. The development and configuration of the PAFSE ERR followed the “Photodentro Software as a Service” (SaaS) model provided by CTI (saas.photodentro.edu.gr).

As a result, the multilingual Photodentro PAFSE Repository was designed, configured, hosted, and made available at the following URL:

http://photodentro.pafse.eu/

Photodentro PAFSE is a European Educational Resource Repository for STEM digital learning resources. It provides two collections for hosting (a) Learning Objects and (b) Educational Scenarios.

It is available in four languages, namely English, Greek, Portuguese, and Polish.

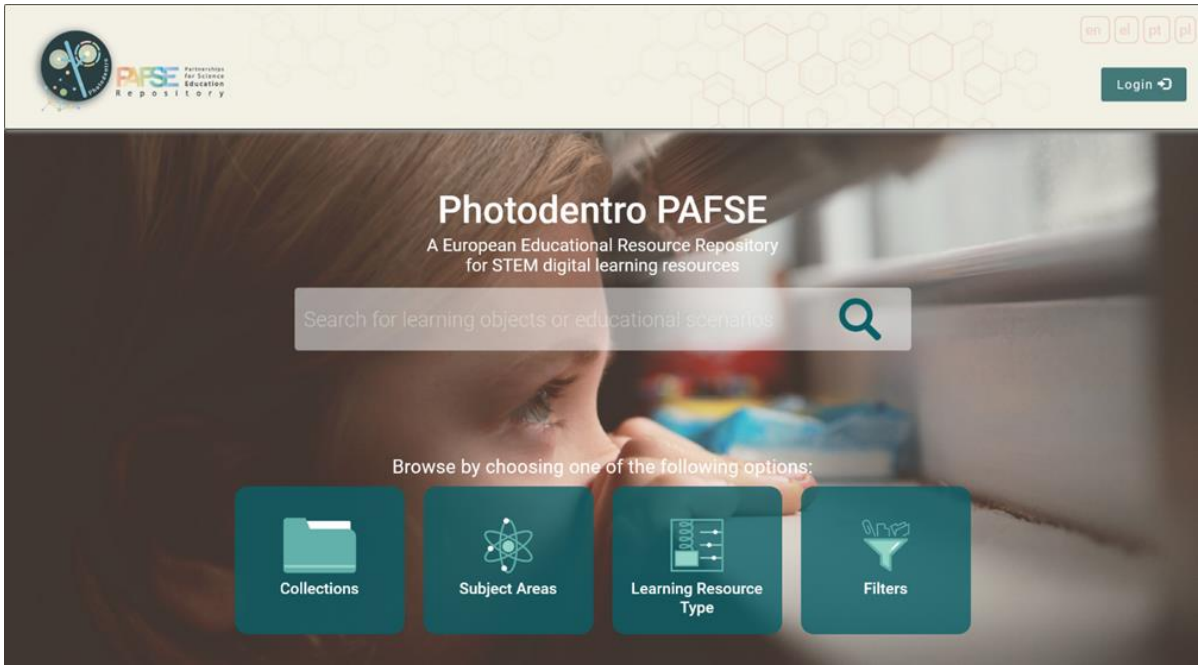

Figure 1. Photodentro PAFSE Repository – Homepage

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Photodentro PAFSE provides two web-based environments:

(a) The Photodentro PAFSE "front-end" environment, which is open to everyone for searching, browsing, and viewing learning resources and educational scenarios.

It supports free text search, browsing through collections of learning resources and educational scenarios, browsing using a domain-specific hierarchy of terms for STEM education and public health issues targeting K-12 education, as well as structured search using multiple filters.

(b) The Photodentro PAFSE "back-end" environment, which provides a form-based environment for authorized users, to upload, classify, document, describe, and publish new resources.

To describe and index the resources, Photodentro PAFSE makes use of metadata based on the IEEE LOM specification (IEEE, 2002) and in particular, the Photodentro IEEE-LOM GR Application Profile, which was customized and extended accordingly to meet PAFSE needs.

Following the Photodentro Software as a Service (SaaS) model, its implementation was based on DSpace, an open source platform for building digital repositories. It also provides an Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) to ensure interoperability with other Repositories.

The D2.2 deliverable includes:

[1] The ONLINE SYSTEM: PHOTODENTRO PAFSE REPOSITORY v1.0

Available at **http://photodentro.pafse.eu/**

[2] Photodentro PAFSE IEEE LOM metadata Application Profile

A customization and extension of the Photodentro IEEE-LOM GR Application Profile metadata profile for the Photodentro PAFSE repository needs.

[3] Photodentro PAFSE User Manual

The User Manual is addressed to all users of the Photodentro PAFSE Repository. It contains instructions for searching, browsing & viewing educational resources.

[4] Photodentro PAFSE Back-end User Manual

The Back-end User Manual is addressed to authorized users and it provides instructions for uploading, documenting, and publishing educational resources on the Photodentro PAFSE Repository.

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3. Attached files

The following files are attached to the D2.2 deliverable:

1. Photodentro PAFSE IEEE LOM metadata Application Profile

PHOTODENTRO IEEE-LOM-GR T-FACTSHEETv2.8.9-VERSION FOR-PAFSE_v1.5_24.03.2022.xlsx

2. Photodentro PAFSE User Manual

Photodentro_PAFSE_1.0_USER_MANUAL_v1.0_28.04.2022.pdf

3. Photodentro PAFSE Back-end User Manual

Photodentro_PAFSE_1.0_BACK-END_USER_MANUAL_v1.0_28.04.2022.pdf

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4. Document History and Co-authorship

This document is the final version (1.0) of the “Web-based Educational Resource Repository” to be submitted in month 9 as a PAFSE deliverable.

Version	Date	Released by	Notes
1.0	31.05.2022	Elina Megalou & Eugenia Oikonomidou (CTI)	

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5. Design and development of the Photodentro PAFSE Repository

5.1. The Photodentro SaaS model

The design and development of the Photodentro PAFSE Repository followed the Photodentro Software as a Service (SaaS) model (https://saas.photodentro.edu.gr/).

Photodentro is the trademark name of the Greek national digital educational repository ecosystem for primary and secondary education, providing the digital infrastructure for hosting, organizing, and allowing easy access to OERs, with a strong emphasis on open access. The ecosystem includes a series of OER Repositories, each one hosting a different type of educational content or serving a different purpose.

For the design and development of a new Photodentro-like Repository, the Photodentro SaaS model defines a set of steps, as shown in **Figure 2**. These steps include:

- requirements acquisition, analysis, and specifications of the new repository, following a well-defined participative procedure;
- conceptual design and development of an IEEE-LOM based Application Profile, customizing and extending the Photodentro IEEE-LOM GR AP;
- selection of the most relevant / appropriate existing “Photodentro” Repository to be used as a basis for the new one;
- customization of the selected “Photodentro” Repository, including both its front-end and back-end environments, to meet the specifications and requirements of the new repository;
- GUI and visual identity design;
- installation and hosting of the new repository;
- development of training materials (user guides);
- technical support.

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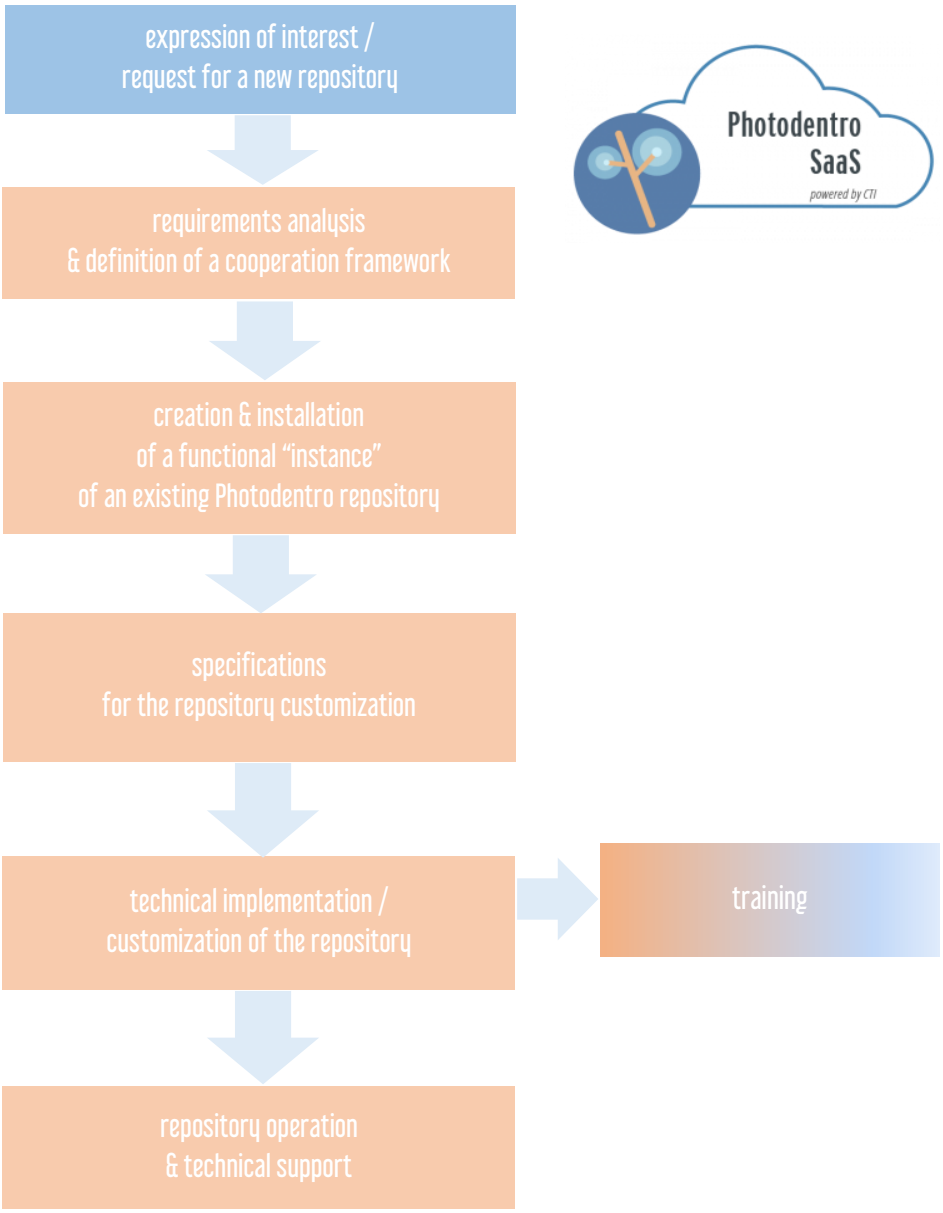

Figure 2: Photodentro SaaS model: Steps for designing and developing a new "Photodentro" Repository

Based on the Photodentro SaaS model, the tasks for the development and implementation of the Photodentro PAFSE Repository included:

5.2. Requirements analysis and specifications of the Photodentro PAFSE Repository

The requirements of the PAFSE repository were defined in collaboration with the WP2 Leader and the PAFSE project Coordinator, with the contribution of all partners. Among others, the specifications concerned the types of educational resources (learning objects and educational scenarios), the metadata for describing the resources, the workflow for uploading, validating, and publishing learning resources, etc.

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5.3. Selection of the Photodentro repository to be used as a basis

Based on the requirements and specifications, it was decided which of the existing Photodentro Repositories would be used as a basis for the PAFSE Repository. It was also estimated the customization needed (including adding new controlled vocabularies, customization of metadata forms, configuration of workflows, configuration of the navigation environment, etc.).

The "Photodentro LOR" Greek National Learning Object Repository (photodentro.edu.gr/lor) was selected to form -conceptually- the basis for the PAFSE Educational Resource Repository. "Photodentro LOR" hosts Learning Objects for primary and secondary education (it currently hosts more than 9,500 open learning objects tagged with educational metadata).

However, technically the development of the PAFSE repository was decided to be based on the most recent Photodentro Repository, i.e. the "Photodentro Learning Scenarios" (photodentro.edu.gr/ls), in order to take advantage of the most updated software technologies used in this repository (i.e. DSpace 6.3).

5.4. Creation & Installation of a functional "instance" of an existing Photodentro repository

A "clone" of the existing Photodentro Learning Scenarios repository was created. This "cloned" repository functioned as an initial pilot prototype, to familiarize the Partners with the concept and functionality of the Photodentro repositories and to set the detailed adaptation specifications, in order to meet the needs of the PAFSE project.

5.5. Customizing the Photodentro Metadata Application Profile

The Metadata Application Profile (AP) is a key conceptual design tool for Digital Repositories, as it integrates and specifies the core database entities, fields, and values they can receive. The Photodentro PAFSE Metadata Application profile was based on the Photodentro LOR IEEE-LOM GR Application Profile (and in particular, on PHOTODENTRO_AGGREGATOR_IEEE-LOM-GR_T-FACTSHEETv2.8.9), and was customized and extended accordingly to meet PAFSE needs.

Customization mainly focused on simplifying elements and terms of controlled vocabularies provided in the LOM-GR AP, in order to make the tasks of metadata authoring easier for the users. Regarding extensions, a new thematic taxonomy for Public Health education was defined (by Escola Nacional de Saúde Pública - Universidade NOVA de Lisboa).

5.5.1. Translation of elements, vocabularies, thematic taxonomies, and guidelines for metadata authoring

The Photodentro PAFSE Application Profile, including all elements, vocabularies, taxonomies, and guidelines for metadata authoring, was provided in Engllish by CTI and was translated in Portuguese and Polish by the corresponding partners (UNL / Escola Nacional de Saúde Pública for Portuguese and AMU for Polish).

As a result, the Photodentro PAFSE IEEE=LOM AP was created *(see attached file: PHOTODENTRO IEEE-LOM-GR T-FACTSHEETv2.8.9-VERSION FOR-PAFSE_v1.5_24.03.2022.xlsx)*.

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5.6. Graphical user interface (GUI) and Visual Identity design

5.6.1. Photodentro PAFSE Logo

A logo for the Photodentro PAFSE Repository was created, by combining the logo of the Photodentro Trademark with the PAFSE project logo.

Figure 3: Photodentro PAFSE Repository – Logo

5.6.2. Photodentro PAFSE GUI

The GUI of the repository was designed and configured.

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Figure 4: Photodentro PAFSE Repository – GUI

5.6.3. Photodentro PAFSE Texts

CTI provided all texts of the Repository in Greek and English; PAFSE project Partners provided translations in Portuguese (Universidade NOVA de Lisboa) and Polish (Adam Mickiewicz University).

5.7. Technical implementation / Customization of the repository

Following the Photodentro SaaS model, the technical customization of the Photodentro PAFSE repository included the following steps:

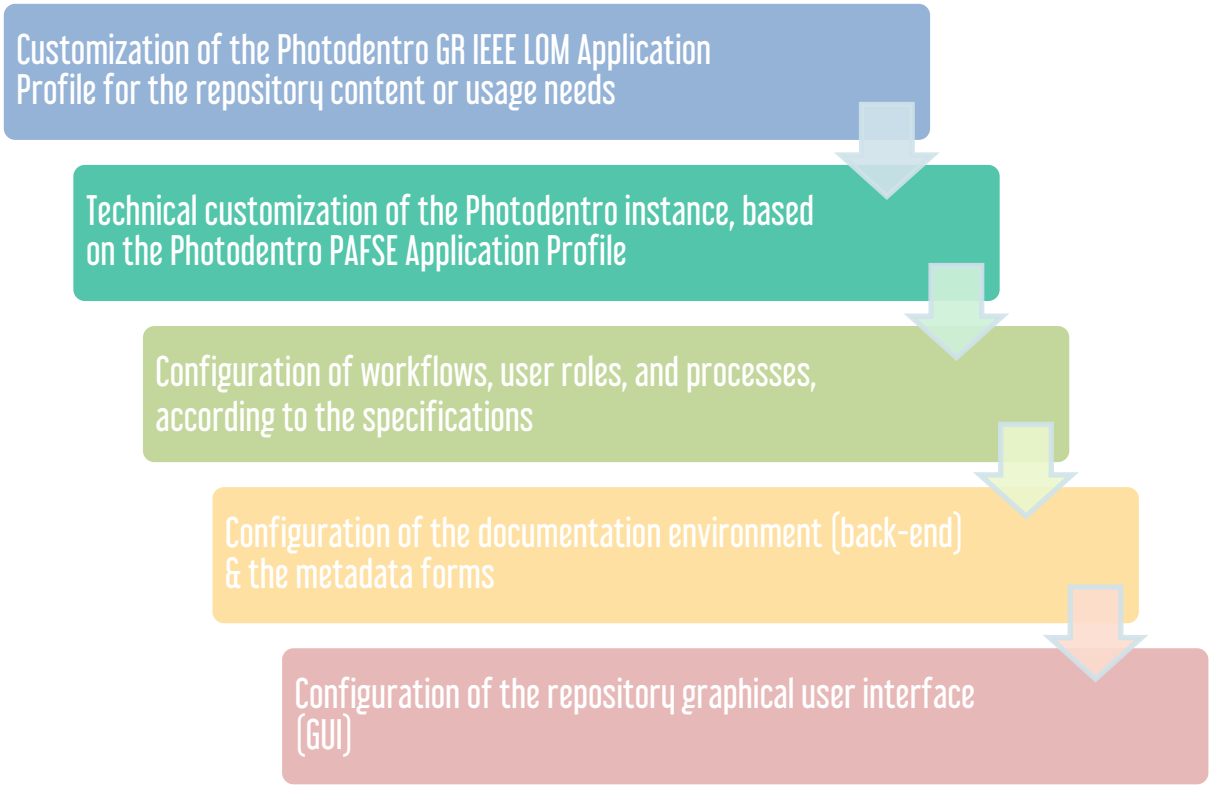

Figure 5: Photodentro SaaS: Steps for the technical customization of a new Photodentro Repository

5.7.1. Technical customization of the Photodentro instance, based on the Photodentro PAFSE Application Profile

The implementation of the Photodentro PAFSE Repository was based on the DSpace open-source platform for building digital repositories.

Extensions of the Photodentro code were needed so as to fully support multilinguality.

5.7.2. Configuration of workflows, user roles, and processes

According to the specifications given, the required workflows, user roles, and processes were configured. The end-to-end submission & publishing scheme was implemented, according to which authorized users are able to upload, document, validate, and publish learning objects and educational scenarios by themselves.

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5.7.3. Configuration of the documentation environment (back-end) & the metadata forms

A form-based back-end environment was configured, in order for authorized users to upload, classify, document, describe, and publish learning objects and educational scenarios.

5.8. Launch of Photodentro PAFSE Repository

A first version of Photodentro PAFSE Learning Resource Repository (v1.0) was launched and made available online on February 28th, 2022 at the following URL http://photodentro.pafse.eu/. Additional translations and improvements were made to the platform since then.

A complete and fully functional version of the Photodentro PAFSE Learning Resource Repository (v1.0) was made available on April 30.

Technical support was and will be provided when needed, by contacting the Photodentro PAFSE Repository Helpdesk Support at support@pafse.eu.

5.9. Training material

Training material for PAFSE project Partners includes the Photodentro PAFSE back-end user manual (in English).

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6. Photodentro PAFSE front-end environment

Photodentro PAFSE Repository provides a multilingual environment for searching, browsing, and viewing educational resources (front-end environment), which is open to everyone.

In the repository, educational resources are organized into two collections, one for learning objects and another for educational scenarios.

Figure 6. Photodentro PAFSE Repository – Collections

The repository supports free text search, browsing by collections, subject areas, or learning resource types, as well as advanced search, using various filters.

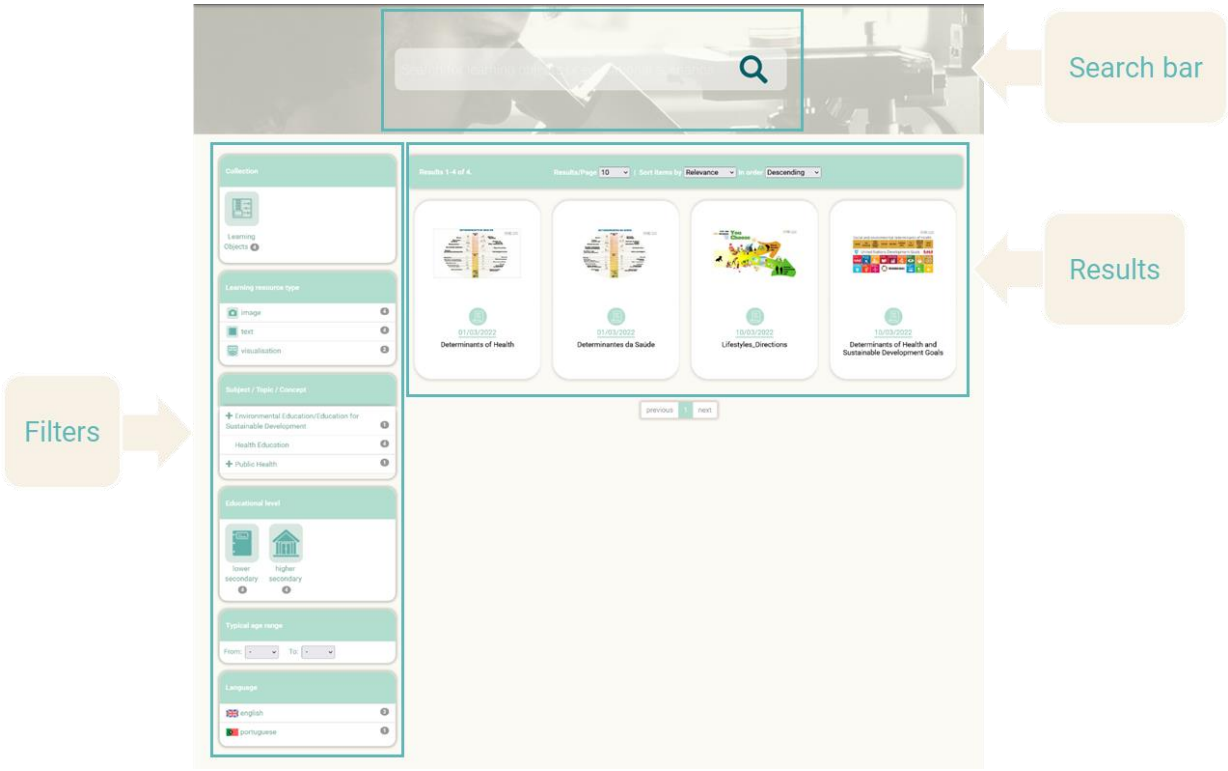

Figure 7. Photodentro PAFSE Repository – Results page

For viewing the educational resources hosted in the repository, a Player was configured to directly display online certain file formats (Photodentro Player).

Moreover, in the repository, every educational resource has a corresponding metadata description page, which contains all the information that describes the specific educational resource, and constitutes its identity.

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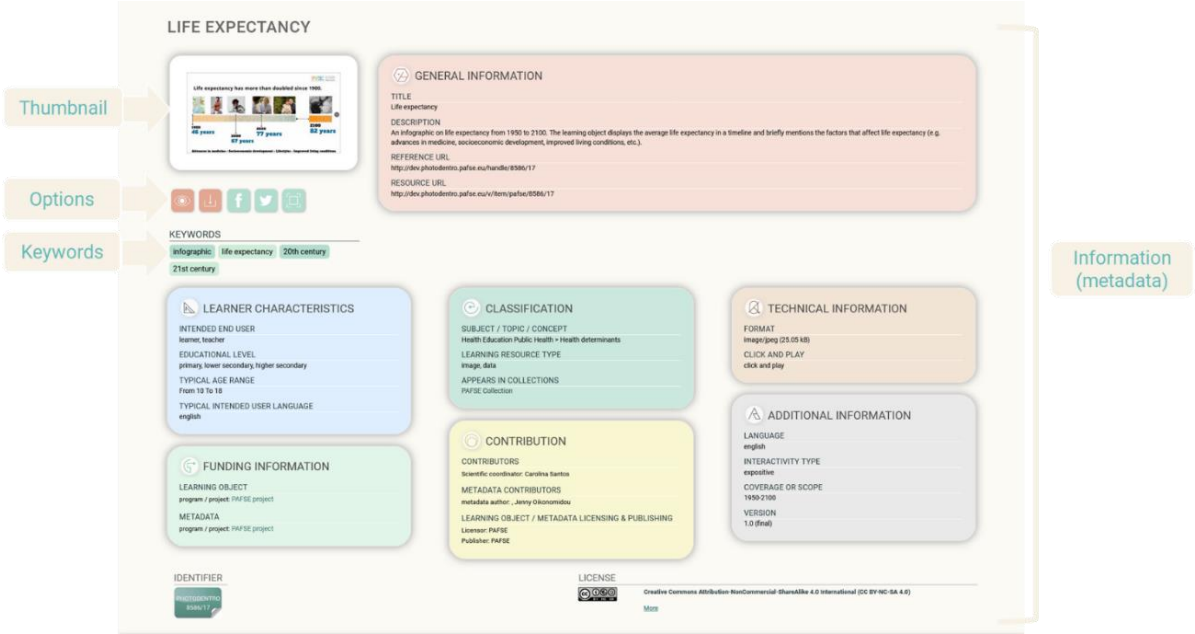

Figure 8. Photodentro PAFSE Repository – Resource description page

In order to facilitate the utilization of the repository, a user manual was written in English, describing the various aspects of the front-end environment *(see attached files: Photodentro_PAFSE_1.0_USER_MANUAL_v1.0_28.04.2022.pdf)*.

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7. Photodentro PAFSE back-end environment

Photodentro PAFSE Repository provides a multilingual form-based environment for authorized users (back-end environment) to upload, classify, document, describe, and publish educational resources. All Partners of the PAFSE Consortium have access to the back-end environment, in order to upload and publish educational resources in the repository.

In the back-end environment, each authorized user has a “workspace” (i.e. a “personal area”), accessible after login.

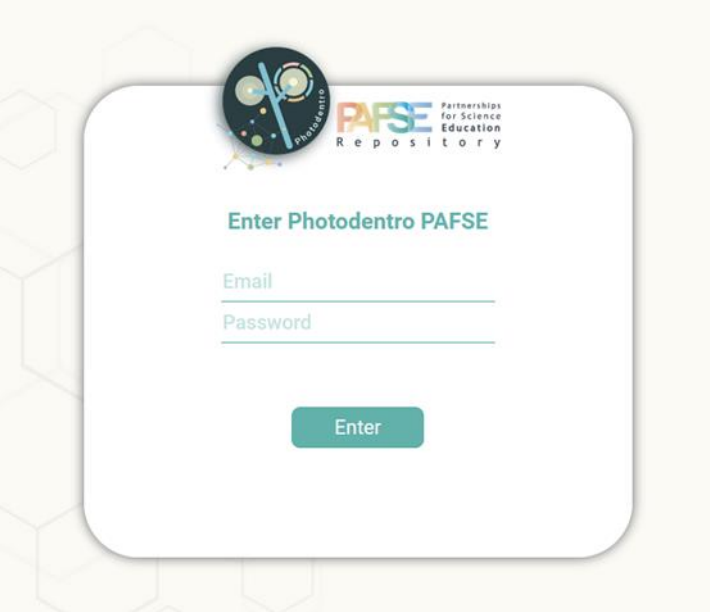

Figure 9. Photodentro PAFSE Repository – Login page

In their workspace, authorized users can upload educational resources (i.e. upload the relevant files), describe them with metadata (i.e. provide information about one or more aspects of the educational resources, according to the Photodentro PAFSE IEEE LOM GR Application Profile), and submit them to the repository (i.e. publish them).

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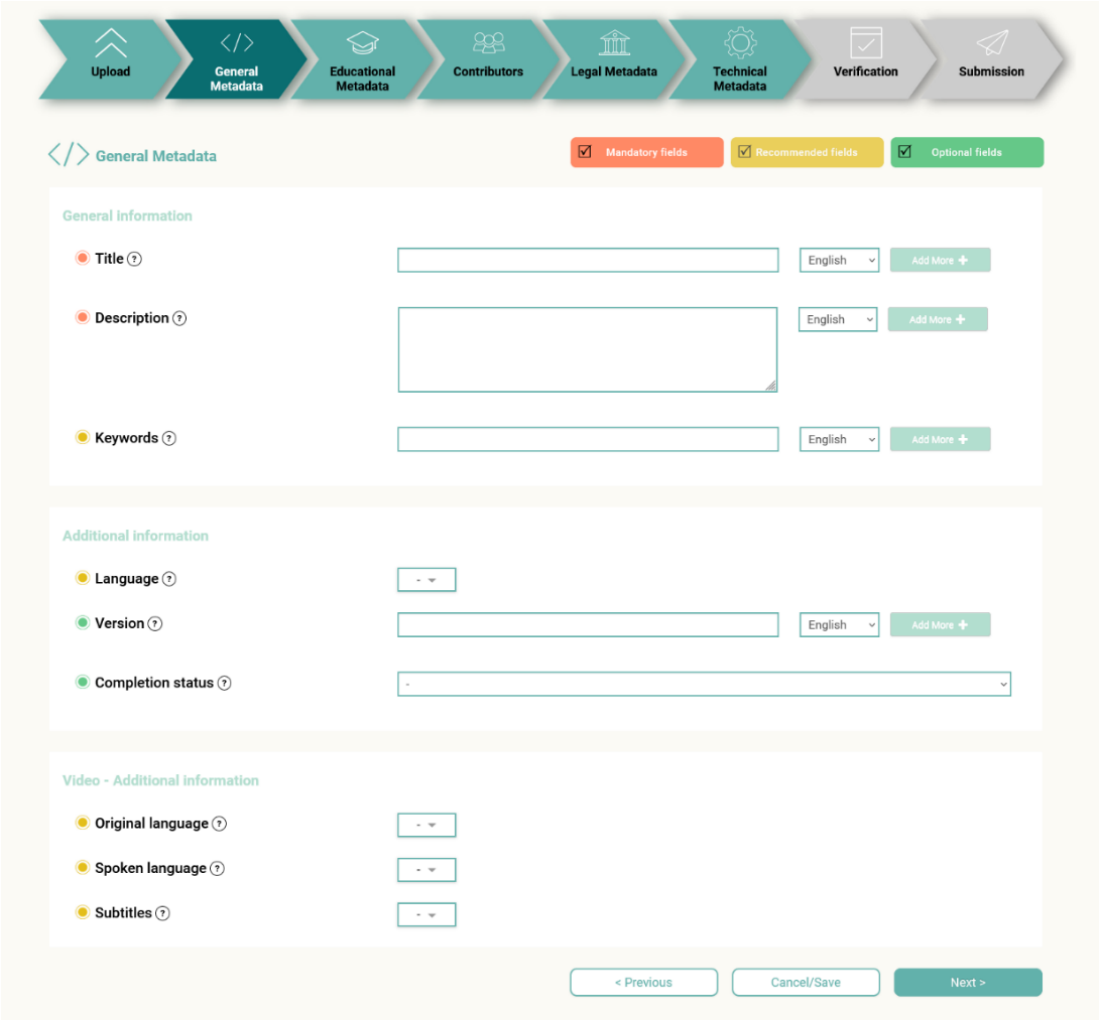

Figure 10. Photodentro PAFSE Repository – Documentation tab in the form-based back-end environment

In their workspace, authorized users can also edit and delete the educational resources they have already published in the repository or the ones that they have not published yet.

In order to facilitate the authorized users to upload, classify, document, and publish educational resources in the repository, a back-end user manual was written in English, describing the various aspects of the back-end environment *(see attached files: Photodentro_PAFSE_1.0_BACK-END_USER_MANUAL_v1.0_28.04.2022.pdf)*.

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Partnerships for Science Education

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