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DELIVERABLE 5.5

DETAILED DESCRIPTION OF TRAINING MEASURES AND TOOLS FOR USERS

Work Package #	WP5 – Enabling excellent user access
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Abstract:

This document describes the user training procedures facilitating the training and preparation of users for experiments performed at the ELI Facilities. As a means of prioritization in the development of the training content within the framework of IMPULSE, it has been decided that safety training would be the first user training made available and used to testbench training procedures and tools and collect feedback from potential users.

The goal of the safety training is to familiarize and remind new and returning Users of hazards, audio and visual indicators, and procedures to deal with such hazards in a safe manner, which could be encountered at the ELI Facilities. These training courses are part of the

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administrative controls by which it can ensured that Users undergo adequate training for procedures and methods, evaluate and assess the User readiness, capabilities, and develop the necessary safety culture for ELI ERIC as an organization, as well as for its Users prior to entering and/or performing work at the ELI Facilities.

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Document Revision History

Date	Version	Author/Editor/Contributor	Summary of main changes
18/02/2022	v0.1	T. Ivănoaica, J. Bartoš	First draft version sent for internal input from the safety groups
04/03/2022	v0.2	All authors	Input from ELI ALPS and ELI Beamlines
21/03/2022	V0.3	I.Mitu, O. Tesileanu, I. Avram	Radiation Protection Safety training input
30/03/2022	V0.4	All authors and users expressing feedback	Users' Event collecting feedback on training measures for users
05/04/2022	V0.5	T. Ivănoaica, J. Bartoš, O. Tesileanu	Incorporating users' feedback and final version of the document
06/06/2022	V1.0	F. Gliksohn	PMT validation and submission to StB

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LIST OF ABBREVIATIONS and DEFINITIONS

Abbreviation	Meaning
LMS	Learning management system: software application for the administration, documentation, tracking, reporting, automation, and delivery of educational courses, training programs, or learning and development activities. The LMS is part of the ELI Integrated Management System and is built to support ELI ERIC's Continuous Learning and employee development processes.
EHS	Environmental, Health and Safety
EHS Responsible Unit	Unit consisting of safety and security experts in the fields of safety management, occupational health and safety, laser and fire safety, security, radiation and environmental protection.
AM	Area Manager: employee nominated as responsible person for the appropriate and safe operation and maintenance of equipment in a given experimental area or laboratory and for user access to the area.
UO	User Office: organizational unit responsible for communication with users and coordination of user access processes.
Training method	Description of the process of training, including the definition of fulfilment criteria or the necessary techniques/technologies used for it.
Continuous verification and evaluation of training	Systematic method for assessing whether the outcome of training is satisfactory, including the re-evaluation process and the validity of the training.
User	Any natural person involved in an experimental team submitting a proposal with a view to perform an Experiment at the ELI Facilities. ELI Staff may be Users when they are part of an experimental team submitting a proposal.

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User Experiment Risk Assessment	Evaluation of the experiment against the hazards and risks posed by the materials, technology, and experimental procedures indicated and intended to be used in the experiment. The safety assessment is a formal and documented review with clearly defined controls to minimize the risk based on hazard information provided by Users or identified by the safety team based on the information provided by the users in the experiment proposal submitted via the Users Portal.

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Purpose and scope of the document

This document describes the user training procedures facilitating the training and preparation of users for experiments performed at the ELI Facilities. As a means of prioritization in the development of the training content within the framework of IMPULSE, it has been decided that safety training would be the first user training made available and used to testbench training procedures and tools and collect feedback from potential users.

The goal of the safety training is to familiarize and remind new and returning Users of hazards, audio and visual indicators, and procedures to deal with such hazards in a safe manner, which could be encountered at the ELI Facilities. These training courses are part of the administrative controls by which it can ensured that Users undergo adequate training for procedures and methods, evaluate and assess the User readiness, capabilities, and develop the necessary safety culture for ELI ERIC as an organization, as well as for its Users prior to entering and/or performing work at the ELI Facilities.

1. Roles and responsibilities

1.1. User Office

The User Office will be the contact point between ELI and Users. After beamtime is granted for a proposed experiment, the User Office shall:

- Get in contact with the PI of the proposed experiment and ensure that personal accounts on the ELI User Portal exist for all members of the experimental team;
- Based on the legal requirements and on the information received from the technical evaluation committee in charge of assessing the feasibility of each experiment, the EHS Responsible Unit and Area manager (of the experimental area where the experiment will be performed), the User Office will develop a training plan for the incoming users;
- Together with the Content managers, track the performance of the mandatory and optional training by the members of the experimental team, issue reminders and notifications for training-related issues;
- Check all training requirements as part of the formalities for the approval of access on the premises of the ELI Facilities and ensure together with the EHS Responsible Unit and the Area manager that all online and on-site training is completed before accessing the experimental area.

1.2. EHS Responsible Units/Groups

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The EHS Responsible Unit, together with the authorized safety officers, are content providers for safety training and in charge of the evaluation and training processes for EHS related skills and knowledge of users. They do so through:

- Performing continuous evaluation and improvement of the training materials concerning risks, training needs, and requirements, in compliance with the legal requirements and domain-relevant regulations (including, but not limited to EHS, fire protection, laser safety, radiation protection, security, etc.);
- Developing and updating the collection of training materials, training techniques and methods used to develop and enrich the safety culture of users and staff of the ELI Facilities;
- Developing an appropriate training strategy based on the risk assessment of the intended works, technologies and processes used;
- Presenting the training plan and the training courses to Users, together with all support materials for training to achieve its goals (list of all training that the user should take, the mandatory training quizzes and surveys, as well as the details about the validity period and details about the re-evaluation process);
- Controlling the training results and adequate safety knowledge of each User and provide/suggest further training programs if deemed necessary.

1.3. CONTENT MANAGERS

The Content Managers are the employees at the ELI Facilities nominated to be the responsible persons for the various areas of training for users. The nomination of the Content Managers should be done for each area of training at the ELI ERIC level, based on the competencies and proposals received from the ELI Facilities, due to the fact that for most of the topics there will be both a "general" part of training (valid for any of the ELI facilities) and a facility-specific part (related to specific equipment, or national laws/regulations).

During the activities of Task 5.6 of IMPULSE, the development of the Safety training courses in EHS, Laser safety and Radioprotection started and Content Managers were appointed for each of those three topics. In line with the distribution of work in the work package, and considering the expertise of the participants, there is one Content Manager per ELI Facility.

The Content Managers will form a team of experts at the Facilities (requesting the allocation of personnel for this) to develop the training materials for the topic they supervise. They will then follow up and make the necessary updates/modifications of the training materials when needed. In order to be promptly informed on needs for updates/modifications, the Content Managers will keep the teams of experts at the Facilities operational at all times and will be in permanent contact with the ELI User Office. The requests for updates of the training materials may come from the Area managers, EHS Responsible Unit, legal, management of

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ELI ERIC or of the ELI Facilities. The Content Managers will develop a workplan for implementing the modifications that will be reported to the ELI ERIC Director General and Management Board, and to the User Office.

The Content Managers will inform the User Office upon completion and upload on the online platform of the modified courses, in order to issue notifications to Users and request re-doing the training within the validity period of the training, if necessary.

The Content Managers will also, upon request of the User Office, follow up and track the progress of the online and on-site training performed by future Users, and will keep the User Office updated on the progress and completion of training courses by the Users.

1.4. AREA MANAGER

The Area Managers, defined as the responsible persons for the safe operations of the respective areas/laboratories, also have a key role in ensuring the safety of Users. They shall:

- Prepare, in cooperation with their respective EHS training providers, each specific on-site (area/lab) training material;
- Facilitate relevant on-site safety training and keep up-to-date the attendance reports;
- Work in liaison with other training providers.

As the persons responsible for the proper operation of the equipment in the experimental area, the Area Manager shall collaborate with Training managers for the implementation of the training courses specific to their experimental area.

1.5. USERS

Users are requested to:

- Create an account on the ELI Portal when requested by the PI and/or the User office
- Complete the required training within the specified timeframe
- become familiar with, and observe all, the relevant internal standards, regulations, policies, procedures, and work instructions;
- The PI for an approved proposal of beamtime has to announce to the User Office the list of members of the experimental team to participate in the beamtime, keep such list up-to-date and communicate to those members the need to create user accounts on the ELI User Portal and for passing the mandatory training before accessing the experimental area. In this process the PI's Team are trainees enrolled in classes on the LMS;
- Allow the use of their personal information by the ELI User office for the purpose of organizing the training sessions before and upon arrival at the ELI Facility.

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2. Training requirements

The training requirements for Users are connected to the internal processes and regulations in force at the ELI Facilities. These specify the required qualifications needed for specific work at their site, as well as the periodicity, means of evaluation, documentation and archiving requirements.

Safety-related training is mandatory for all Users accessing the ELI Facilities as members of the experimental teams. The modules and deadlines for safety training are communicated to future Users by the User Office, based on the communication with the EHS Responsible Unit and the responsible Area manager.

Other specific types of training may be requested by the PI or the Area manager in order for the users to be familiarized and able to operate equipment used during the experiment.

User safety training to be completed by the Users is defined by the EHS Responsible Unit, based on:

- Risk assessment of the User Experiment;
- Legal or other applicable regulations for ensuring compliance in all safety-related areas;
- Workplace conditions.

The specific training providers of the Safety Groups/Responsibles as well as the members of the UO can follow up on the progress and check that users are complying with the user safety training requirements, considering both online and offline training required before the performance of the experiment at the facility. In this context, the training track record management system and common evaluation standards are mandatory to be established to preserve a consistent user training and user knowledge/skills evaluation process, as well as a standard user experience across all ELI EIRC online systems.

3. LMS SUPPORT FOR UO AND ELI ERIC PERSONNEL. THE INTEGRATED LMS.

In terms of usage, the LMS, started based on the first set of requirements provided by the safety groups, has been designed to provide support for multiple areas of the ELI ERIC Integrated organisation. This is why, the solution has been developed to support the integration with multiple modules and submodules of the Integrated Management System of ELI ERIC, including the possibility to provide support for Scientific Training Activities. (the system already supports: MathType for mathematical notation, Microsoft Word File import/export, Jupyter Notebook with an automatic grading system for the user's notebooks has already been developed by ELI ERIC, tools supporting LTI standard, and more.)

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Even from the initial design, the UO was considered an external client application that is integrated with the LMS, this allows us to have the users allocated to training classes and users' career paths defined by the UO Managers.

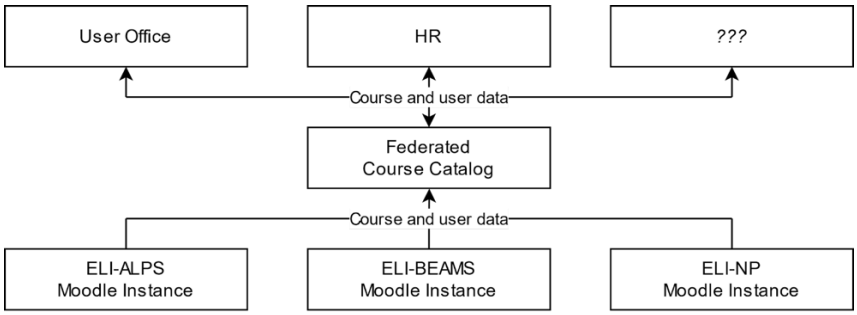

Fig 1. ELI ERIC LMS – Integration Layer – a Federated Course Catalogue

As presented in the above diagram, the UO, as well as other modules of the ELI ERIC IMS, are all using a central Federated Course Catalogue to connect to the LMS instances. The Course Catalogue acts, in this case, as a unique API gateway allowing external clients, such as HR modules, UO modules, Project management or others, to submit training requests for users of the facilities. In this context, the fully integrated LMS is facilitating the user's and staff's continuous development.

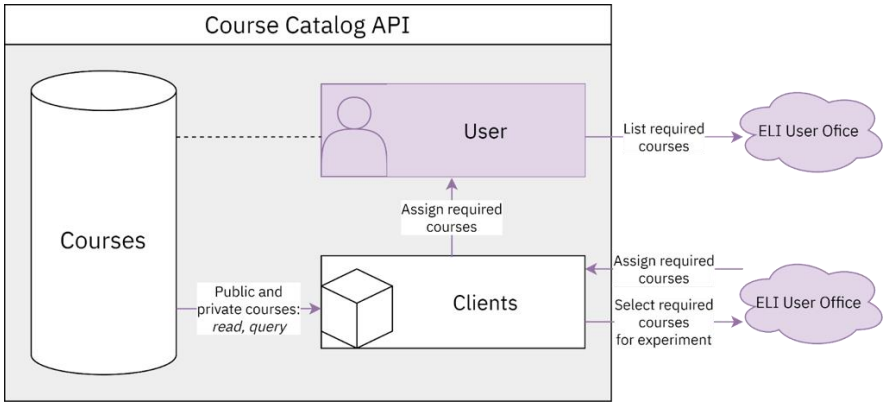

Fig 2. ELI ERIC LMS – Integration Layer – a Federated Course Catalogue external clients

There are, in the current format, two major users' and training management processes supported by the LMS:

- Users/trainees and training classes are managed from the LMS, meaning that users are allocated to training by the teachers of the specific class or by platform managers. This process is considered a process that does not necessarily require a special training track record management to be reported/sent to other modules of the IMS. (e.g., a summer school using the LMS tools and services, is an event that generates badges and certificates of completion which are not reported to an external database in an automated way)
- Users/trainees are automatically allocated to classes, in some cases even the accounts might be

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automatically provisioned, by an external client application, in this case, the UO. This allows the UO manager to even create a career path for the users by selecting a list of training that is mandatory. In this approach, the LMS provides a more automated training track record management which sends back the reports on users' achievements to the UO. (e.g., in the automated workflow, the UO manager assigns a user as a trainee for the safety training, as soon as the user takes the assessments, the achievements are sent back to the UO, validating the achievement)

The LMS is, in this configuration, the central training provider, enabling:

- Online training – already tested and evaluated by the safety group; consists of courses (which are interactive) and online assessment of progress/ completion;
- Onsite training which can use the LMS as an online training library and track record management platform storing the users' achievements and progress:
    - Lectures - if needed or required by law, on specific topics not covered by online training
    - Facility orientation or domain or area-specific training;
    - In-lab training - in working conditions for the specific workplace and equipment;
    - Practical skills - whenever practical training in specific (safety) procedures or coding/programming training for scientific training using jupyter notebook resources
- Hybrid training sessions are also an option – in this context, the platform is acting only as a content library, providing the training material as a backup source of information for the trainees, as well as an assessment platform used to evaluate the knowledge of the users and track the training records.

All the above modules are now available and can be further developed to support other training activities and integrated to support user and personnel training activities.

4. TYPE, TECHNIQUE AND TECHNOLOGY USED FOR USER TRAINING

4.1. TRAINING TYPES CONSIDERED FOR SAFETY GROUPS

For the safety training, the following categories of training can be considered:

- Online training - preferred type of training, described in detail in the following sections of this chapter; consists of courses (which may be interactive) and online assessment of progress/completion;
- Onsite training:
    - Lectures - if needed or required by law, on specific topics not covered by online training
    - Facility orientation
    - In-lab training - in working conditions for the specific workplace and equipment

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- Practical skills - whenever practical training in specific (safety) procedures is needed.

4.2. LMS SERVICES SUPPORTING THE TRAINING PROCESS

ELI ERIC Learning Management System has been developed to support interactive and dynamic training of ELI's users and staff. The LMS has been developed as a distributed training environment, supporting the continuous learning process for users and staff of ELI ERIC and ELI Facilities. The proposed system relies on three standalone learning management systems instances, deployed at each of the facilities while a fourth, a training catalogue, is deployed at the level of ELI ERIC, acting as a central ELI training Directory for the LMS.

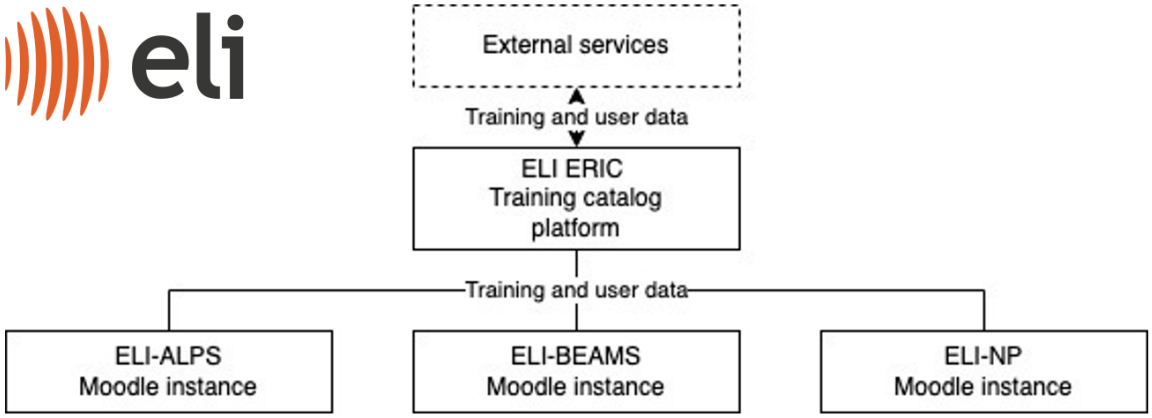

Fig 3. ELI ERIC LMS – Integration Layer –https://eli-laser.study – Integrated LMS instances into a common training catalog

To add a paragraph about the possibility to support the in-person training by hosting the content that the user can read/use etc..

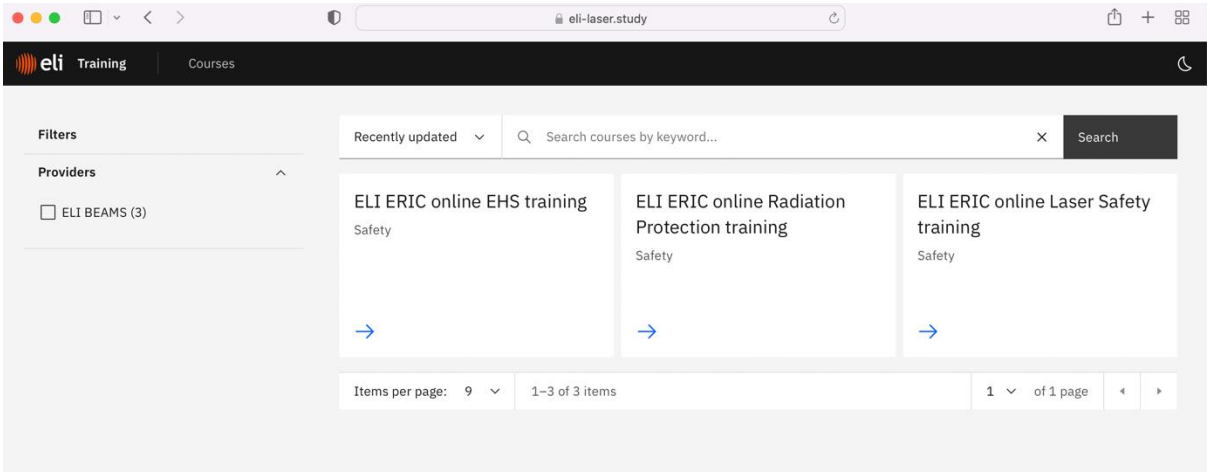

Fig 4. ELI ERIC LMS – Integration Layer – the Federated Course Catalogue https://eli-laser.study – the User Interface

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The training catalogue, hosted at https://eli-laser.study is the central point of contact, acting as a catalogue of training that links content provided from each LMS instance and publishes it via a single interface accessible to users.

After selecting the training, the catalogue redirects the user to the instance hosting the particular training, which is the instance controlling the training content and the activities associated with each class, controlling all aspects related to the training record management and storing the activity of each user undertraining a training.

4.3. LMS Specific Terminology

Instance - An Instance is a standalone deployment of the Moodle platform for each of ELI's facilities or for a federated directory publicly accessible course. Each instance has dedicated staff members appointed to different areas of instance management.

User - Compared to the general "User" broadly defined as "user of services at ELI facility", a User in the context of Moodle platform is any person accessing the Moodle instance website for training purposes. The user can be assigned to a class/group, asked to take training or to go through a quiz/exam/assessment to validate his knowledge and/or technical competencies. This definition applies for this sub-section and when specifically mentioned in other parts of the document.

Role(s) - A Role defines the responsibilities and permissions of a given User. This can range from a User with a base-level role allowed to only view available public courses, Students who are enrolled in a specific course, Content Providers & Content Managers responsible for the management of Courses, to Instance Administrators responsible for technical aspects of the given Moodle instance deployment.

Course - Courses are areas on the LMS platform where Content Providers & Content Managers supply learning materials, activities and assessment setups for each of their assigned topics/areas.
Users are manually enrolled in specific courses, gaining the student role in the context of the given course. They are provided course materials and activities, their progress can be tracked, and they can be required to take assessment steps, possibly resulting in certificate acquisition.

Course tools - Both the Content Providers & Content Managers have access to a wide variety of tools for delivering interactive learning experiences and procedures. The Moodle LMS

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comes by default with a set of basic tools and can be extended by third-party extensions enabling even some of the more complicated implementations.

For the default tools, the official documentation presents an extensive description of all important topics. Not all functions might be available during the production deployment of the learning platform - it is a subject to address during the definition of responsibilities and permissions for individual user roles.

The following paragraphs will focus on a short overview of different resources in order to further introduce 3rd-party extensions, which are not part of the default Moodle LMS and therefore not included in the official documentation. These extensions need to be evaluated by Content Providers & Content Managers and can be set up on demand by Instance Administrators responsible for technical aspects of the given Moodle instance.

Resources - are content items that a person managing the course content can use to support the learning experience, such as text, links, images, videos, file downloads and similar, without any further interactivity. The 3rd-party resource extensions enable integration of other content formats, i.e., MathType for mathematical notation, Microsoft Word File import/export, Jupyter Notebook viewer, tools supporting LTI standard, and more.

Activities - are course components that feature interactivity between students and other students or Content Providers & Content Managers, enabling them to actively contribute to and validate their learning progress. There are multiple built-in activities, such as assignments, choice selection, forums, quizzes and many more. It should be clearly distinguished by the course managers which activities are part of learning content and which are part of an assessment portion. Additional activity extensions can be added, on-demand if they're needed. The open-source community has developed over 1900 plugins that can be used, serving different purposes and adding extra functionality for the users.

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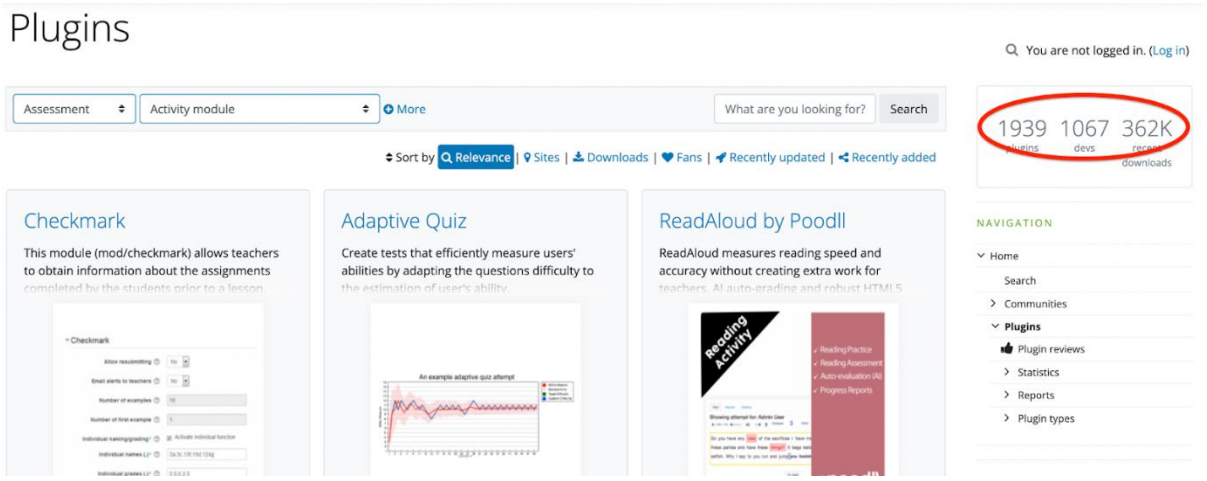

Fig 5. ELI ERIC LMS – Activities, plugins to be considered for further development

Assessment - Most activities provide an option for some form of assessment. Results of such interaction are always available to the course manager and it is up to them whether the results will be a part of the grading setup (in case the given course serves such function). The assessment tools range from manual input result (i.e. response to a written form submission), through automatic evaluation of close-ended formats (i.e. multiple-choice quiz), to advanced external auto-graders (i.e. Jupyter Notebook grader). The grades functionality also offers various features, such as grade scales, collection exports or certificate generation, assignment of badges as well as a wide range of reports and alerts that can be sent to the user taking the course or to the training manager.

Externally provided tools can be also integrated- Apart from the previously mentioned built-in tools and 3rd-party extensions library hosted on the Moodle website, there are plenty of other tools available on other websites on the internet, reachable by doing an online search using keyword combinations such as “Moodle extensions”, “Moodle plugins” for example. The Content providers and Content managers may suggest the implementation of solutions feasible for their needs to Instance Administrators or other technical staff members.

5. MAIN USER SAFETY TRAINING MODULES

5.1. EHS AND FIRE SAFETY TRAINING

In the case of this user safety training module, a common ELI ERIC level online training is mandatory to be completed prior to the safety training specific to each of the ELI Facilities. It shall contain the following in a general way (valid for all facilities):

- SECURITY
    - Access

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    - Smoking policy
- OHS
    - Fitness for work
    - Safety signs
    - Safety measures
    - Incident report
    - First aid rules
    - Material handling
    - Machinery and equipment
    - Electrical safety
    - Cryogenics
    - Chemical safety
    - Biosafety
    - Environmental awareness
- FIRE SAFETY
    - Fire safety equipment
    - What to do in case of fire

The common ELI ERIC safety training is valid for 2 years, all trained users will be informed by any change of the validity periods and instructed in accordance with these changes. A facility-specific online training is also mandatory to be passed before receiving access and starting work at any of the ELI facilities.

It shall contain the following, in a facility-specific way (valid only for a given facility):

- General information about the facility and its buildings
- Contact information to the EHS Responsible Unit
- Experiment related contact persons and their main roles and responsibilities
- OHS legislation to be complied with
- EHS principles, rules, requirements for users
- Emergency procedures, location of first aid points and kits
- Waste management
- Fire safety equipment and suppression systems at the given ELI facility
- Escape rules and assembly points
- Site-specific security rules

Following the completion of the above-mentioned online training, the on-site (laboratory and experimental equipment specific) training of additional EHS rules and procedures are also presented:

- The layout of the experimental and research area
- Contact information to the experiment related contact persons
- Safety equipment
- Rules for using experimental equipment, devices, and research technologies
- Personal protective equipment
- Emergency procedures

The preparation and maintenance of the content of this training module is ensured and supervised by OHS and fire safety experts.

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5.2. LASER SAFETY

The ELI ERIC laser safety training is valid for 2 years. The common training materials are supplemented with the facility-specific materials, provided to the User-based on the facility of choice.

The common ELI ERIC laser safety online training covers the following topics:

- Introduction to the terminology
- Laser classification
- Biological effects
- Accidents and incidents
- Overview of engineering controls
- Overview of administrative procedures
- Overview of Personal protective equipment
- Overview of safety rules when operating lasers, laboratory good practice
- Overview of associated hazards (electrical, chemical…)
- Information on relevant legislation
- Emergency situations

The online laser safety training particular to each ELI facility covers the following topics, reflecting the specifics of the given site and therefore valid only for the given facility:

- Properties of lasers at the given ELI facility
- Implemented engineering controls
- Administrative procedure
- Personal protective equipment used
- Safety rules when operating lasers
- Associated hazards (electrical, chemical…)
- Emergency procedures
- Relevant legislation

The online training (ERIC and site-specific) is complemented by on-site training, related to the specifics of the relevant laboratory and equipment used within the User experiment:

- Properties of the laser to be used (and associated hazards)
- Engineering controls implemented in the experiment
- Particular administrative procedures to be followed
- Particular Personal protective equipment to be used (incl. instructions on handling)
- Specifically associated hazards
- Emergency procedures

The preparation and maintenance of the content of this training module is ensured and supervised by laser safety experts.

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5.3. RADIATION PROTECTION

The ELI-ERIC common radiation protection training module is available for any user accessing the experimental environment of any of the ELI facilities. This type of training is a general one, having as the main goal to provide the users with general knowledge on the risks of ionizing radiations and means of protection while performing experiments at ELI pillars. The training material is in the online version, easily accessible by the users before arriving at any of the ELI facilities. This training is valid for 1 year.

The common ELI ERIC radiation protection online training covers the following topics:

- Basics of ionizing radiation
- Ionizing radiations classification and characteristics
- Dosimetry quantities
- Best practices for reducing exposure
- Biological effects of ionizing radiations
- Symptoms of exposure
- Operational classification of areas
- Warnings/Signs
- Dosimeters wearing
- Legal frame

The online radiation protection training particular to each ELI facility covers the following topics, reflecting the specifics of the given site and therefore valid only for the given facility:

- Radiological installations/sources of ELI facility
- Identification of site-specific radiation hazards
- Policies and procedures
- Implemented engineering controls (access, interlocks, etc.)
- Areas classification
- Radiation monitoring system and personal dosimetry
- Local radiation protection legislation

Depending on the user proposal, the online radiation protection training (ERIC and site-specific) is complemented by on-site training, related to the specifics of the relevant laboratory and/or equipment used within the user experiment:

- Radiation hazard for the experiment
- Engineering controls implemented in the experiment
- Particular administrative procedures to be followed
- Key personnel
- Specific dosimetry provision
- Emergency procedures

The preparation and maintenance of the content of this training module is ensured and supervised by radiation protection experts.

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6. TRAINING RECORD MANAGEMENT

Training record management is, in the ELI ERIC LMS is based on a few major categories of records which are treated differently based on the specifics of each training activity:

- The user's completion progress, which shows the user's progress in each activity, is a user-specific training track record, allowing the user to restart the activity, the "bookmark" feature (e.g., reading half of the content one day and start the second day from the page/activity the user left open on the previous day);

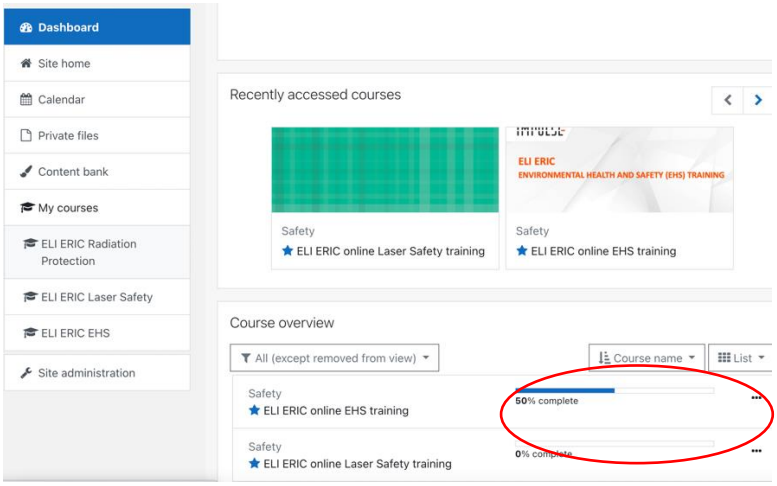

Fig 6. ELI ERIC LMS – Tracking activity reports

- Assessments are activities that include sets of questions, in various forms and formats with different levels of interactivity. Assessments usually have a classic pass/fail result, but they can also have some achievements like badges and certifications associated with these results. These records can also be reported outside and they are part of a specific training record management system that can be customized by each trainer for the target category of training.

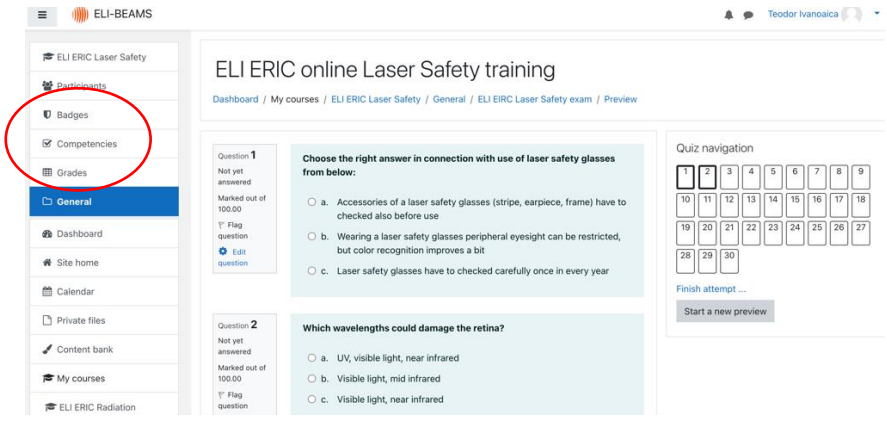

Fig 6. ELI ERIC LMS – Assessments examples

- Quizzes – or surveys –aiming at collecting, in this initial format of the content, the users' satisfaction and, for the production environment are a critical component of the overall quality control process of the platform

IMPULSE has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871161.

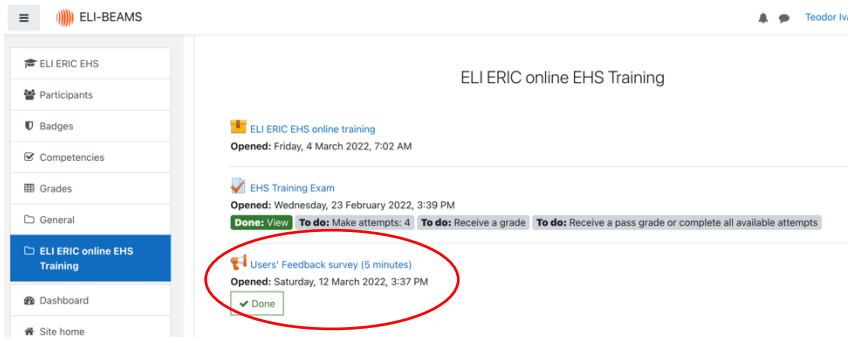

Fig 6. ELI ERIC LMS – The users' surveys

Training record management is made available in the ELI Learning Management System. The training records are subject to GDPR and the Data management policies of ELI ERIC. They shall be kept in accordance with the Data Protection rules and regulations that apply to each particular training category.

7. TRAINING OF SAFETY TRAINING CONTENT PROVIDERS

The expertise of individual trainers is to be ensured by established regulatory requirements (legally qualified person). The trainers shall be adequately qualified, having valid legal qualifications wherever applicable.

The trainers can be provided internally (by members of EHS Responsible Units) or externally (especially for providing some specialized training).

To ensure high-quality ELI ERIC supports continuous education of its safety experts, by providing resources for internal workshops (in between the ELI facilities), participation in topical international conferences, workshops and training courses. Further, professional visits to other similar facilities are supported and encouraged, to exploit external expertise available.

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