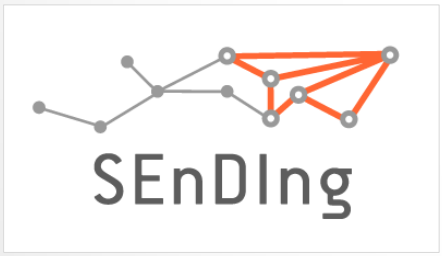


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# SEnDIng

## D5.1.2

# SURVEY OF E-LEARNING SOLUTIONS

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|---|---|
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SEnDIng

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| | |
|---|---|
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## Delivery Slip

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# PROJECT SUMMARY

SEnDIng project aims to address the skills' gap of Data Scientists and Internet of Things engineers that has been identified at the ICT and other sectors (e.g. banking and energy) at which Data Science and Internet of Things have broad applications. To achieve this goal, SEnDIng will develop and deliver to the two aforementioned ICT-related occupational profiles two learning outcome-oriented modular VET programmes using innovative teaching and training delivery methodologies.

Each VET program will be provided to employed ICT professionals into three phases that include: (a) 100 hours of on-line asynchronous training, (b) 20 hours of face-to-face training and (c) 4 months of work-based learning. A certification mechanism will be designed and used for the certification of the skills provided to the trainees of the two vocational programs, while recommendations will be outlined for validation, certification & accreditation of provided VET programs.

Furthermore, SEnDIng will define a reference model for the vocational skills, e-competences and qualifications of the targeted occupational profiles that will be compliant with the European eCompetence Framework (eCF) and the ESCO IT occupations, ensuring transparency, comparability and transferability between European countries.

Various dissemination activities will be performed – including the organization of one workshop at Greece, Bulgaria and Cyprus and one additional conference at Greece at the last month of the project – in order to effectively disseminate project's activities and outcomes to the target groups and all stakeholders. Finally, a set of exploitation tools will be developed, giving guides to stakeholders and especially companies and VET providers, on how they can exploit project's results.

# TABLE OF CONTENTS

# 1 Introduction

This deliverable surveys different eLearning platforms for the delivery of SEnDIng online courses. In the context of the survey, we considered four eLearning platforms, whose main features are presented below based on the information provided at their websites. After reviewing the key characteristics of the four eLearning platforms, we tested each one aiming to define the best that meets the pre-defined target specifications according to Deliverable D5.1.1.

The platform we considered and tested are the following:

- Moodle
- Open edX
- Sakai LMS
- Cypher Learning NEO LMS

In Section 2 are presented the key features of each platform, while in Section 3 are presented the testing results. Finally, Section 4 concludes the deliverable.

# 2 Potential e-learning platforms

## 2.1 Moodle

Moodle [1] is an open source eLearning platform written in PHP and distributed under the GNU General Public License. It has been developed based on pedagogical principles and is used for blended learning, distance education, flipped classroom and other e-learning projects in schools, universities, workplaces and other sectors. Its main features are the following:

General features

- **Modern, easy to use interface**. Designed to be responsive and accessible, the Moodle interface is easy to navigate on both desktop and mobile devices.
- **Personalized Dashboard**. Display current, past and future courses, along with tasks due.
- **Collaborative tools and activities**. Work and learn together in forums, wikis, glossaries, database activities, and much more.
- **All-in-one calendar**. Moodle's calendar tool helps you keep track of your academic or company calendar, course deadlines, group meetings, and other personal events.
- **Convenient file management**. Drag and drop files from cloud storage services including MS OneDrive, Dropbox and Google Drive.

- **Simple and intuitive text editor**. Format text and conveniently add media and images with an editor that works across all web browsers and devices.
- **Notifications**. When enabled, users can receive automatic alerts on new assignments and deadlines, forum posts and also send private messages to one another.
- **Track progress**. Educators and learners can track progress and completion with an array of options for tracking individual activities or resources and at course level.

Administrative Features

- **Customizable site design and layout.** Easily customize a Moodle theme with your logo, colour schemes and much more - or simply design your own theme.
- **Secure authentication and mass enrolment.** Over 50 authentication and enrolment options to add and enroll users to your Moodle site and courses.
- **Multilingual capability**. Allow users to view course content and learn in their own language, or set it up for multilingual users and organizations.
- **Bulk course creation and easy backup**. Add courses in bulk, backup and restore large courses with ease.
- **Manage user roles and permissions**. Address security concerns by defining roles to specify and manage user access.
- **Supports open standards**. Readily import and export IMS-LTI, SCORM courses and more into Moodle.
- **High interoperability**. Freely integrate external applications and content or create your own plugin for custom integrations.
- **Simple plugin management**. Install and disable plugins within a single admin interface.
- **Regular security updates**. Moodle is regularly updated with the latest security patches to help ensure your Moodle site is secure.
- **Detailed reporting and logs**. View and generate reports on activity and participation at course and site level.

Course Development and Management Features

- **Direct learning paths.** Design and manage courses to meet various requirements. Classes can be instructor-led, self-paced, blended or entirely online.
- **Encourage collaboration.** Built-in collaborative publishing features foster engagement and encourage content-driven collaboration.
- **Embed external resources.** Teach materials and include assignments from other sites and connect to the gradebook in Moodle.

- **Multimedia Integration.** Moodle's built-in media support enables you to easily search for and insert video and audio files in your courses.
- **Group management.** Group learners to share courses, differentiate activities and facilitate team work.
- **Marking workflow.** Conveniently assign different markers to assignments, manage grade moderation and control when marks are released to individual learners.
- **In-line marking.** Easily review and provide in-line feedback by annotating files directly within browser.
- **Peer and self-assessment.** Built-in activities such as workshops and surveys encourages learners to view, grade and assess their own and other course members' work as a group.
- **Integrated Badges.** Fully compatible with Mozilla Open Badges, motivate learners and reward participation and achievement with customised Badges.
- **Outcomes and rubrics.** Select from advanced grading methods to tailor the gradebook to your course and examination criteria.
- **Competency based marking.** Set up competencies with personal learning plans across courses and activities.
- **Security and privacy.** Teach and share in a private space only you and your class can access.

## 2.2 Open edX

Open edX [2] is an eLearning technology that enables online campuses, instructor-led courses, degree programs, and self-paced courses using a single platform. It is available for desktop, iOS and Android versions, and provides access to course content and supporting infrastructure. It includes Open edX Studio a cutting-edge authoring tool which empowers learning and development through custom experiences powered by the latest in instructional design:

- Author courses and evolve your content while live with learners
- Manage your course schedule, course team, and grading policy
- Utilize documented and open XML standards (OLX) for import/export of courses.
- Easily import content and manage content across platforms.
- Access rich 3rd-party tools or add additional building blocks.

In addition, Open edX Insights provides intelligent, learner-centric analytics to help instructors understand how learners engage with course material.

- Designed to support millions of users, Open edX Insights scales along with your learning program.
- Built-in reports help instructors and course teams manage online content for cohorts of any size.
- Learning teams can leverage existing data to build custom adaptive content and store data in a warehouse or learning record store.

The key Open edX features are the following:

- **Supported Learning Types**. Asynchronous Self-paced, Asynchronous Instructor-led, Synchronous Virtual Classroom and Blended Learning.
- **Mobile Learning Support**. Online (Internet connected), Offline (disconnected Mobile app).
- **User Accounts**. Browse list of users, Bulk User Actions, Add a new user, Custom/Mandatory User profile fields, Upload users, Archive users.
- **User Roles**. Define roles, Role Assignment, System Permissions per role, Teams and Team Hierarchies.
- **User Authentication**. Self-Registration, Self-Registration w. Admin Confirmation Manual Accounts, Active Directory/LDAP Integration, SAML2/API Integration, Custom User login page, No login.
- **User Enrollment.** Guest Access Settings, Manual Enrollment, Self-enrollment, Survey enrollment (based on a response), Automated Enrollment (based on User data), Attendance Tracking.
- **Course Creation.** Built-In Authoring Tool, Changing Course default settings, Upload courses, Can reuse PPTs, PDFs, Videos, Consume online video content, Tests Engine, Survey Engine, Assignments Engine, Course backup Options, Scheduling LIVE events, Learning Paths (Curriculums).
- **Course Categories**. Create new Categories, Assign Courses to categories, Manage Categories, Priced Categories (Bundle).
- **Course Format**. Social Format, Weekly Format, Topics Format, Gamification, LIVE Videoconferencing / Webinar, LIVE Chat Option, Course Discussions, Learner Upload.
- **Activity Grading**. Gradebook, Gradebook comments, Gradebook audit trail, Multiple grading scales, Manual Grading ("Marking"), Course History,
- **Gamification**. Badges, Badge customization, Levels.
- **Reports**. Grading Report Settings, Training Record Maintenance, Exporting Reports in variety of formats, Canned Reports, Automated Report Scheduling, Email delivery of Reports, Dashboards and Graphic Reports.

- **Compliance Management**. Soft/Hard Stop Due Dates, Certification Expiration Management, Due Date notifications, Certificate expiration notifications.
- **Certificate Management**. Unique Certificate by Course, Unique Certification by Curriculum, Predefined certification templates, Manage certification templates, Certification life-cycle.
- **Interface Options**. Block Management, Language settings, Multilanguage Support, Media embedding settings.
- **System Reports**. Live Logs, Email notification settings, Automatic email reports in predefined intervals, Custom reports generator.
- **Security**. IP Blocker, Anti-spam, Anti-virus, Strong Passwords, Restrict registration to specific domains.

## 2.3 Sakai LMS

Sakai LMS [3] is an open source learning management system providing a wealth of powerful, flexible tools that enable great teaching, compelling learning, and dynamic collaboration. It includes a modern and easy to use User Interface, which thanks to its responsive design, enables instructors and students to achieve their academic goals.

Its features are the following:

- **Communication and Collaboration**. Variety of synchronous and asynchronous tools for messaging, discussions, social connections, and collaborative work: Announcements, Calendar, Chat, Commons, Contact us, Email, Email archive, Forums, Messages, Sign-up, Wiki.
- **Course and System Management**. Powerful course and system administration features: polls, roster, section info, site info, statistics, aliases, become user, delegated access, email templates, external tools, job scheduler, memory, message bundler manager, site archive, sitestats admin, tags service, user membership, users.
- **Grading and Assessment**. State of the art grading and assessment features: assignments, gradebook, rubrics, tests and quizzes.
- **Community Contributed Tools**. Take advantage of open source, Sakai-specific tools developed by community members and then released for others to use outside of the packaged Sakai release: Attendance, Certification, Clog and Evaluation System.
- **Content Development and Delivery**. Sakai lets you create and organize text, resources, quizzes, tests, assignments, links, video, and other media into lessons or modules; control access to materials via conditional release; upload, store, and

share files and other resources; and much more. Features: dropbox, external tool, lessons, news, overview, podcasts, resource, search, syllabus,

- **External App Integrations**. Sakai is a leader in the development and implementation of the IMS LTI specification. In addition, Sakai has an extensive API which facilitates the development of deep, native integrations with third party applications.

## 2.4 Cypher Learning NEO LMS

Cypher Learning NEO LMS is a commercial eLearning platform. It is suitable for managing all classroom activities, whether it's creating classes, assessing students, facilitating collaboration, or tracking student achievement. Its main features are the following:

- **User experience**. Graphical dashboards, Beautiful, modern, easy-to-use interface, Fully responsive design works on all devices, Native mobile apps for iOS, Android, and Windows, Offline mode for native apps, Avatars and profile pictures, Accessibility features, Support for 40+ languages.
- **Classes**. Instructor-led classes, Self-paced and blended classes, Graphical class catalog, Class templates, Class content synchronization, Content authoring and navigation, Class syllabus, Class archival, Waitlists, Seating charts, Certificates of completion, Class prerequisites, Record audio from browser, Time limits for classes, Drip content, Record video from browser, Video transcoding, SCORM, Ratings and reviews, Compliance features.
- **Assessment and grading**. Gradebook, Quiz, essay, survey, attendance, offline, and dropbox assignments, Question banks, Rubrics, Point grading scales, Portfolios, Debates, discussions, and team assignments, Grading scales per school, class, and assignment, Personalized assignments, Printable attendance forms, Export attendance data, Certificates, Printable PDF certificates, Plagiarism detection via integration with Turnitin or Unicheck, SCORM assignments, Custom LTI assignments, Peer assessment, Proctored assignments.
- **Mastery and Competency-based learning**. Create or upload competencies, Associate competencies with a class, Align lessons and assignments with competencies, Track and view learner competency, Coverage analysis, Associate competencies with rubrics, Associate competencies with individual quiz questions, Integrated with automation system.
- **Gamification**. Badges and badge builder, Custom game levels, Use automation to award points and badges, Customizable leaderboard, Class and site-wide games, Path games, Group players into teams.

- **Collaboration and communication.** Graphical resources catalog, Groups, Social networking, Community groups, Activity feeds, Collaboration tools (chat, wikis, forums, blogs), Built-in messaging system with email integration, Calendaring, Display online users, Use with your favorite web conferencing product, Calendar integration with Web conferencing, Automatic translation of communications.
- **Learning paths and adaptive learning.** Define a set of classes, certificates and/or paths to be completed, Define the order that the items must be completed, Track progress towards the goal, Certificates of completion, Integrated with automation system, Path templates, Path archival, Personalize path goals, Sell learning paths through the class catalog, Personalize classes dynamically, Hide/show lessons based on assignment scores and mastery, Seamlessly integrated with the automation system.
- **Analytics and reporting**. Completion progress, Basic analytics, Time tracking, Student activity timelines, Advanced analytics, Canned reports, Ad-hoc reports, Reports history, Saved and scheduled reports, Compliance management.

# 3 eLearning platforms testing results

The testing of the aforementioned eLearning platforms was based on the technical and functional specifications defined in Deliverable 5.1.1. This work was concluded with a list of important platform features and their prioritization as a result of a survey carried out with project partners. The testing plan developed contains questions related to the most essential features and functionalities of the eLearning platform.

## 3.1 Moodle testing report

Below is the testing report for Moodle.

| Category | Questions for testing | Notes & comments |
|---|---|---|
| **1. Collaboration - Discussion Boards** | How clear and simple the discussion boards are for user? | Many features and options but the user interface lacks clarity |
| | What kind of editing and customization possibilities are available? | Many, even more with add-ins |

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|---|---|---|
| | Is it possible to assign a specific board/area to a learning module/topic/assignment and how this is done? | Yes, but the basic layout and structure is not very accessible |
| **2. Content development & management - content editor** | Does the system provide wysiwyg editing features and how advanced they are? | Yes, quite advanced |
| | Does the system provide html editing features and how advanced they are? | Yes, quite advanced |
| | Are pre-configured content elements and actions available (e.g. exercise templates)? | Templates can be developed but the basic version is not very fluent in this |
| | Does the system support the use of external media (e.g. video embedding)? | Yes. |
| | Is it possible to import ready-made content to the system? | Yes, the system supports import and export including SCORM |
| | Is it possible to export content developed within the system to be used elsewhere? | Possibly, at least through manual copy/paste of page elements. Did not test this further. |
| | Is Preview available to show how scalable content looks in different devices? | No. Scalability is quite limited. |

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| | Does the system provide version control and backups for created content? | No. Manual backups can be done for the system data however. |
| | Is collaborative editing of same content possible (by different editors)? | Not simultaneously. |
| | Is it possible to design and use content templates? | Yes. |
| **3. User management** | User registration management – how simple, easy the process is, is self-registration possible, registration short-cuts (e.g. access vouchers)? | Not very fluent. Didn't come across with any quick access features. |
| | To what extent the user profiles can be customized? | Quite a lot of customizable info fields and resources included. Sufficient, I would say. |
| | Course notifications – how sophisticated? Automated? | Notifications about new forum posts, assignments needing grading or badges awarded are available. New notifications are highlighted with a number in the notifications menu at the top of the screen. |

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| | Calendar / event management – support for most popular calendar systems (e.g. synchronization), possibilities to manage other than LMS-specific actions (e.g. classroom training) | The calendar can display site, course, group, user and category events in addition to assignment and quiz deadlines, chat times and other course events. Colour coding helps identification. A calendar may be included in a course or the site Front page by adding a Calendar block or an Upcoming Events block. External calendars (such as Google Calendar, or a calendar from another Moodle site) can be imported into Moodle's calendar via the iCal standard. |
| **4. Reports and progress follow-up** | How well the user is informed about his/her study progress? | Additional tools and plugins are available for very advanced progress follow-up and statistics. |
| | Do the basic analytics features provide enough of information about course progress per group of students, on individual basis? | The built-in features of basic version are quite limited and not so informative. |
| | Does the system generate demographic data about the course e.g. to see progress averages, study times per module/topic, modules/topics which are most challenging to complete etc.? | This info should be available but requires additional tools and configuration. |
| | How well the system is able to visualize study progress information? | Poorly |

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| | Are certifications generated automatically by the system, what different forms of certificate are available, what is the level of customization of certificates, is it possible to use external certificate elements? | Available through additional plugin. |
| | How simple/complicated it is to upload a SCORM package in the system? | Not very complex, works fine. |
| | Does the SCORM work with a test course package (e.g. to mark a course module as "completed") | Yes, it worked. |
| | How easy to implement and use the assessment/evaluation tools are? | Built-in tools are not very sophisticated. Many additional tools available, however. |
| | Are the assessment/evaluation features sufficient based on your teaching experience? | Not quite. |
| | Does the system provide an exam engine and how developed it is? How user-friendly it is? | Plugins are available to do this but require additional work and configuration |
| **5. Usability & access** | Does the system provide personalization features and how advanced they are? | Not really in the basic version. |

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|---|---|---|
| | Is it possible to develop course modules which provide personalization options for the learner (e.g. possibility to select audio-/text-based instruction, possibility to test knowledge before studying anything and the system adapts the content based on the test. | By designing content elements accordingly. No built-in processes to do this easily and fluently. |
| | Is the system fully responsible? If not, test how the UI works with different devices (smartphone, tablet, pc browser) | No. Moodle Mobile App allows for full mobile support and responsibility: https://docs.moodle.org/36/en/Moodle_app |
| | Is there a search function and how advanced/precise it is? Does it work in practice? | Search works quite well. |
| | Does the system have a course catalog? Is it suitable for our purposes? | Course catalogue is available and suitable with a little bit of adjustment. |
| **6. Maintenance & support** | Does the system provide automated backups on all system data, users etc.? | This would have to be custom-built into the system when installing it to a server |

### 3.1.1 Main Pros and Cons

Main Pros

- The platform has the most needed features implemented in effective way.
- Excellent customer base and references from the users.
- Well-developed apps for mobile devices.
- Open source platform with large active community.

Main Cons

- The platform requires professional IT knowledge to be installed and maintained.
- No information for advanced functions. In many cases, the administrators need to develop and integrate them.

## 3.2 Open edX testing report

Below is the testing report for Open edX.

| Category | Questions for testing | Notes & comments |
|---|---|---|
| **1. Collaboration - Discussion Boards** | How clear and simple the discussion boards are for user? | Users can discuss topics, share ideas and ask questions through three levels of interaction: Post (Question or Discussion), response to the post and comment. The posts, respective responses and comments are organized as a thread and are saved as a history of the course. The discussion structured, as threads, are easy to follow and participate.<br>Friendly discussion board environment with functionality to search in topics using keywords. |
| | What kind of editing and customization possibilities are available? | General topic is included in every course by default. The teacher can add introductory post to initiate a thread for student. Discussions can be moderated using different roles. |

| | | |
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| | | The admins can manage the posts, responses and comments in the discussions. |
| | Is it possibile to assign a specific board/area to a learning module/topic/assignment and how this is done? | There are opportunities to discuss specific topic including but not limited to: video lectures, reading assignments, homework problems, etc. When discussion topics are part of the course, they typically appear below the topic content associated with them. |
| **2. Content development & management**<br>**- content editor** | Does the system provide wysiwyg editing features and how advanced they are? | The user can work with HTML components in a "visual" or "what you see is what you get" WYSIWYG editor that hides the HTML code details. The editor provides all the basic functionalities of a software for documents editing |
| | Does the system provide html editing features and how advanced they are? | There are html editing features available through Raw HTML Editor. |
| | Are pre-configured content elements and actions available (e.g. exercise templates)? | The platform supports key course components. HTML, Videos, Problems and Libraries. |
| | Does the system support the use of external media (e.g. video embedding)? | Yes, it supports the use of external video. |
| | Is it possible to import ready-made content to the system? | Yes, the system supports import and export, but it seems to be |

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| | | 'problematic' as there is no native SCORM support. |
| | Is it possible to export content developed within the system to be used elsewhere? | Yes, the system supports import and export. |
| | Is Preview available to show how scalable content looks in different devices? | Preview option is available. |
| | Does the system provide version control and backups for created content? | Versioning is planned for future releases. |
| | Is collaborative editing of same content possible (by different editors)? | Not sure. |
| | Is it possible to design and use content templates? | Yes. |
| **3. User management** | User registration management – how simple, easy the process is, is self-registration possible, registration short-cuts (e.g. access vouchers)? | Very easy and seems to be secure. The registration is straightforward. In addition there is also the possibility to integrate CAS authentication and authentication with external accounts (i.e. Google, LinkedIn, etc.) |
| | To what extent the user profiles can be customized? | Good enough! Fully customization of users' profile. |
| | Course notifications – how sophisticated? Automated? | Discussion notifications available. Automated communication engine, |

| | | |
|---|---|---|
| | | A.C.E. can manage notifications through email. |
| | Calendar / event management – support for most popular calendar systems (e.g. synchronization), possibilities to manage other than LMS-specific actions (e.g. classroom training) | Schedule tab for each course is available. Sync with google calendar is possible.<br>I am not aware about advanced calendar options. |
| **4. Reports and progress follow-up** | How well the user is informed about his/her study progress? | Course progress tab provides information about the progress against predefined milestones e.g. quiz and activities. Detailed learning progress view (per week, per module, per exam, per problem solved, etc.) |
| | Do the basic analytics features provide enough of information about course progress per group of students, on individual basis? | Information about individual progress easily available. The system provides to each learner a graph depicted the learning progress. I am not able if such graphs are also available to the system administrator. |
| | Does the system generate demographic data about the course e.g. to see progress averages, study times per module/topic, modules/topics which are most challenging to complete etc.? | Information not available. |

| | | |
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| | How well the system is able to visualize study progress information? | It seems that only basic visualizations are available. |
| | Are certifications generated automatically by the system, what different forms of certificate are available, what is the level of customization of certificates, is it possible to use external certificate elements? | Certification available. The system supports the automatic generation of certifications and their customization. The system provides some base certifications templates, however new ones can be created. |
| | How simple/complicated it is to upload a SCORM package in the system? | Open edX doesn't support SCORM natively, but an integration with SCORMCloud and Open edX exists. So the upload of a SCORM package seems to be complicated. |
| | Does the SCORM work with a test course package (e.g. to mark a course module as "completed") | n/a |
| | How easy to implement and use the assessment/evaluation tools are? | Simple assessment tools such as quizzes and assignment are available. No information about sophisticated assessment tools. |
| | Are the assessment/evaluation features sufficient based on your teaching experience? | Yes, if they are used in a proper way. |
| | Does the system provide an exam engine and how | Proctored exams could be integrated using proctoring |

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| | developed it is? How user-friendly it is? | software that monitors the examinee computer. |
| **5. Usability & access** | Does the system provide personalization features and how advanced they are? | No extensive personalized features on user side. |
| | Is it possible to develop course modules which provide personalization options for the learner (e.g. possibility to select audio-/text-based instruction, possibility to test knowledge before studying anything and the system adapts the content based on the test? | Such features potentially could be developed but no information to be integrated in the platform. |
| | Is the system fully responsible? If not, test how the UI works with different devices (smartphone, tablet, pc browser) | The system works well with different devices. Mobile apps for Android and IOS are well functioning and available. 4.6 rating form about 43 000 users and more than 1 million downloads for Android. |
| | Is there a search function and how advanced/precise it is? Does it work in practice? | There is search engine using keywords and the possibility to filter the results using various parameters. Search function for the portfolio of courses available and works well. No search function within a single course that was used to test the platform. |

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| | Does the system have a course catalog? Is it suitable for our purposes? | Course catalogue is available and suitable. |
| **6. Maintenance & support** | Does the system provide automated backups on all system data, users etc.? | It seems that automatic backups are not supported natively. Effective backup solution for Open edX requires expert knowledge on different technologies. No information about automated solution, which is integrated in the platform. |

### 3.2.1 Main Pros and Cons

Main Pros

- The platform is fit for purpose. It has most needed features implemented in effective way.
- Excellent customer base and references from the users.
- Well-developed apns for mobile devices.
- Open source platform with large active community.
- User friendly GUI.
- Easy content creator environment.

Main Cons

- The platform requires professional IT knowledge to be installed and maintained
- No information for advanced functions. In many cases, the administrators need to develop and integrate them.
- Limited community compared to other LMS (e.g. Moodle)

## 3.3 Sakai LMS testing report

Below is the testing report for Sakai LMS.

| Category | Questions for testing | Notes & comments |
|---|---|---|
| **1. Collaboration - Discussion Boards** | How clear and simple the discussion boards are for user? | The user can easily create forum. The forums can be used for initiating and maintaining of various discussions. |
| | What kind of editing and customization possibilities are available? | Advanced features such as creation of multiple topics per groups, grading and scheduled availability. . |
| | Is it possible to assign a specific board/area to a learning module/topic/assignment and how this is done? | Yes, it is possible. |
| **2. Content development & management - content editor** | Does the system provide wysiwyg editing features and how advanced they are? | Reach Text Editor that covers WYSIWYG (What You See Is What You Get) functionality. |
| | Does the system provide html editing features and how advanced they are? | No information for direct HTML editing. No advanced features. |
| | Are pre-configured content elements and actions available (e.g. exercise templates)? | Email, forum and content templates can be developed and used. |
| | Does the system support the use of external media (e.g. video embedding)? | Video and other external media can be embedded in the content. |

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|---|---|---|
| | Is it possible to import ready-made content to the system? | The user can import a previously exported IMS Common Cartridge (.imscc) from other Sakai sites, publisher materials, or content from other learning management systems. |
| | Is it possible to export content developed within the system to be used elsewhere? | Export options similar to the import options are available. |
| | Is Preview available to show how scalable content looks in different devices? | n/a |
| | Does the system provide version control and backups for created content? | Versioning can be done through archive function. No information about internal versioning system. |
| | Is collaborative editing of same content possible (by different editors)? | A simple wiki tool allows users to collaboratively author web pages. |
| | Is it possible to design and use content templates? | Email, forum and content templates can be developed and used. |
| **3. User management** | User registration management – how simple, easy the process is, is self-registration possible, registration short-cuts (e.g. access vouchers)? | The self-registration is easy and user friendly. |

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| | To what extent the user profiles can be customized? | Simple customization availbale |
| | Course notifications – how sophisticated? Automated? | Notifications for the main actions available and can be customized by the users. |
| | Calendar / event management – support for most popular calendar systems (e.g. synchronization), possibilities to manage other than LMS-specific actions (e.g. classroom training) | Simple user-friendly calendar. Syncing with other calendar applications is available. |
| **4. Reports and progress follow-up** | How well the user is informed about his/her study progress? | The user receive notifications. No information about special tool that measures the progress. |
| | Do the basic analytics features provide enough of information about course progress per group of students, on individual basis? | No information about special analytical tool. |
| | Does the system generate demographic data about the course e.g. to see progress averages, study times per module/topic, modules/topics which are | No information available. |

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| | most challenging to complete etc.? | |
| | How well the system is able to visualize study progress information? | Poor visualization of the information |
| | Are certifications generated automatically by the system, what different forms of certificate are available, what is the level of customization of certificates, is it possible to use external certificate elements? | No information about integrated certification features. |
| | How simple/complicated it is to upload a SCORM package in the system? | No information about SCROM support.<br>Third-party tools are needed for playing SCORM packages. |
| | Does the SCORM work with a test course package (e.g. to mark a course module as "completed") | No information about SCROM support.<br>Third-party tools are needed for playing SCORM packages. |
| | How easy to implement and use the assessment/evaluation tools are? | Integrated assessment builder support easy development of different quizzes and questionnaires. |
| | Are the assessment/evaluation features sufficient based | Yes, for the purpose of the project. |

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| | on your teaching experience? | |
| | Does the system provide an exam engine and how developed it is? How user-friendly it is? | Gradebook is a tool for instructors to calculate and store grade information and distribute it to students online. |
| **5. Usability & access** | Does the system provide personalization features and how advanced they are? | Simple personalization of the notifications. |
| | Is it possible to develop course modules which provide personalization options for the learner (e.g. possibility to select audio-/text-based instruction, possibility to test knowledge before studying anything and the system adapts the content based on the test? | No information for personalized learning options. |
| | Is the system fully responsible? If not, test how the UI works with different devices (smartphone, tablet, pc browser) | Web page is responsive but no information for mobile apps that support the system. |
| | Is there a search function and how advanced/precise it is? Does it work in practice? | Search function work well. |

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| | Does the system have a course catalog? Is it suitable for our purposes? | Comprehensive course catalogue is available and seems suitable. |
| **6. Maintenance & support** | Does the system provide automated backups on all system data, users etc. | Site Archive tool allows admin users to "back up" or archive sites within the system, as well as import sites from existing archives |

### 3.3.1 Main Pros and Cons

Main Pros

- Well organized information about the system.
- Seems to be relevantly easy to install and maintain.
- User-friendly interface.
- Open source.

Main Cons

- No mobile apps.
- Small community in Europe.
- Limited functionality.

## 3.4 Cypher Learning NEO LMS testing report

Below is the testing report for Cypher Learning NEO LMS.

| Category | Questions for testing | Notes & comments |
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| **1. Collaboration - Discussion Boards** | How clear and simple the discussion boards are for user? | Very simple and intuitive to use, supports full html editing features and typical discussion board features. Discussion boards can be |

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| | | linked with any course, module or topic on the platform. |
| | What kind of editing and customization possibilities are available? | Several areas of the course site, such as classes and groups, have forums for discussions. Quite advanced features with moderation and tracking of activity included. Additional content elements can be added by the user (Right Box) |
| | Is it possible to assign a specific board/area to a learning module/topic/assignment and how this is done? | A group is a place for members to meet and collaborate. Various group types: study groups, interest groups, business groups, and course groups. Each group has its own news feed, calendar, resources area, forums, wikis, blogs, chat rooms, and RSS feeds |
| **2. Content development & management**<br>**- content editor** | Does the system provide wysiwyg editing features and how advanced they are? | Yes. Quite advanced – didn't face any issues or something missing in the editor. |
| | Does the system provide html editing features and how advanced they are? | Yes. Standard editor. |
| | Are pre-configured content elements and actions available (e.g. exercise templates)? | Resource Library can be used to store templates for assignments for example. 12 pre-configured assessment templates are available. |

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| | Does the system support the use of external media (e.g. video embedding)? | Yes it does. |
| | Is it possible to import ready-made content to the system? | Yes in various formats including SCORM and Tin Can API |
| | Is it possible to export content developed within the system to be used elsewhere? | Admin Export feature is available. And by switching to html-editing mode and copy/pasting the content |
| | Is Preview available to show how scalable content looks in different devices? | No, but Tile and List view can be selected to adjust scalability, content is scalable. |
| | Does the system provide version control and backups for created content? | Yes |
| | Is collaborative editing of same content possible (by different editors)? | Non-simultaneously yes |
| | Is it possible to design and use content templates? | Resource Library can be used to store templates |
| **3. User management** | User registration management – how simple, easy the process is, is self-registration possible, registration short-cuts (e.g. access vouchers)? | Students enrolment is really simple via different choices:<br>a) People picker<br>b) Classes tab<br>c) Email invitations<br>d) Enroll students from a file<br>e) Student's profile page. |

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| | | Learners can create accounts from the portal or the catalog |
| | To what extent the user profiles can be customized? | Users can change their profile information by clicking the Edit button at the top right of their profile page. Basic features + personal blog and picture gallery are available. |
| | Course notifications – how sophisticated? Automated? | Advanced, automated, see screenshot 002 for more info. |
| | Calendar / event management – support for most popular calendar systems (e.g. synchronization), possibilities to manage other than LMS-specific actions (e.g. classroom training) | Several areas of the site have a calendar. For example, each class and group has a calendar of events and each school has a calendar of school events. iCal feed can be used to sync calendar with other systems. |
| **4. Reports and progress follow-up** | How well the user is informed about his/her study progress? | There are very advanced and highly visual options available. Two main ways of doing this are via Mastery and Gradebook. |
| | Do the basic analytics features provide enough of information about course progress per group of students, on individual basis? | Advanced built-in features + unlimited reporting options via custom reports.<br>Multiple analytics of students' progress. |
| | Does the system generate demographic data about the course e.g. to see | Yes. Mastery view provides big data visualizations of all course data. |

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| | progress averages, study times per module/topic, modules/topics which are most challenging to complete etc.? | |
| | How well the system is able to visualize study progress information? | The system tracks the first and last time a student visits a particular lesson, as well as the total number of times that they've visited the lesson on a particular day and the amount of time they have spent there. To see a chart of this information, click the Analytics button in the Lessons section. |
| | Are certifications generated automatically by the system, what different forms of certificate are available, what is the level of customization of certificates, is it possible to use external certificate elements? | Automated certifications are available via Automation. External certificates available through API. |
| | How simple/complicated it is to upload a SCORM package in the system? | You can upload industry-standard SCORM 1.2 packages to NEO that can be used as resources, lesson sections, and SCORM assignments. Works with no issues. |
| | Does the SCORM work with a test course package (e.g. to mark a course module as "completed") | |

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| | How easy to implement and use the assessment/evaluation tools are? | 12 types of pre-configured assignments are available |
| | Are the assessment/evaluation features sufficient based on your teaching experience? | Yes |
| | Does the system provide an exam engine and how developed it is? How user-friendly it is? | Assignments can be used to develop tests. Quite easy. |
| **5. Usability & access** | Does the system provide personalization features and how advanced they are? | Via Rules - used wisely, rules can define individualized learning paths and make a class more fun, engaging, and flexible. For example, you can define a rule so that when a student completes a beginner-level class, it automatically enrolls them in the intermediate level class or adds them into an "alumni" group of students who have completed that class. Completion order of modules can be forced too. |
| | Is it possible to develop course modules which provide personalization options for the learner (e.g. possibility to select audio-/text-based instruction, possibility to | Yes, by using rules and via designing the content to address these needs. |

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| | test knowledge before studying anything and the system adapts the content based on the test? | |
| | Is the system fully responsible? If not, test how the UI works with different devices (smartphone, tablet, pc browser) | The browser version is not fully but quite highly responsive.<br>Mobile apps allow users to access the full feature set of course site, create classes and assignments, connect with students, collaborate, track student progress, and share resources. Students can easily keep track of their schedule and become more involved in academic activities even when they are not at school. |
| | Is there a search function and how advanced/precise it is? Does it work in practice? | Yes. Basic and advanced search which seem to work well. |
| | Does the system have a course catalog? Is it suitable for our purposes? | The class catalog lists all the classes that you wish to offer to students. If you have e-commerce enabled, classes may be purchased directly from the catalog. |
| **6. Maintenance & support** | Does the system provide automated backups on all system data, users etc.? | Yes. |

### 3.4.1 Main Pros and Cons

Main Pros

- Highly intuitive and user friendly platform with many built-in features that would require a lot of configuration in open source platforms.
- Supports online-only courses as well as instructor-led, blended, self-paced, and micro learning (with Add-in).
- Strong learning analytics which allow for adaption and personalization of learning.
- Excellent user support.
- Tailored platform features for corporate learning meaning that the program should be adaptable to companies with little effort.

Main Cons

- Commercial platform

# 4 eLearning platform for SEnDIng online courses

At this section, we present the key findings of eLearning platforms' testing and the arguments we used for selecting the platform for the delivery of SEnDIng online courses.

Moodle is the most popular and widely spread open source LMS which, in principle, has all the required features, at least through extensive customization. However, the main negative issue with Moodle is its complexity and usability reflecting both students and teachers. Open edX covers the majority of the required features, at least through add-ons and plugins. It has an excellent customer base and references from the users and a large active community. Considering Sakai LMS, it has limited functionalities compared to Open edX and Moodle, while it has also a small community in Europe.

On the other hand, Cypher Learning NEO LMS seems to be the most strong eLearning platform compared to the other alternatives by its visuality and clarity. However, it has a major drawback. It is a commercial solution putting in danger the sustainability of the project and the exploitation of its results after its end, as any difficulties faced to find the required budget after the project end, will result in terminating the operation of the eLearning platform. For this reason, we rejected Cypher Learning NEO LMS as a potential solution.

Considering the open source solutions, Moodle and Open edX are the two platforms covering the majority of the required features, as build-in or through extensions, add-ons and plugins. Although Moodle seems to be slightly better than Open edX, Open edX is more oriented as a MOOC environment, compared to Moodle which is more oriented as an LMS

environment. **For this reason and given that the majority of the training material developed will be available in the form of videos, we selected Open edX as the eLearning platform for hosting the SEnDIng online courses.**

# REFERENCES

[1] Moodle, https://moodle.org/
[2] Open edX, https://open.edx.org
[3] Sakai LMS, https://www.sakailms.org
[4] Cypher Learning, http://www.cypherlearning.com/