SAM Experience
Alliances towards a Sustainable Future

Sustainable Alliance Manager: Learning Experience towards Collaborative Skills with Green Consciousness

WP3. D4 Development of the final digital platform



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Purpose, scope and relation

This activity marks the completion of the SAMExperience digital learning environment developed during Workpackage 3. Building on the prototype developed in A 3.3 and the testing user-experience evaluation conducted in A 3.4, followed by A.3.5, this activity delivers the fully implemented, final version of the SAMExperience Moodle course, ready for extended piloting in WP4 and long-term use beyond the project.

While A3.3 focused on designing and deploying a single prototype module (FOCUS) and A3.4 validated its usability with real students, Activity 3.6:

- extends the digital architecture to include all four modules of the Alliance Creation Learning Path (FOCUS, CREATE, MANAGE, SUSTAIN);
- implements the Global Challenge as a cross-module, programme-level summative task;
- defines and configures course competencies aligned with the SAM profile;
- enables badges and completion certificates at module and course level;
- integrates improvements arising from UX testing (simplified navigation, clarified instructions, refined workload distribution);
- consolidates the platform into a robust, documented digital system that can be reused and scaled by other institutions.

The final SAMExperience course is now available as a single structured learning pathway in Moodle, with the following main sections:

- Opening (Welcome video, Initial Self-Assessment, “Who am I?” Padlet activity)
- Focus (full module with content, in A3.3.)
- Create (full module on alliance design and interpersonal skills)
- Manage (full module on conflict resolution, planning and circular collaboration)
- Sustain (full module on adaptive management, capacity building and sustainability values
- Retake (dedicated area to retake selected activities and challenges)
- Global Challenge (programme-level integrative task)
- Closing (final self-assessment, additional resources)

In addition, the course now integrates Moodle Course competencies, as well as Certificates and Badges, to recognise learners’ progress and achievements across modules.

The present deliverable documents: the final digital architecture of the SAMExperience platform;, the implementation of the learning pathways and competence model across all modules, the technical

configuration and plugin integration of the final system, the improvements introduced following user testing and the administrative and maintenance arrangements that ensure sustainability.

The description of the entire digital architecture aims to allow other developers and institutions to assess the robustness of the SAMExperience platform, reuse its design, and identify areas for future enhancement in WP4.

Final digital architecture of the SAMExperience Moodle platform

This chapter describes the overall architecture of the final SAMExperience course as it is implemented in Moodle after Activity 3.6. Whereas the prototype phase (A3.3) focused on one module, the platform now hosts the full Alliance Creation Programme, from Opening to Closing, including four competence-based modules, a Retake area and a Global Challenge (done in A3.5).

The SAMExperience learning environment is implemented as a single Moodle course titled SAM Experience, organised into a sequence of collapsible sections. These sections reflect the pedagogical progression of the programme and provide a coherent path from orientation to final evaluation.

The main sections visible in the course navigation are:
Announcements / Q&A / Dashboard

- Opening
- Focus
- Create
- Manage
- Sustain
- Retake
- Global Challenge
- Closing

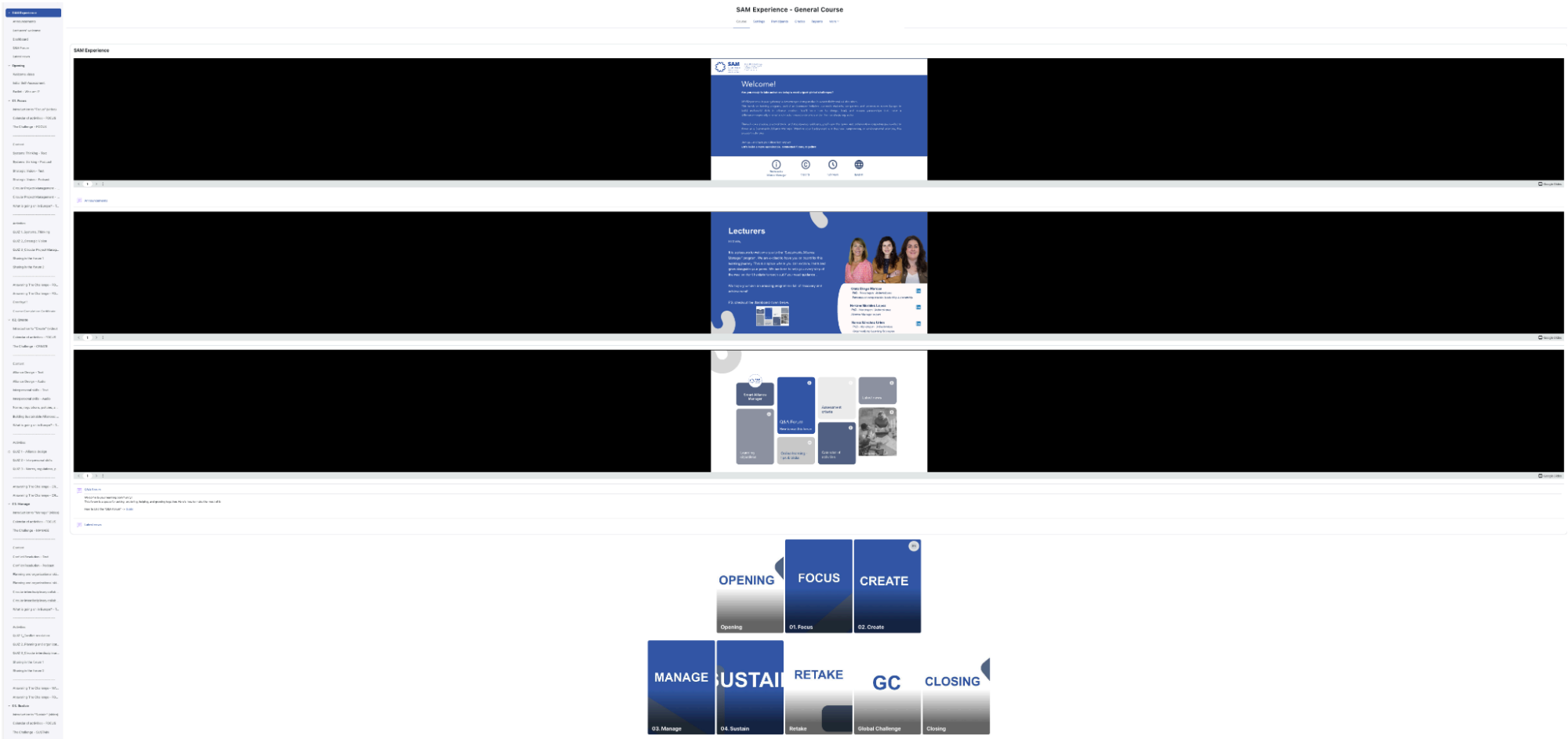


Figure 2.1. Course Design page.

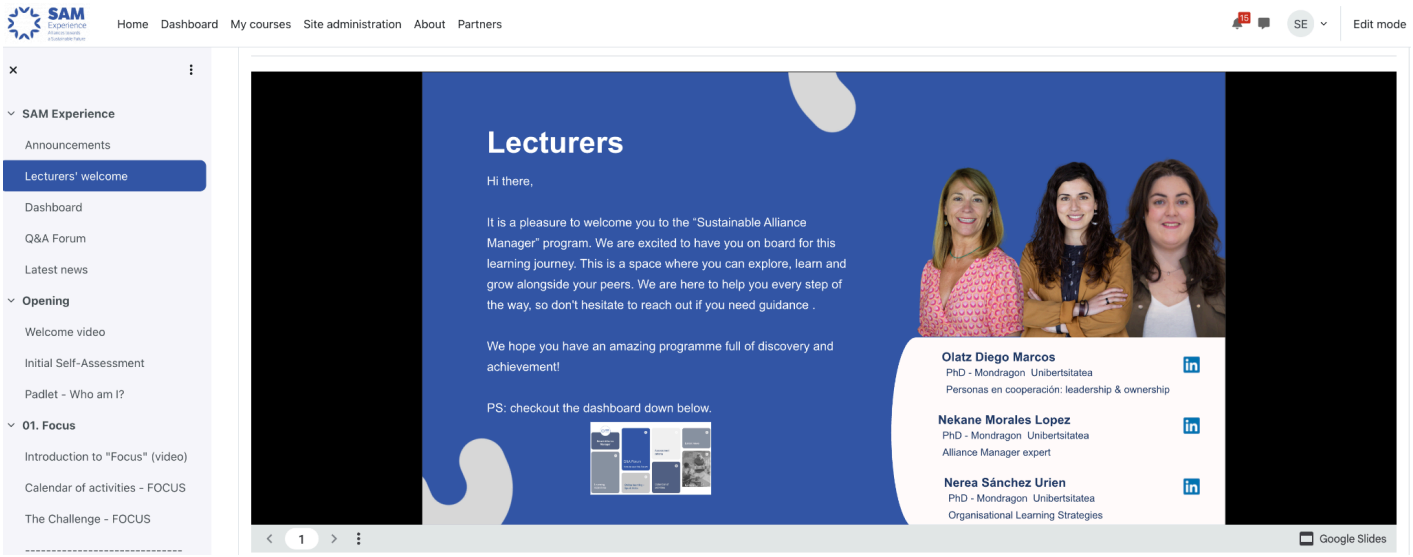
This structure ensures that learners always perceive the programme as one integrated learning journey rather than four isolated modules. At the same time, each module has a clearly delimited internal structure and assessment logic.

Top-Level Communication and Support

At the top of the course, the following spaces support communication and orientation:

- Announcements - central space for official messages from the teaching team.
- Lecturers' Welcome - introduction to the teaching staff, their roles and expectations.
- Dashboard - entry point for learners to monitor their progress and see upcoming deadlines.
- Q&A Forum - open channel where learners can ask questions about the course, platform or assessments.
- Latest News - feed of important updates (deadlines, new resources, live sessions).

These elements create a front-office layer common to the entire SAMExperience course.



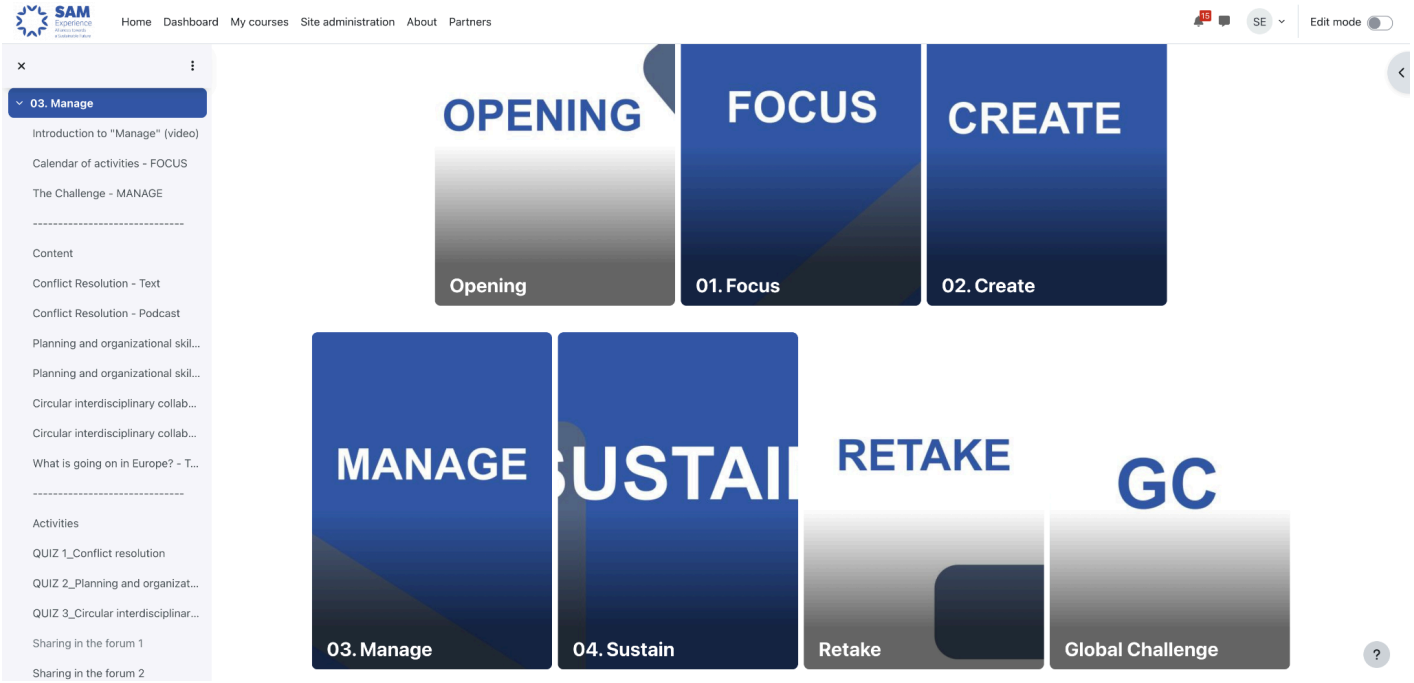


Figure 2.2. User interaction design.

Opening section

The Opening section prepares learners for the programme and introduces them to the SAMExperience environment. It includes:

- Welcome video - a short, recorded message from the teaching team introducing the goals of the course, the four modules (Focus, Create, Manage, Sustain) and the expected workload.
- Initial Self-Assessment – an online questionnaire that captures learners' starting point in relation to the SAM competences.
- Padlet - "Who am I?" - an interactive activity where students briefly introduce themselves, their background and their motivations. It helps build community and gives facilitators a sense of the cohort profile.

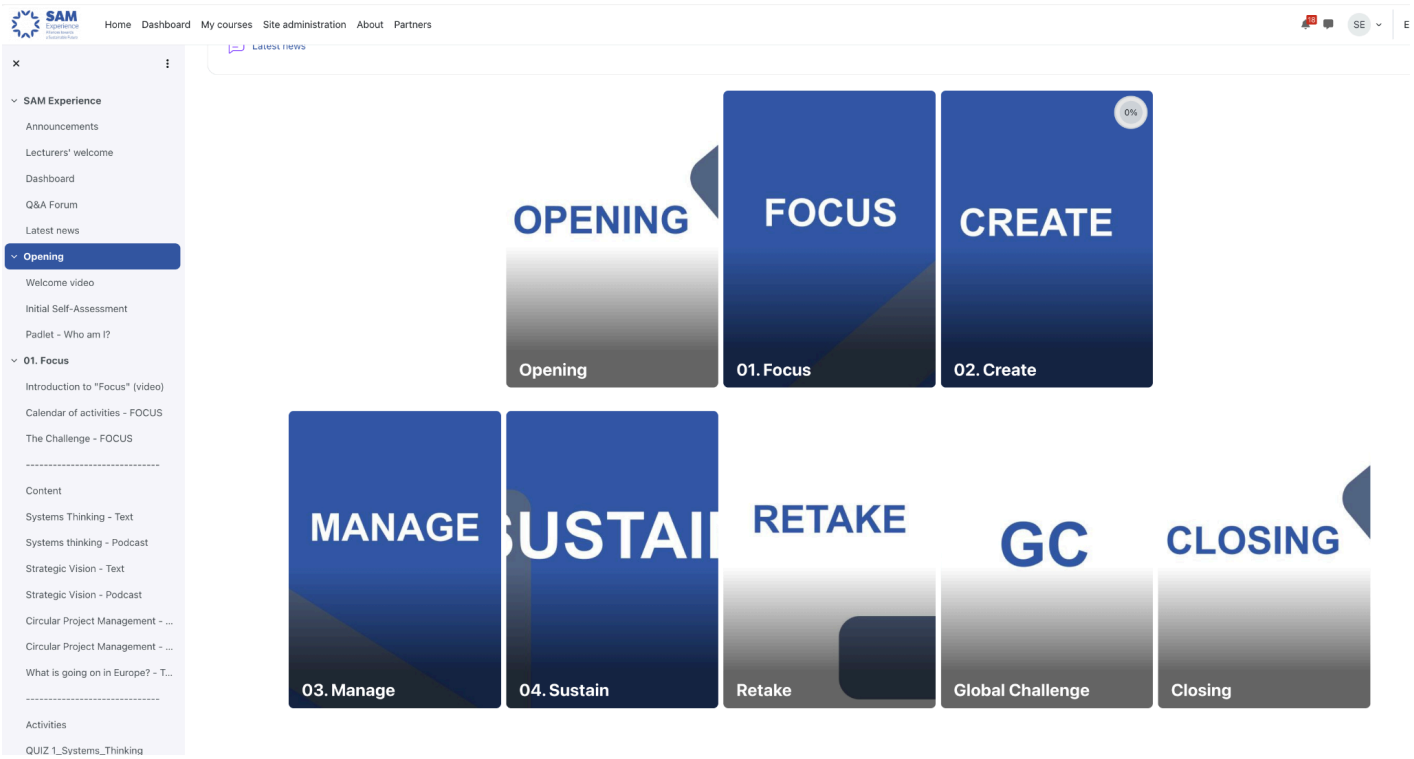
The Opening section thus plays the role of onboarding hub, ensuring that learners understand the context, tools and expectations before entering the first module.

Module sections

Each of the four modules (Focus, Create, Manage, Sustain) follows a consistent internal architecture, preserving the logic defined in A3.3 but now applied to all competences. Every module includes: an introductory video, a calendar of activities, a challenge section, content sub-section (theoretical resources),

activities sub-section (quizzes, forums and related tasks), and one or more “Answering the Challenge” tasks as final assessments. Each module has same structure, as follows:

- Section title in Moodle: Focus/ Create/ Manage/ Sustain
- Introduction
- Calendar of activities
- The Challenge
- Content sub-section, dedicated for competences framework, e.g.:
    - Systems Thinking - text/ audio (if case)
    - Strategic Vision - text/ audio (if case)
    - Circular Project Management - text/ audio (if case)
    - (Reflection) Use-case practical exercise
    - QUIZ 1 - Systems Thinking (earn badge)
    - QUIZ 2 - Strategic Vision (earn badge)
    - QUIZ 3 - Circular Project Management (earn badge)
    - Sharing in the forum 1
    - Sharing in the forum 2
    - Final assessment: answering the challenge (earn badge)
- Closing and module completion certificate (for module-level completion where applicable)



Retake section

The Retake section will provide a dedicated space for learners who need to retake specific activities or final challenges after the first run of the modules. It contains:

- clearly labelled retake quizzes and assignments,
- instructions on eligibility and deadlines,
- configuration aligned with the project's assessment policy (e.g. after the four modules have finished, before the Global Challenge).

This section will enhance flexibility and fairness, ensuring that learners who did not initially reach the expected competence level have a structured opportunity to complete or improve their performance. The concrete methodology of retaking section will be delivered in WP4.

Global Challenge section

The Global Challenge is the programme-level capstone task that requires learners to integrate knowledge and competences developed across all four modules with specific challenges provided by SMEs. Section elements:

- introduction to "Global Challenge" (video) - explains the integrative nature of the task.
- the grand challenge instructions - a detailed brief describing the scenario, expectations, evaluation criteria and submission format
- Answering The Challenge - Global Challenge - the main assignment activity where students submit their final output (e.g., video, report, or combined artefact).

The Global Challenge operationalises the SAM profile at referent level, asking students to synthesise insights from Focus, Create, Manage and Sustain into a coherent alliance strategy.

Closing section

The closing section formally concludes the learning journey. It displays a final self-assessment, a reflective questionnaire allowing learners to compare their initial and final perceived competence levels. Other additional resources are listed as optional materials for further exploration beyond the course. Through this closing sequence, learners are encouraged to reflect on their progression and identify how they might apply SAM competences in their academic, professional or community contexts. In this section a dedicated course completion certificate will be available.

This module implements the competence-development flow for the first phase of alliance creation, combining theory, interactive practice, reflection and a summative video task.

Competence model, badges and certificates course

This chapter describes how the SAMExperience platform operationalises the SAM competence model through Moodle's course competency framework. It documents the configuration of competencies, their mapping to module activities, and the rules governing module badges and completion certificates. The integration of competencies ensures that the digital platform aligns with the pedagogical framework defined in WP2 and WP3, allowing learning outcomes to be explicitly defined, tracked, and recognised throughout the programme.

Competence Model for the SAMExperience Programme

The SAM competence model covers the four phases of alliance creation (Focus, Create, Manage, Sustain) and includes transversal capacities such as systems thinking, strategic vision, circular collaboration, conflict management, interpersonal communication, adaptive leadership, and sustainability values. For A3.6, these competencies were translated into Moodle course competencies, allowing:

- explicit alignment between learning outcomes and activities
- structured tracking of learner progress at module and programme level
- automated generation of completion outcomes in summative tasks
- and standardised evaluation across the consortium

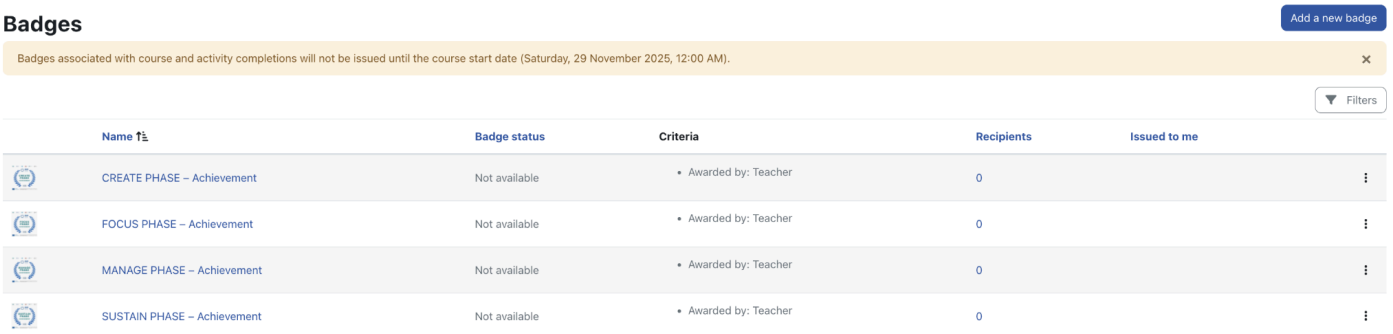


Figure 1.1. Moodle platform badges overview.

The entire framework of competencies will be fully integrated in Moodle, as defined in the next workpackage (WP4) with:

- a description aligned to WP2 outputs
- a taxonomy level (e.g., understanding, application, integration),
- and a set of linked activities across modules.

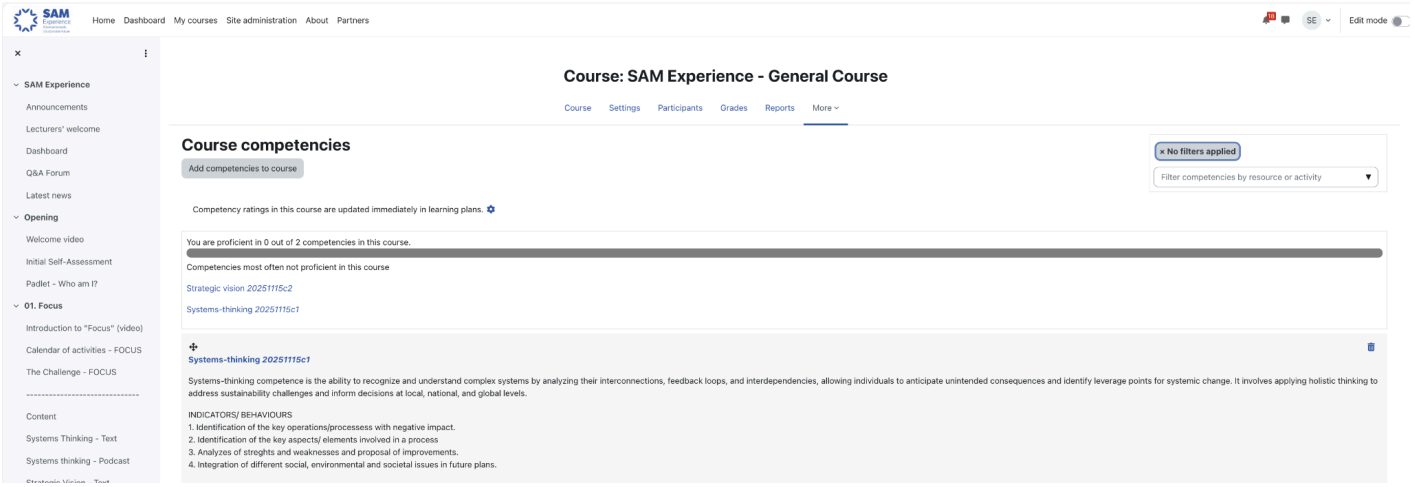


Figure 3.2. Moodle platform competences overview.

Completion Criteria per module & course

Each module has defined completion conditions, like:

- completion of all quizzes (minimum grade 5/10 where required)
- completion of both forum reflections (Focus, Manage, Sustain)
- completion of the “Answering the Challenge” task
- all mandatory activities are marked as completed, and the summative challenge is submitted.

For each completion activity at the level of modules, learners can achieve module-level badges, visibility of the next module (optional enforcement) and access to the Global Challenge after completing all four modules. Each badge uses SAMExperience branding and Erasmus+ visibility requirements. On the other hand, certificates are managed using the custom certificate plugin.

This chapter describes the pedagogical and technical organisation of the SAM EXPERIENCE prototype developed in this activity. It explains how the conceptual model from raw materials was transformed into a coherent digital learning pathway, implemented in Moodle as a fully operational prototype of one competence module. The prototype demonstrates the instructional design, sequencing, multimodal content, and assessment model that will later be scaled to the full SAM EXPERIENCE full platform.

The complete structure of the FOCUS module was developed as the reference model. The FOCUS module integrates all methodological principles, learning phases, technical configurations, and assessment mechanisms that will characterise the final platform. Its architecture serves as the template for the remaining modules (Create, Manage, Sustain) to be finalised in the last part.

Technical implementation and integrations - final state

This chapter describes the final technical configuration of the SAMExperience platform, including software stack, plugin integration, and performance/security measures.

As stated in A3.3 the SAMExperience platform is hosted at the West University of Timișoara (UVT), Faculty of Mathematics and Computer Science, on an OpenStack virtual machine.

Table. 4.1. Hosting Environment.

Parameter	Specification
Operating System	Ubuntu Server 22.04 LTS
Moodle Version	Moodle 4.5.1 (customized)
CPU	4 vCores
RAM	16 GB
Storage	100 GB SSD
Database	MariaDB 8.0.43
Web Server	Apache HTTP Server
Security	HTTPS (Let's Encrypt SSL), UFW Firewall, Fail2ban
Backup Policy	Incremental backup (cron job) + 2 full backups
Accessibility Compliance	WCAG 2.1 AA compatible
Multilingual Support	Moodle default plugin
Backup	At 2 months + 2 full backups

The infrastructure supports scaling (CPU, RAM, storage) depending on the number of learners in future editions. A full list of installed plugins, their version numbers and their pedagogical roles is provided in Table 5.2.

Table. 4.2. Moodle plugins installed and purpose.

Plugin / Feature	Type	Functionality / Purpose	Integration in SAM Platform
H5P Interactive Content	Learning Tool	Enables creation of rich multimedia activities such as quizzes, drag-and-drop exercises, and interactive videos.	Used for self-diagnosis quizzes and formative tasks in each module.
Quiz Module (Core)	Assessment	Provides auto-corrected questions with instant feedback.	Implemented in all modules for knowledge checks.
Forum (Enhanced)	Communication	Facilitates asynchronous discussions, peer feedback, and reflection.	Used in “What Have You Learned?” tasks and peer-evaluation activities.
Assignment Module	Assessment	Allows students to submit text, files, or videos.	Used for “Answering the Challenge” video submissions.
Google Meet	Synchronous Communication	Provides integrated video conferencing inside Moodle.	Used for the kick-off session and optional live mentoring.
Custom Certificate	Certification	Automatically generates course completion certificates with EU and SAM branding.	Issues certificates and badges per module and final course.
Completion Progress Bar	Tracking	Displays visual indicators of learner progress across activities.	Integrated on dashboards and module pages.
Scheduler	Interaction Management	Enables appointment booking between students and teachers.	Optional use for one-on-one mentoring or project feedback.
Feedback Module	Evaluation	Collects student opinions for quality assurance.	Used at the end of each module for learner feedback.
Analytics Graphs Plugin	Data Visualization	Generates charts and statistics for teachers and administrators.	Used to monitor completion rates and quiz performance.

Plugin / Feature	Type	Functionality / Purpose	Integration in SAM Platform
Multilang2 Filter	Localization	Displays multilingual content within the same activity.	Supports multi languages

The plugin ecosystem used in the final course extends the default Moodle setup and supports pedagogical, analytical and administrative functions.

The SAMExperience platform exposes the standard Moodle LMS REST API, described through an OpenAPI 3.1 specification and available at the endpoint /r.php/api/rest/v2. This interface enables controlled programmatic access to platform data and services, such as:

- fetching theme templates and rendering components;
- managing and reading user preferences;
- accessing course and activity information, in accordance with user permissions.

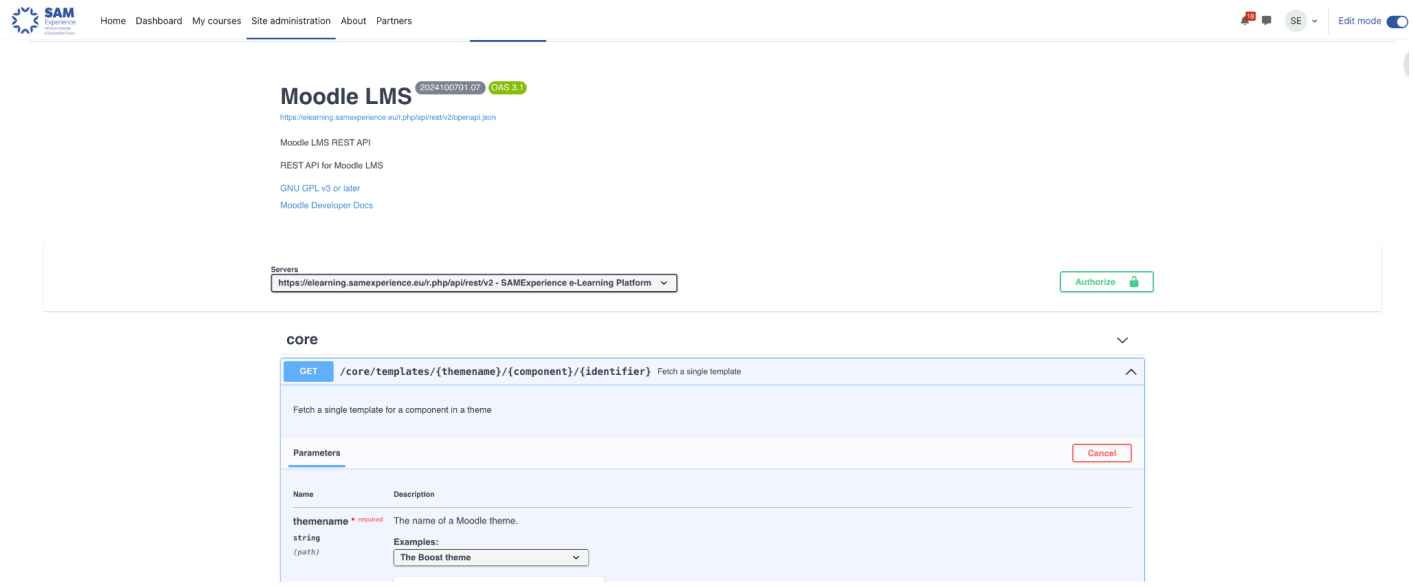


Figure 4.1. Moodle LMS REST API.

The REST API is protected by the same authentication and authorisation mechanisms as the main platform, ensuring that only authenticated clients with appropriate capabilities can access data. The existence of this interface supports future integration with external systems (e.g. institutional dashboards, data warehouses, or additional Erasmus+ platforms) and demonstrates the extensibility of the SAMExperience architecture. The OpenAPI description (Moodle LMS REST API) is provided at the following link: https://elearning.samexperience.eu/r.php/api/rest/v2/openapi.json as evidence of standards-compliant interoperability.

The SAMExperience platform relies on the standard Moodle 4.5.1 core distribution, which includes a set of third-party libraries maintained and tracked through the Site administration - Development - Third party libraries interface. Each external component is listed with its version, installation path and licence, ensuring full transparency and licence compliance. The libraries cover critical functionalities such as: database and data handling (AdoDB, PhpSpreadsheet, OpenSpout), security and authentication (WebAuthn, PHP-JWT, AWS SDK for PHP, CAS), user interface and front-end behaviour (jQuery, jQuery UI, Bootstrap 4.6.2, Font Awesome, Chart.js, VideoJS), content rendering and document generation (TCPDF, Markdown, HTML Purifier, PrismJS, mimeTeX), HTTP and integration layer (GuzzleHttp, PSR HTTP client and message interfaces, Slim Framework, FastRoute) All licences (MIT, BSD 3-Clause, Apache 2.0, LGPL, GPL, etc.) are compatible with Moodle's GNU GPL v3 licence. The list is automatically generated by Moodle and kept up to date with each upgrade, providing a verifiable record for technical and legal audits. A detailed excerpt of the third party libraries is provided in Table 4.3 .

Table. 4.3. Third party libraries installed.

Library	**Version**	**Location**	**Licence**
AdoDB	5.22.7	/lib/adodb/	BSD/LGPL 3-Clause/2.1+
axe-core	4.10.0	/lib/behat/axe/	MPL 2.0
Bennu	0.2-custom	/lib/bennu/	LGPL 2.1+
EvalMath	1.0.1	/lib/evalmath/	BSD
PhpSpreadsheet	1.29.0	/lib/phpspreadsheet/phpspreadsheet/	MIT
Google APIs	1.1.7	/lib/google/	Apache 2.0
HTML Purifier	4.17.0	/lib/htmlpurifier/	LGPL 2.1+
MatthiasMullie\Minify	1.3.73	/lib/minify/matthiasmullie-minify/	MIT
MatthiasMullie\PathConverter	1.1.3	/lib/minify/matthiasmullie-pathconverter/	MIT

Library	Version	Location	Licence
Pear_HTML_Common	1.7	/lib/pear/HTML/Common.php	PHP 2.0
Pear_HTML_QuickForm.php	2.0	/lib/pear/HTML/QuickForm.php	PHP 2.0
Pear_HTML_QuickForm	2.0	/lib/pear/HTML/QuickForm/	PHP 2.0
Pear.php	1.4.5	/lib/pear/PEAR.php	PHP 3.0
PHPMailer	6.9.1	/lib/phpmailer/	LGPL 2.1
SimplePie	1.8.0	/lib/simplepie/	BSD
TCPDF	6.7.5	/lib/tcpdf/	LGPL 3.0-or-later
YUI	3.18.1	/lib/yuilib/	BSD
YUI Gallery	gallery-2013.10.02-20-26	/lib/yuilib/gallery/	BSD
jQuery	3.7.1	/lib/jquery/	MIT
jQuery UI	1.13.2	/lib/jquery/	MIT
HTML2Text	4.3.2	/lib/html2text/	GPL 2.0+
Markdown	2.0.0	/lib/markdown/	BSD
XHProf	2.3.9	/lib/xhprof/	Apache 2.0
RequireJS	2.3.5	/lib/requirejs/	MIT
loglevel.js	1.9.1	/lib/amd/src/loglevel.js	MIT

Library	Version	Location	Licence
Mustache	2.14.2	/lib/mustache/	MIT
Mustache.js	4.2.0	/lib/amd/src/mustache.js	MIT
Graph Class	1.6.3	/lib/graphlib.php	GPL
PHP-CSS-Parser	8.4.0	/lib/php-css-parser/	MIT
RTLCSS for PHP	1.0.1	/lib/rtlcss/	MIT
scssphp	1.12.1	/lib/scssphp/	MIT
OpenSpout	4.23.0	/lib/openspout/	MIT
Chart.js	4.4.2	/lib/amd/src/chartjs-lazy.js	MIT
GeoIP2 PHP API	3.0.0	/lib/maxmind/GeoIp2/	Apache 2.0
MaxMind DB Reader API	1.11.1	/lib/maxmind/MaxMind/	Apache 2.0
LTI Tool Provider Library PHP	3.0.2	/lib/ltiprovider/	Apache 2.0
LTI 1.3 Tool Library	6.0.0	/lib/lti1p3/	Apache 2.0
Truncate.js	0.0.1	/lib/amd/src/truncate.js	MIT
Font Awesome - http://fontawesome.com	6.5.2	/lib/fonts/	SIL OFL 1.1
WebRTC adapter	8.0.0	/lib/amd/src/adapter.js	BSD 3-Clause
validateUrlSyntax		/lib/validateurlsyntax.php	GPL 2.0+

Library	Version	Location	Licence
Popper.js	v1.12.6	/lib/amd/src/popper.js	MIT
Popper.js	v2.11.8	/lib/amd/src/popper2.js	MIT
GeoPattern	1.1.2	/lib/geopattern-php/	MIT
PHP-JWT	6.10.0	/lib/php-jwt/	BSD 3-Clause
regenerator-runtime	0.13.7	/lib/polyfills/	MIT
core-js-bundle	3.15.0	/lib/polyfills/	MIT
mdn-polyfill	5.20.0	/lib/polyfills/	MIT
Emoji data	15.1.2	/lib/emoji-data/	MIT
url-polyfill	1.1.12	/lib/polyfills/	MIT
plist	2.0.3	/lib/plist/	MIT
ZipStream-PHP	3.1.0	/lib/zipstream/	MIT
php-enum	1.8.4	/lib/php-enum/	MIT
container	2.0.2	/lib/psr/container/	MIT
clock	1.0.0	/lib/psr/clock/	MIT
http-client	1.0.3	/lib/psr/http-client/	MIT
http-factory	1.1.0	/lib/psr/http-factory/	MIT

Library	Version	Location	Licence
http-message	2.0.0	/lib/psr/http-message/	MIT
psr/http-server-handler	1.0.2	/lib/psr/http-server-handler/	MIT
psr/http-server-middleware	1.0.2	/lib/psr/http-server-middleware/	MIT
event-dispatcher	1.0.0	/lib/psr/event-dispatcher/	MIT
log	3.0.2	/lib/psr/log/	MIT
simple-cache	3.0.0	/lib/psr/simple-cache/	MIT
phpxmlrpc	4.10.1	/lib/phpxmlrpc/	BSD 3-Clause
GuzzleHttp/Guzzle	7.8.1	/lib/guzzlehttp/guzzle/	MIT
GuzzleHttp/Promises	2.0.2	/lib/guzzlehttp/promises/	MIT
getallheaders polyfill	3.0.3	/lib/ralouphie/getallheaders/	MIT
GuzzleHttp/PSR7	2.6.2	/lib/guzzlehttp/psr7/	MIT
Symfony Deprecation contracts	3.5.0	/lib/symfony/deprecation-contracts/	MIT
Guzzle cache middleware	5.1.0	/lib/guzzlehttp/kevinrob/guzzlecache/	MIT
WebAuthn	2.1.1	/lib/webauthn/src/	MIT
AWS SDK for PHP	3.318.0	/lib/aws-sdk/	Apache 2.0
JMESPath	2.7.0	/lib/jmespath/	MIT

Library	Version	Location	Licence
Serializable Closure	1.3.3	/lib/laravel/serializable-closure/	MIT
PHP Dependency Injector	7.0.6	/lib/php-di/php-di/	MIT
PHP DI Invoker	2.3.4	/lib/php-di/invoker/	MIT
Slim Framework	4.13.0	/lib/slim/	MIT
FastRoute	1.3.0	/lib/nikic/fast-route/	BSD 3-Clause
PHP Cloneable	1.0.2	/lib/spatie/php-cloneable/	MIT
libphonenumber for PHP (Lite)	8.13.31	/lib/giggsey/libphonenumber-for-php-lite/	Apache 2.0
CAS	1.6.1	/auth/cas/CAS/	Apache 2.0
IMS-BLTI	1.0	/enrol/lti/ims-blti/	MIT
Highslide JS	5.0.0	/blocks/analytics_graphs/highslide/	MIT
Highcharts JS	5.0.2	/blocks/analytics_graphs/externalref/	MIT
VideoJS	8.17.3	/media/player/videojs/amd/src/video-lazy.js	Apache 2.0
videojs-youtube	3.0.1	/media/player/videojs/amd/src/Youtube-lazy.js	MIT
VideoJS support files	8.17.3	/media/player/videojs/videojs/	Apache 2.0
ogv.js	1.9.0	/media/player/videojs/amd/src/local/ogv/ogv.js	MIT
ogv.js support files	1.9.0	/media/player/videojs/ogvjs/	MIT

Library	Version	Location	Licence
ogv.js Tech plugin for Video.JS	1.0.0	/media/player/videojs/amd/src/videojs-ogvjs-lazy.js	MIT
WeBWorK	2.4.9+	/filter/algebra/AlgParser.pm	GPL 2.0+
PrismJS	1.29.0	/filter/codehighlighter/amd/src/prism.js	MIT
mimeTeX	1.77	/filter/tex/mimetex.*	GPL 3.0+
Rangy	1.3.1	/lib/editor/atto/yui/src/rangy/js/*.*	MIT
Tiny	6.8.3	/lib/editor/tiny/js/tinymce/	MIT
PHP-ML	0.10.0	/lib/mlbackend/php/phpml/	MIT
S3	0.5.1	/repository/s3/S3.php	BSD
lunr - http://lunrjs.com	2.3.9	/admin/tool/componentlibrary/amd/src/lunr.js	MIT
Roundcube Framework	1.6.6	/admin/tool/messageinbound/roundcube/	GPL 3.0+
jQuery EU Cookie Law popups	1.1.3	/admin/tool/policy/amd/src/jquery-eu-cookie-law-popup.js	MIT
Twitter Bootstrap	4.6.2	/theme/boost/scss/bootstrap/	MIT
bootstrap-alert	4.6.2	/theme/boost/amd/src/bootstrap/alert.js	MIT
bootstrap-button	4.6.2	/theme/boost/amd/src/bootstrap/button.js	MIT
bootstrap-carousel	4.6.2	/theme/boost/amd/src/bootstrap/carousel.js	MIT
bootstrap-collapse	4.6.2	/theme/boost/amd/src/bootstrap/collapse.js	MIT

Library	Version	Location	Licence
bootstrap-dropdown	4.6.2	/theme/boost/amd/src/bootstrap/dropdown.js	MIT
bootstrap-modal	4.6.2	/theme/boost/amd/src/bootstrap/modal.js	MIT
bootstrap-popover	4.6.2	/theme/boost/amd/src/bootstrap/popover.js	MIT
bootstrap-sanitizer	4.6.2	/theme/boost/amd/src/bootstrap/tools/sanitizer.js	MIT
bootstrap-scrollspy	4.6.2	/theme/boost/amd/src/bootstrap/scrollspy.js	MIT
bootstrap-tab	4.6.2	/theme/boost/amd/src/bootstrap/tab.js	MIT
bootstrap-toast	4.6.2	/theme/boost/amd/src/bootstrap/toast.js	MIT
bootstrap-tooltip	4.6.2	/theme/boost/amd/src/bootstrap/tooltip.js	MIT
bootstrap-util	4.6.2	/theme/boost/amd/src/bootstrap/util.js	MIT
bootstrap-util	4.6.2	/theme/boost/amd/src/index.js	MIT
Font Awesome - http://fontawesome.com	6.5.2	/theme/boost/scss/fontawesome/	(MIT)
h5p-php-library	moodle-1.27.0	/h5p/h5plib/v127/joubel/core/	GPL 3.0+
h5p-editor-php-library	moodle-1.27.0	/h5p/h5plib/v127/joubel/editor/	GPL 3.0+
FPDI	2.6.0	/mod/assign/feedback/editpdf/fpdi/	MIT
codemirror	5.65.16	/lib/editor/atto/plugins/html/yui/src/codemirror/	MIT
jsbeautify	1.15.1	/lib/editor/atto/plugins/html/yui/src/beautify/	MIT

Library	Version	Location	Licence
jscolor Color Picker	2.5.2	/lib/editor/tiny/plugins/fontcolor/js/jscolor/	GNU GPL v3
codemirror	6.0.1	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/autocomplete	6.16.0	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/commands	6.5.0	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/lang-css	6.2.1	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/lang-html	6.4.9	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/lang-javascript	6.2.2	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/lang-xml	6.1.0	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/language	6.10.1	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/lint	6.7.1	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/search	6.5.6	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/state	6.4.1	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
codemirror/view	6.26.3	/lib/editor/tiny/plugins/html/amd/src/codemirror-lazy.js	MIT
js-beautify	1.15.1	/lib/editor/tiny/plugins/html/amd/src/beautify/	MIT
OTPHP	11.3.0	/admin/tool/mfa/factor/totp/extlib/OTPHP/	MIT
Constant-Time Encoding	2.1.1	/admin/tool/mfa/factor/totp/extlib/ParagonIE/ConstantTime/	MIT

UX improvements

The UX evaluation conducted in the testing phase highlighted several areas requiring refinement. While students reported high levels of satisfaction with the course structure and content, they also identified challenges including ambiguity in task descriptions, high density of textual content, and varying ease of navigation across devices. Requests for more examples, lecturer participation in forums and clearer guidance for video-based assessments were recurrent across institutions.

In response, the development team implemented a series of evidence-based enhancements. The instructional text for all summative tasks was rewritten with explicit step-by-step guidance. Additional case examples and context updates were integrated to increase authenticity. The layout of modules was simplified to reduce scrolling, while longer texts were broken into manageable segments enhanced with illustrations.

Forum activity prompts were restructured to encourage deeper engagement and to facilitate lecturer intervention where pedagogically appropriate. Technical adjustments were introduced to improve mobile usability.

Feedback from A3.4 led to several optimisations in the final platform. Navigation pathways were simplified, instructions for challenge tasks rewritten for clarity and content reorganised to reduce cognitive load.

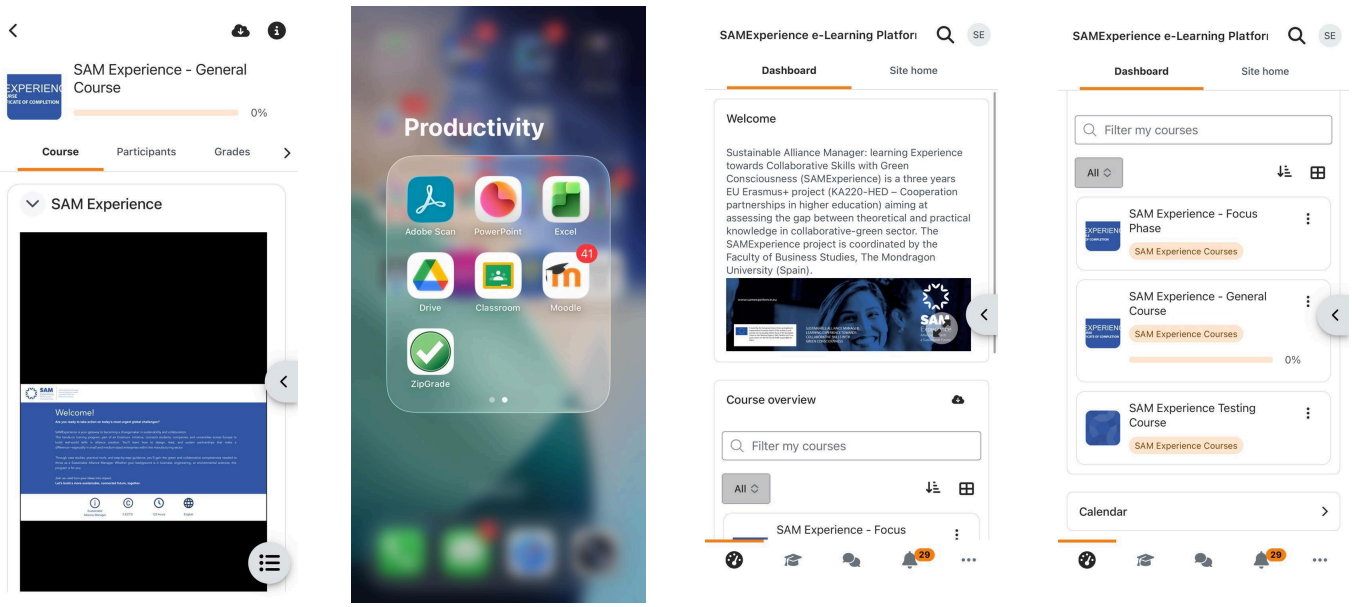


Figure 5.1. Mobile Moodle app access.

Mobile responsiveness was enhanced through spacing adjustments and larger interaction targets. To support learners unfamiliar with Moodle, additional tooltips and orientation messages were introduced. These improvements were evaluated through internal quality checks, confirming significant improvements in navigation fluency and learner confidence.

Preliminary internal monitoring indicates a reduction in navigation errors and fewer support requests regarding task instructions or technical errors. These suggested recommendations alongside the refinements applied in the final version can be measured to strengthen platform usability ahead of WP4.

Administration, monitoring and sustainability

Administrators represented by the UVT team manage enrollment, cohort creation, and role assignment through Moodle's administration interface. The system supports mixed enrolment strategies, including manual enrolment and self-registration with validation. Module visibility is controlled through a schedule aligned with the programme's semi-asynchronous structure. To support the progression model, retake activities are only activated after all four modules are completed. Access to the Global Challenge is automatically granted once the four module badges have been issued.

Teachers and administrators benefit from a comprehensive reporting suite. Activity Completion Reports provide a clear overview of learner progress, while Analytics Graphs and Moodle Logs offer insights into engagement, access patterns and submission behaviour. Gradebook summaries enable performance monitoring at module level and across competencies.

These tools collectively support pedagogical decision-making and ensure traceability for QA and audit purposes. The SAMExperience platform is designed for long-term extensibility. Its modular architecture supports:

- expansion to new learner cohorts,
- replication of the SAM profile in additional programmes,
- integration of new learning content,
- addition of AI-driven analytics or tutoring tools (if any free version),
- multilingual deployment through the Multilang2 plugin.

To ensure the stability, responsiveness, and sustainability of the SAMExperience final digital platform, continuous performance monitoring is carried out using Moodle's built-in diagnostic tools and the infrastructure-level monitoring of UVT's OpenStack environment (Grafana dashboard mounted in the High Performance Computing Center of West University of Timisoara). The Moodle Performance Overview panel provides real-time checks on key configuration parameters that directly influence platform speed, caching efficiency and user experience quality. All checks returned OK, confirming that the platform is configured according to Moodle's recommended production standards:

- Caching is fully enabled (JS, CSS, theme assets).
- Debug/developer modes are disabled in production, preventing slowdowns.
- Automated backups are active but scheduled outside learning hours.
- Statistics and logs are processed efficiently without affecting UX.

- Database schema integrity ensures system consistency and prevents performance anomalies

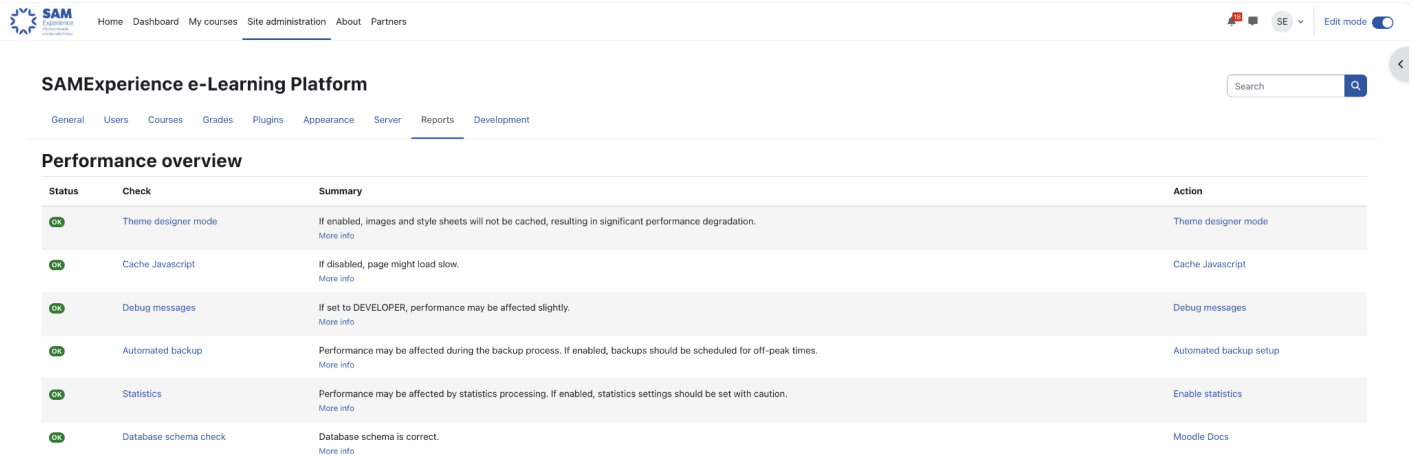


Figure 6.1. Moodle platform performance overview.

Potential future enhancements include developing a teacher manual, integrating adaptive learning pathways, expanding simulations and role-play tasks and incorporating advanced analytics dashboards.

Thus, platform administration is carried out by the UVT team through Moodle's standard administration interface. Three main roles are in place across the SAMExperience course:

- Site administrators (UVT team project) - responsible for system configuration, user provisioning models, plugin management and performance/security settings.
- Course managers / teachers - responsible for course structure, content updates, grading and pedagogical alignment for each module (Focus, Create, Manage, Sustain, Global Challenge).
- Students / learners - participants in the SAM profile, organised in cohorts corresponding to project editions or institutional intakes.

Enrolment and cohort management follow a flexible but controlled model. The platform supports manual enrolment for pilot groups and invited participants and self-registration with email validation via the SAMExperience signup form (/login/signup.php), used when extending the programme to wider audiences.

The SAMExperience platform has been conceived from the outset as a sustainable digital learning environment, not a one-off prototype. Its sustainability is underpinned by:

- Institutional hosting and ownership, while the platform is hosted (VM) and maintained by the West University of Timișoara, through the Faculty of Mathematics and Computer Science and the High

Performance Computing Center. It runs on UVT's OpenStack-based infrastructure, benefiting from institutional backup, security and maintenance procedures.

- Dedicated human resources, like a core project team of UVT is responsible for system updates, plugin maintenance, security patches and configuration adjustments. The UVT project will continue to provide operational support after the end of the project.
- Reusable course architecture, like the modular structure (Focus, Create, Manage, Sustain, Global Challenge, Retake) and the underlying competence model allow the course to be reused with new cohorts, replicated in other programmes, or adapted to different Sustainable Alliance Manager profiles without redesigning the core platform.

In this sense, UVT formally assumes the responsibility to keep the SAMExperience platform online and functional beyond the project's lifetime, ensuring:

- continued access for project partners and future cohorts
- a stable environment for follow-up Erasmus+ or cooperation projects building on the SAM profile.

For technical and administrative matters related to the long-term operation of the SAMExperience platform, the contact point is: Ph.D. Sebastian-Aurelian Stefaniga, Vice Dean of Faculty of Computer Science, e-mail: sebastian.stefaniga@e-uvt.ro, Ph.D. Todor Ivascu - Head of Software Engineering and Digital Technologies Department, e-mail: todor.ivascu@e-uvt.ro, and Ph.D. Adriana Loredana Tanasie - Senior Lecturer at Artificial Intelligence and Computational Sciences Department, e-mail: adriana.tanasie@e-uvt.ro, West University of Timișoara, Romania.

This governance and sustainability framework guarantees that the digital platform developed under SAM Experience Project remains a living resource, capable of supporting continued learning, experimentation and collaboration in the field of sustainable alliance management well beyond the funding period.