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iLed
Innovating Learning Design
in Higher Education

Technical specification of course scaffolding

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EXECUTIVE SUMMARY

The aim of this document is to present the development of course scaffolding that enables alignment between learning design and implementation in Learning Management System. This is related to activity A.2.3.2. Pilot implementation of course scaffolding through four phases: 1. Idea, Concept & Design, 2. Prototyping, 3. Development and 4. Piloting and Upgrade (Figure 1).

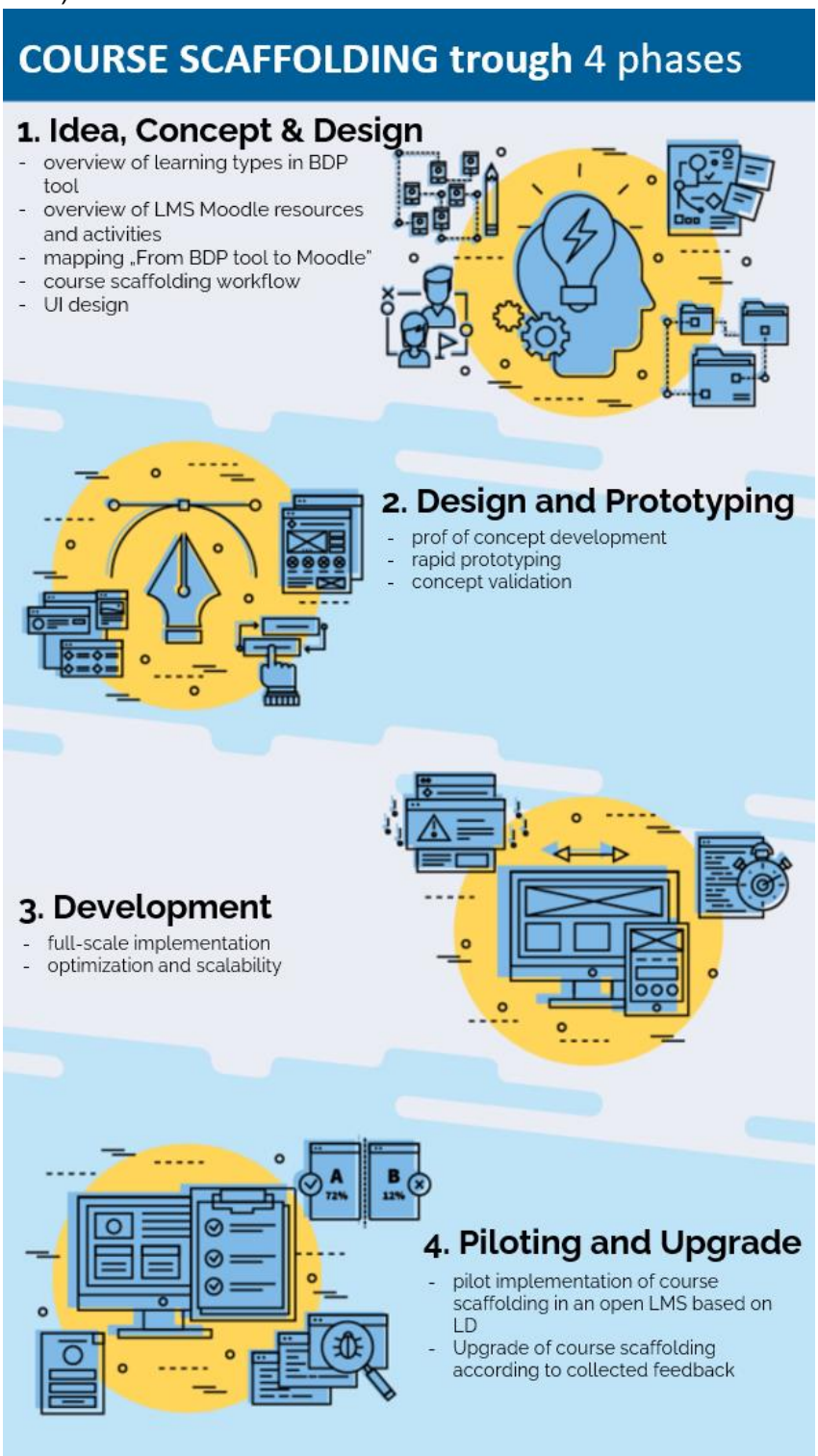


Figure 1: Course scaffolding through 4 phases

1. Idea and Concept

The main idea of activity A.2.3.2. Pilot implementation of course scaffolding is to link the BDP tool and LMS Moodle and ensure that course implementation (e-course structure) is aligned with learning design prepared within BDP tool. For that purpose, within this phase will be given overview of learning types in BDP tool and resources and activities in LMS Moodle to ensure proper matching. The technology ecosystem supporting implementation of course scaffolding consists of Balanced Design Planning (BDP, available at learning-design.eu) and Learning Management System (LMS) Moodle.

Overview of learning types in BDP tool

Definition:
Learning Design is the framework that supports learning experiences. It refers to deliberate choices about what, when, where and how to teach. Decisions need to be made about the content, structure, timing, pedagogical strategies, sequence of learning activities, and the type and frequency of assessment in the course, as well as the nature of technology used to support learning.
There are several learning types (each activity can have only one learning type associated) defined in the BDP tool.

Learning types:

- **Acquisition** - Learning through acquisition is what learners are doing when they are listening to a lecture or podcast, reading from books or websites, and watching demos or videos.
- **Discussion** - Learning through discussion requires the learner to articulate their ideas and questions, and to challenge and respond to the ideas and questions from the teacher, and/or from their peers.
- **Investigation** - Learning through investigation guides the learner to explore, compare and critique the texts, documents and resources that reflect the concepts and ideas being taught.
- **Practice** - Learning through practice enables the learner to adapt their actions to the task goal, and use the feedback to improve their next action. Feedback may come from self-reflection, from peers, from the teacher, or from the activity itself.
- **Production** - Learning through production is the way the teacher motivates the learner to consolidate what they have learned by articulating their current conceptual understanding and how they used it in practice.
- **Assessment** - Use this category to allocate time to activities which are directly assessed, either by a tutor, a peer or a computer. Assessment includes both formative and summative assessment.

Overview of LMS Moodle resources and activities

Moodle is a free, online Learning Management system enabling educators to create their own private website filled with dynamic courses that extend learning, any time, anywhere.
General features:

- Modern, easy to use interface

- Personalised My course page
- See-at-a-glance Timeline
- Collaborative tools and activities
- Convenient file management
- Simple and intuitive text editors
- Notifications
- Track progress

Moodle activities:

- **BigBlueButton** - Run live video conferencing sessions within Moodle
- **Chat** - Allows participants to have a real-time synchronous discussion
- **Choice** - A teacher asks a question and specifies a choice of multiple responses
- **Database** - Enables participants to create, maintain and search a bank of record entries
- **Feedback** - For creating and conducting surveys to collect feedback.
- **Forum** - Allows participants to have asynchronous discussions
- **H5P activity** - Enables H5P content created in the Content bank or on h5p.com or with the lumi App to be easily added to a course as an activity.
- **Lesson** - For delivering content in flexible ways
- **LTI External tool activity** - Allows participants to interact with LTI compliant learning resources and activities on other web sites.
- **Workshop** - Enables peer assessment
- **Glossary** - Enables participants to create and maintain a list of definitions, like a dictionary
- **Quiz** - Allows the teacher to design and set quiz tests, which may be automatically marked and feedback and/or to correct answers shown
- **Wiki** - A collection of web pages that anyone can add to or edit
- **Assignment** - Enable teachers to grade and give comments on uploaded files and assignments created on and off line
- **SCORM** - Enables SCORM packages to be included as course content
- **Survey** - For gathering data from students to help teachers learn about their class and reflect on their own teaching
- **Workshop** - Enables peer assessment

Moodle resources:

- **Book** - Multi-page resources with a book-like format. Teachers can export their Books as IMS CP (admin must allow teacher role to export IMS)
- **File** - A picture, a pdf document, a spreadsheet, a sound file, a video file
- **Folder** - For helping organize files and one folder may contain other folders
- **IMS content package** - Add static material from other sources in the standard IMS content package format
- **Page** - The student sees a single, scrollable screen that a teacher creates with the robust HTML editor
- **Text and media area** - Can be a few displayed words or an image used to separate resources and activities in a topic section, or can be a lengthy description or instructions
- **URL** - You can send the student to any place they can reach on their web browser, for example Wikipedia

Mapping “From BDP tool to Moodle”

Following the overview of learning types in BDP tool and resources and activities in LMS Moodle, we performed mapping from BDP tool to Moodle. For each learning type it is defined with which activities or resources can be implemented in LMS Moodle to ensure achievement of learning outcomes. We recommended for each learning type first option but can be implemented through various activities and resources (appropriate choice). Figure 1 represents Mapping “From BDP tool to Moodle”.

	Acquisition	Discussion	Investigation	Practice	Production	Assessment
ACTIVITIES						
BigBlueButton	X	X				
Chat		X	X			
Database		X	X		X	X
Forum		X	X		X	X
H5P activity	X					X
Lesson	X					
Workshop			X	X	X	X
Glossary	X					X
Quiz				X		X
Wiki	X		X		X	
Assignment			X	X	X	X
RESOURCES						
File	X					
Book	X					
Folder	X					
Text and media area						
URL	X					
Page	X					

RECCOMENDED *(first option)*

Figure 1. Mapping “From BDP tool to Moodle”

Course scaffolding workflow

Course scaffolding workflow is designed as three-step (Figure 2). The first and second steps take place in BDP tool while third step take place in LMS Moodle. First step refers to learning design in BDP tool – defining learning outcomes, topics, units and teaching and learning activities (TLA). The second step refers to export to Moodle including course configuration, that is defining appropriate resources and activities for each TLA implementation and download of Moodle course backup. The third step refers to creation of e-course in Moodle according to defined learning design (restore).

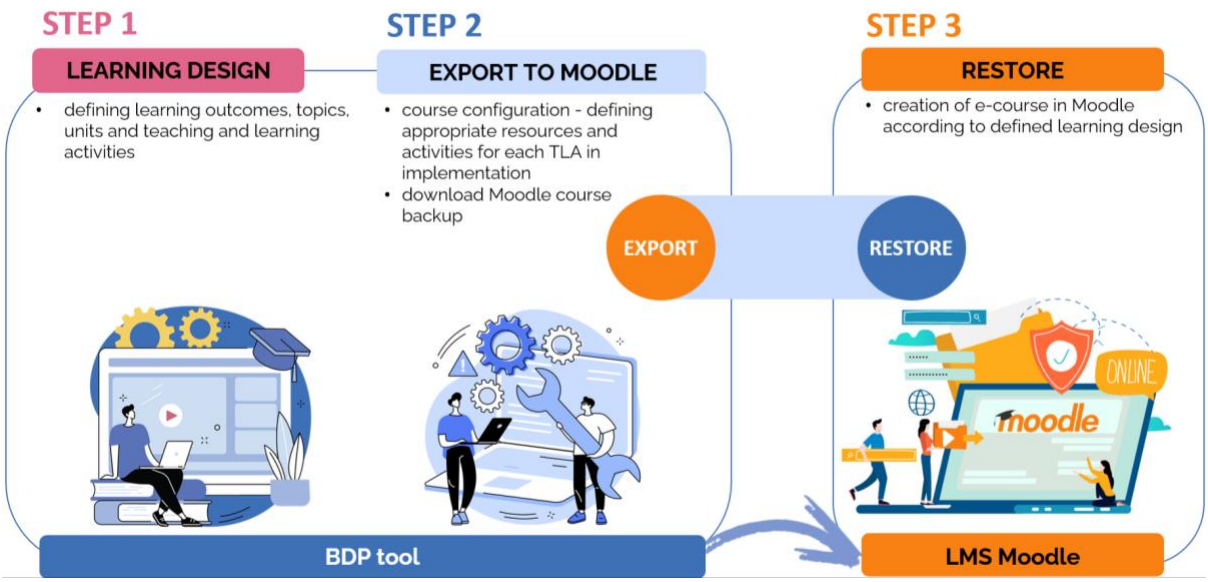


Figure 2. Course scaffolding workflow

STEP 1 - Learning design

As already mentioned, the first step of course scaffolding is learning design (in BDP tool). It consists of several steps as presented in figure 3: 1. Defining course details (such as: ECTS credits, number of learners, mode of delivery, level of planning, learning outcomes). 2. Planning (defining topics, units and TLA), 3. Analysis of prepared learning design and 4. Update of learning design according to analysis of workload, assessment and learning outcomes and constructive alignment.

It is important to mention that sound learning design is a precondition for effective course implementation and achievement of learning outcomes. Thus, it is important that learning design is completed before you start with the next step (course configuration).

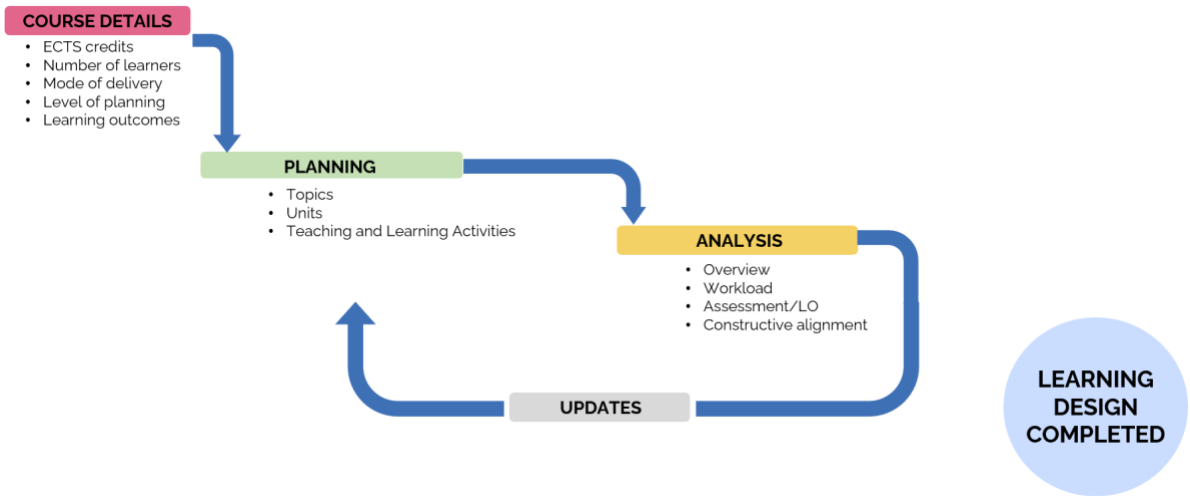


Figure 3. Step 1 - Learning design

STEP 2 - Export to Moodle - Course configuration and download of Moodle course backup

After successful completion of course learning design, within BDP tool it is necessary to perform following steps to transform learning design into e-course structure (Figure 4).

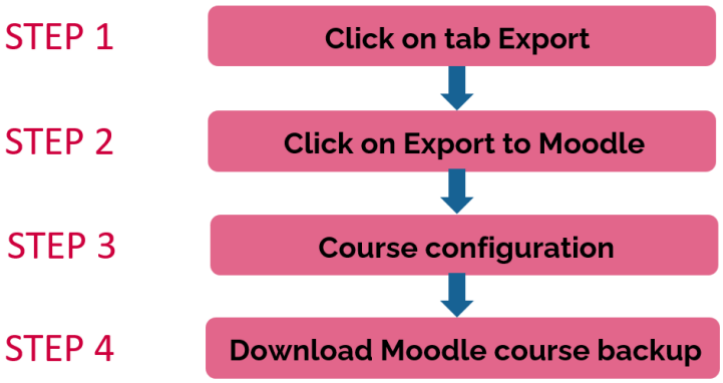


Figure 4. Workflow – Export to Moodle

First, click at Export tab and select “To Moodle” (Figure 5).

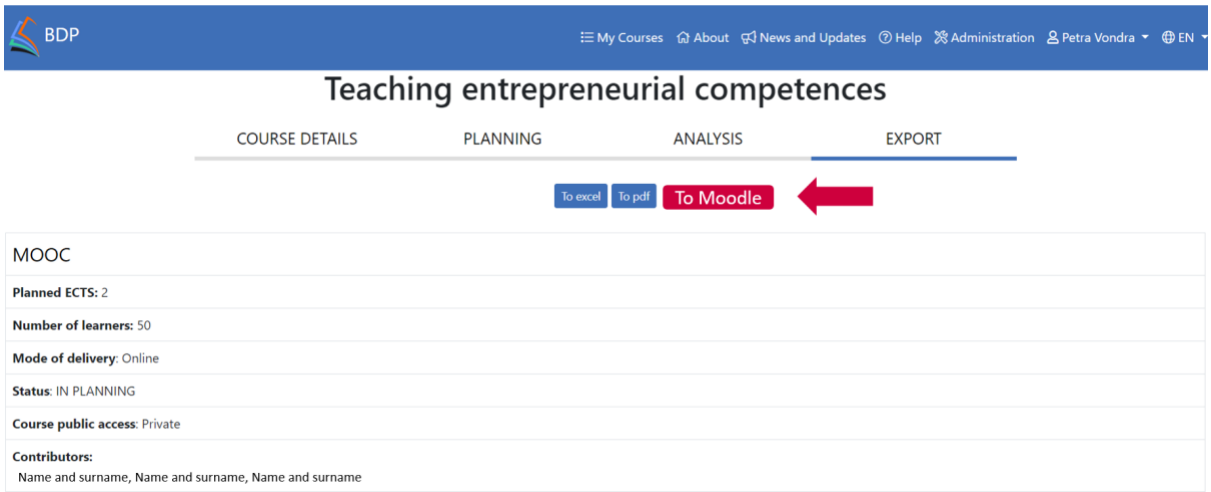


Figure 5. Export to Moodle

Course configuration enables to teachers/instructional designers/learning designers defining/selecting the most appropriates resources and activities in implementation for each Teaching and Learning Activity.

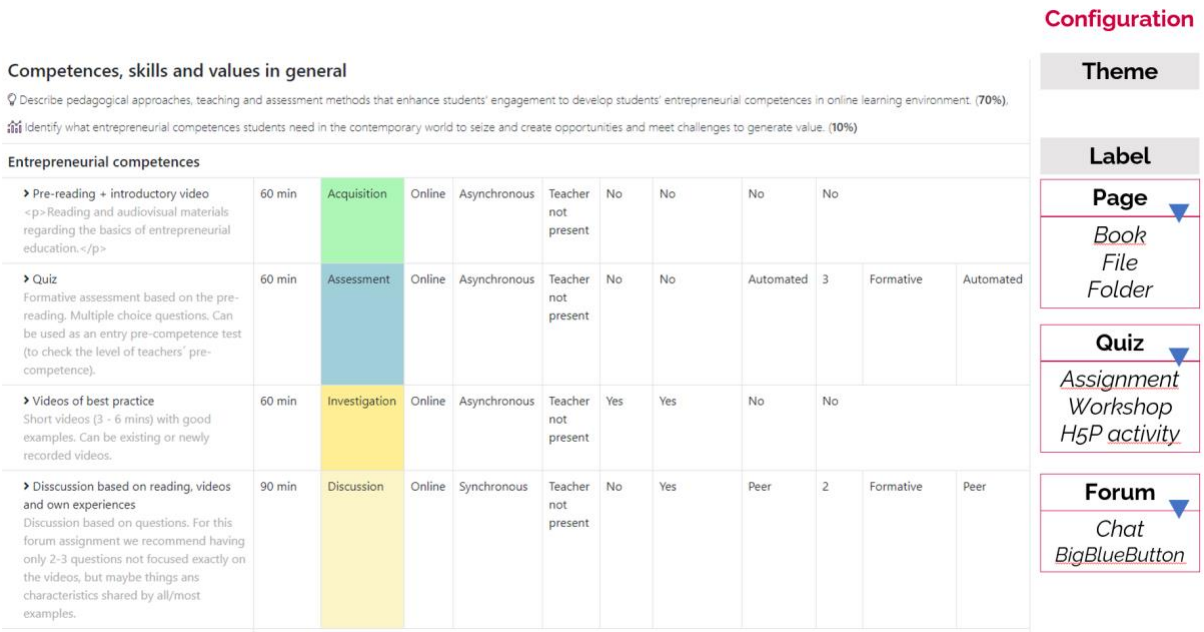


Figure 6. Concept of Course configuration page in BDP tool (Step 2)

When you finished with course configuration you can download Moodle course backup (Figure 7).

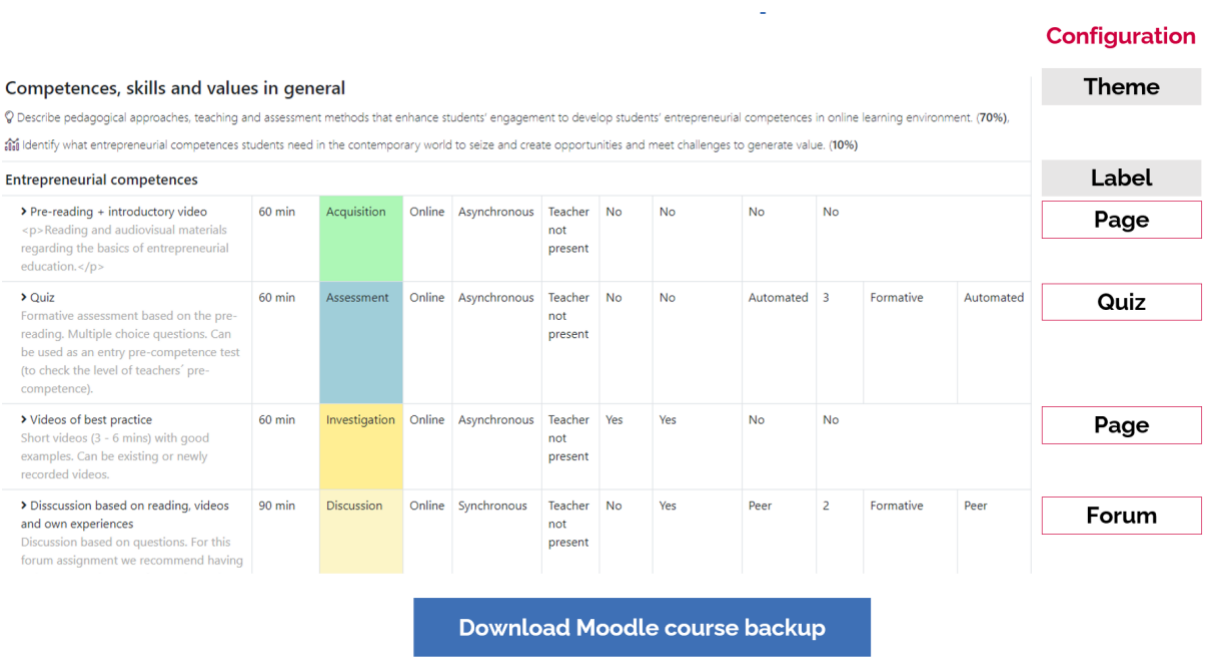


Figure 7. Download Moodle course backup (Step 2)

STEP 3 - Restore in Moodle

Following the downloaded Moodle course backup you can access to it restore in LMS Moodle. Restore referes to creation of e-course in Moodle according to prepared learning design and selected resources and activities for TLA. It consists of following steps: 1. LMS administrator creates a blank e-course, 2. User selects course restore option under course Reuse, 3. Import a backup file and 4. finish restore procedure.

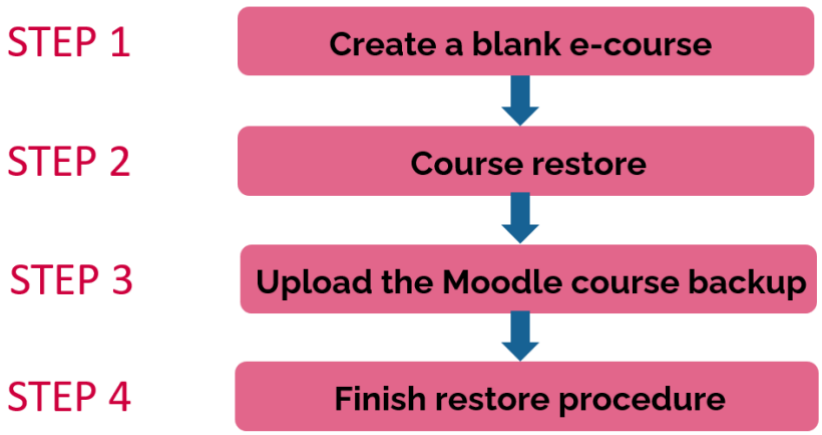


Figure 8: Workflow - Restore in Moodle

Use Interface design

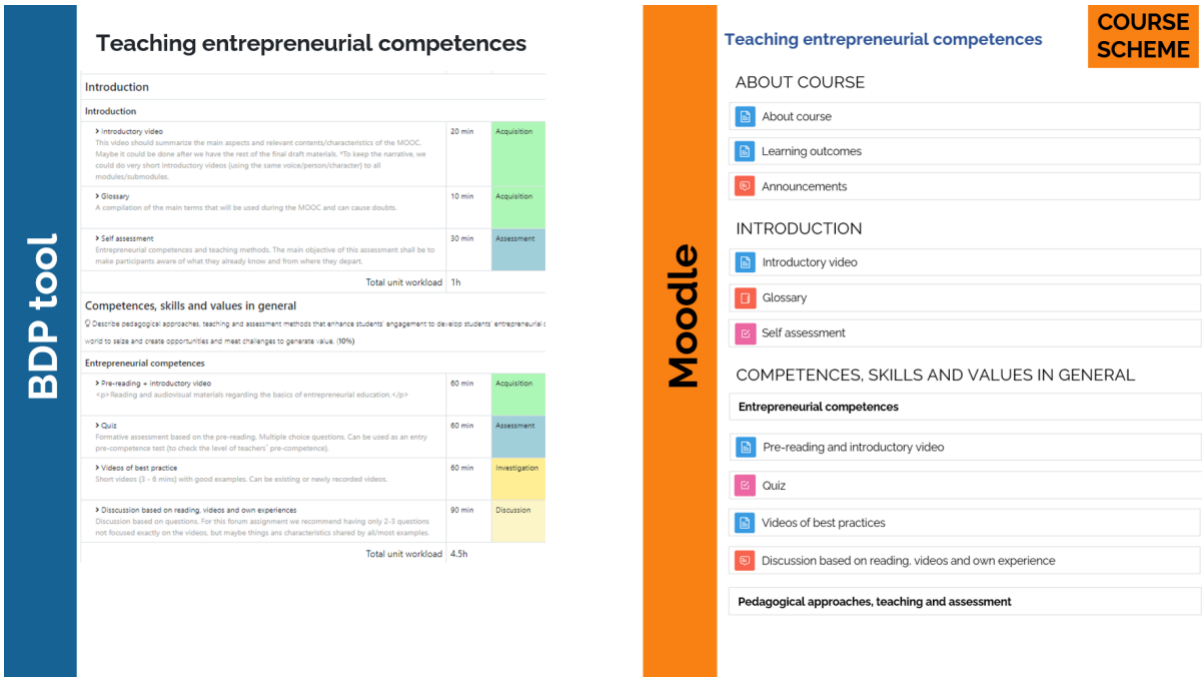


Figure 9: Alignment of learning design (BDP) and e-course (LMS Moodle)

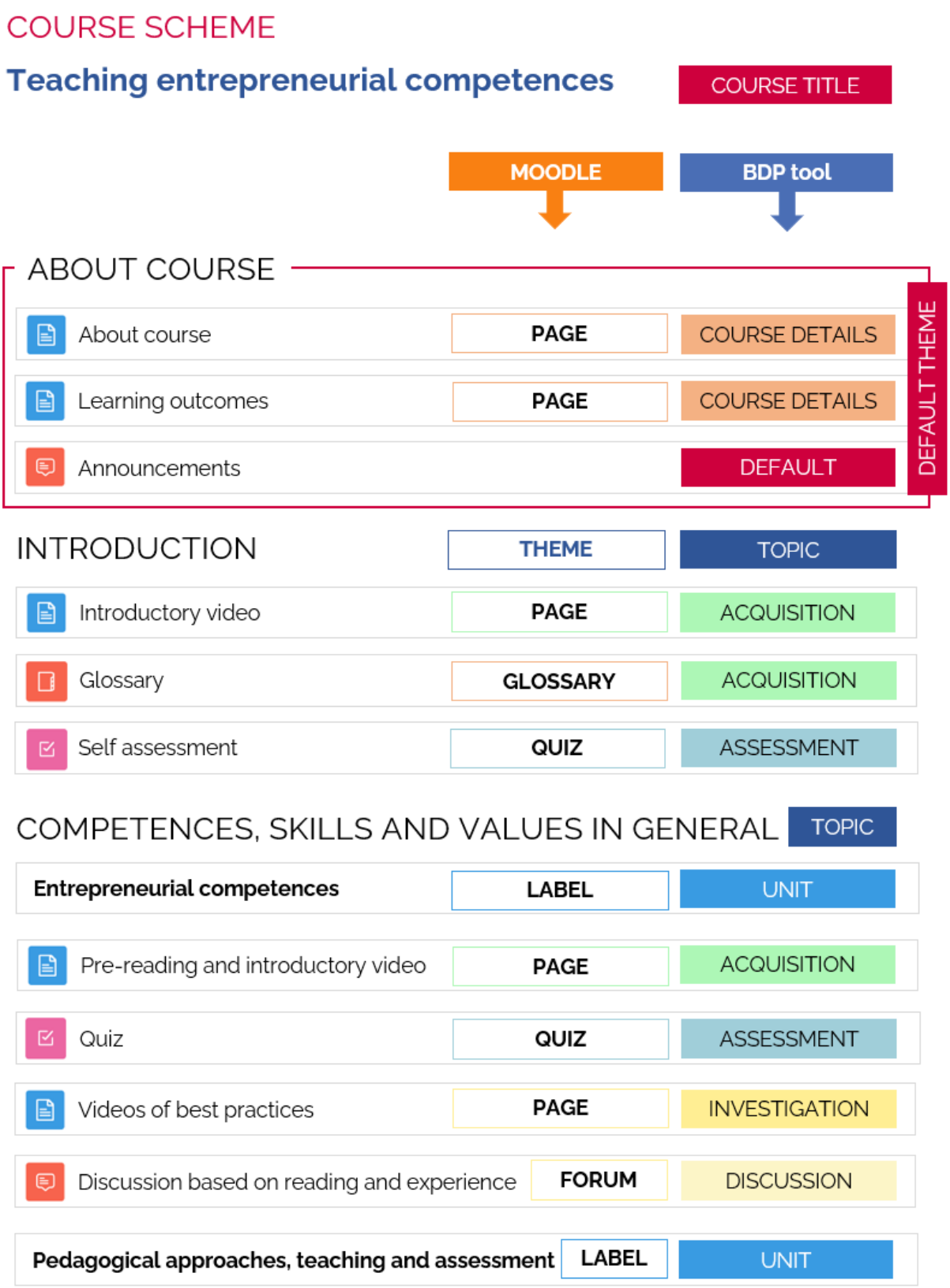


Figure 10: Alignment of learning types (BDP) and resources/activities in e-course (LMS Moodle)

Page: About course

Reccomended structure:

- Introductory video
- About course (description)
- Instructors

Course info BDP COURSE DETAILS

Expected workload
25 hours

Mode of delivery
Blended

No of learners
50

Enrollment
Free with access key

Figure 11. Design of “About course” page

Page: Learning outcomes

BDP COURSE DETAILS

- Describe pedagogical approaches, teaching and assessment methods that enhance students' engagement to develop students' entrepreneurial competences in online learning environment.
  Level: Understanding Weight: 10
- Identify what entrepreneurial competences students need in the contemporary world to seize and create opportunities and meet challenges to generate value.
  Level: Analysing Weight: 15
- Identify relevant pedagogical approaches to support students to analyse the impacts of ideas, opportunities, actions, created values and ethical implications in the selected real-world environment.
  Level: Analysing Weight: 15
- Use appropriate technology to support sound pedagogical approaches that contribute to the development of students' entrepreneurial and problem-solving skills.
  Level: Applying Weight: 10
- Evaluate individual and group strengths and weaknesses of students and staff regarding hybrid and digital teaching and learning about entrepreneurial competences.
  Level: Evaluating Weight: 10
- Create interactive learning designs and sessions developing students' entrepreneurial competences, minding students' pre-competence, available resources and pedagogical techniques that enhance students' engagement and motivation.
  Level: Creating Weight: 20

Figure 12. Design of “Learning outcomes” page

2. Prototyping

The Prototyping phase is a crucial stage in the software development lifecycle aimed at validating the feasibility of a proposed solution. The primary objective of this phase was to build a minimal viable product (MVP) or prototype to demonstrate the core functionalities and technical viability of the concept.

Prof of concept development

In this phase, the first prototype of the export functionality was developed. In order to be able to create Moodle backup file, we have consulted Moodle developer documentation and analyzed various examples of Moodle course backups. Based on this analysis, the first prototype was developed that allowed transfer of basic structure from BDP tool (Topics and Units) to Moodle course. At this stage none of the Teaching and Learning activities where transferred to corresponding Moodle activities or resources.

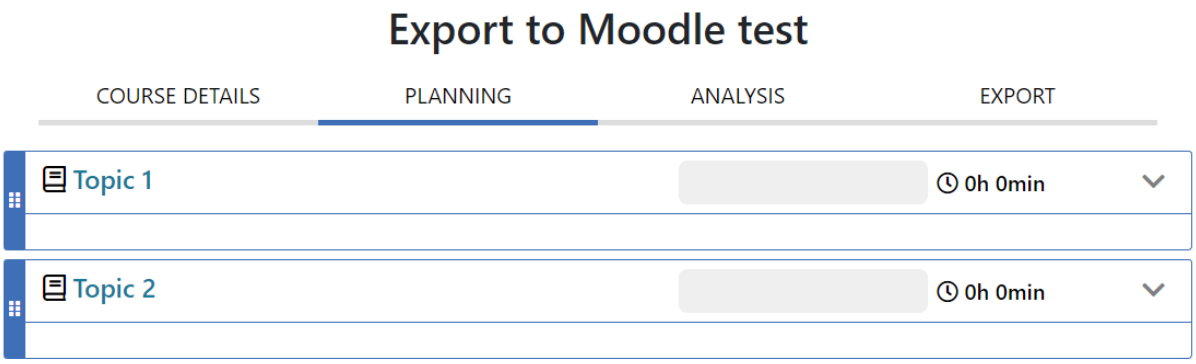


Figure 13. Learning design

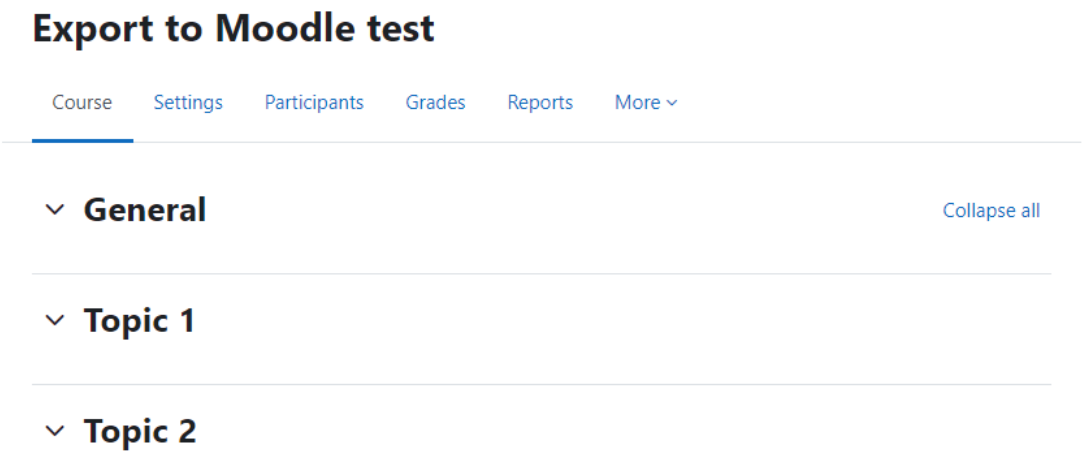


Figure 14. Course in Moodle

This first phase proved that the planned concept is sound and that we can proceed with further development of export functionality.

Rapid prototyping

During this phase, several iterations of the prototype were developed to explore various design ideas, validate assumptions, and gather feedback from potential users.

In this stage MVP was further developed which allowed us to create first to simplest resources in Moodle (Page and Label) from our Learning Design.

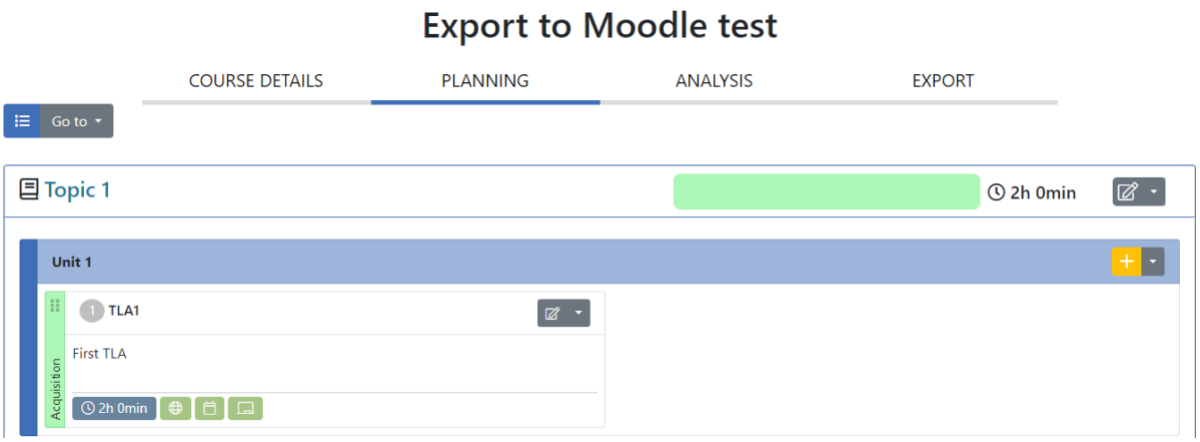


Figure 15. Learning design

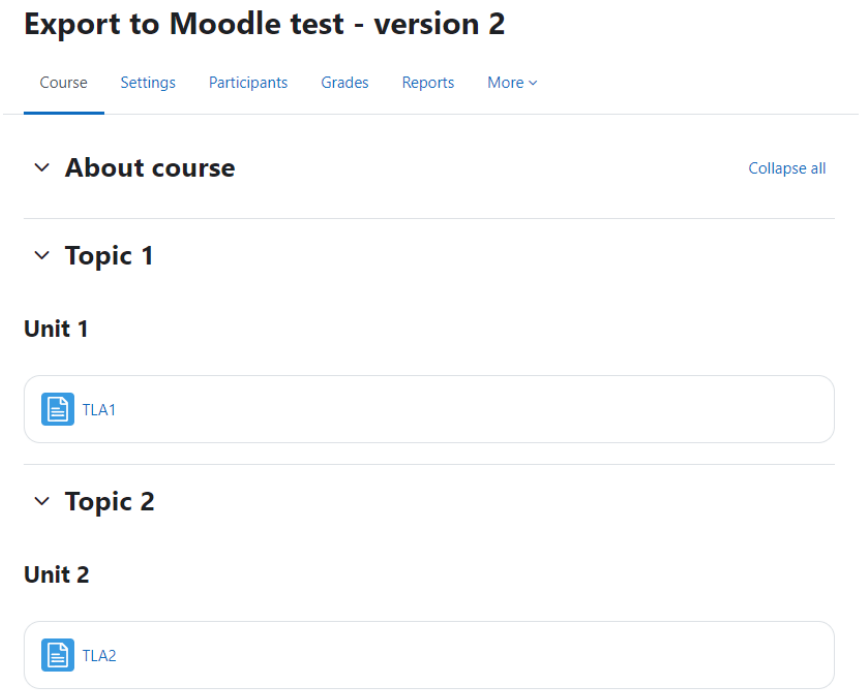


Figure 16. Course in Moodle

Concept validation

Based on the previous 2 phases, final technical development specification for export module was developed. At this stage, final specific requirements, functionalities, and technical details were defined.

3. Development

The Development phase, succeeding the Prototype phase, marks the transition from conceptualization to tangible realization of the software solution. The entire development phase was done by using an agile approach, which allowed us continuous feedback loops and adaptability to evolving project needs.

Full-scale implementation

At this stage we have started development of the final product based on the validated prototype, leveraging insights gained during the prototype phase to guide the development process. Based on lessons learned and detailed technical insights gained during the previous phase, we have started working on final export module functionality that will allow us to transfer content from learning design to Moodle using all appropriate resources and activities as outlined in section 1.2. Mapping “From BDP tool to Moodle”.

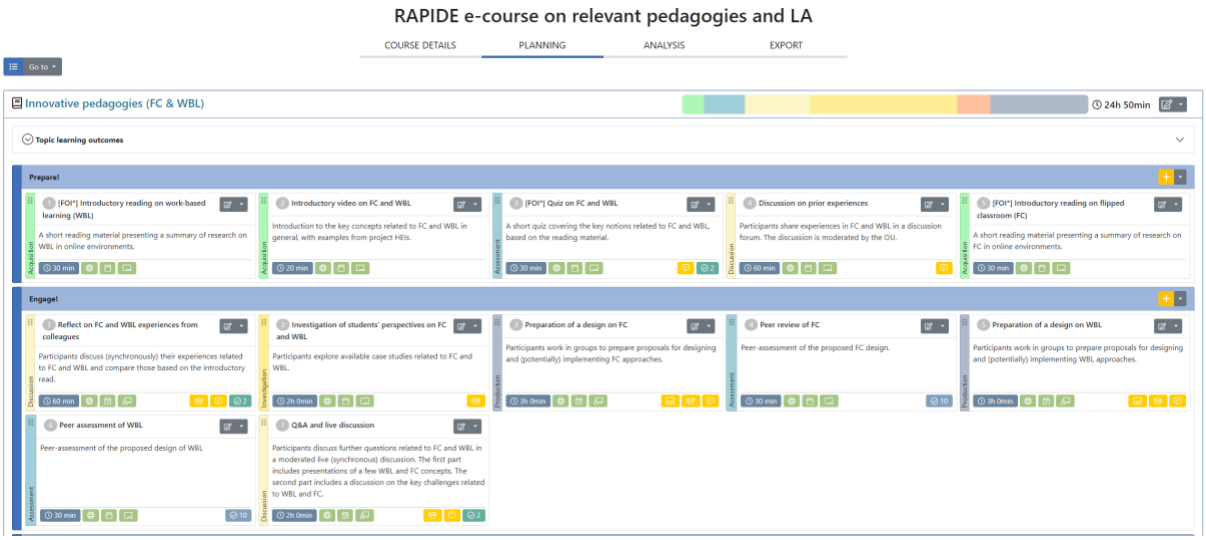
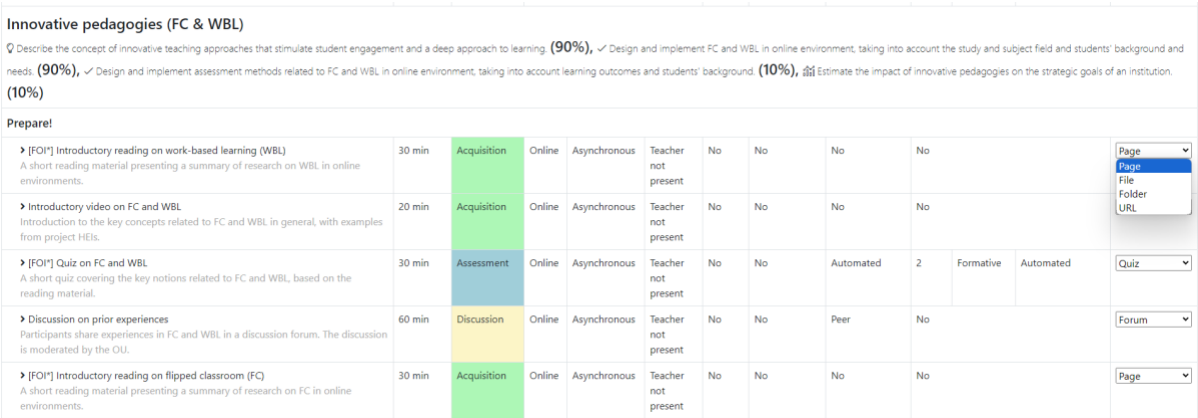


Figure 17. Learning design



Innovative pedagogies (FC & WBL)

Describe the concept of innovative teaching approaches that stimulate student engagement and a deep approach to learning. (90%), ✓ Design and implement FC and WBL in online environment, taking into account the study and subject field and students' background and needs (90%), ✓ Design and implement assessment methods related to FC and WBL in online environment, taking into account learning outcomes and students' background. (10%), Estimate the impact of innovative pedagogies on the strategic goals of an institution. (10%)

Prepare!

[FOI*] Introductory reading on work-based learning (WBL) A short reading material presenting a summary of research on WBL in online environments.	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No			Page (Page, File, Folder, URL)
Introductory video on FC and WBL Introduction to the key concepts related to FC and WBL in general, with examples from project HEIs.	20 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No			
[FOI*] Quiz on FC and WBL A short quiz covering the key notions related to FC and WBL, based on the reading material.	30 min	Assessment	Online	Asynchronous	Teacher not present	No	No	Automated	2	Formative	Automated	Quiz
Discussion on prior experiences Participants share experiences in FC and WBL in a discussion forum. The discussion is moderated by the OU.	60 min	Discussion	Online	Asynchronous	Teacher not present	No	No	Peer	No			Forum
[FOI*] Introductory reading on flipped classroom (FC) A short reading material presenting a summary of research on FC in online environments.	30 min	Acquisition	Online	Asynchronous	Teacher not present	No	No	No	No			Page

Figure 18. Export to Moodle configuration

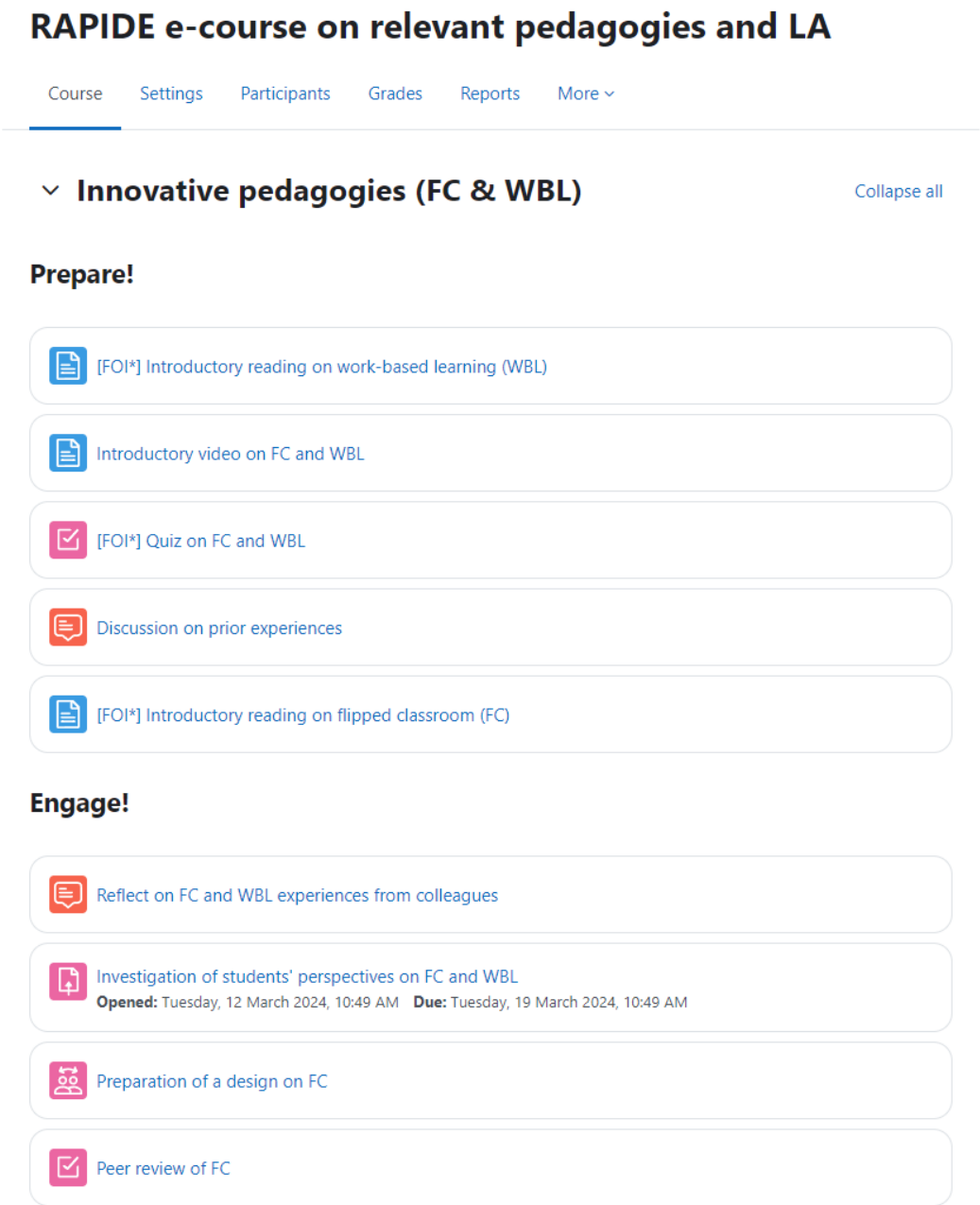


Figure 19. Course in Moodle

Optimization and scalability

At this, final stage of the development, focus was on optimizing code efficiency, performance, and scalability to ensure the product meets quality standards and can accommodate future growth and expansion. At this stage, we have made final changes to code base that will ensure that export functionality is easy to maintain and adaptable to future needs.