

# ACADEMIAUP: EMPOWERING DISTANCE EDUCATION AT UNIVERSITY OF PORTO

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## Abstract

In recent years, there has been a growing demand for online. University of Porto (U.Porto), established an unit of Educational Technologies 20 years ago and after an accumulated experience in providing an Learning Management Systems (LMS) to support face-to-face teaching and learning (T&L), in 2016, the U.Porto developed AcademiaUP, a portal and a LMS platform for the delivery of e-learning and blended learning courses.

Based on LMS Moodle, AcademiaUP considers the specificities of deployment and creation of distance education contents and materials, as well as the target audience characteristics. Moodle was chosen because our acquired experience but also for its maturity, for being open source and fully customizable and for a large support community.

AcademiaUP, has an extensively customized interface and technical infrastructure. It integrates with external tools, BigBlueButton to better respond to synchronous online communication and Panopto for lecture capture and video production. AcademiaUP uses new plugins and a new theme to improve usability and enable a more suitable navigation for formal and non-formal T&L environments - sequential content delivery and contextual presentation of activities and resources. When designing the new LMS for AcademiaUP we were inspired in Coursera Massive Open Online Courses (MOOC) approach for the marketing of the courses and in Open2Study for the delivering of the courses. All changes, however, avoided altering Moodle's core code, allowing for easier upgrades whenever newer Moodle versions are available.

For the future, we intend to integrate AcademiaUP with the University information system to improve consistency of courses and users essential to accreditation procedures and quality assurance.

Keywords: Distance learning, e-learning, blended learning, Moodle, AcademiaUP.

## 1 INTRODUCTION

For the past 20 years, the Educational Technologies unit (ETU) of the University of Porto (U.Porto) has been responsible for managing a Learning Management System (LMS) to support face-to-face classes on graduated cycles of study. In the last years, benefiting from the Educational Technologies unit experience and structure, some Continuing Education courses based on a blended-learning model started to arise. These courses were delivered in Moodle U.Porto the closed LMS used by F2F courses. Soon it became obvious that the platform designed to host the granting degrees' courses did not fully meet the requirements of distance learning, not only because of technical issues but also because of the lack of visibility those courses were having for the general public.

We could see a demand for courses in the Portuguese language by overseas communities and Portuguese-speaking African countries, but only recently we noticed a significant growth in demand for online courses in general. In 2016, the ETU began working on the definition of a technical strategy for the development of distance education at U.Porto. AcademiaUP was born from that strategy, a portal and a platform designed to meet the needs of distance learning and its particularities, making the individual a whole. A highly customized environment dedicated to Lifelong Learning courses taught in an e-learning or blended-learning model.

In this paper, we will present the most significant challenges from design to deployment and first results of running the AcademiaUP pilot.

## 2 METHODOLOGY

Defining a technical strategy for the development of distance education at U.Porto was a priority for the ETU. It was strategic for the U.Porto to position itself as a reference in the distance learning scenario, taking as main goals:

- provide a flexible, accessible and certified education;
- shorten the distance between university and society;
- attract new audiences, specially professionals in the labour market;
- respond to the frequent demand for online courses from Portuguese-speaking countries;
- increase the visibility of the University nationally and internationally;
- constitute a quality offer of distance education in Portuguese;
- and generate own revenues.

To create a catalogue of the University's distance learning courses, a single environment where each faculty could present what it has to offer but also a LMS where all the courses are delivered, has emerged from this strategy. The name defined for this new environment dedicated only to distance learning at U.Porto would be AcademiaUP. We would like to emphasize that is not a future goal of U.Porto to become a distance learning University, our focus is only related to LLL courses in a short to medium time span.

Step one was to outline most of the requirements for the intended online learning environment and for that a significant number of brainstorming meetings were made with some continuing education offices of the University. At the moment in U.Porto there is no regulation for distance education and each continuing education office has its own procedures, gather all the specifications and trying to make them all converge into common objective has been, and continues to be, a difficult task.

Step two, inspired by some well known commercial platforms, namely, Coursera and Open2Study, whose evolution and online teaching method we have been following and study over the last years, we started with the development of some of the most important features, like navigation. Technological options could be validated and we could estimate efforts quickly. Deployment was immediately done, first in a test server, where new developments were implemented so that feedback was given frequently and new requirements could arise and be quickly implemented. An iterative development based on Agile development methodologies [1] was naturally adopted.

Although the steps mentioned were taken in an iterative manner we will here introduce each phase separately: requirements, design, development and deployment, and finally running the pilot.

### 2.1 Requirements

A list of requirements for the AcademiaUP portal interface was outlined:

- There should be a showcase with all U.Porto distance learning courses and each faculty should have the opportunity to present separately their own courses;
- Each course should have a public syllabus, providing detailed information about the course and the registration process. The information should be presented in a standardized interface, thus ensuring consistency in the presentation format of the courses to the general public;
- There should be a search tool so users can find their courses;
- On the entrance page the public coming to the portal should be able to immediately understand which courses are open for registration, which ones are already in progress or closed;
- The courses organization should be unattached from the academic year.

On courses context, some requirements were also defined for the platform:

- Navigation should be simple, allowing “sequential” or “modular” study content delivery;
- A lecture capture should be integrated to allow teachers to easily produce and publish video contents on the course;

- A web conference tool should be available to allow synchronous communication;
- Asynchronous communication tools (e.g. forums) should be highlighted;
- Educational contents should be organized on small block, having an expository content, typically a video lecture, followed by contextual activities and resources;
- Students and teachers should be aware of their progress in the course;
- Pay special attention to usability.

In order to meet all requirements and design an online learning environment that would fit U.Porto current needs we had to take some options, at both technological and organizational levels. We will introduce here some of the biggest challenges and justify the options taken. We will also present some solutions for customization and development.

It is important to refer that another set of requirements were defined concerning the administrative process like, students registration, payments, issue certificates or automatic creation of the courses and users on the platform side. However, those will not be listed or explored because they belong to the second phase of this project, where AcademiaUP will be integrated with the University Information System.

These requirements answer to specifications of online learning environments, specificities of deployment and creation of distance education contents, the target audience characteristics and the specifications mentioned by the continuing education officers.

## **2.2 Designing a new platform**

AcademiaUP design was inspired by two well known systems: Coursera MOOC approach for the marketing of the courses and Open2Study for the delivering of the courses.

### *2.2.1 Choosing a framework*

The first technical challenge was to choose a framework capable of handling all the needs. There are several platforms that meet similar requirements so building AcademiaUP from scratch was not considered. Moodle was adopted by U.Porto since 2006 to support face-to-face teaching and learning, so the know-how on administrate, manage and pedagogical training from the Educational Technologies team was taken into consideration. Moodle is also a mature platform, open source and fully customizable with a large support community, and working in conjunction with web server performance can be easily scaled up to many thousands of users. An extensive documentation and its modular infrastructure were also a plus for the choice. EdX was also evaluated but technically required a long learning curve, it had a small support community and not so good documentation. Moodle was considered the best option.

### *2.2.2 Needs assessment*

We had to fill the gap between feature requirements and what Moodle offers. We gave special attention to the following features:

- Courses showcase: Moodle does not integrate an appealing list of courses. To create a catalog of the University's distance education offer and a showcase for each faculty is one of the main goals of AcademiaUP.
- Detailed information about the courses: It is essential to have a place where detailed information about the course is presented. The answer to questions like "What information do we need?", "Who will provide that information?" and "Where should it be inserted" led us to choose the platform course settings as the place to insert all the information.
- Navigation improvements: Sequential access and module driven navigation are the preferred navigation methods to guide the learner through content, especially when you want them to access the content in a prescribed order [2].
- Contextual presentation of resources and activities: Linking content to activities and resources promotes active learning and engages students with the material [3].
- Video support: Facilitate video integration and introduce real-time video to fill the lack of face-to-face conversation.

The environment was designed as represented by the scheme below (Fig. 1). The video was supported by two external tools: Panopto as a video platform and Big Blue Button as a webconference tool. Development and deployment issues will be addressed on the next item.

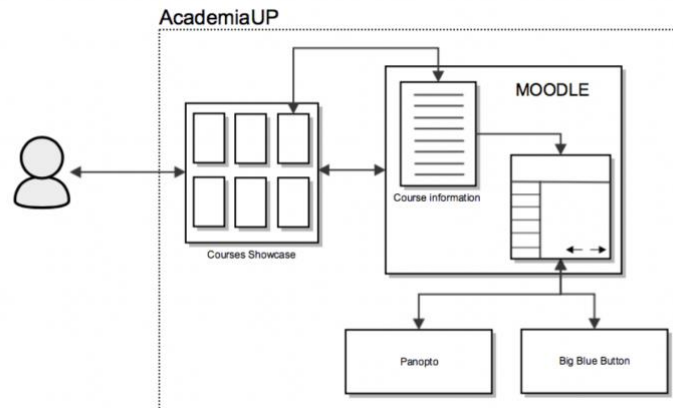


Figure 1. Environment design.

## 2.3 Development and deployment

### 2.3.1 Development Principles

We tried to adopt the following principles in AcademiaUP development, based on the 12 principles behind the Agile Manifesto [1]:

- Welcome changes, even late in development;
- Deliver working software frequently so it would be possible to make quick reviews;
- Frequent face-to-face conversations (the whole team works in the same working space);
- Simplicity and continuous attention to technical excellence and good design.

And to achieve the last item, some technical and Moodle specific development principles were implemented:

- Avoid changing core code, otherwise it will make upgrades much harder to accomplish and the platform should be always updated on a supported version at least;
- When a slight change to a Moodle module is needed always check first the renderer file and if possible make the changes overriding it with the renderer theme's file. This will concentrate all the changes in a single place;
- Create a new plugin for any new functionality. The M in Moodle stands for modular. Moodle provides dozens of plugin types [4] so almost any new feature can fit on a plugin type;
- Use a version control system like git to track code changes.

To maintain the changed code we use git version control system [5] and U.Porto bitbucket repository. All U.Porto custom modules were saved in separate repositories and all the minor changes to the core code are tracked in a clone from Moodle official repository. Upgrades to minor versions are easily accomplish with a simple merge and when upgrading to major versions we manually reintroduce the updated code and check if any change is needed.

### 2.3.2 New Plugins And External Tools

The following plugins were developed:

- AcademiaUP course format: a new course format that allows you to input extra course information to be displayed on the course detailed information page, use a sequential navigation method and display resources' contextual information (Fig. 2).
- AcademiaUP theme: a new theme with usability improvements like the course module chooser panel, course detailed information page which displays all the information introduced in the course form or the courses showcase, among other improvements (Fig. 3).

- Video resource: a new resource type was created, based on the generic page resource but specific to video, allowing the teacher to easily publish the videos recorded with the lecture capture software that the University acquired (Panopto). This resource type was developed to highlight the importance of video-based learning, an idea standing-out in education world in our days [5].
- Communication block: a block where all the communication activities from the course are gathered and presented to the learner.

A courses showcase was also developed. This is the area where people can see all the available courses and understand if a course is either open for registration, in progress or closed and where people can find next and past courses. A static interface, independent from the platform, was developed on a first stage, as a prototype. This prototype was part of the running pilot for some time and it is now being integrated as a customization in AcademiaUP theme (Fig 3.) to facilitate data entry and courses management. As the number of courses scaled-up we felt the need to integrate it on AcademiaUP and get everything automatically updated accordingly to the information inserted on the course information form. In a near future the courses showcase will be integrated with U.Porto information system.

Other plugins developed by third party developers were installed in AcademiaUP, namely, progress bar, H5P and download materials block.

As external platforms, we have BigBlueButton and Panopto, both platforms provide their own plugins. Only installation and configuration are required to integrate with Moodle platform.

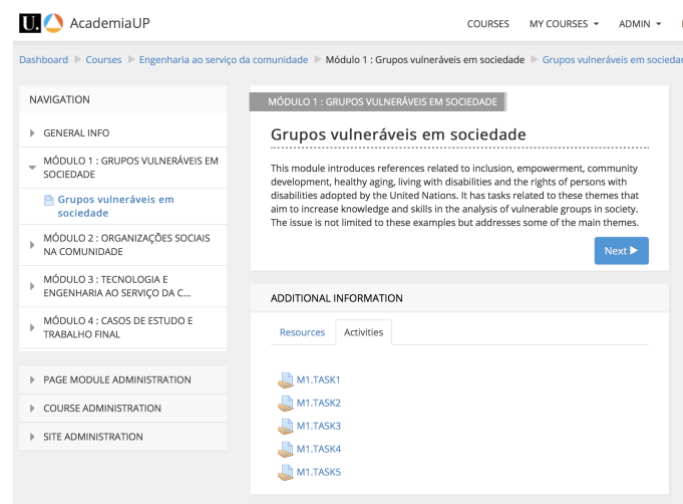


Figure 2. AcademiaUP format developed based on MOOC formats (sequential navigation and contextual information).

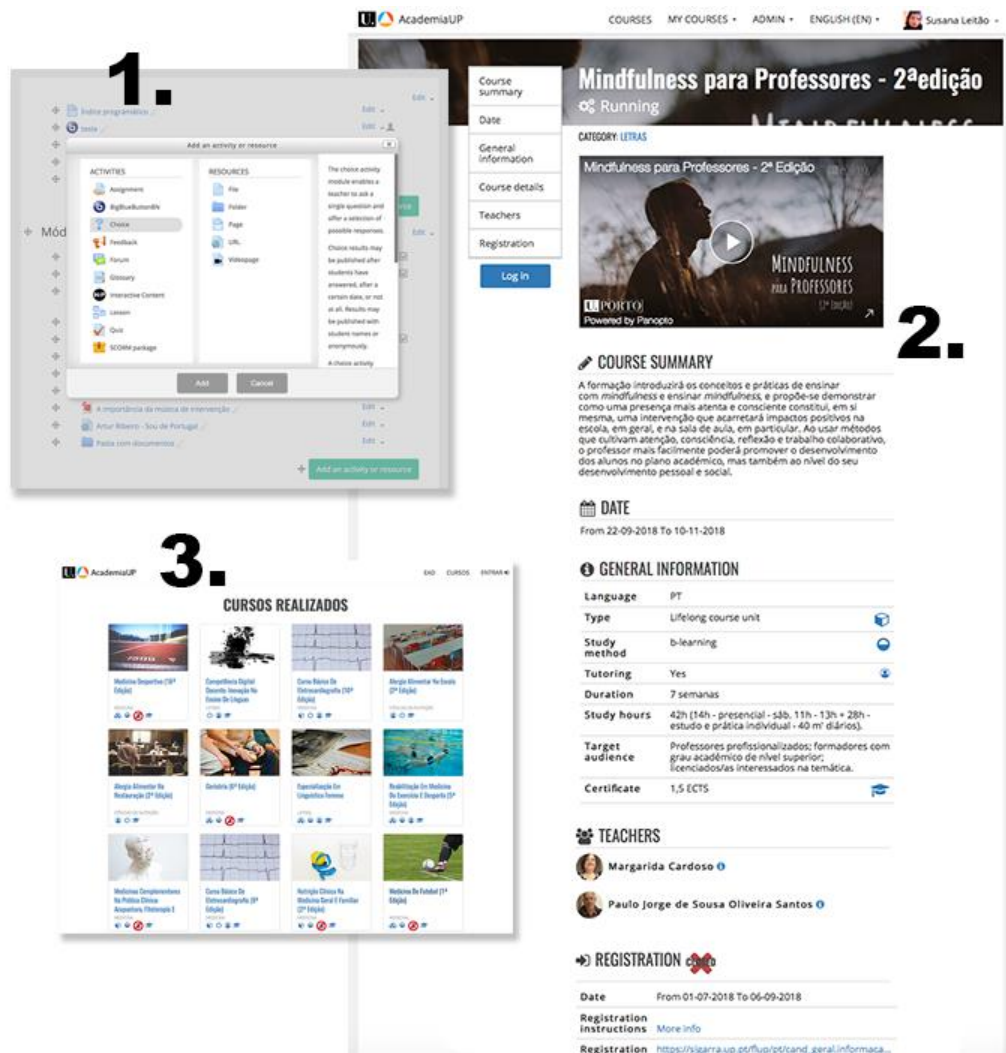


Figure 3. AcademiaUP theme (1. Module chooser panel, 2. Course detailed information page, 3. Courses showcase).

### 2.3.3 Technical Infrastructure

Like all critical U.Porto systems, AcademiaUP uses a dedicated in-house server infrastructure. The platform architecture is supported by a virtual infrastructure based on VMWARE, consisting of three virtual machines and shares a unified storage system. The service consists of two layers: database layer and application layer. The application layer, based on open-source solutions, consists of a two-node cluster, with the operating system Ubuntu Server 18.04, Apache Server and Moodle 3.5.2. Web access is balanced by a Cisco ACE Load Balancer (hardware). The database layer, also based on open-source solutions, consists of a single computing node (1 VM), with the Ubuntu Server operating system 18.04 and PostgreSQL 10.5 database engine (Fig. 4).

The web conferencing system, BigBlueButton, also based on open-source solutions, is supported by a 96 GB RAM server and 63 TB of storage. Panopto is a commercial platform based on a cloud solution.

All the work related to infrastructure design and system deployment was carried out together with the U.Porto systems administration and technological infrastructures teams.

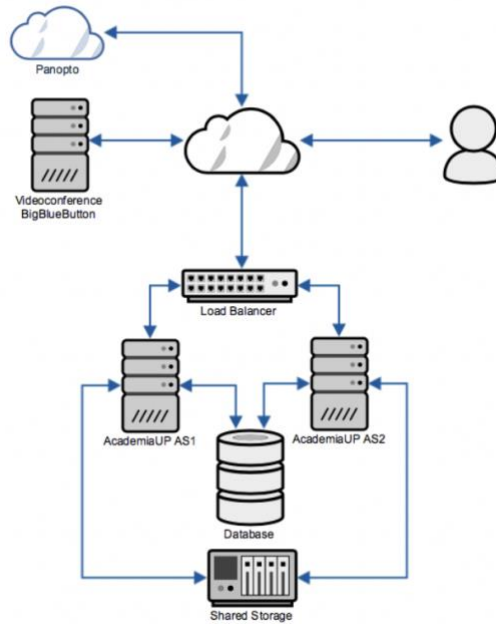


Figure 4. Systems Architecture.

#### 2.3.4 The first course at AcademiaUP

AcademiaUP started with a pilot course about Food Allergies from the Medicine Faculty on April 2017. The course was designed according to a blended learning model and because of the subject we were expecting a large number of students. The response of the public was outstanding with 161 students register.

The course was delivered in a modular format, the 6 learning modules were all available allowing trainees a self-paced learning - supported by video classes recorded with Panopto and supporting documentation - and at the end of each module a multiple-choice quiz was presented to the trainees. Because it was a blended course, three synchronous classes were scheduled and the students could choose to attend them face-to-face or at distance. The teacher had used Panopto in a previous experiment, as such he preferred to use this technology for streaming the classes instead of using BigBlueButton.

### 3 RESULTS

One year after the released we count with 40 courses (Fig. 5) from 6 different faculties. The majority of the courses are using the blended model and belong to our Faculty of Medicine but we also have courses in the biomedicine, linguistics, engineering and humanities areas.

In September 2018 we have 2040 students and the average number of logins per month is about 7000 with a maximum of 10700 in May 2018. For this level of use, AcademiaUP infrastructure proved to be perfectly stable since it was designed to able to handle much higher traffic.

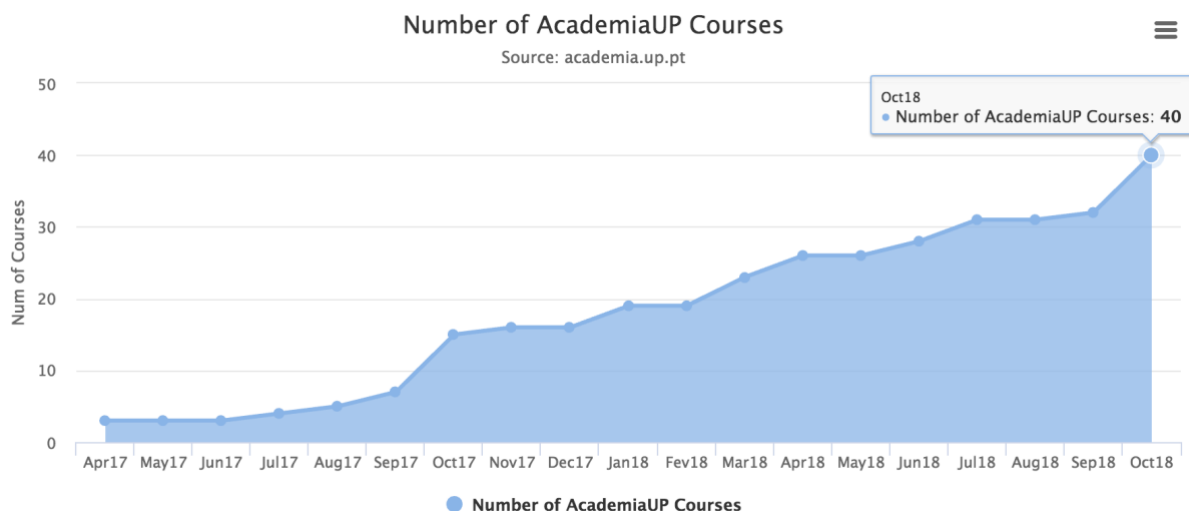


Figure 5. Number of AcademiaUP courses between April 2017 and October 2018.

## 4 CONCLUSIONS

There's a lot of work still to be done in the promotion of LLL e/b-learning courses taking advantage of scientific quality of our teachers and researchers and the experience of our staff.

First phase of AcademiaUP, the launch of a pilot, can be considered a success and we are now prepared to present AcademiaUP to the academic community as U.Porto official distance education portal. However, until then it is important to work at different levels to ensure the future success of this project.

At institutional level we are working towards the internal regulation for distance education and to define the status of distance students in U.Porto along with Academic Services.

Involving more teachers and valuing their work in the distance learning field will have to be a priority for faculties in the future, not just for the "sake of justice" with whom shares knowledge, but also this is a growing market with great potential as a source of revenue in a country where government funding to public universities is increasingly reduced.

Training all actors in this process, teachers, e-tutors, academic staff and others, to raise awareness about the distance learning methodologies in order to assure the quality of online courses of the University.

Concerning technical challenges, we intend to allow a simplified registration process with online payment, automatic certificate generation by the IS and the definition of the administrative workflow - creation/delivery/conclusion - of a Continuing Education course totally online. On the LMS side we need to work the improvement of layout usability and the integration with other technical functionalities that best respond to online communication. Also, the statistics retrieval of students' performance should be improved.

The integration of the learning management system AcademiaUP with the Information System will be very valuable to consolidate all the administrative procedures and lighten the ETU of users registration workload. Currently, all the courses and user are manually created which is very time consuming and subject to human error.

The Educational Technologies unit, with 6 full time staff members, provides instructional design support of courses, technical and pedagogical training to the teachers developing online courses and content production. Scaling up a project like AcademiaUP also implies investing in specialized human resources under the risk that the quality of the support will be compromised.

To meet the paradigm shift we are associated partners of projects related with Online Proctoring for Remote Examination (<http://www.onlineproctoring.eu/en/home/>) and we apply for national funding projects. The AcademiaUP development along with the future integration with the IS of University of Porto (SIGARRA) is partially financed by U.Norte Extension School project (<http://www.unortext.pt>).



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