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EU portal proof of concept - the example of the BLOOM hub

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This report is the deliverable of D2.11 of the OpenU project
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1. About the EU portal

1.1 The OpenU project

The Erasmus+ KA3 project "Online Pedagogical Resources for European Universities (OpenU)" is directly addressing the Commission's priorities by creating a European digital hub that targets three key spheres: blended and online learning, academic cooperation, and virtual and blended mobility. The project was launched officially on February 20, 2019, and ran until December 19, 2022 (47 months)

The OpenU project aims to reinforce strategic and long-term structural cooperation between HEIs by developing a shared digital infrastructure, the BLOOM hub, to support blended learning, mobility and networking in higher education.

1.2 Aims and objectives of the BLOOM hub

One of the aims of the OpenU project, represented by its implementation cluster (WP2) was to build the European-wide online hub providing to stakeholders and participants in the European Higher Education Area added value to digital developments taking place in higher education institutions in Europe.

The BLOOM Hub is a central deliverable of the OpenU project and is likewise designed to support and enhance evidence-based policy making. It is developed to promote mobility, support collaboration, drive innovation and advance blended and online education as well as a digital infrastructure that will link local software of universities in order to provide exchange and inter-connectivity of the digital infrastructures. BLOOM will therefore foster European Higher Education cooperation through digital processes, focusing on those institutions participating in the European University Initiative. It will support mobility between universities, promote online cooperation between academic stakeholders across countries and institutions by providing expertise and peer-to-peer learning.

The online hub intended to enable the 'once only principle' for students and higher education staff, so as to make it possible to browse between the hub and integrated or related platforms without having to undergo further authentication process.

The online hub then should provide critical digital infrastructure for higher education institutions to cooperate at transnational level, co-create and co-deliver curricula and support mobility of students and staff in this context. The platform development explicitly was deemed to be of support to the development of European university initiatives, by considering three spheres:

- a) learning sphere;
- b) cooperation sphere;
- c) student and staff mobility sphere.

Subsequently, Priority Actions and Tasks have been identified as per the initial OpenU proposed framework. The Hub was to be embedded both into the policy cluster, meeting the High-Level Authorities expectations and assumptions in regard to both the European level priorities as well as national policies, and into the HEIs' cluster, where it was supposed to tether two rounds of experimentations in regard to innovative learning formats.

1.3 Purpose and scope of the present report

This report is published as part of the OpenU project. It establishes a proof of concept for a portal whereby structured information regarding learning opportunities would be made publicly available.

While the success of the implementation of the OpenU hub provides in itself a proof of concept, this report also details the applicability and feasibility of a similar EU portal and offers the perspectives of creating a scalable and sustainable online environment to support transnational, bilateral and multilateral cooperation between HEIs at large scale.

2. EU portal successive designs and respective applicability

2.1 First serve – Generic online infrastructure for focal services

Based on the Priority Actions set out in the OpenU application and the involvement of public authorities in the project, the priorities regarding the identification, creation, and management of mobility windows (PA2), the integration of HEI's existing digital infrastructures (PA9) and implementation of blended learning in the curricula (PA5) were deemed to be of the highest importance. Synergies with existing projects and platforms were deemed to be a relevant asset, and the weighted average of the remaining priorities in regard to expectations of the target audience were factored in into the first steps.

Identified target groups included the Higher Education academic staff, students, and administrative staff, including the IT related staff members, as well as so called other learning opportunity providers, which would bring means for additional content for a broader public audience, e.g., within MOOC learning opportunities. Last but not least, the institutional target groups complete the schematics by accounting for the envisaged usage and added value for European university Alliances, higher education institutions, third-party learning providers and enterprises or civil society stakeholders, bridging the gap towards supporting a framework for lifelong learning opportunities.

The implementation forecast made use of four distinct phases, which would consist of

- a first phase where a basic architecture and user interface would be designed, along with a provision for user management, cooperation spaces, content spaces and an API.
- a second phase where the learning opportunities will be available within an engine, including MOOCs, as well as an index and search possibilities for staff mobility opportunities and improved cooperation spaces and authentication within the MyAcademicID/eduGAIN realm.
- a third phase, providing curricular cooperation tools, and Erasmus+ API integration collaborative pedagogical tools and a further improvement to community and support infrastructure.
- a fourth phase with an anticipated interlinkage with third party tools and initiatives like the Erasmus portal via an API, interactive virtual classroom settings as well as further iterative improvements.

The first development strategies and milestones have been summarized in a document, the blueprint of the BLOOM Hub, which has been circulated for further discussion with the project partners, most notably in order to ensure the more general OpenU project aims in interlinking the Work Packages.

However, the feedback to the blueprint, especially from the universities involved in the OpenU project, was mixed. While the clear focus and the thorough serve in regard to users and user experienced has been seen as valuable regarding the organization of the digital offerings, it lacked a vision, technical specification, or interoperability description on how to cope both with existing landscaping of the higher education institutions, as well as the ways and means to identify, sort and present content from a pedagogical, technical and educational point of view.

This approach also raised considerable ethical questions among HEs institutions and authorities, as it appeared that the performance level such a design required would entail assigning or outsourcing part

of the obligations and tasks to a subcontractor. Yet, this entailed a significant amount of financial and human resources – it is to be noted that a feasibility study conducted on behalf of the Hochschulforum Digitalisierung calculated in 2018 costs of 30 million Euros over 4 years years to establish a national platform with similar features as OpenU¹, and national projects in Spain and England had costs of 30 million Euros over 6 years. It also implied a unfaillible trust in said subcontractor, and a willingness to resort to external, private, and/or non-open-sourced parties, which is not a given in the EHEA.

2.2 Second serve – the middleware approach

While it is clear that the OpenU project as a whole, and the BLOOM Hub in special, were very ambitious and in some regard on the way to a journey in uncharted waters, it still needs to fit into the practicability requirements of the intended target audience, especially the universities that are supposed to be both content providers as well as “people providers”. In this regard, the Blueprint did not bring the necessary level of detail to satisfy the bulk load of questions that arose within the university partners. While general thoughts, like using an eduGAIN based authentication, have been deemed a sustainable approach, other items such as complex dependencies between projects, the scope of integration especially of the cooperation spaces for the different user groups, ranging from members of the public, members of an individual institution or members of the emerging European university alliances that should be viewed independent of their individual home organization, have not met the level of confidence into the foreseen development.

In reaction, a New Work Plan factoring in concerns and suggestions from all involved OpenU project partners has been proposed in February 2020, regrouping tasks and concepts both within implementation and experimentation cluster in light of the intended target audiences. Main focus points included the commitment of all partners to pursue and further the creation of a European platform for blended and online learning, academic cooperation, and virtual/blended mobility, but shifting the focus in building on the strengths of existing solutions and with a view to pave the way for the establishment of the European university, including the required infrastructural architecture.

One of the main concerns regarding the first laid out development was the applicability and feasibility regarding the integration if the BLOOM Hub within existing IT systems and landscaping. Universities, both as part of the OpenU project as well as the intended target audience, are the pillar in regards both content and people, and thus need to be able to operate with the utmost confidence within the BLOOM Hub. As such, a shift towards more strategic connection between stakeholders and existing landscapes has been at the core of the New Work Plan. This marks the evolution of the BLOOM Hubs design from a rather monolithic style central repository towards a middleware style exchange infrastructure that links local infrastructure from involved partners while still allowing common and shared spaces for new content and cooperation.

The services to be provided at the hub also became clearer. The close cooperation that a European University offers implies higher levels of trust, which in turn had to enable more automatic processes, such as enhancing access and authorization to a multitude of nodes in a heterogeneous network, speaking from a data integrity viewpoint. Those mechanisms also need to be able to scale to a staggering extent, accounting for potentially cascaded demand with regards to automation, scalability and availability.

¹ Schmid, U., Zimmermann, V., Baeßler, B., Freitag, K. (2018). Machbarkeitsstudie für eine (inter-)nationale Plattform für die Hochschullehre, Arbeitspapier Nr. 33. Berlin: Hochschulforum Digitalisierung beim Stifterverband für die Deutsche Wissenschaft e.V.

Thus, a different IT paradigm was in order. The idea of middleware was proposed to serve as an operating system, like a data clearing point or data warehouse for a University Alliance. The middleware approach is far less error-prone, contributing to enhance trust among partners and much greater levels of configurability. It also enables University Alliances to share the code of new functionality they will develop for their own middleware, which will be interconnected through a federated approach that will also enable the publication of content towards EU level platforms.

With this shift, or rather evolution, additional benefits were to be realized, especially regarding legal and privacy requirements and data ownership. Also, it was envisioned that following this avenue, content sharing and content creation would be drastically simplified, because the requirement to duplicate content and to keep it up to date is no longer in place.

2.3 Third serve – new amendments and adjusted hub

Structural pillars within the design of the hub were implemented as far as all involved partners were convinced of the practicability and sustainability of the revised approaches both regarding architecture as well as foreseen operations, especially after two experts' meetings in Leuven and Potsdam December 2019 and January 2020. However, beyond the realm of the project, the strained and tense employment market for IT specialists in Germany as well as long trails in finishing required paperwork, created new obstacles and challenges.

In light of these surrounding conditions, Freie Universität Berlin took over the implementation of the hub in September 2021 in order to secure the successful realization of the BLOOM Hub. To achieve this goal, we have sought to activate resources both centrally and from experts in faculties so we can adjust and adapt towards the defined tasks and milestones. Careful as to not contradict or invalidate the objectives and abovementioned needs, the adjusted hub retained the need of remaining university driven without having to rely on recruiting additional work force, thus alleviating the already challenging timeframe and resources constraints.

Persuant to the consensus between the project partners, and considering the target audiences, we opted for existing solutions within the universities landscaping to be evolved and combined, thus being able to cater both to the OpenU project needs as well as perspectively the universities within European university alliances and cooperations both represented within the OpenU project and beyond. We believed that the modular aspect of combining open-source solutions allows for the realization of synergies between the participating project partners, and we committed ourselves to the success of the OpenU project.

3. Overview of the modular BLOOM Hub as an EU portal proof of concept

3.1 Tools and functionalities

One of the aims of the BLOOM Hub is to facilitate blended learning, mobility, and networking. Functionalities that we planned to adapt in a first step and that we believed were necessary for the work conducted within the Work Package 3 included:

- a course catalogue with comments and a “site browser,”
- the pre-enrolment towards courses and the possibility of preferential choices,
- application for courses and examinations,
- student enrolment lists,
- performance records/transcripts

- collaborative project spaces crossing courses

Other functionalities of the software tools, like a scheduler, an office hours management, a planner to match courses to available halls or to match that all necessary courses are staffed and can be held were of no direct concern to the use cases of the hub and thus are deemed to be adapted later on and specifically with the European university alliances regarding the implementation and administration their proposed joint curriculum programmes in mind.

We were convinced that the BLOOM Hub still offers an added value regarding the needs of universities and alliances alike, even when considering both the long and dynamic project period as well as the tremendous improvements in IT and digitalization in the European higher education area because of the Corona pandemic. Still, where an image speaks a thousand words, a useable and working portal as a proof of concept helps better disseminate the capabilities and potential of the BLOOM Hub and its interlinkage within the ecosystem.

Thus, the development of the different phases of the BLOOM Hub was geared towards always having a public instance, a proof-of-concept portal so to speak, in order to better demonstrate what can be achieved in linking available information, aggregating, and making it available.

Examples of the adapted course catalogue (cf. Fig. 1), accessible both via a plain site browser², as well as via a more sophisticated course catalogue overview³ (cf. Fig 2), are included below.

Course Nr	Course Type	Title	Main Events	Start date	Hours	ECTS	Category	Instructors	
19325911	Seminar	12983: (Real Time) Delphi im Praxistest S22			2			<none>	Join
19326002	Übung	12989: Forschungspraxis. Von der Mittelakquise bis zur Ergebnispräsentation S22			2			<none>	Join
19000170	Begrüßungs- und Abschlussveranstaltung	Absolventenfeier S22		22.07.22	0			<none>	Join
19405311 + 19405301 + 19405302	Seminar + Vorlesung + Übung	Advanced Algorithms in Bioinformatics S22	Tue 10-12 Thu 14-16	19.04.22	2 + 2 + 2		Master	<none>	Join
19206011	Seminar	Advances in extremal combinatorics S22	Wed 12-14 Thu 8-10	20.04.22	2		Master	<none>	Join
19306501 + 19306502	Vorlesung + Übung	Algorithmen zum Auf- und Abzählen S22	Tue 14-16 Thu 14-16	19.04.22	2 + 2		Bachelor, Master	<none>	Join
19221001 + 19221002	Vorlesung + Übung	Analysis 1 (Mathematik für Physiker I) S22	Tue 10-12 Thu 10-12	19.04.22	4 + 2		Bachelor	<none>	Join
19211641 + 19211601 + 19211602	Zentralübung + Vorlesung + Übung	Analysis II S22	Tue 10-12 Wed 14-16 Thu 10-12	19.04.22	2 + 4 + 2		Bachelor, Master	<none>	Join
19202801 + 19202841 + 19202802	Vorlesung + Zentralübung + Übung	Analysis I S22	Tue 10-12 Wed 10-12	19.04.22	4 + 2 + 2		Bachelor, Master	<none>	Join

Fig. 1: Screenshot of the BLOOM Hub course catalogue, bloom.bloomhub.eu/vv

² „Site browser“, <https://bloom.bloomhub.eu/vv/?0>. Retrieved December 19th, 2022.

³ „Overview“ starting page, <https://bloom.bloomhub.eu/mvs2/course/overview/?locale=en>. Retrieved December 19th, 2022.

Overview

Institutions <input type="text" value="Aalto-yliopisto"/>	Departments <input type="text"/>	Semester <input type="text" value="WiSe 2022/23"/>	Course Language <input type="text" value="All"/>	Tags <input type="text"/>
<input checked="" type="checkbox"/> Show Ancillary Courses <input checked="" type="checkbox"/> Show Maternity Protection	<input type="checkbox"/> Show Rooms	<input type="button" value="View"/>		

Legende

 Dangerous / Alternative Course	 Partly dangerous	 Not dangerous	 Missing or unconfirmed
--	--	---	--

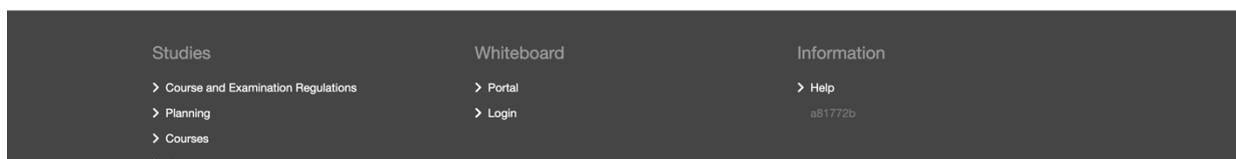


Fig. 2 Screenshot of the BLOOM Hub course catalogue overview, <https://bloom.bloomhub.eu/mvs2/course/overview/>

While the adaptation and evolution of the BLOOM Hub components showed that the technical expectations laid out over the course of the project have been met, and that the BLOOM Hub is a collection of tools that also drew interest from stakeholders, namely European university alliances outside of the project, due to organizational constraints within the project partners, we were much to our dismay not able to recruit courses and content open for a broader public outside of the scope of the OpenU projects own experimentations within the Work Package 3 support of the BLOOM Hub. Nevertheless, the implementation of the portal proof of concept is available and ready to be furthered within the scope of partners beyionf the projects timeframe.

3.2 Technical approach

As outlined in the deliverables regarding the first and second development phases, D2.6 and D2.7 respectively, the BLOOM Hub provides on its public instance provisions for a course catalogue (cf. Fig. 1). This catalogue can be merged from input fed by different sources, be it a manual data entry (cf. Fig. 3) or an import using an XML data exchange either by file, or rather by pulling data from an agreed source (cf. Fig. 4).

Basic information Texts Ancillary Courses Modules Scheduling Change History Maternity Protection

Institution
Katholieke Universiteit Leuven

Department
Misc. Leuven

LV prefix
139 000

Type
(01) Lecture

Name
[Empty field]

SAP Name
[Empty field]

English name
[Empty field]

Required

Frequency
Non recurring

Capacity
[Empty field]

SWS
[Empty field]

Planhelper
[Empty field]

Course language
German

Responsible lecturer
[Empty field]

Secretaries
[Empty field]

Executive lecturers
[Empty field]

Attendance

Fig. 3: Screenshot of the manual addition of a course in the BLOOM Hub curriculum/programme administration support interface, bloom.bloomhub.eu/mvs2

KVV MANAGER 2 Link Help Fullscreen

Datenimport Kursverwaltung Dozierende Datenquellen **Import-Konfigurationen** Werkzeuge

Import Konfigurationen

[Neu](#)

Name	Datenquelle	Fachbereiche	Angelegt von	Job Einstellungen	
Alle S22	Evento S22	Wirtschaftsinformatik, Fachbereichsbezogen, Mathematik, Informatik, Bioinformatik, Physik, Chemie, Biochemie, Geologie, Geographie, Meteorologie, Charité Universitätsmedizin, Geo-Fachbereichsbezogen	hsteller	Cron-Expression Zeitplan erstellen	Bearbeiten Löschen
ReWiss Tuts MVS W21/22	MVS ReWiss 21/22	WE1 Zivilrecht, WE0, WE2 Strafrecht, WE3 Öffentliches Recht	hsteller	Cron-Expression Zeitplan erstellen	Bearbeiten Löschen

Fig. 4: Screenshot of the import settings for automated import of course information in the BLOOM Hub Community Portal Administration Workspace, bloom.bloomhub.eu/portal

The XML format used is described in Deliverable D2.15, and the associated mechanisms are detailed in Deliverable D2.7.

3.3 Organizational approach and challenges

Populating the course catalogue allows for the visiting viewer, for example a student from a university member of a European university alliance, or an interested party not actively enrolled in a degree programme, to consult available resources. It is obviously imperative that the hosting institution includes necessary information, like capacity information regarding the maximum number of allowed attendees per course, or prerequisites like a certain language level to be mastered or a certain attendance or participation quorum to be achieved. Depending on the structure of the offered course, be it a MOOC with a certificate of attendance or a ECTS credited seminar with an exam embedded in a study regulation or module equivalency for different degree programmes, the visiting viewer needs to be able to quickly see and understand the topic, the requirements, and the organizational information regarding the offered courses.

While we were able to feed the course catalogue with data from Freie Universität Berlins Department of Mathematics and Computer Sciences courses from the current winter semester 2022/2023, this is intended only as a proof of concept regarding the toolset. The lack of actual course data is, much to our dismay, mainly due to organizational circumstances rather than technical reasons as, indeed, in the current term there are no actual courses offered that are freely available and open to be joined by third party students. The course setting used within the OpenU projects Work Package 3 experimentations were linked to the summer term of 2022, and these courses have by now ended.

As well, while we have had talks with OpenU project partners regarding including course data from their respective institution, it was always emphasized that only fictional data, or actual data that has been unmistakably marked as for evaluation and testing only be used. The reasoning is, again, that opening up courses and displaying them as being available to participate in creates a right, an entitlement that needs to ultimately be fit within the administrative workflows and regulations of the hosting partner institution.

For example, a partner university was willing to provide us with a rather detailed list of courses they offer to incoming Erasmus+ students. But to actually participate in one of these courses, the student would have to apply for an Erasmus+ exchange with the partner university, be on site and follow the administrative and legal procedures of the university and the host country. Another example from another partner university would be the need to define quotas of participating students from external partners per course, as the university already uses quotas per course between students from different faculties, so it must extend this capacity attribution system also to external participants, notwithstanding other administrative hoops regarding enrolment to be able to be credited ECTS points.

We expect, strongly support, and encourage that, within the relevant universities and European university alliances, there will be agreements on which courses can be opened for students at partner universities, especially regarding the possibility of automation and the relevant local guidelines, like course access quota or the like.

4. Outlook

In a certain way, the stages of group development as laid out by Tuckman⁴ do apply to the evolution of many European university alliances. Having found themselves forming alliances and storming highly motivated towards creating a sustainable space for sharing knowledge, ideas, and values, most of them now are on the track from norming to performing, with evaluations of the structure's viability and necessary adjustments to the practices found in the emerging communities.

This includes the need to further embrace the common vision of connecting resources to foster joint education, innovation, and mobility support. Existing schemes and tools, like Erasmus Without Papers, the European Student Card, or the BLOOM Hub, allow to bridge legacy IT worlds together and enable more seamless collaboration and exchange, no matter where the participants are actually rooted.

As laid out in Delivery D2.15, we strongly believe that the BLOOM Hub as an outcome of the OpenU project is not only a tool that enables institutions and alliances to integrate better and easier, but it creates a community of practice in itself, allowing for stakeholders within the European Higher Education Area to mutually participate in an open exchange regarding the common challenges on the road towards a sustainable, inclusive, and integrated future.

⁴ Tuckman, Bruce W (1965). "Developmental sequence in small groups". *Psychological Bulletin*. 63 (6): 384–399. [doi:10.1037/h0022100](https://doi.org/10.1037/h0022100)



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