

Benefits and challenges of distributed student activities in online education settings: cross-university collaborations on a pan-European level

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Abstract—In this paper we provide the first results obtained from an ongoing project on collaborations between Universities on blended learning courses in Innovation and Entrepreneurship. Using a design based research approach, all Universities participating in the pilot co-designed settings on how they will collaborate on a course, relying entirely on online tools and online materials. In total there were seven such cross-University collaboration settings, all of them using different key features, ranging from webinars (virtual classes), collaboration on a specific project, peer-review assignments, exchange of personnel, to an exchange of pedagogical methods. In this paper we report on the outcomes from a workshop in which the impressions from teachers and the students were presented for each collaboration. We analyze what worked well, and what did not, as well as recount the perceived value of the approaches taken by the collaborating Universities.

I. INTRODUCTION

Recently there has been an exponential growth in online and distant learning that is rapidly transforming higher education. Technology advances (ubiquity, power, flexibility) have increased the ease of learning at distance [1], [2]. Universities expand their offering of online courses and in return also the research on distant education has increased. Numerous studies have shown that teaching online requires different pedagogy and a unique set of skills compared to a traditional classroom setting [3], [4], [5]. Researchers and educators in online education are faced with new issues surrounding student interactions, course content design and delivery, defining types of assignments, performance expectations and different assessments and evaluations techniques [5].

The need to design learning environments that facilitate social interaction, cooperation and collaboration in the classroom has increased [6], [7]. Recently, the focus is also to analyze the interactions as a means to gain insights into the process of collaborative learning. Although a wide range of terminology relating to collaborative learning exists in the literature: peer collaboration, collaborative learning, coordinated learning, there is a consensus among researchers that collaborative learning involves construction of meaning through interaction with others and a joint commitment to a shared goal. Collaborative learning requires more effort than simply cooperative work or a division of labor. Collaboration necessities that participants are engaged in

reciprocal understanding of the problem given at hand, and involves construction of solution that is shared between team members, established through negotiations of meaning and mutually shared common knowledge [8], [9], [10].

In this paper we address the problem of pedagogical cooperation between Universities on a European level and we investigate benefits and challenges of distributed student activities in an online education setting.

In this work we co-designed cross-university settings in which students physically located at distant Universities can collaborate with each other. The diverse blended learning settings were arranged before the beginning of the fall semester 2018-2019 and involved in total 10 Universities. In all the settings the students followed online lectures, participated in seminars (and/or webinars) where they could ask for additional information or discuss the concepts already introduced in the contents watched, and they were asked to deliver assignments using the knowledge gained from the online contents in a collaborative fashion.

Here we present the different settings, the different strategies used to activate students, and how we plan to understand if the settings promoted collaboration between the students and teachers from the different Universities. All the participating Universities are part of the partner network of EIT Digital, a European body aimed to foster digital transformation in Europe. The cross-university collaborations presented in this paper are as follows: Sorbonne University (SU) and University Paris Sud (UPS), on the course of Innovation and Entrepreneurship Basic, Aalto University (Aalto) and University of Trento (UNITN), on the course of Innovation and Entrepreneurship Basic, University of Nice-Sophia Antipolis (UNS) and UNITN, on the course of Innovation and Entrepreneurship Basic, University of Twente (UT), Technical University Eindhoven (TUE) and University of Technology Delft (DUT), on the course of Business Development Laboratory, SU and UPS on the course of Business Development Laboratory, SU, UPS and University of Rennes 1 (UR1), on the course of Business Development Laboratory, UNITN and Technical University of Madrid (UPM), on the course of Innovation and Entrepreneurship Studies.

At the end of the pilot teaching collaborations, the aim is to statistically determine which features of the pilots were

more effective in the cross-university collaboration. For this purpose, we additionally categorized all the settings by the features on which they relied, namely: webinars (virtual classes), collaboration on project, peer-review assignments, exchange of personnel, and exchange of pedagogical method.

In all the cross-university pilots 11 Professors and more than 290 students are involved. The paper will present the detailed information for each of the settings and our initial findings on the aspects presented above. The main intent of this publication is to recount the feedback and impressions for the first students and teachers involved gathered during the collaborations workshop. The workshop took place in Eindhoven, on Dec 12th 2018. A more elaborate analysis of the implications of the pilots will be published in later report of the same project.

The paper is structured as follows: in Section II we explain the educational context in which the cross-university settings were designed and conditions that were met so that we could pilot such settings, in Section III we explain each cross-university setting and their individual characteristics, and in Section IV we present the first collected leanings from a workshop in which each setting was presented and our next steps in this direction, and we conclude the paper reflecting on its generalizability in Section V.

II. BLENDED I&E EDUCATION

A. *The context*

EIT Digital is a leading European digital innovation and entrepreneurial education organization driving Europe's digital transformation. The EIT Digital Master School is a joint initiative by the leading technical universities and business schools in Europe with the aim to train IT graduates at Masters levels, with strong innovation and entrepreneurial competences. Our partner network of High Educational Institutions works together to provide cutting-edge ICT education in combination with innovation and entrepreneurship (I&E) education. To implement the later one, each partner university in the EIT Digital network implements an Innovation & Entrepreneurship (I&E) minor, for which the Universities need to implement three harmonized I&E courses: I&E Basics, Business Development Lab (BD Lab), I&E study and one elective course in a full freedom to be decided locally. In I&E Basics students are given the basic theoretical knowledge on concepts in the domain, in BD Lab students work on a innovation project where they develop new product / service from scratch, and in I&E study they work on a business challenge provided by a company. In both, BD Lab and I&E study they work in teams of 3-4 students. EIT Digital set up a blended education strategy with the aim to have more effective and flexible education experience for its I&E education, as well as to exploit to full potential the knowledge already available in its network. In it the professors teaching in the network, also produce online contents on subject matter for these courses (within their domain of expertise), and these online contents are later used by all the Universities in the network to teach the courses [11]. Some of the initial effects of the deployment of the

blended strategy on local education contexts are described in [12]. All the materials are offered on a shared platform where all the students are given access and follow the related online materials for the course at hand.

B. *The online contents*

A step that brought the group closer to the piloting and trying out cross-university collaborations was the deployment of the so-called EIT Digital I&E Red Thread suite. It is a set of online I&E contents packages that all universities in the EIT Digital network deliver in their I&E courses with the aim to even more harmonize the education between the different Universities. It is a coherent suite of packages covering the main I&E topics, introduced in 2017-2018 to all Universities, and fully deployed in the fall semester 2018-2019. Each session of the red-thread is composed of video materials and quizzes and peer-review assignments, leaving the possibility for each teacher to choose their preferred assessment type to better tune the delivery to the participating students. The red-thread is usually delivered with these two blending approaches: The first approach is flipped classroom, in which each University adapts the course syllabus and puts the themes of online modules as topics and asks the students to watch the online modules before coming to class so that the online contents are exploited at their fullest. The second approaches independent learning, in which the students follow the online module, the modules are decoupled from the course syllabus, and students master and learn independently the topics at their own pace. This was intended as a quick solution to get started if the University is not ready for full deployment with flipped classroom. More on the different blended models used for the I&E education is available in [13].

C. *The instructional design*

Instructional design models had to be adopted to integrate the red-thread delivery. It was necessary to choose the appropriate technology tools to foster collaboration, communication and cognition. Instructional design models were chosen so that they anchor student interaction and help them to achieve the instructional objectives and to support and enhance learning, while still fulling the scope of harmonization and synchronization of our education.

Students were aware and guided in the learning process to be undertaken and why the learning process was set in place. In the preparation of the online modules we followed these learning principles:

1. We included a forethought phase that involved a setting of a goal: why students watch the videos, what they will learn from them, as well as information on the total duration of the video material,
2. We provide performance phase in which the students test or apply the gained knowledge or via quiz, or on an assignment that is later a peer-reviewed, to ensure students have watched the contents and gained the knowledge.

III. THE COLLABORATIONS

The following seven cross-university collaborations were proposed as pilots:

A. *SU and UPS (I&E Basics)*

For the needs of the course the teachers from both Universities came up with a unique syllabus based on online contents and assignments for each module that students perform either in class or before or after the class. The students follow all the lectures together, with some of the sessions taking place at Sorbonne University and some sessions taking place at UPS, relying also on classes from lecturers from the respective Universities. Students have pitching exercises at the end of each class, presenting the outcomes from an assignment that they have been working on during the class, to improve their presentations and pitching skills.

B. *Aalto and UNITN (I&E Basics)*

The collaboration consists of two lectures given in front of Aalto students, transmitted via webinars also to the students in UNITN, and vice versa, two lectures given in front of the students in University of Trento and transmitted via webinars to the students in Aalto. After each such lecture, the respective lecturer delivers an assignment to the students at both locations, the assignments are peer-reviewed by the students from both of the Universities. The students for this worked in teams at the both ends in order to improve their ability to work in teams.

C. *UNS and UNITN (I&E Basics)*

In this collaboration, a methodology already used at the University of Trento, is ported and tried in the University of Nice. Namely, the methodology consists of case in the domain of innovation or entrepreneurship for which two groups of students prepare and present the case in class, the students are asked to prepare an in-class debate around two competing views on the case and then in class all the present students vote on which group defended their view better. The exercise aims at covering relevant content while explicitly focusing on the development of soft skills such as presentation, public speaking, creativity and negotiation. The cases reports are peer-evaluated between the students at both of the Universities.

D. *SU and UPS (BD Lab)*

For the cross-university collaboration on this course, UPS and Sorbonne split the course, with the first half of the course being delivered by UPS and the second half delivered by Sorbonne. The first part of the course consists of lectures on Business creation provided by a lecturer also involved in different local business acceleration programs and mentors the students in the developments of their projects. In the same part of the course the online contents are delivered and the students perform peer-review assignments for them. In the second part of the course, the students work jointly in groups on a practical business development case to improve their team working skills.

E. *UT, TUE and DUT (BD Lab)*

In this cross-university collaboration the three Dutch Universities collaborate by creating a mixed groups of students (groups composed of students coming from the different Universities in the cross-university collaboration) and the groups work together to deliver peer-reviews of the submissions of the other groups, the groups exist and collaborate only online, for the practical part of the course, the students work individually. This kind of assignment was aimed to help their ability to work in distributed teams.

F. *UNITN and UPM (I&E Study)*

In this course the students work in groups on a case study throughout the course. At both Universities there are local groups, that is groups composed only of local students working on the delivery on a case from the local ecosystem of the respective University, while there are three groups, composed of 2 members coming from University of Trento and 2 members coming from UPM, working on an international case. The group members need to work together to deliver the case and like this improve their abilities to work in distributed teams as well as their ability to work in international teams.

G. *SU, UPS and URI (I&E Study)*

In this course all the students from the three French Universities work together on the online modules and deliver the assignment in a peer-review fashion. For the practical work on the case studies, the students from UPS and Sorbonne meet and work together, creating mixed groups of students coming from both of the Universities, while the students from University of Rennes work only on their own.

We sum the features on which each collaboration relies in TABLE 1.

IV. DISCUSSION

We have co-designed online learning settings for cross-university collaborations and tested them in the real world. The diversity of the settings illustrates how the contextual and subjective aspects are at play when planning such experiences and in the design and implementation of innovative educational practices.

The cross-university pilots are in their concluding phase and the first impression of them were discussed in a workshop where each participating Universities presented a small progress report on aspects completed, the cross-university collaboration status, and their opinion of the experience.

The common problems reported were mainly of a technological nature and problems with finding adequate technology to do webinars in front of audiences present in two different location. This is also in line with previous literature suggesting there is a wide range of frustrating problems with webinar technology and that finding the right technology can be really difficult [14], [15], [16].

TABLE I
FEATURES OF CROSS-UNIVERSITY COLLABORATIONS

Cross-University Setting	Webinars	Collaboration on project	Exchange of personnel	Peer-review assignments	Exchange of pedagogical method
SU & UPS (I&E Basics)		X	X	X	
Aalto & UNITN (I&E Basics)	X	X	X	X	X
UNS & UNITN (I&E Basics)	X			X	X
UT, TUE & DUT (BD Lab)			X	X	
SU & UPS (BD Lab)		X	X	X	
UNITN & UPM (I&E Study)		X	X		X
SU, UPS & UR1 (I&E Study)		X	X	X	

Another commonly reported problem in the literature that we also observed was in the scheduling of the lessons, i.e. to find time slots that work for students present at two different locations [17]. In the collaborations on the I&E Basics courses the scheduling of the lessons was reported as the most problematic aspect. The students are coming from different technological specializations (majors) and because of this finding a suited slot to have the class for the students in a single University is already reported problematic, in the case of cross-University collaborations the case was becoming even more evident, as there was the need to synchronize the delivery of webinars between at least two Universities.

The collaboration on BD Lab courses reported problems from technical nature when running the peer-review assignments. Namely, there was no possibility to control who is reviewing who's assignment and we could not guarantee to we provide cross-university peer-reviewing and the allocation of students was random. This required an additional effort to understand what to be configured and needed technical support. The use of forums was promoted in these settings was also highly valued and reported to contribute for better dialog between the students.

The collaborations on I&E Study courses, where the students worked in distributed groups, were insightful for the effect of learning in distributed groups with help of technology. The involved professors shared that the student-to-students interactions were truly collaborative and students worked together towards the shared goal. The effect of group learning seemed to be even greater when students were having multicultural backgrounds. The teachers observations are consistent also with other works in the domain suggesting that the interaction in such teams is task-oriented [18] and students acquire additional skills in remote collaboration

[19].

The teachers appreciated the pedagogical collaboration between each other to organize classes jointly and said that it promoted better knowledge and practice exchange between the involved universities, additionally the cross-university collaborations provided benefit for the students on the development of their skill to work in distributed and physically colleagues.

In all the collaborations the teachers stated that there was also the benefit also for them, and through community of practice and working jointly they also learned from their colleagues from the other Universities, expanded their perception of the body of knowledge and of its application, and opened themselves to perspectives outside of their home University.

In some of the collaborations, the professors complemented the approach with lectures form their local educational context, which even more helped to better exchange of experience and knowledge between the professors involved and exposed even further the students to events and knowledge available at the other location.

Some professors also reported to have created their own web pages to present additional training information to their students.

The professors also told that the approaches worked better when the online contents were integral part (central part) of the course and not an add-on. This integration required some degree of forethought, work to do beforehand on planning and goal setting on the part of the professors to ensure efficient and effective student use of online materials. The professors also told that the training on the on the online materials and on the platform usually done during dedicated workshop was instrumental for this.

Some saw as a drawback of the general online education approach the lack of physical contact with the online lecturer. What we noticed is that it is good to have the possibility to get a hold of the online lecturer at least for a single physical session, so to compensate for the fact that students follow his/her lectures only online.

In this line it also suggested by the teachers that the online learning approach and class delivery should be enhanced in continuity and that we should work more as a group to study how to spread of use of online contents between in class and out of class time, like this embedding the learning experience in also in the other spheres of activities of the students.

The global feedback from the partners about the implementation of these courses was very good. The online contents were uniting all the remote students around them and proved to be very compliant and adoptable to the different local contexts. The opportunity to accessing them was fully appreciated.

This is a first recount on our experience with the pilots. In a future detailed report we plan to give detail overview of data we are collecting at the moment, using standardized questionnaires, from all the students participants in the all the cross-university pilots, to understand better:

- Was the cross-uni pilot an effective learning experience?

- Did it increase students sense of belonging to the community?
- Did it increase students ability to work in distributed teams?
- How engaged in learning the students were?
- How supportive was the technology in this cross-university pilot?

Also we are organizing a focus group with the professors involved in order to deepen our understanding on what worked in each setting, what did not work in each setting, and to understand better how easy is it to scale and employ the same setting for other purposes, and like this to learn which settings can be replicated and used by the other Universities and under which conditions.

After all the courses are completed, and standardized questionnaires delivered and collected, we aim to perform statistical analysis and to study which features of the pilots brought to more effective cross-university collaboration experience. For this purpose we categorized all the settings in terms of the features (as already presented in TABLE 1).

V. CONCLUSIONS

Building a community of learners, where students and professors cooperate and learn together can become a powerful motivator and powerful mechanism for extending learning. In this paper we have presented how such community managed to organize and deliver collaborations on I&E courses within the network of Universities in Europe.

The paper deals with a European experience of education in Innovation and Entrepreneurship using online resources mutualisation and remote delivery approaches to physically distant students. The project addresses the problem of pedagogical cooperation between Universities on European level.

With the pilots presented here we provide online collaboration schemes for distributed running of courses that is scalable and that can be implemented in any network of Universities. Considering the level of academic demand, and considering that a European network connecting about 14 Universities was already attracted and enthusiast for such an approach, a network connecting of even more centers of knowledge may be easily envisaged.

ACKNOWLEDGMENT

The authors would like to acknowledge and thank all the teachers, especially Javier Segovia, Milena Stoycheva, Lorenzo Angeli and Olli-pekka Mutanen, and all the students who took part in the cross-university pilots initiative. The pilots were supported financially by EIT Digital under the Innovation and Entrepreneurship Improvements Education projects.

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