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A SUSTAINABLE APPROACH TO THE REUSE OF STUDENT-CENTERED LEARNING SCENARIOS

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Abstract

Several annual reports express the increasing role of Learning Management Systems (LMS) in the context of Higher Education Institutions (HEI), as primary tools to support learning. However, in most cases, the integration of technology in the teaching-learning process is not being combined with a shift in pedagogical methodologies, and thereby teachers are not taking full advantage of the capabilities offered by these learning environments. This has led to a situation where LMS are mainly being used as digital libraries where learning contents can be downloaded.

Therefore, we believe that it is necessary to overcome this notorious tendency for development of content-centered environments, by expanding pedagogical strategies and learning opportunities that support student engagement and active learning. This is not only the biggest challenge of today's education, but also a tremendous challenge for teachers, particularly where the rearrangement of new workflows are concerned. Designing and implementing situated or articulated learning activities is a complex and time-consuming process aggravated by the fact that, in general, teachers don't have the expertise of an instructional designer.

Still, those who undertake the challenge face the difficulty of not having a return on the time and effort they invested: a new semester/year usually represents a new learning context, new learning objectives and new students with different learning styles, to which teachers should adapt new learning strategies and activities. Although LMSs like MOODLE offer backup and restore functionalities, they lack the potential to rapidly change learning flows: insert/remove new activities, (re)design new paths, determine or adjust synchronizing points and group formation periods, etc.

We believe that the solution for these problems relies on the design and reuse of online learning scenarios, based on sequences of articulated activities, allowing for the dissemination and presentation of concrete templates for active learning strategies. We are using LAMS together with MOODLE, as a coupled-system, thus taking advantage of the well-established LMS and the drag-and-drop capabilities of LAMS, to easily design learning experiences. We also designed a repository of

learning scenarios templates created by teachers to be then imported to LAMS and executed in MOODLE.

Although it is still in progress, we believe we have a suitable implementation and assessment methodology for this project: in a first phase we use 3 teachers from 3 subject areas, which have to build their own learning scenarios and run them in MOODLE with their students. In a second phase, each of the teachers must choose a scenario built by one of their pears to be adopted or adapted to their own context and run it in MOODLE again. During and after these phases, interviews, documents, inquiries and system logs are used to assess and measure the proportion of changes between the first and the second scenario, the capacity of a scenario to be used in different areas (inter-subject reuse) and students' and teachers' response to the methodology. The purpose is mainly to analyze student engagement and satisfaction, the efficiency of the learning environment to fulfil the learning objectives and amount of return in terms of time and effort that the rapid change of activity sequences is able to grant teachers.

Keywords **-** Learning Scenarios, LAMS, MOODLE, reusability, methodology

1 INTRODUCTION

The rapid growth of the use of the Internet and educational technologies has allowed deep transformations in the teaching-learning processes and paradigms. Particularly in where education is concerned, the Internet has been gaining an increasing role as a mediator-facilitator platform, thus allowing the creation of new contexts where learning opportunities can be expanded, dynamic, and potentially collaborative and where the resources are widely available.

Some authors [1, 2] highlight precisely that the purpose of technology-mediated education resides in its potential for the creation of personalized, generative, adjustable environments and systems that add value to the traditional classroom. In fact, these traditional environments are being expanded towards the virtual world in a growing relation of complementarity that can be either purely electronic (e-learning) or combined (b-learning).

Nevertheless, the source of educational potential does not rely on technology itself but on its creative and reflexive application [3], since technology does not replace the teacher nor guaranties learning [4].

In this new paradigm, the posture of the online tutor must not consist of a replica of the teaching models based on the traditional lecture. It is necessary to adopt student/activity-centered models/strategies, according to which the tutor is an organizer, a facilitator and a mediator for the construction of knowledge and interactions, allowing the student to succeed as a learner and as an individual [3]. This new posture implies recognizing that changing the means through which education occurs means changing education itself [5].

These modifications should, therefore, impact the organizational culture of schools, its pedagogical practices and the redefinition of the roles of its intervenients. Allowing for the stagnation of pedagogical practices before the emergent technological evolution may allow technology to become a recreational agent, misleading the real purposes of educational institutions.

In this article we present a research project being implemented at School of Accounting and Administration of Oporto (ISCAP – http://www.iscap.ipp.pt) in the scope of a Master Degree attended at Faculty of Engineering of Oporto (FEUP – http://www.fe.up.pt). The project has been framed in the Online Support Project's (PAOL - http://www.iscap.ipp.pt/paol) activity, which is the responsible entity for the implementation and management of educational technologies at ISCAP.

2 CONTEXT

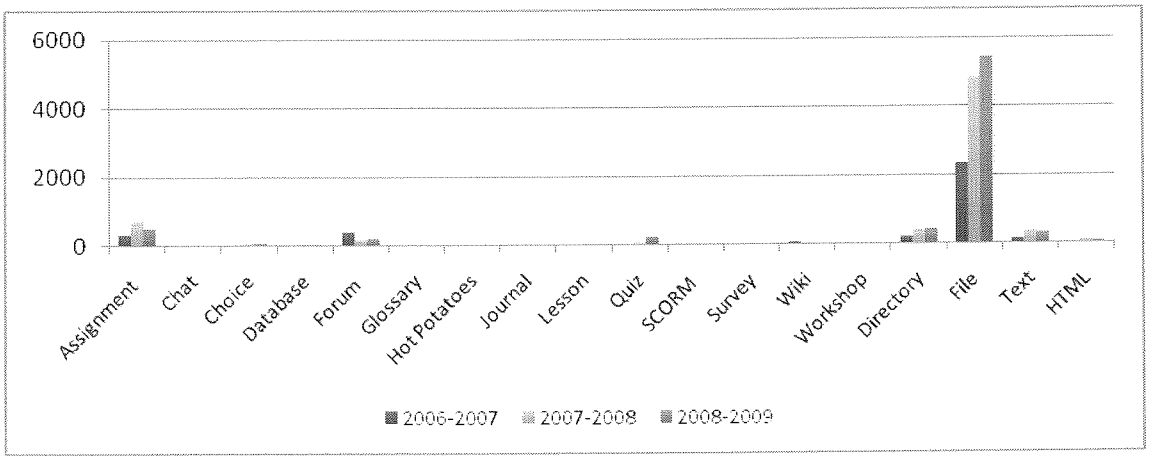
Higher Education Institutions (HEI) have been adopting Virtual Learning Environments (VLE) as the primary tools to support teaching and learning. Amongst the large variety of commercial and open source solutions, MOODLE, Blackboard and DrupalED are the most widely spread [6].

Accompanying this technological integration there is an enthusiastic effort demonstrated by teachers to include VLEs in their daily practices. Annual reports [7] from PAOL about the use of MOODLE at ISCAP reveal a notable increase of users (teachers and students) in the last three years.

This means a great step has been taken particularly in terms of the increasing number of student access to course contents, the reuse of MOODLE course pages from one year to another and the adoption of tools that facilitate teacher-student communication.

Nevertheless, it is possible to verify that the integration of technology in the teaching-learning process, in the majority of the situations, was not accompanied by a shift in the pedagogical methodologies that would to truly transport the teaching-learning process into VLEs and in fact foment the teaching and learning opportunities. This is the biggest challenge of today's education [8]. According to Rogers [9] it is necessary to expand educational methodologies by designing learning activities that promote student involvement and allow them to develop/apply their knowledge/skills.

Indeed, as we can see trough PAOL's reports summed up in Graphic 1, VLEs have been used as libraries for content storage and distribution [10], where there is neither accommodating for learning activities [11] nor for students' opportunity to perceive the different phases of their learning process [12].



Graphic 1: The use of MOODLE Activities and Resources at ISCAP in the last three years (data from May 2009)

Thus, this tendency for development of content-centred environments results not only from the absent and/or slow adjustment of new pedagogical strategies to technology, but also from the VLE's architecture itself. This, in fact, is also reinforced by an international enthusiasm for the development of educational content packaging and interoperability standards that lead to the creation and development of the Sharable Content Object Reference Model (SCORM).

Two of the most evident and less positive aspects of content-centred environments are well evident throughout the literature that refers to the use of Learning Objects (LO): on the one hand they are pedagogically neutral or poor contents in order to maintain their potential for reuse [13, 14], on the other hand they don't accommodate collaborative learning/work opportunities. Actually they keep the individualized legacy of the 70'sinstruction endorsed by many authors [15-19].

This is the "sad truth about e-learning" [10] in the majority of educational institutions, since the ambition to optimize technology-based education trough digital reusable contents has lead to the content distribution habits and to rhetorical pedagogies.

In this context, Rogers highlights [9] the importance of Instructional Design as a means for pedagogical planning, taking into account students previous knowledge, the teaching and learning objectives and the most appropriate set of activities to pursue those objectives. This planning process is generally defined by the Joint Information Systems Committee (JISC) [20] as the "process of designing, planning and orchestrating learning activities" where the student is the central element and the contents are mere information resources integrated into that planning. As a result the teacher will be increasing student active and potentially collaborative engagement.

Salmon [21] also states that the success of online learning resides on the balanced arrangement of the old but still relevant teaching-learning concepts and the implementation of innovations that take full advantage of technology's potential. Therefore, it is necessary to instigate a new teaching and learning culture [22], where technology: acts as a facilitator of fundamental changes germinating and diversifying new processes and contexts [23]; promotes collaborative and personalized learning opportunities; generates higher levels of student performance and motivation [24].

Supporting the idea of reusability as fundamental concept to e-learning sustainability [2], it is essential to document pedagogical planning and strategies in order to perfect them by its repeated usage [9]. This will also allow the economy of time and effort inherent to its construction. Indeed generally the teacher intellectually builds and adjusts teaching processes and implements them without having documented them. As a result there are very few collections of documented strategies that teachers can use to satisfy their educational needs [25].

The IMS Global Learning Consortium (IMS GLC) Learning Design (LD) specification [26] appears in this scenario as a response to some of the identified difficulties [27], by presenting a formal language to describe the relations between the agents, activities, resources, tools and services that compose the teaching-learning process [28]. The IMS LD specification also supports the description of all kinds of pedagogies, including the most recent ones based on social constructivism [29]. Apart from offering a notational system, the specification has promoted the development of authoring and reading/execution technologies that make it possible to build, describe and run learning designs by packaging them into Units of Learning (UoL) [30]. These authoring tools can promote the development of new pedagogical planning habits when gifted with some ergonomic quality and an appropriate representation of the educational concepts and realities [28].

In fact, the arrival of this technological typology and the simplification of authoring software is allowing teachers to take control of new dimensions of learning that have been retained by experts, software engineers and instructional designers for a long time [31].

However, these are very young specifications and technologies that are still in development and that are not integrated into teacher's everyday activities. It is also still not possible to find a substantial amount of investigation results on registered impacts in Higher Education (HE), particularly when considering the Portuguese context.

Therefore, it's important to analyze the announced potential of these technologies and evaluate their authentic capability to respond to the growing demands of e/b-learning. This analysis should also take into account teacher's concrete needs to simplify and optimize their process of adjustment to these emerging environments.

A. Objectives

In the context described above, our investigation aims to: promote the design and reuse of activity-based pedagogical scenarios; to document learning contexts; and to increase active e/b-learning pedagogies sustainability by studying the potential of reusability in the reduction of the time and effort that teachers take to adopt or adapt teaching-learning strategies.

We believe that the existence of documented strategies facilitates their comprehension, their reuse and instigates the development of active learning scenarios by given teachers concrete examples.

We also believe that learning scenarios can be reused amongst different courses (inter-subject reuse) by being adopted or adapted, refilled with new contents and services and thereby generating variations from pre-existent strategies.

Finally, we think that the design of activity-based learning scenarios promotes active and student-centered contexts, offering opportunities for collaborative work and a more personalized learning.

In order to clarify our goals and to guide the investigation properly, we have conceived the following investigation question: How does reusability impact the reduction of the time and effort taken to build learning scenarios and the dissemination of multidisciplinary pedagogical strategies?

3 METHODOLOGY

The problem that instigated our investigation is related to the study of a new educational phenomenon [32]: the introduction of a new learning environment into the institutional context. In the construction of the most adequate strategy to evaluate the responses to the formulated problem, we considered that the investigation should be accommodated into a flexible methodological plan [33]. This plan should allow for the combination of concurrent procedures of quantitative and qualitative analysis. Therefore, and considering the syntax of our investigation question [34], we believe the case study methodology to be appropriate: it comprehends the study of a group of individuals' behaviour in a specific context and through whom it might be possible to illustrate one or several abstract theories or principles [35].

3.1 Technological infrastructure

In order to carry out our investigation we have assembled the essential technological infrastructure, using three components, as shown in Fig. 1. A new learning environment – LAMS – was integrated with the pre-existent MOODLE platform. This became the new built-in environment that allowed us to take advantage of the well established MOODLE platform, with which teachers and students were well familiarized.

Simultaneously, we built the Supporting Design for Learning portal (SD4L) where we published a set of support resources and LAMS tutorials for the participating teachers. This portal was also designed to embed the learning scenarios repository.

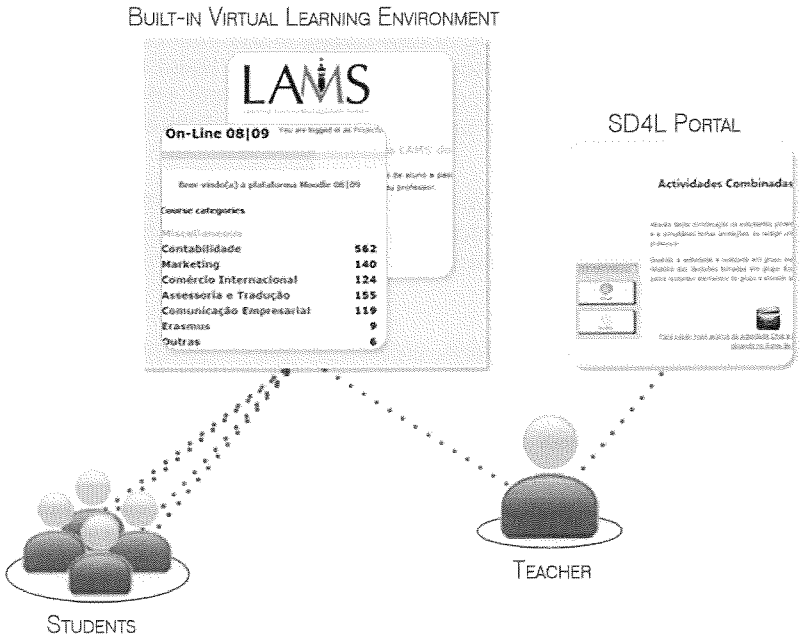


Fig. 1: Technological infrastructure used in the investigation

A. Learning Activity Management system (LAMS)

LAMS in an open source authoring tool and learning environment inspired by the IMS LD specification, which can be integrated into most of the wide spread LMS. Its latest version 2.2 was released in December 5th 2008.

This system was developed by James Dalziel, the director of Macquarie E-Learning Centre Of Excellence (MELCOE) at Macquarie University, and has become the world's leading design software [36]. Two major organizations were established in order to support LAMS's development: the LAMS International (http://www.lamsinternational.com/) - responsible for technical support and development, hosting, training and integration services – and the LAMS Foundation (http://www.lamsfoundation.org/) – responsible for the investigation on LAMS implementation impacts.

According to Britain [11], the evaluation of Learning Design software may be considered in two perspectives: the level of conformance with the IMS LD specification (conformance level); its capability to design the learning contexts/scenarios that have been motivating the construction of that same specification (educational potential).

When we consider LAMS advantage we cannot refer to high levels of conformance, but there are significant benefits for developing learning structures. The tool has a great pedagogical planning potential and offers an accessible interface that allows for a quick global comprehension and edition of learning sequences [37, 38]

LAMS construction philosophy meets one of the biggest digital learning trends announced by IMS GLC in late 2008: "The future of digital learning revolves more around context than content. (...)Multi-

media and online activities are the learning tools of tomorrow because you can tell so much more of a story with it than you can with the simple written word. Reading about science can be tedious and boring, but to actually watch and experience it can be amazing." [39]. Indeed, active learning grants higher levels of student motivation and assessment [40].

LAMS allows the creation and orchestration of activities in linear, conditional and branched learning flows, offering teachers a growing set of instruments: sequence management tools (sequence gates, branching tool, grouping tool, optional activities and sequences), activities (chat, forum, multiple choice, notice board, notebook, question and answer, share resources, submit files, survey, voting, scribe, task list, data collection, spreadsheet, Google Maps, DimDim Conference, Pixlr Image Editing, image gallery, video recorder, wiki) and combined split-screen activities (forum and scribe, chat and scribe, forum and share resources) [41].

LAMS development allowed the identification of new needs in the IMS LD specification [42], amongst which: "Need more tools (services), and descriptions of tools; (...) Need a user grouping concept, not just a role concept; Need an ability to pass roles/groups and tool information across Acts; More development of how a teacher monitors and approves actions in real-time during a complex, multi-task activity sequence." [37]

LAMS is composed of three main environments: the authoring environment – where activity sequences are constructed – the run-time environment – from which students have access to activities – and the monitoring environment – from which teacher can control the learning flow.

B. MOODLE

MOODLE is an open source e-learning platform, created by Martin Dougiamas to help teachers create online courses with rich interaction opportunities. It is available in more than 75 languages and spread over more than 30 000 schools [43]. MOODLE architecture promotes a learning philosophy based on constructivist and social constructivist approaches to education [44] where knowledge is built from social interactions.

LAMS integration with MOODLE allows teachers the benefit from the orchestrating of activities in different types of learning flows, which is not provided by MOODLE. Therefore, it is possible to access all the LAMS environments (authoring, run-time and monitoring) from inside MOODLE simplifying the teachers work. In MOODLE the access to LAMS is made from the activity toolkit, as shown in Fig. 2. It is also possible to choose the LAMS course format in MOODLE.

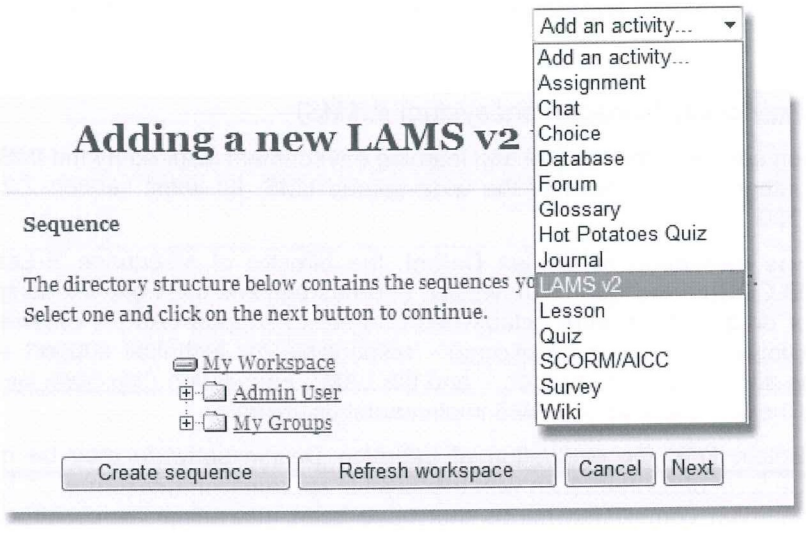


Fig. 2: LAMS Management through MOODLE

LAMS International has also developed tool adapters [45] for LAMS that allow LMS native tools and other web applications to be imported into LAMS authoring toolkit. When this happens these tools are added with LAMS tools properties and are able to be sequenced and used with separate groups of students, even if they were not originally meant for that. LAMS can also use these tools output as parameters to determine conditional learning paths. In early May 2009 it was possible to find tool adapters for MOODLE and .LRN.

3.2 Teacher and Student Dynamics

Our unit of study encompasses three teachers from three different subjects and their students: Information and Communication Technologies, Business English 2 and Electronic Tools Applied to Translation.

We are investigating with more detail the processes and events related to teachers, since they are the portion of the unit of study with more potential to answer our investigation question. Therefore, here we are mainly using a qualitative approach, because it will allow us to understand particularities that could not be stated trough enquiries and that require careful analysis and observation [46]. Where students are concerned, we are applying the quantitative approach through inquiries, so we will be able to refer to the impacts of the built-in environment on their learning.

We designed an exercise composed of two fundamental cycles in order to test the propositions of our study, as illustrated in Fig. 3:

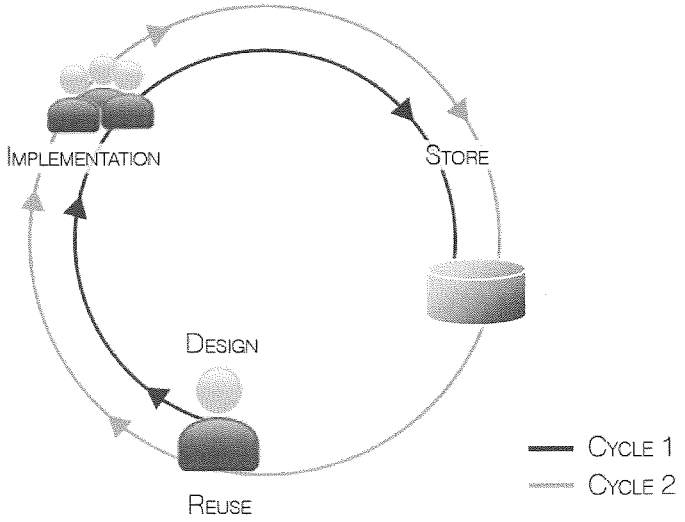


Fig. 3: Activity Cycle to Accomplish

In a first phase (black cycle), after receiving initial training, the three teachers have to build their own learning scenarios using LAMS and run them in MOODLE with their students. After that, the teacher must fill in a description grid about the implemented strategy and store it together with the LAMS exported pack in the repository.

In a second phase (grey cycle), each of the teachers must choose a scenario built by one of their pears from the repository to be adopted or adapted to their own context and run it in MOODLE again. Once that is accomplished, the teacher must fill in a description grid about the adapted/adopted strategy and store it together with the LAMS exported pack in the repository.

During and after these phases, interviews, documents, inquiries and system logs are used to assess and measure the proportion of changes between the first and the second scenario, the capacity of a scenario to be used in different areas (inter-subject reuse) and students' and teachers' response to the methodology. The purpose is mainly to analyze student engagement and satisfaction, the efficiency of the learning environment to fulfil the learning objectives and amount of return in terms of time and effort that the rapid change of activity sequences is able to grant teachers.

3.3 Evaluation instruments

In order to guarantee the investigations' desired degree of validity and reliability we are using several evaluation instruments in different phases of the project.

The interviews and inquiries applied to teachers are based on the instruments developed by some international projects: the JISC e-Learning Pedagogy Program – Evaluation of LAMS [47], the

Designing and Sharing Inquiry-based Learning Activities (Desila) program [36] and the Supporting Practitioners in Producing IMS Learning Designs (LD4P) [48].

The teachers interviews are distributed in three phases: before the design of learning scenarios, after their implementation and after their reimplementation. We expect to be able to build a progressive report on teachers' adjustment to the reuse process and to the tools. In the end of the cycles described above, we will apply an inquiry to obtain general feedback and reinforcement of conclusions taken from interviews.

The inquiries applied to students are based on instruments designed by the projects Desila [36] and JISC - Authoring Using Learning Design (ALED) [49]. These inquires are distributed in two phases that correspond to both periods of post-implementation and we expect them to help us report on the efficiency of LAMS and on the student level of satisfaction with the pedagogical strategy.

4 CONCLUSIONS

There is an emergent need to develop new mechanisms with potential to enrich online learning environments and thereby education itself, by supporting teachers and providing them with adequate training, tools and resources. We believe that this enrichment of learning environments may be encouraged by the articulation of individual and collaborative learning activities as a part of the development process of learning scenarios, designed to accomplish a set of learning objectives.

The design of learning experiences in the context of higher education is a complex activity, where, for example, a great diversity of student backgrounds and competencies need to be taken into account. In fact, Instructional Design is a field in which the majority of teachers don't have formal competencies. From our daily contact with teachers, we could also perceive that the lack of the technological competencies necessary to manage VLEs has, in some cases, led to a discredit in the pedagogical added value of technology-enhanced learning.

Therefore, our work relies on the development of collaborative efforts amongst teachers, in a way that their time and effort investment may have the highest possible return, as they are members of a community that works together in the development and reuse of pedagogical strategies and methodologies.

At this stage (middle May 2009) we are not able to present substantial results about the reusability process amongst teachers, once we are only approaching the end of the first cycle we have described above (see Fig. 3). Therefore, we are still collecting information for analysis and comparison with cycle two.

We expect our investigation to give us not only a considerable analysis of reusability benefits, specially in terms of time and effort taken to develop online learning strategies, but also to bring up important guidelines for a broader implementation of our methodology, inside and outside the institution.

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