An Institutional Personal Learning Environment Enabler

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Abstract—**In this paper, we first discuss the concept of Personal Learning Environment (PLE) with respect to higher-education institutions and Virtual Learning Environments (VLEs). This discussion rapidly confronts us to the place of the PLE and self-directed learning and/or training inside the institution. We therefore introduce the concept of institutional PLE enabler (iPLEe), which is expected to stimulate students to create and use their own resources and institutional resources and share them with peers during formal and informal learning activities. Next, we describe a proposal for a federated design and implementation of the iPLEe within multiple institutions. Various teaching scenarios are tested to investigate how teachers can solicit students to exploit their PLE resources and introduce self-paced actions in teaching. We conclude with a discussion about these experiments and draw further directions from the technological and pedagogical perspectives.**

Personal learning environment; virtual learning environment; self-directed learning; web 2.0

I. INTRODUCTION

Virtual Learning Environments (VLEs) involve a variety of tools, which generally share the feature of being institutionally controlled. To respond to the trend of learners increasingly consuming web tools and sharing contents within the cloud, a new framework (the "iPLEe"), built on recent student-centric concepts, is first presented, along with a concrete implementation of it. Live tests using various teaching scenarii are then described before discussing their effective usages and perspectives for future developments.

A. Virtual Learning Environments and Beyond

In higher education, information-communication-technology (ICT) based Learning Environments (LEs) are nowadays widely established. For instance, VLEs are increasingly common and some authors (e.g., [1]) identify four main components: 1) to manage registrations and records; 2) to store learning material; 3) to store and assess learners' productions; and 4) to manage learners' interactions inside virtual classrooms. Nowadays it is common that higher education institutions provide teaching and learning through some kind of these VLEs. Such a technological trend is well confirmed in the case of the Swiss higher education landscape where all institutions are equipped with at least one VLE [2]. From a pedagogical point of view, in the way VLEs are designed and implemented, they favour and induce the traditional form of academic face-to-face teaching: teachers organize courses and define teaching activities that learners can only passively follow. Although VLEs are currently evolving towards the integration of social components such as blogs and wikis, they maintain their initial intrinsic teacher-centric form, to the exception of e-portfolios that bring up a student-centric component.

As a counterpart to VLEs, which are often marked as institutional [3], a new concept has recently emerged: the Personal Learning Environment (PLE). Innovative teaching and learning concepts are readily introduced in PLEs, requiring specific technology infrastructures, which may not necessarily exist yet. The concepts behind PLEs are not clearly identified, as exemplified by the following definitions taken from literature: "Under the concept of the PLE we find everything (literally: everything) that a person is using to learn" [1]; "they are personal to each individual, created by them, owned by them, used by them within their lifelong learning" [3]; "a PLE is comprised of all the different tools we use in our everyday life for learning" (and it is not an application) [4]; "PLEs are typically described as a collection of different ICT tools and software, usually social software, to foster self-regulated and collaborative learning" [5]. We thus see many diverging acceptations of what a PLE could/should be. In [6] three diverging orientations of the PLE are further proposed. More concretely, in [3] the PLE is considered as the set of all resources that learners are using, even including their mental resources (i.e., models, tools, and knowledge). The PLE is therefore part of the "person-plus" [7] concept, which takes into account the learners' physical and social surrounds in addition to themselves. The PLE is also closely related to the introduction of the Web 2.0 ecosystem in learning activities [8].

To summarize, PLEs include two intersecting components: the Personal Web Tools (PWT) and the Personal Learning Network (PLN) [3]. The PWT gathers the web tools that learners use for performing learning activities (personal dimension) and the PLN represents the network of people and resources that learners generate and organize during both formal and informal learning activities (social dimension). A quite complete and broad overview of those various PLE definitions is available in [5]. From a strict

functional point of view, the PWT component of a PLE is expected to support four main features [9]: generation, organization, sharing of content, and communication. In [10], twelve dimensions structured into three categories define these functionalities: 1) pedagogy, personalisation, control; 2) connectivity and compatibility; and 3) platform.

B. Bridging Institutional and Personal Learning Environments

Although PLEs are usually presented in opposition to VLEs (see above), VLEs cannot be simply excluded from the learning environment landscape or replaced by PLEs. To some extent, if we apply the most general definition of PLE [1], the VLEs, as used by learners for their learning activities, should also be counted as one of the many components of their PLEs. Moreover, in a survey conducted at the University of Geneva (Switzerland) [11], students have clearly expressed their attachment to VLEs. They are particularly sensitive to the fact that the content made available through VLEs is specifically selected and validated by teachers for them, and thus there is no need to search, filter and validate these resources, which are ready to be used for their learning and training activities. Usually, such VLEs clarify learning objectives and propose validated testing activities, which for individual learners with a low autonomy level are difficult to assess by their own.

Reference [3] expresses well the various possible viewpoints with respect to the double pairs VLEs/institutions PLEs/students: "… whether PLEs should remain the sole domain of the learner, or whether in some way they could be incorporated into institutional infrastructures. Some argued strongly for sole student ownership, vehemently opposed to any institutional meddling in a PLE. Others held the position that PLEs should have some institutional provision incorporated within them. Still others thought that PLEs should be part of the institutional infrastructure, brought within the protective envelope of the university fire wall." These positions are still debatable and no global agreement has emerged yet. According to [12], institutions should provide two distinct but related environments: an Informal LE to support the learning process based on self-paced contents and features and a Formal LE to manage learning with features akin to VLEs. In [3], the PLE design is augmented with a Cloud LE presented as a conceptual bridge between the PWT of the PLE and the institutional VLE. The concept of "institutional PLE" (iPLE) is proposed in [13]: iPLE is defined as "an environment that provides a personalised interface to University data and services and at the same time exposes that data and services to a student's personal tools". Two alternatives are depicted in [1]: first, the iPLE consists in providing some Web 2.0 tools inside the VLE, and second, the Hybrid Institutional PLE (HIPLE) allows the direct use of third parties Web 2.0 tools.

The aim of this paper is to further develop the notion of iPLEe, which represents a powerful concept helping to establish a bridge between VLE and PLE. The methodology is based on a students' survey conducted at the University of Geneva [11]. The initial objective of this survey was to identify the personal learning activities, which are most representative of students' usages. The main consideration followed during the design of the survey was to start from current students' practices. The main conclusions drawn from the survey analysis led the research team to build the following scheme: the skills required by learners for self-regulating their learning being key, they must be integrated into the PLE design and supported by pedagogical resources (this scheme shares similarities with the one exposed in [5]). These resources were proposed to focus on information literacy training under the form of digital soft skills seminars and workshops. Another outcome of this study was to conclude that the digital natives generation is much less competent and innovative with regard to information technologies than what was initially expected (see also [14][15][16]). To take into account this lack of knowledge in computer literacy, the proposal further included a technological watch and a recommendation engine in order to help and encourage self-construction of students' PLE through social networks and resources sharing.
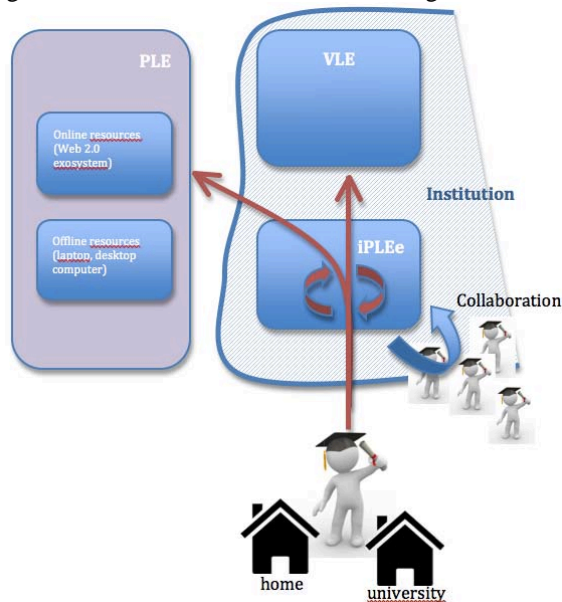

Figure 1. The iPLEe structure (from the student's viewpoint).

To develop one-step further this proposal, this paper argues that the main issue is finally not to provide an institutional PLE but rather an extension of it: a "PLE enabler". Such a PLE enabler aims to bridge personal, institutional and worldwide resources, as well as to enable collaborations between co-learners and sharing of resources. To add a new acronym to the list depicted in [1], we name it "iPLEe" for "institutional PLE enabler". This iPLEe somehow provides a unique framework merging learning services and features offered by iPLE and HIPLE (which focuses more on non-formal learning). The resulting iPLEe scheme can be viewed as a student centric self-directed collaborative didactic dashboard, clearly distinct from a VLE. In this view, the role of the didactic dashboard is key to provide an ergonomic interface to learners who can manage with ease their didactic personal resources (from their own PWT), the institutional resources (from the VLE)

and work by interacting with them. The iPLEe is thus a kind of "meta" or "augmented" PLE behaving like a didactic hub in which three components are further added: collaboration with peers, digital literacy training resources and recommendations obtained from a recommendation engine. The whole scheme is schematically illustrated in Figure 1.

II. iPLEe DESIGN

In this section, the main components of the proposed iPLEe are described more concretely. Considering that a PLE is closely related to life-long learning and students' mobility (student are not bounded to a single institution), our proposal further integrates a quite new dimension: the federation of institutions which we test in the three Swiss institutions: University of Fribourg (UniFR), University of Geneva (UniGE) and the Swiss Federal Institutes of Technology in Lausanne (EPFL). Working within a federation asks for an adaptive and flexible iPLEe design that can be deployed within different pre-existing LEs, such as LMS (e.g., Moodle, Chamilo, etc.) and ePortfolio (e.g., Mahara), while keeping a common and consistent iPLEe framework. This federated approach enables the Recommendation Engine (RE) to work inter-institutionally, benefiting from the aggregation of a larger set of recommending resources (coming from each institution), visible to the learners through their dashboard widgets.

Our initial implementation of the iPLEe relies on the Graasp social media platform (formally called Graasp) [17]. Graasp's main purpose is to support self-directed learners and knowledge workers in their daily online learning and knowledge management practices. Graasp enables the aggregation, the sharing and the interaction with a rich set of resources in private and public contexts defined by the learners themselves, and is based on the so-called 3A interaction model [18]: "Assets", "Activities" and "Actors". Activities are organized as spaces created by users. Assets, activities and actors can then be added and organized within these spaces, which behave as didactic dashboards. Users can be invited in a space (and therefore associated to the corresponding activity) accordingly to three distinct roles: viewers, contributors and owners. Sub-activities can be inserted as sub-spaces. All Graasp entities share typical Web 2.0 features such as wiki-like descriptions, rating, tagging and commenting. Because Graasp relies on resources gathered from the Web and online communities through widgets that can be integrated inside spaces, assets and Web apps can easily be added. The widget mechanism is currently being extended in order to make possible the integration of institutional VLE resources in the didactic dashboards the same way other Web 2.0 resources are integrated.

To stimulate collaboration and cooperation between learners, activities and assets are both declared as public by default (they can be further changed to private if needed). To enforce self-directed learning, and in strong opposition with traditional VLEs, all users have the same role giving them access to exactly the same functions. This feature introduces a new relationship between teachers and students and unlocks new scenarios: a student inviting peers to a learning activity, or a student inviting teachers to a learning activity.

III. INTRODUCING iPLEe-BASED ACTIVITIES IN TEACHING

Providing learners with a new technology is useless as long as they are not trained to use it [5]. Learners will not adopt new technology as long as they do not understand its potential use and the benefit they can get from it. They also need to be convinced that the tool is efficient for learning and training. A first strategy to introduce and promote the iPLEe in the learner practice is to apply it in conventional formal teaching by introducing activities that involve external resources (mainly web 2.0). The learning process is organized into three successive steps, which progressively bring learners to move from passive resources consumers to active resources contributors: the teacher first provides learning material and resources that learners can consult and use, following the traditional teacher-centric approach as conveyed with VLEs; then learners are requested to comment and discuss these resources; finally learners are encouraged or required to submit their own resources that co-learners and teachers can in turn discuss, comment and eventually expand. An important ingredient of this learning strategy is to analyze and document learning activities, which are part of the everyday life of students using a combination of VLE and PLE functions [19].

We describe various scenarii using Graasp as the iPLEe. These scenarii have been introduced to stimulate learners' interest in pre-existing courses and teaching activities.

A. Common shared course space

The iPLEe approach is applied at UniGE in a bachelor level course: "Introduction to programming" where a dedicated Graasp space is created to distribute course material (texts, slides, etc.) and share bookmarks. For each available resource, a discussion forum is available. This allows students, for example, to share both questions and answers within a space for each section of the course. In a subsequent stage, students are requested to create their own space to work in small groups during the semester project to develop small software applications. Each group has to write the description of the software application they intended to develop using their project space defined in Graasp. The space is further used by the students and the teacher to share and exchange project material and other resources.

The same scenario is applied at EPFL with a master course on "Multivariable Systems". Students are able to access course-related resources made available under creative commons license on SlideShare and integrated in the dedicated Graasp course space. As a matter of fact, the PLE paradigm change is also an interesting way to initiate and develop further sharing practices among teachers. It is intended to add in a next release of Graasp built-in creative common licenses on every public asset in raise awareness and enforce open sharing schemes. A simulation widget of a Segway illustrating a case study was also proposed (http://graaasp.epfl.ch/#item=widget_1175).

B. Common shared workshop space

"Service innovation lab" is a master level course at UniGE. It is a typical example of a course originally

organized as a face-to-face workshop animated by teachers. The course's objective is to design innovative web services according to a context, pre-defined by the teachers. The students are trained to apply design innovation collective techniques during workshops in classroom. The different design process steps are supported with collaborative web 2.0 tools: mind maps, social bookmarks, post-it walls, etc. Graasp is used as a shared space where students are involved as regular contributors. The teachers start as first contributors with teaching material contents to initiate the class collaboration and expose the Graasp's features. The shared space is continuously fed with workshops' contributions that can be updated, enhanced, but also commented and discussed between face-to-faces sessions.

"ICT to learn at University" is a BA level course at UniFR. Its objectives are: 1) to make students think about their PLE needs and to answer the question: for what learning tasks a PLE will help me and how? 2) to aggregate needed resources within Graasp in order to create their PLE; 3) to make them use their PLE during various learning tasks that teachers organize within different courses. The ICT course is organised by alternating a series of workshops (objectives 1 and 2) and a series of distance activities (objective 3). Graasp is used in a collaborative way to develop a common space where all the participants of the ICT course share resources and reflections on PLE-VLE usages.

IV. RESULTS AND DISCUSSION

In this paper, the iPLEe concepts are introduced along with a concrete implementation based on the Graasp tool. Pilot classes using a range of iPLEe usages have been performed or designed. The teachers' observations and students' feedbacks allowed us to perform a qualitative evaluation of the different pilot courses and to identify the potential of the proposed approach, but also the limitations and the obstacles that we review and discuss now.

The hypothesis that students, although "digital natives", do not demonstrate any particular interest or innovativeness in using ICT for their learning and training activities, previously verified in the context of a students' survey [11], and notified in other publications as well (e.g., [5][14][15][16]) is again confirmed by the present pilots, even for students in information technology.

Almost no spontaneous contributions from students, even simple comments have been observed. The contributions submitted by students were mostly of the simplest kind: assets with attached files (usually without description nor tags). Assets are usually produced with offline tools such as desktop text editors and uploaded to the relevant space.

From the students' informal feedbacks, it appears that ICT-based activities like commenting, bookmarking, sharing, and editing are sometimes perceived as extra unnecessary work. Such activities require being continuously "active" during the course, which does not correspond to standard and usual rhythm of students' working habit. In the context of a campus university, a lot of informal interactions happen among students face to face with no necessity of ICT, nor understanding of the added value of discussion,

deconstruction-reconstruction of arguments, etc. in the learning process. By generalizing a deep learning approach, reorienting this situation would probably have deep consequences with respect to the current academic practices. For instance, a possible way to address this issue could be to investigate how to valorise these activities with respect to other more traditional activities. Validation and maybe evaluation of these activities should also be questioned anew. Inserting the global objective « learning to learn » in University curricula is also a possible action to be analysed.

Some students are even reluctant to submit intermediate results. In the programming introduction course, for instance, students were required to submit the skeleton of their semester project (it was defined as mandatory) in order to have a pre-evaluation with comments and suggestions from the teacher and to initiate a discussion. Almost half of the students did not submit their contribution in time and multiple reminders have been useless. For many contributions only very fractional information have been finally submitted. Some students sometimes invoked the fear of having their ideas stolen if they submitted intermediate results or if they continuously documented their semester projects. Deeper information about controlling data privacy would probably help, but to some extent, this issue should also be considered with respect to the plagiarism. Requesting students to submit intermediate results, share and comment them in an implicit "open context" and in the same time making them aware of "copy/paste" and plagiarism places them in a quite uncomfortable posture. A possible direction to address this issue could be to integrate reusability and co-creation (with links to digital copyrights initiatives such as the Creative Commons as described in one of the scenarii). Instead of forbidding plagiarism, inspiration could be valorised as long as the sources are explicitly indicated and the result recognized as bringing added values. The Yahoo pipe [20] ecosystem can be a good example: copying existing pipes is authorized and encouraged and even becomes embedded in the learning process. Users can "clone" an existing pipe script, and the new cloned script keeps a track of the initial source that could be used later in a reflexive activity.

Collaboration between students was also found to be difficult to initiate, a fact confirmed in [5]. There are probably many reasons, but one seems to come from students that meet continuously at the University and prefer face-to-face meeting and collaboration than virtual ones. They work together and usually delegate one of them to submit the final result. At some point, online collaboration appears artificial as long as students have the possibility to physically meet. Online collaboration is better viewed as a solution when people are distant. At a more general level, it appears that with blended learning, it is difficult to mix standard academic teacher-centric format (based on face-to-face sessions) with self-directed activities in online sessions.

In [21], an infography summarizes the results from different surveys about technology use in the USA in college campuses. It corroborates that technology based collaboration remains a difficult aspect to introduce in teaching. For example, the Word editor is still massively

considered as the most important software by 76% of college students whereas wiki (the top-ranked collaborative tool), is rated as the most important by only 21%. Moreover, when 86% of the students are using social networks, only around 10% or less are considering that social networks are extremely valuable for academic success and 58% feel at ease to share and exchange about coursework over social networks (without support or initiative of teachers).

From the teachers' point of view, the iPLEe offers an interesting option: the teachers are able to use their own PLE (to be renamed PTE for Personal Teaching Environment). It has two side effects: teachers can use the iPLEe at the level of their own digital skills (from simply attaching and creating documents to developing new didactic strategies necessitating widgets). Moreover, the iPLEe offers a lite, accessible and flexible environment to create course spaces without the need to master sophisticated VLEs. We can think of the iPLEe as a unique environment that researchers may, in the future, use first during their studies and then during their careers as researchers and teachers.

While the potential of iPLEe to bridge formal and informal learning is real, such potential will not be expressed as long as the difficulties inherently related to inherited learning habits have not been overpassed. The merit of this longitudinal study is in the identification of the main issues behind iPLEe, the only hope now being in addressing each of these issues. Training students in becoming more literate in ICT, through for instance soft-skills seminars, seems to offer at least one promising way of promoting a new learning culture, which would more fully benefit from iPLEe-like concepts.

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