Informal learning in formal contexts? An empirical assessment of the potential role of PLEs in higher education

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Abstract

Social Software applications have raised expectations in the context of higher education. Assuming that learners today are increasingly used to online communication, e-learning researchers have envisioned how social software could stimulate forms of e-learning that are more motivating and engaging than those afforded by traditionally established e-learning systems. The PLE is expected to play a central role in this process, allowing learners to collect, organize and re-distribute information and resources.

Experiences with social software use in formal contexts indicate however that students' media competence is less developed than required for the new learning practices and that students perceive their online learning spaces very differently from their personal online spaces. These observations call into question the application of PLEs in formal contexts of higher education.

This paper takes an empirical approach to identify the potential role of PLEs in university education. Departing from the assumption that higher education is too often equated with formal learning, it presents the results of ongoing research into the challenges higher education poses to students beyond their courses and into the informal learning practices (and social software applications) students employ to cope with it. Desk research and focus group interviews were used to assess the role of informal learning practices in the formal context of university studies.

To integrate the identified informal practices together with the formal practices into a process model of academic learning, we adopt the concept of a "student life-cycle". It helps to depict the respective tasks and to identify social software tools that support students in solving these tasks. This theoretical approach to informal learning in higher education together with the empirical insights into actual learning practices will help to elaborate the concept of a PLE as a methodical-didactical concept and to specify its role in bridging the gap between formal and informal learning in higher education.

1. Changing technological environments – changing learning practices?

"Today's students are no longer the people our educational system was designed to teach" wrote Prensky in his influential essay on the "digital natives" (Prensky 2001). He envisioned a fundamental revolution of learning practices caused by the widespread use of digital technology by young people.

Currently both the empirical findings on young people's media use as well as the debate about pedagogical practices appear less revolutionary. Although young people

use digital technologies routinely, they have not developed behaviors that would justify talking of a new generation (Schulmeister 2009). Although several authors have argued that teaching and learning practices need to be revised following the advent of social software and web 2.0, "many of the fundamental elements of learning and teaching remain largely untouched by the potential of educational technology", as Selwyn writes in a recent paper (Selwyn 2010, 66). This general observation also applies to the use of Personal Learning Environments (PLEs) in the context of higher education. Despite almost ten years of research in this field, there has not been widespread adoption of PLEs to support higher education learning processes.

This paper investigates the potential role of PLEs in higher education by looking at practices and contexts of learning. In line with research that focuses not on the technological or pedagogical aspects of PLEs, but on their correspondence with existing learning practices, the paper presents the results from empirical research on the use of social software for informal learning at German universities, with a view on both what universities offer to their students and what demands students have.

The paper develops a practice oriented theoretical model of the student life-cycle that helps to apply the results to the design of strategies for implementing PLEs in higher education, but also helps to identify open issues in the conceptual framework of PLEs. Based on the results, implications for future research are discussed.

2. State of research on PLEs

Since the term PLE was mentioned for the first time, various authors have used it giving it various meanings. Although the term has sparked a lively debate about the use of PLEs for teaching and learning, there is no widespread agreement about significance or even the very meaning of the term. The following sections give a brief overview of the research on PLEs and the affordances and constraints they offer in educational contexts according to the literature.

2.1 Research on PLEs: tool or pedagogical concept?

The PLE concept was first discussed in 2001 in an unpublished conference paper by members of the Centre for Educational Technology und Interoperability Standards (CETIS) (Oliviers and Liber 2001). Early definitions of PLEs were dominated by a technological perspective. PLEs were describes as technological system, as software application or as toolkit. But it was clear that not a single tool, but rather the combination of different applications make up a PLE. Accordingly, Milligan (2006) defines a PLE as "a single set of tools, customized to [the learners'] needs and preferences inside a single learning environment”.

Downes (2005) extends the notion of PLEs to the whole environment and points out the difference between institutional and personal use: “The e-learning application (…) becomes not an institutional or corporate application, but a personal learning center, where content is reused and remixed according to the student's own needs and interests. It becomes, indeed, not a single application, but a collection of interoperating applications – an environment rather than a system.”

Several technological approaches were taken. An early application called "Interactive Logbook" was designed as a mobile portfolio and personal development planning tool. It aggregates different tools and network resources the learner requires, and helps to plan, manage, track, and review learning activities (Corlett et al. 2005). "ELGG" was first presented in 2004 and combines elements of weblogs, e-portfolios

and social networking to create "personal learning landscapes" (Schneider 2007). In 2005, CETIS was commissioned by the Joint Information Systems Committee (JISC) to elaborate the PLE concept by specifying a reference model and prototypical software applications in the project "PLEX". PLEX is called a "Personal Learning Toolkit" (PLT) and can be used to aggregate information from services, publish information to services and manage information as well as activities, people and resources (Schneider 2007).

Later, the discussion centered more on the concept of PLEs, including pedagogical aspects and models, but still "…there was no consensus on what a Personal Learning Environment (PLE) might be. The only thing most people seemed to agree on was that it was not a software application. Instead it was more of a new approach to using technologies for learning" (Attwell 2007). Downes (2007) summarizes that "the PLE is a recognition that the 'one size fits all' approach characteristic of the LMS (Learning Management System) will not be sufficient to meet the varied needs of students. It is, indeed, not even an application per se, but is rather a characterization of an approach to e-learning."

Within the last years some EU-funded projects tried to combine the pedagogical with the technological approach. The main objective of the EU project "iCamp" (2005-2008, www.icamp.eu/) was to create "open virtual learning environments" by providing interfaces for interoperability (Kieslinger et. al. 2006). iCamp's pedagogical model focuses on self-directed and self-organized learning, social networking, and collaboration, aiming to support capacity building in these three areas. The "ROLE" project (2009-2013, www.role-project.eu) aims at supporting the learner's individual assembly of available learning services, tools and resources as well as to research and develop a psycho-pedagogically sound framework for supporting the individual composition of learning services.

2.2 Expectations of PLEs to support learning processes

There are high expectations for PLEs to support learning in different contexts: PLEs are envisioned to bridge the gap between informal and formal learning, to allow for control, ownership and self-direction on the learner's side, to provide access to a vast amount of resources, people and networks and to foster lifelong learning across institutions and contexts.

Attwell sees the potential of PLEs to support learning in informal contexts, an area currently "disconnected from the formal learning which takes place in our educational institutions" (Attwell 2007). PLEs put the learner center stage and in control of the learning process; he or she has control over form and content of his or her own learning environment (van Harmelen 2006) and plans, controls and reviews his formal and informal learning (Zauchner et al. 2010). Thus, the PLE as a personal system allows for "more responsibility and more independence" (Attwell 2007).

Mott and Wiley (2009) hope that "these new affordances facilitate a richer, more meaningful, and longer-lasting learning experience". An important aspect is their ability to provide "access to a variety of learning resources" and "to learners and teachers who use PLEs" (van Harmelen 2006). Furthermore they can support lifelong learning by offering "a standard interface to different institutions' e-learning systems" that can be used across institutions (van Harmelen 2006) and in different contexts and situations (Attwell 2007).

However there are several unresolved issues, possible drawbacks and problems associated with the implementation of PLEs in higher education. Research into stu-

dents' use of social software has shown that they react rather skeptical once institutions enter into their 'private spaces' like social networking sites (Jones et al. 2010). There is also the risk to formalize, or at least structure informal learning practices to an extent that it loses its informal qualities (Jensen 2004). According to Zauchner et al. (2010), current research on PLEs neglects the context of learning processes so that the full potential to support lifelong learning cannot be realized.

Gillet and colleagues point out the risk of overburdening the learner: "It could become an overwhelmingly challenging task for a learner to decide what to use when, how and why" (Gillet et al. 2010). As discussed above, capacity building is a critical factor in empowering learners to learn self-dependently: "The ability to gain access to and choose selectively from a full range of tools, services (…) thus needs to be considered as an important aspect and expression of self-directing intentional learning and change in education" (Väljataga and Fiedler 2009). Apart from these aspects, Atwell points out that there are also "many unresolved practical issues, including who provides technology services, security of data and of course the personal safety of students" (Attwell 2007).

2.3 Summary and open questions

The review of PLE research shows that PLEs are primarily associated with informal learning, that the focus is on the learner rather than on the context and emphasis is given to temporal aspects of learning rather than on the social communities it is embedded in. Although technological issues are very important and require attention, we favor a broad definition of PLEs that extends beyond the tools and resources to encompass also the expertise and competencies of the users as well as the institutional contexts, such as the one provided by Gillet and colleagues (2010): PLEs "can be simply a set of devices, tools, applications, and physical or virtual spaces associated by learners at a specific time, for a specific purpose, and in a given context" (Gillet et al. 2010). The integration of PLEs in a given (e.g. formal) context, the stretching out over several biographical phases of learning as well as the competencies needed by learners to exploit the full potential of PLEs are in our view still open questions, at least with respect to contexts of higher education.

3. A closer look at the environment of PLEs – higher education as practice

The question of how to use PLEs in the context of higher education leads us to focus on the institutional environment in which PLEs are being used. Higher education institutions typically organize learning in the form of curricula for certain subjects. Learners take specific courses and undergo instruction from lecturers. In contrast to research on PLEs, much research on e-learning broadly is dominated by a perspective on formal learning processes and emphasizes issues like exclusiveness and reliability of services, standardization and institutionalization of procedures etc. (Kleimann 2007, 156f.; see also Atwell 2007, 5).

Informal learning, on the other hand, comprises forms of self-organized and incidental learning as well as socialization (Schugurensky 2000). Formal learning in higher education is accompanied by numerous informal activities, like planning for courses, finding out about the field of study and discussing or just having fun with other students. Such informal activities are still neglected in e-learning research in the context of higher education, although researchers acknowledged already in the 1970s that a large amount of learning activities is actually informal (OECD 1977).

Whereas some authors view formal and informal learning as fundamentally different types of learning, we employ a practice-driven theoretic view that questions the separation of both (Lave 1996). Learning in this view is always a situated activity, and only on second view can we distinguish between formal and informal situations. This view seems particularly suited for analyzing the role of PLEs (as informal tools) in higher education (as formal context), as it accounts for both aspects simultaneously.

According to a practice theoretic account, learning is situated in two respects: First, learning takes place in a *social context*, with learners as part of small or large communities of practice (Lave and Wenger 1991, Wenger 1998). A community of practice is defined by a group of people interacting with each other, a shared domain of expertise, and a common practice that evolves in the course of time within this group. Applying this model to the context of higher education, we can identify the following forms of practice among students (Arnold 2003): a joint enterprise to finish studies successfully, mutual engagement in the form of asking questions, sharing documents, establishing contacts etc., and a shared repertoire of traditional and technology-enhanced means of communication (see figure 1).

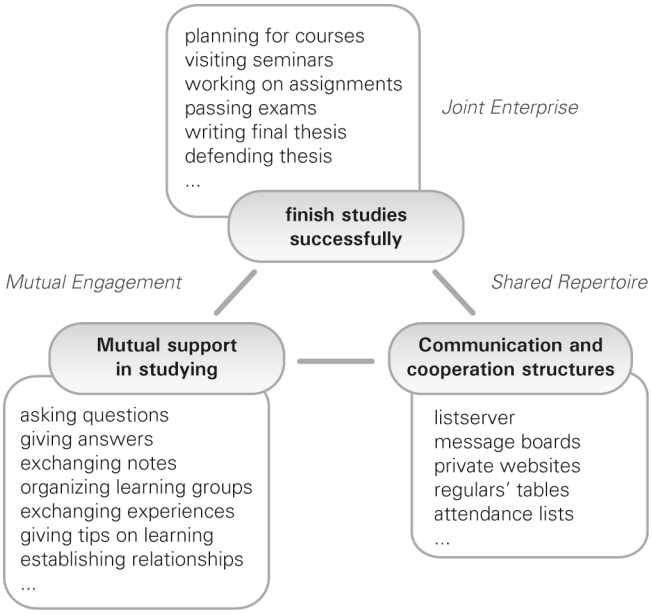

Figure 1: Dimensions of practice within a students' community of practice (Arnold 2003, 145; translation by authors)

Second, learning is *temporally situated* in the biographical context of the learner. Studying is one phase in the biography, following (in many cases) secondary education and leading (eventually) to professional work in the respective domain. The study phase can be further differentiated in phases similar to those defined in student life-cycle models (HEFCE 2001). Whereas the student life-cycle is mostly modelled from the point of view of administration, we follow Schulmeister's (2007) proposal to model it from a genuinely pedagogic perspective. As a process model of learning, the student life-cycle helps to view studying as one phase in the process of lifelong learning, but also as structured in several phases. Each phase is characterized by specific tasks students are facing and by specific activities performed in response to these tasks (see figure 2).

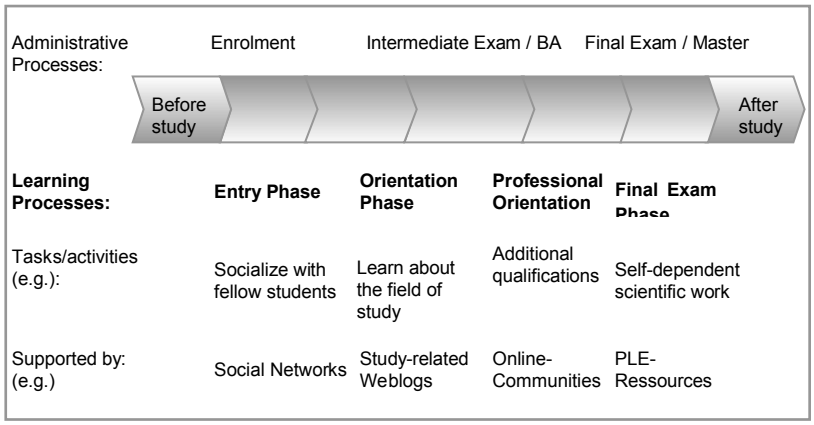

Figure 2: Life-cycle of informal learning during studies

4. University strategies and student practices in empirical perspective

Based on this practice theoretical account, we have researched how PLEs are currently used in higher education institutions in Germany and what kind of learning practices and phases are characteristic for today's students. The following two subsections report on the results of case studies of PLE use at German universities as well as focus group interviews with students on the tasks and challenges of informal learning.

4.1 PLE use at universities in Germany

Although many students in Germany use social software not only to keep in touch and communicate with friends, but also to discuss study-related matters (Kleimann et al 2008), the number of initiatives to support informal learning at German universities with social software appears small. Also the introduction of new media technology has not been accompanied by innovation of pedagogical practices but rather follows the lines of existing practices (Schaffert and Kalz 2009).

Existing initiatives that go beyond formal coursework can be found in (a) university hosted blogfarms offered for students and teachers, e.g. "Uni-Blogs" at University of Osnabrück, (b) the development of Social Networks for students, e.g. "CollabUni" at University of Hildesheim, (c) offering e-portfolios, e.g. to support students in developing scientific, social or problem-solving competencies at University of Augsburg, or (d) implementations of PLEs, e.g. "MyPaed" at Technical University of Darmstadt and "TUgether" at Technical University of Braunschweig.

Both MyPaed and TUgether can be seen as good practices in providing students with PLEs. MyPaed started as a student initiative at the Department of Education at Technical University of Darmstadt. It is administered and further developed by students and postgraduates and is open only to students at the department. TUgether is hosted by the Department of Information Management at Technical University of Braunschweig and is open for all students at the university. Both social software initiatives focus on the support of learners' activities and are not course centric, but open toward informal learning and thus share a central characteristic of PLEs.

The online-platform MyPaed (www.mypaed.tu-darmstadt.de) consists of three spheres of activities: In the community sphere, students can connect with each other, exchange information and communicate, e.g. by personal messages or a "Twitter"-like tool called "Flurfunk". The project sphere aims to support collaborative and individual learning. Here students can create their own projects and produce content

or work with tools. They can invite other students to join these projects. Finally, the personal sphere serves self-presentation and connection within the MyPaed community and helps to reflect one's activities. In addition to the three spheres, a wiki informs about different web-tools and how they can be applied in learning processes and beyond. The wiki is intended to support students' media literacy and to encourage them to use external web-tools (Herbst et al. 2010).

The student portal TUgether (tugether.tu-braunschweig.de) provides students with integrated access to the university's online services, like webmail, library services, a campus map and information about the cafeteria's offers. It is designed as a customizable web page with different portlets, i.e. containers on the web page that display specific information or applications, similar to sites like "netvibes.com". Students can choose among a number of tailored portlets to integrate in their personal page, for example, they can display RSS feeds of their choice on their page. Unlike netvibes, the portal is designed specifically for students' needs and also supports social networking and the exchange of portlets among students of the university.

Both systems represent different types of PLEs. While MyPaed centers more on community building and improving students' knowledge of and competencies in using social software, the aim of TUgether is apparently to give students a platform to collect, organize and share information and organize their every-day life at university and beyond. Students can design their very own online environment. On the other hand, they have to make a number of choices, so that only experienced users will be able to successfully use the portal. The community factor plays an important role in both initiatives. While MyPaed focuses on building up a community of practice among students of education, TUgether gives priority to the exchange of information among individual learners within the university's community.

Relating both concepts to the student life-cycle, we can see that the approach taken by MyPaed is more applicable to the problems arising during entry phase, because it supports learning how to learn with the help of social software and orienting oneself within the community of students of education. It also serves as "play ground" for learners, where they can try different social software tools and learn to apply them in the educational context and beyond. TUgether, on the other hand, offers the possibility to collect and organize information in a self-determined way and to share it within a community of student learners. This responds to requirements that arise during the end of the study, the (professional) orientation and examination phase. Furthermore, as portlets can be transferred from TUgether to other platforms, the support extends beyond the phase of studying into post-graduation.

4.2 Tasks and challenges of informal learning in higher education

The phases in the life-cycle model reported above have been defined heuristically in a first step. To get a better picture of the actual phases, the tasks associated with them and the social software applications used to deal with them, six focus group interviews were conducted at five Saxon universities with altogether 34 students from different fields of study and in different stages of their studies. As a result, four major phases emerged:

In the *entry phase*, orientation within the subject matter, organization of the studies and socializing with other students are the central challenges for students. This includes scheduling courses for the first term in compliance with the examination regulations. Especially in programs where the curriculum is not fixed students tend to feel left alone and overstrained. As one participant says: "At the beginning you don't

know which way to go, you don't have anything in your hand (…) I stood in my studies and wondered how I could handle it".

Socializing with other students is the central activity students do to reduce the feeling of isolation and excessive demands. Such contacts provide information exchange and support when coping with the new demands. In the first term stable groups of students are formed, supported by formal or student-organized introductory courses. Completing studies successfully is perceived as a joint enterprise ("you know for sure that the others have exactly the same problem") that fosters the formation of a community of practice.

Mutual engagement in terms of mutual support also plays a decisive role as a dimension of shared practice. Beside regular face-to-face meetings in and between courses, social networking sites like "facebook" or "StudiVZ" are used in the entry phase as a shared repertoire, i.e. as communication and cooperation structure. Those sites are used for exchange and networking with other students. Further means of communication and coordination are message boards offered by student unions as well as boards within the learning management system.

The second phase can be characterized as *moving through the course* (cf. HEFCE 2001). The central tasks mentioned were to become acquainted with the subject matter and to identify with it. Students bring their studies forward following the schedule by visiting courses, working self-dependently in groups or alone and writing first exams. It's an "entry into things I have to do to pursue the studies successfully and to achieve one's aim", as one participant puts it. In this phase dropouts or changes to other programs occur: "Some people realize – that's nothing for me – and leave."

In this phase, the established community of practice focuses on the organization and handling of the shared practice of its members as the tasks and challenges are generally similar for all students. To support and coordinate the shared "learning according to schedule" and the regular group work, tools like online calendars, "doodle" (for the coordination of meetings) and chat tools like "skype" and "ICQ" are being used by the students.

The *phase of orientation* at the beginning of the advanced respectively master studies period is specified by increasingly independent work as central task. In this phase, the group of fellow students disintegrates continuously because of dropouts, different specializations, failed exams etc. Thus, self-dependent learning and organization of the studies becomes inevitable: "In the introductory study period you had a nice schedule and were not so self-dependent. […] You are gradually forced into self-dependency later, as there is no other option."

Additionally, students report that they start making plans for their later transition into the professional world. This includes specifying career aspirations, planning internships and establishing ties with professionals. Conditional on the different specializations within this phase the community of practice is losing relevance for the individual student. Although some close contacts from the entry phase are being maintained, they have less importance for mastering studies. Simultaneously, orientation towards other subject-related professional communities of practice is increasing with students' career aspirations.

The landscape of tools used for communication and cooperation does not change significantly. In addition to the tools already in use, participants mentioned tools for self-dependent organization of bookmarks and references (e.g., tools like "delicious"

and "zotero"). Given the specialization within this phase, students have a strong need to get in contact with other specialists. One participant of the focus groups articulated a wish for technological support: “We would need something to form groups. I have a feeling that this doesn’t work anymore because people are doing things individually like practical courses or working… If I had an overview of people learning for the same exams I would also study with a stranger as I find it really hard at the moment feeling left alone with my studies.”

The orientation phase is followed up by the *final exam phase* in which the final thesis has to be written: “In the end you have to write the final thesis. That means, you are completely alone and you don’t even need to ask fellow students to help you”. At the same time contacts to professionals become more important. Some students start using professional social networking sites like "xing". This highlights the importance of passages from the community of students to professional communities of practice at the end of the study phase. At the same time, the shared practice with other students becomes less relevant.

5. Discussion

The results of our research on institutional uses of PLEs and students' tasks and challenges provide valuable insight for the design of strategies to implement PLEs in higher education. Whereas PLEs have mostly been viewed as personal tools for learning, their use in the institutional context of higher education requires certain support structures on the side of the institution to realize their full potential. We can identify three areas that call for institutional support:

- *Pre-configuration* of PLE tools and contents to fit into existing practices: Measures to reduce the number of tools or resources in a PLE do not necessarily restrict the freedom of users, but help them use PLEs more effectively. The student life-cycle can help to provide PLEs tailored to the needs of students.
- *Support for communities of practice*: Learners are members of several communities of practice. PLEs should be designed to support the interaction with members of these communities, taking into account trajectories within and between communities of practice and existing shared repertoires (e.g. by providing interfaces to existing communication tools).
- *Capacity building*: Several participants mentioned a need for more information about available tools and how to use them for learning. This calls for measures to develop students' skills, including media literacy as well as learning skills.

These results may not only help universities that wish to support their learners with PLEs, but also point to some neglected issues in PLE research. While some of the aspects touch upon the design of technology, the concept of a PLE needs to cover also the perspective of the individual learner (her or his competencies and biographical trajectory) as well as the wider institutional context of learning (including existing institutional structures and communities of practice).

The practice oriented theoretical model of the student life-cycle is one attempt to address the interplay of formal and informal learning practices and contexts. In our view, future research on PLEs in higher education would benefit from such an integrated perspective. Furthermore, empirical research should be done to analyze actu-

al experiences with PLEs from both an individual learner's as well as the institution's perspective.

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