Towards Privacy Issues in Personal Learning Environments: A Conceptual Model of PLE Privacy

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Abstract

Personal Learning Environments (PLE) as an approach to technology enhanced learning emphasizes the shift of control and ownership from the educator or the designer of a learning environment to the user or the learner. While more and more private data is created and shared on the Internet, more and more enterprises, government agencies and marketers are collecting personal data. Many users and learners are not aware of how their private data is used or misused and they are not taking steps to protect their personal data from being used by others. At the same time, it is possible to use the data created and shared on the Internet for educational purposes. This paper firstly introduces the topics of data literacy and safety as part of the digital competence regarding privacy issues. Then, it discusses several issues related to privacy in different types of PLEs such as: informal Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-based PLEs, badges-driven PLEs, PLEs connected to formal learning process in higher education in the context of self-regulated learning. In this article the relationship between privacy and PLEs and between privacy and students' learning control is presented; and, a conceptual model of privacy in PLEs is developed to present current factors influencing it.

Abstract in Spanish

Los Entornos Personales de Aprendizaje (PLE, por sus siglas en inglés) como un enfoque del aprendizaje potenciado por la tecnología enfatiza el cambio del control y la propiedad del educador o diseñador de un entorno de aprendizaje hacia el usuario o el alumno. Mientras más y más datos privados se crean y comparten en Internet, más y más empresas, agencias gubernamentales y comerciantes están recopilando datos personales. Muchos usuarios y alumnos no son conscientes de cómo se utilizan o se abusan de sus datos privados y no están tomando medidas para proteger

sus datos personales de ser utilizados por otros. Al mismo tiempo, es posible utilizar los datos creados y compartidos en Internet con fines educativos. En este documento primeramente se introducen los temas de seguridad y alfabetización de los datos como parte de la competencia digital que tiene que ver con la privacidad. Seguidamente, se examinan varias cuestiones relacionadas con la privacidad en diferentes tipos de PLE, tales como: PLE basados en la Web 2.0 y medios sociales en contextos informales, PLE móviles, PLE basados en ePortfolios, PLE promovidos por insignias y PLE conectados con el proceso de aprendizaje formal en la educación superior en el contexto de la autorregulación del aprendizaje. En este artículo se presenta la relación entre la privacidad y los PLE y entre la privacidad y el control del aprendizaje de los estudiantes; y, se desarrolla un modelo conceptual de la privacidad en los PLE para presentar los factores influyentes actuales.

Abstract in German

Personal Learning Environments (PLE) als Ansatz für technologiegestütztes Lernen betont die Verlagerung von Kontrolle und Eigenverantwortung vom Lehrer oder Designer einer Lernumgebung auf den Benutzer oder Lernenden. Während immer mehr private Daten im Internet erstellt und weitergegeben werden, sammeln immer mehr Unternehmen, Behörden und Vermarkter personenbezogene Daten. Viele Benutzer und Lernende sind sich nicht bewusst, wie ihre personenbezogenen Daten verwendet oder missbraucht werden, und sie unternehmen keine Schritte, um ihre personenbezogenen Daten vor der Verwendung durch andere zu schützen. Gleichzeitig ist es möglich, die im Internet erstellten und geteilten Daten für Bildungszwecke zu nutzen. Dieses Papier stellt das Thema von Datenkompetenz und Datensicherung als Teil der Digitalkompetenz bezüglich des Datenschutzes vor und behandelt mehrere Fragen im Zusammenhang mit dem Datenschutz bei verschiedenen Arten von PLEs, wie z.B.: informelles Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-basierte PLEs, Badges-gesteuerte PLEs, PLEs, die mit dem formalen Lernprozess in der Hochschulbildung im Kontext des selbstregulierten Lernens verbunden sind. In diesem Artikel wird die Beziehung zwischen Privatsphäre und PLEs und zwischen Privatsphäre und Lernkontrolle der Schüler vorgestellt; und ein konzeptionelles Modell der Privatsphäre in PLEs wird entwickelt, um aktuelle Faktoren darzustellen, die die Privatsphäre beeinflussen.

Abstract in Catalan

Els Entorns Personals d'Aprenentatge (PLE, per les sigles en anglès), com a enfocament de l'aprenentatge potenciat per la tecnología, emfatitza el canvi del control i la propietat de l'educador o dissenyador d'un entorn d'aprenentatge cap a l'usuari o l'alumne. Com més i més dades privades es creen i comparteixen a Internet, més i més empreses, agències governamentals i comerciants estan recopilant dades personals. Molts usuaris i alumnes no són conscients de com s'utilitzen o es abusen de les seves dades privades i no estan prenent mesures per protegir les seves dades personals de ser utilitzats per altres. Alhora, és possible utilitzar les dades creats i compartits a Internet amb fins educatius. En aquest document primerament s'introduexien els temes de seguretat i alfabetització de les dades coms part de la competència digital que té a veure amb la privacitat. Seguidament, s'examinen diverses qüestions relacionades amb la privacitat en diferents tipus de PLE, com ara: PLE basats en la Web 2.0 i mitjans socials en contextos informals, PLE mòbils, PLE basats en ePortfolis, PLE promoguts per insígnies i PLE connectats amb el procés d'aprenentatge formal en l'educació superior en el context de l'autoregulació de l'aprenentatge. En aquest article es presenta la relació entre la privacitat i els PLE i entre la privacitat i el control de l'aprenentatge dels estudiants; i, es desenvolupa un model conceptual de la privacitat en els PLE per presentar els factors actuals que hi influeixen.

Keywords: Personal Learning Environments (PLEs), Higher Education, Data Privacy, Conceptual Model, Web 2.0, Data Literacy

Introduction

Higher Education has been enriched by an increasing diversity demanding inclusive practices (Kaur, Noman, & Nordin, 2016), among which technology enhanced learning (TEL) has emerged as paramount for more student-centred (personal) learning. This personal learning involves changing the nexus of power and control from institutions and teachers to learners, e.g. students being able to orchestrate the different educational tools, resources and content (Buchem, Attwell, & Torres, 2011). It occurs causally in informal learning settings, and can be connected to parts of the formal learning process. The learning happens in an open and social environment of the web – social media, social networks and community of practices – and contributes to expanding the possibilities of personal learning to collective and social learning (Camacho & Guilana, 2011). Personal Learning Environments (PLE) as an approach to technology enhanced learning emphasizes the shift of control and ownership from the educator or the

designer of a learning environment to the user or the learner, bestowing decision making and choice upon the learner, especially the choice of the learning tools and the use of these tools for learning (Buchem, Tur, & Hoelterhof, 2014). According to the PLE approach each learner designs a unique learning environment to support and enhance individual learning, collecting a wide variety of personal data related not only to the private life, but also to the student learning profile. Especially young people share their private lives online, providing huge amounts of data while older generations are fighting to keep private, among others because they do not fully understand the public nature of the Internet and its implications (Barnes, 2006). While more and more private data is created and shared on the Internet, more and more enterprises, government agencies and marketers collect this data for purposes other than learning and education which can involve another political agenda (Parrota & Williamson, 2018). Barnes (2006) names this situation *a privacy paradox* since many users and learners are not aware of how their private data is used or misused and they are not taking the necessary steps to protect their personal data from being used by others. At the same time, it is possible to use the data created and shared on the Internet for educational purposes, for example by means of learning analytics and recommender systems to support individual learning processes.

The term *data* can be defined as meaningful information that can be stored and recorded for further processing (Data Protection Act, 1998) and also as representation of information that includes a personal identifier (Woo, 2010). The term *personal data* is related to the data used for identification of individuals (Data Protection Act, 1998). Personal data contains any opinion expressed by individuals or expressed by other individuals towards the first ones. Personal data can be divided to *ordinary* and *sensitive*. Ordinary data presents the main information about any individual including name, address, phone number and sensitive data describes person from political, ethnic, religious, criminal, etc. point of view, including biographical information, facts, opinion (Data Protection Act, 1998). In the context of PLE, sensitive data includes also learning background, student's profile, progress, shared documents or opinions. The unauthorised disclosure of personal data is normally considered a breach of privacy, although what is personal data and hence data privacy has been a matter of dispute. Sociological theories consider privacy as part of social life. In the past people experienced social life in relation to small, often local communities, while with the advent of the Internet social life is becoming increasingly networked with access to much larger, distributed and more loosely defined social connections (Rainie &

Wellman, 2012). From this perspective, the practice of personal information sharing can be considered as part of social participation and social learning.

By addressing the problem of privacy in Personal Learning-Environments in this paper, we are focusing on privacy of ordinary and sensitive data in context of digital, social learning. The emerging research questions are:

- What kind of skills are needed to support a safe PLE?
- What kind of personal data is required to support organisation and management of learning in a Personal Learning Environment?
- What kind of personal data should be shared and with whom to support learning achievements and personally successful learning?
- How can student's data privacy be guaranteed in PLEs, if it is to be connected to analytical tools applied for educational purposes?

This paper introduces the topic of data literacy and discusses several issues related to privacy in different types of PLEs such as: informal Web 2.0 / Social Media PLEs, mobile PLEs, ePortfolio-based PLEs, badges-driven PLEs, PLEs connected to formal learning process in higher education in the context of self-regulated learning. This is a first attempt to identify the relationship between privacy and PLEs and between privacy and students' learning control. A conceptual model of privacy in PLEs is developed in this paper to present current factors influencing on privacy.

Framework

PLE and digital competence: data literacy and safety

Safety and data literacy are two of the areas in which digital competence has been described in the DigiComp 2.0 Framework (Vuorikari, Carretero, Punie, & Van den Brande, 2017) – supported by the European Commission –, along with others such as communication and collaboration, digital content creation and problem solving. Data literacy is described in a set of four sets of competences which are very closely related to the search, management and critical selection of information. In this regard, data literacy has a lot to do with cognitive and metacognitive skills that help in the processes of browsing, finding, filtering, evaluating, storing and retrieving information. The safety area is described by a set of four skills, two of them related to the person's well-being and ethical usages and the sustainability of the environment. As for the two others, one is about taking care of the devices and the second is about particular skills needed in terms of protecting personal data and privacy. In the DigiComp 2.1 framework (Carretero, Vuorikari & Punie, 2016), further work on the digital competence area is

presented and those skills are described in levels of performance. Each competence area is shown in eight proficiency levels, in which the users' skills are developed from awareness and autonomous learning (levels from one to four, structured in initial and intermediate stages) to levels of mastery and high specialization, which involve the use of skills in a wide range of contexts and play a key role at the social level by helping, giving feedback and support to one's own community.

Data literacy as a competence skill area is described in terms of abilities needed to manage, select, store and retrieve information, but it fails in contextualizing the neoliberal current economy in which users become data sources for the economic benefits of big financial enterprises (Adell, Llopis, Esteve, & Valdeolivas, 2019). Thus, both safety and data literacy need to be addressed from an approach that deals with a critical perspective, highlighting new skills for the awareness and control of one's own personal and private data. Data, analytics, coding and algorithms play a central role in what contemporary education is, lying at the heart of range of recent education developments (Selwyn, 2016; p.82, p.91). There are clear benefits of data-based education, such as the possibility to use data to place educational decision-making in the hands of learners and keep it apart from experts and institutions (Selwyn, 2016; p.94), which is also in line with a perspective of privacy control in PLEs by learners. Another one points towards to collaborative data sharing strategies (*data for good*), which help to make progress in specific areas and enhance data literacy in those contexts (Voiklis, Fraser, Flinner, & Norlander, 2018). Despite this, the use of educational data is not exempt of dangers. One is the arising hierarchy of data classes. Most of the individuals create data that others process, often without being aware of it. There are others that do create data too but have the awareness of doing so. The smaller groups of individuals have the means to collect data and the expertise to analyse data (Selwyn, 2016; p.100). Another is related to the type of measurement that educational data systems generate, which is mainly what can be easily measured, leaving behind what is difficult to measure but still important (Selwyn, 2016; p.98). Both benefits and dangers of data-based education expose the relevance of developing what has been called as *data literacy*, which consists of "the desire and ability to constructively engage in society through or about data" (Bhargava et al., 2015; p.7). Although it is indeed important to adopt measures for data safety and data management, the focus on the development of learners' skills to manage and control the data traces they leave when using digital media for empowerment and own profit for learning (Pangrazio & Selwyn, 2018) is cornerstone in an era where data plays a crucial role in educational decisions.

Web 2.0 / Social Media PLE

The conceptualisation of PLE has been carried out through two main strands of research as observed by Fiedler and Väljataga (2010; 2014). The main one has been about its technical nature, and the second one, has been about the pedagogical aspects that need to be addressed when implementing PLEs in different learning contexts. The former integrates diverse issues such as the ones which have arisen through Web 2.0 and Social Media based PLEs; the latter is mainly based on the self-regulated learning as an educational aim (Dabbagh & Kitsantas, 2012). In the context of social media, the PLE approach is addressed to tackle the lack of student control and sense of ownership observed in institutional VLEs, such as traditional Learning Management Systems (LMS). Thus, social media has been observed to give students the opportunity to control and own not only the tools as tangible elements but also the processes or the intangible ones (Buchem, 2012; Buchem, Tur, & Hölterhof, 2014; Torres et al., 2018). Therefore, Web 2.0 and Social Media based PLEs, especially where social networks have a predominant role, have become environments where learners can bring together individual, group and multiple communities learning spaces. In these learning spaces, multiple levels of publicity and privacy can be established, considering a more comprehensive approach that takes into account the fact that there are common aspects in the way people perceive the privacy of their information (Razavi & Iverson, 2007). Hence, a PLE can contain collective spaces, accessible only to collaborators, specific people or open publicly, and private individual spaces and other individual spaces, which are accessible to certain people or completely public (Coll & Engel, 2014). However, challenging as it may be, privacy has not given much attention in either of the two strands of the PLE research, although some research in progress related to self-regulated learning in PLEs and trust and safety can be identified (Muthupoltotage & Gardner, 2018) and it has been discussed as a critical issue in the context of Web 2.0 and Social Media studies (Selwyn, 2016). Especially, Social Networking Sites (SNS), such as Facebook and Twitter, create privacy problems that may make users more self-conscious (Blank, Bolsover, & Dubois, 2014). For instance, Forgerock research shows that about half (53%) of the European adults surveyed are worried about how much personal information they have shared online but 47% affirms do not feeling they know how much of it is available online, and 51% felt uncomfortable with the amount of information social media platforms have about them (Forgerock, 2018). Also other types of PLEs may create similar privacy issues as these related to Web 2.0 and Social Media, since most PLEs integrate some of elements of the social web.

PLE and Higher Education

There are different good practices in the use of PLEs in higher education, e.g. as bridge between formal and informal learning. iPLE environment proposed in Salinas and Marín (2016) consists of Learning Management System (LMS), Web 2.0 tools and ePortfolio. Students have possibilities to take advantages of these three elements to construct their PLEs. The organisation of personal data is an aspect that students revealed as problematic; and therefore, proposals to support students bringing together LMS and PLE through information management, such as in Pérez Garcías, Marín and Tur (2018), may result helpful. Another study reports successful connection between social LMS and PLE using bookmarking tools for knowledge creation and sharing (Hölterhof & Heinen, 2014). Different studies (e.g., Bartolomé & Cebrián de la Serna, 2017; Pérez Cascante, Salinas, & Marín, 2016; Saz, Engel, & Coll, 2016) report on iPLE experiments that bring together academic and social environments. Two directions for knowledge transfer are possible: from LMS to PLEs and from PLEs to LMS. The question that emerged in this context is related to the private data flows in these two directions – what and where data is shared, stored and processed. A specially developed social media platform Graasp for university students is introduced by Benson, Morgan, and Tennakoon (2013) with features for arrangements of collaborative spaces, recommendations in context and management of privacy. Mechanisms for privacy management are introduced to protect users from unauthorised access to the social shared items. Users express their need to control the privacy in spaces and their profile.

ePortfolio-based PLE

Web 2.0-based ePortfolio has been an interesting educational implementation and research aimed at incrementing students' awareness of their PLE (Gewerc et al., 2016). In this context, social media has been argued to impact the ePortfolio construction, see for example, implementations based on blogs (Tur & Castañeda, 2016) or social networks (Gewerc et al., 2016). The open nature of Web 2.0-based ePortfolio has been observed both as a potential and a limitation (Tur & Urbina, 2014). In parallel, it has also been claimed that in order to maximise the learning effect of the use of an ePortfolio-based PLE, the student's personal space requires having some proprieties such as privacy, property and permanence (Rodríguez et al., 2014). Privacy in the case of PLE is related to the control that the learner has on the publication of the content. E-portfolio users can store their own artifacts and evidences in a private way until they decide to publish the content on the web or provide access to the teacher. Gillet et al. (2017) describe the possibilities of Graasp as an ePortfolio-based PLE -a personal shareable online space- insomuch it allows learners to archive learning artifacts and

activity traces for analytics-driven self-assessment. However, privacy issues have not been addressed in the exploratory studies on ePortfolios, in which learning is enhanced by an open environment for collaboration and peer-feedback.

Mobile PLE

Further development of the PLE approach has been carried out with the use of mobile technology (Attwell, Cook, & Ravenscroft, 2009; Conde, García-Peñalvo, Alier, & Piguillem, 2013; Humanante-Ramos, García-Peñalvo, & Conde-González, 2015). Mobile devices have been claimed as powerful tools for contextual and ubiquitous learning and have been introduced in designs of formal PLEs which included mPLEs from technical and pedagogical perspectives (Humanante-Ramos, García-Peñalvo & Conde-González, 2017). The development of geolocalisation, navigation and communication apps has empowered the possibilities for learning everywhere although some risks have also been observed in mobile learning research such as distraction or the negative effect of multi-tasking (Mendes, de Oliveira, & das Neves, 2018). The affordances of mobile technologies have had an important drawback related to privacy issues as mobile devices and apps capture personal data during browsing, trace Web habits, look into contact lists, and gather phone numbers and the unique ID number of the personal phone, among others. Currently, this aspect has become a topic of key concern as many businesses take advantage of the information obtained through mobile devices and applications.

Open Badges and PLEs

Recently, the question related to educational uses of Open Badges, i.e. digital credentials and/or micro-credentials, has emerged as an important aspect of capturing and visualising learning in digital learning contexts (Buchem, 2017). Open Badges, have been also used as parts of ePorfolios to demonstrate learning achievements, recording learning processes, recognising learning (Buchem, 2016). Different types of digital credentials based on the Open Badge standard can be designed and issued according to the student profile, e.g. based on the background, prior and current knowledge, learning activities and learning performance (Abramovich, Schunn, & Higashi, 2013). Open Badges may be used to support (a) recognising skills, achievements, experiences, practices, memberships, engagement on individual, peer and community levels, (b) assessing learning including summative, formative and transformative assessment, (c) motivating learning and providing orientation, (d) studying learning based on the information contained in a badge such as what the badge represents, criteria, evidence, issuers, earners (Buchem, van den Broek, & Lloyd, 2016). Since issuing and earning of

Open Badges includes tracking of student progress, participation activities, learning outcomes, learning systems may be designed to process data related to the personal profile of every learner, including personal data. This learner-related data opens new opportunities but also creates new questions about data privacy. The latest blockchain technological development contributes to open credentials with Blockcerts technology, as a new standard that may support the issue with greater possibilities for trust, security and ownership over one's own personal data (Grech & Camilleri, 2017).

Learning Analytics and PLE

Learning analytics could be used to improve learning through the information that can be obtained, but more importantly in the PLE context, it can also provide learners with recommendations in their learning based on earlier learning activity (Fournier, Kop, & Sitlia, 2011). For that purpose, not only data from a formal learning context (such as Virtual Learning Environments or VLE) is required, but more importantly, information from the outside of the institutional context, where learners are in an informal and personal learning context (PLE), which has also been defined as a source in the capturing data process (Leitner, Khalil, & Ebner, 2017). This new context involves using distributed services across multiple learning scenarios and, consequently, new methods of data collecting and interpretation, for instance, Social Network Analysis (Casquero, Ovelar, Romo, & Benito, 2014; Fournier, Kop, & Sitlia, 2011). Evidently, these learning analytics methods can raise uncovered data of privacy issues related to the gathering of information that the learner is creating and sharing across multiple learning scenarios.

Privacy Model in PLE

Based on the different types of PLEs and their specific privacy issues, we propose the PLE privacy model to conceptualise privacy on different levels. Figure 1 summarises the main factors that have impact on privacy in PLEs. The model includes two levels of privacy control – learner-driven and institution-driven privacy control. Learner-driven privacy control is especially relevant in Web 2.0 and Social Media PLEs as well as in mobile PLEs, which are usually applied to support informal learning. Informal learning with PLEs gives more flexibility to learners to organise and control their private data. At the same time, learners in informal learning context are at a higher risk of disclose and misuse of private data, such as using default privacy setting in registration to Social Media, posting risqué pictures or excessive sharing of own and other users private data. In contrast to that, institutional PLEs limit learners possibility to control their privacy, but at the same time protect learners from inappropriate usage of their private data, e.g. by introducing certain regulations, such as Social Media Guidelines or keeping private

data locked in an LMS, and more recently the EU citizens call to take control of their personal data by the EU General Data Protection Regulation (GDPR) that also includes, among others, individuals' rights to access the own data (European Union, 2018). In the centre of the model, ePortfolio-based and Open-Badges-driven PLEs connect informal learning and formal learning contexts and require a both learners and institutions to apply common data privacy principles. An important question here is related to the connections between data privacy in formal and informal learning contexts and in data permeability.

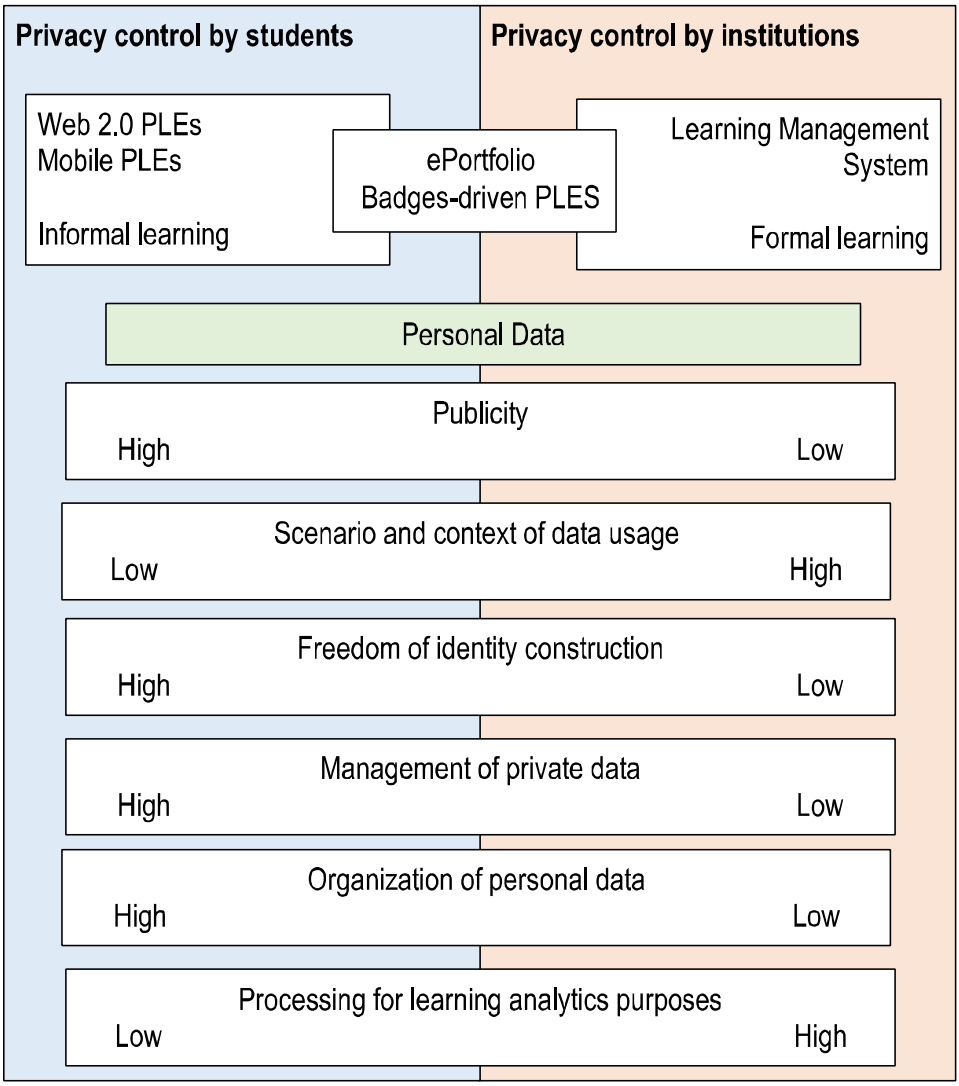

Figure 1. The PLE Privacy Model

The proposed PLE privacy model shows that the data privacy could be controlled more or less by students as well as by the training institutions. The main factors that reflect on the data privacy are extracted from the above described PLEs different implementations and they can be explained using a scale from low to high. The meaning of the factors is summarized as follows:

- Publicity: Publicity in PLEs means how much information is shared by students and universities and it is available for public usage outside the purposes of the educational process. It can be seen that Web 2.0 and mobile PLEs are characterized with high publicity, because of the nature of the web and mobile applications which usage drives students to generate content – sharing information, communicating is social networks, annotating, etc. In contrast, when the personal learning process is organized in LMS, the shared information is closed in the training institution and the publicity is low.
- Scenario and context of data usage: PLEs organized in the web utilizes learning scenarios consisting of learning in open groups of interests, learning in community of practices, learning in social networks that leads to the low level of privacy and usually it is a self-directed learning. PLEs that are part of the formal learning space are more closed just to the pointed learning groups by an educator and the PLEs are used in support of formal learning in well-defined educational scenarios according to a given course curriculum.
- Freedom of the identity construction: The possibility for students' identity construction is higher in the PLEs which purpose is to facilitate informal learning, because the students have freedom to prepare their own profile according to the specific learning interests and used tools/applications/services. This possibility is lower in the institutional PLEs, because the students' identity is forming from their participation and achieved results during given classes.
- Management of private data. The private data are with high possibility for management in Web 2.0 and mobile PLEs where students decide how to arrange the personal information. In university PLEs such freedom of private data management is not allowed, because of the strongly regulated principles and rules of the institutional learning environment.
- Organization of personal data: What kind of personal data will be hidden, shared or stored, kept or deleted, it depends of the students' understanding and this data organization is controlled by students. In the university settings the organization of personal data is low controlled by students, this process is typical for educators.

- Processing for learning analytics purposes: The control on the personal data usage for the purposes of learning analytics is low in web-based and mobile PLEs, because the students' data are utilized in many cases without their permission. In contrast of that, the training institutions have policies for personal data delivery to the third parties or applications where such data are analysed.

Conclusions

This paper provides an overview of existing PLE types in the context of data privacy to reveal several problems related to data privacy. The model summarizes the current situation of personal data usage in PLEs and could be used in the form of a recommendation tool explaining the possibilities for personal data sharing, organization and management and the influence of this fact on the data privacy. As learners need more tools to organise and control private data, there is a need for more research related to data privacy in Personal Learning Environments and safe and critical usages by learners. One of the key directions in this emerging research may be the question of effective mechanisms and digital competence for a responsible use and sharing of own and others private data in different media, learning systems, services and applications to enhance self-regulated learning in the context of growing diversity in higher education and to empower lifelong learners through personal safety skills and data literacy.

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