

Learner Control in Personal Learning Environments: A Cross-Cultural Study

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Abstract

Changing power relations and the shift in control have been some of the key issues driving the discussion in Technology-Enhanced Learning (TEL) in the last years. As opposed to deterministic approaches to designing learning, such as the system approach in instructional design, emancipatory approaches, such as Personal Learning Environments (PLE), emphasizes the *shift of control and ownership* from the educator or the designer to the learner, bestowing decision making and choice upon the learner, not only in terms of choosing the content or the sequence of learning steps, but first and foremost the choice of the learning tools and the use of these tools to support one's own learning, including co-creation of learning content and fostering of Personal Learning Networks (PLN). In this paper we describe the results of an international, cross-cultural study exploring the role of ownership and control in Personal Learning Environments. Our study is rooted in the theory of psychological ownership and utilizes research instruments developed in the predecessor study by Buchem (2012). The study was conducted in winter and spring 2013 at three different universities in Germany and Spain including students from six different courses, i.e. three courses in media sociology in Germany, two online master programs in educational media and educational leadership in Germany and a teacher education program in Spain. An online survey was used to collect data in two languages - German and Catalan. Following the concept of ownership proposed by Buchem (2012), the study is based on the assumption that a learning environment becomes a Personal Learning Environment when the learner (subjectively) feels the owner this environment and perceives herself/himself to be able to exercise control over this environment. The study presented in this paper aims at advancing our understanding of the role of psychological ownership in context of PLE, especially in relation to *learner control*. This paper specifically explores ownership and control in context

of ePortfolio practice. Finally, this article provides a contribution to methods of measuring the impact of PLEs.

Introduction

Personal Learning Environments (PLE) is an approach to using technology for learning, focusing on self-directed and self-regulated uses of tools and resources by the learner (Buchem, Attwell and Torres, 2011). It is capturing the *personal activity*, or how the learner uses technology to support own learning, rather than developing *personalised platforms*, that lies at the heart of the PLE research. The first survey about the role of ownership and control in context of Personal Learning Environments was conducted in 2012 at two universities in Germany (Buchem, 2012). This study was rooted in the theory of psychological ownership by Pierce, Kostova and Dirks (2001, 2003) and reported on empirical findings from an online survey and analysis of educational practice, exploring multiple relationships between ownership, control and learning in context of technology-enhanced learning environments created in the process of creating ePortfolios. The results of the study indicated that control of *intangible elements* of a learning environment, such as control of content or personal data, is more strongly related to the feeling of ownership of this learning environment than is the control of *tangible elements*, such as technical tools (e.g. Web 2.0 services). The underlying assumption was that not every learning environment - not matter how personalized - automatically becomes a PLE, but that it is the perception of the individual learner that makes a learning environment to a PLE. Further, the hypothesis is that this perception depends on whether the learner develops a feeling of ownership and control of the learning environment. More specifically, it was argued that the perception of a learning environment as a PLE is related to the feeling of ownership of intangible elements rather than tangible ones (Buchem, 2012). The results of the study

indicated that learners perceive a learning environment as a PLE even if they do not have the full control of all elements of this environment and do not in fact own them. For example, Web 2.0 services do not belong to the learner in terms of legal or intellectual proprietorship, and yet learners may feel in control when using them. The follow-up research presented in this paper further explores the role of psychological ownership and learner control in PLEs from a cross-cultural perspective.

Theoretical Background

Learner control has been one of the key research interests in the field of technology-enhanced learning. In the early years, learner control was analyzed mainly within technology-enhanced instructional delivery systems, such as computer-assisted learning programs including intelligent tutoring systems. Recently, the socio-constructivist paradigm in technology-enhanced learning and the emergence of Personal Learning Environments have introduced new lines of research in the area of learner control.

Research on learner control in 1980s and 1990s was to a wide extent embedded in the instructional design paradigm. This prescriptive approach to learner control focused on control as a choice of a pre-defined set of elements, including learning paths (e.g. lesson branching) and learning materials (e.g. examples and exercises) in computer-supported settings. Later, in web-based settings, new types of learner control have been explored, including informational control enabled by hypertext and hypermedia systems (Wilson and Jonassen, 1989; Lin and Hsieh, 2001). Within the instructional design framework learner control has been pre-programmed by the designer and conceptualized as choices provided within computer-delivered instruction, for example in form of *control of sequence* (i.e. control of sequencing of topics or

exercises), *control of level*, (i.e. control of the difficulty level or degree of difficulty within a learning sequence), *control of pacing* (i.e. control of speed of presentation of learning content), *control of display* (i.e. control of viewing materials from a selection including examples, exercises or quizzes), *control of support* (i.e. control of using system advice such as recommendation on learning materials) (cf. Merrill, 1983; Laurillard, 1987; Milheim and Martin, 1991; Chung and Reigeluth, 1992). A number of authors including Buchem, Attwell and Torres (2011) have argued that this type of conceptualization of learner control allows for system adaptivity and individual customization but not for a genuine co-/design of a learning environment by the learner.

More recently research on learner control in context of PLE has moved beyond computer assisted programs, intelligent tutoring systems and learning management systems towards authentic learning contexts mediated by technology in which the learner may have a greater control of either tangible or intangible elements of a learning environment (Buchem, 2012). Buchem, Attwell and Torres (2011) carried out an extensive literature review on Personal Learning Environments and showed that learner control in context of PLEs has been conceptualised broader in relation to different dimensions of learner activity. Based on the activity theory framework (extended triangle) these authors analysed learner control in PLEs in five dimensions: objectives, tools, rules, community and tasks.

The results of the grounded theory analysis pointed towards a multi-dimensional notion of learner control in PLEs, which goes beyond the previous conceptualizations of learner control in terms of scope (Table 1).

Table 1. Dimensions of learner control in PLEs (Buchem, Attwell and Torres (2011, p. 10-11).

Dimensions of learner control	Examples of learner activities
A. Control of objectives	The learner (subject) can: <ul style="list-style-type: none"> • Determine learning goals and outcomes • Manage data, services, resources, content • Use scaffolding and guidance
B. Control of tools	The learner (subject) can: <ul style="list-style-type: none"> • Select and use tools according to own needs • Reuse and remix content • Aggregate and configure tools based on own preferences
C. Control of rules	The subject can: <ul style="list-style-type: none"> • Configure the environment according to own preferences • Negotiate rules of communication and collaboration with teachers, peers, communities • Negotiate intellectual property rights
D. Control of social base	The learner (subject) can: <ul style="list-style-type: none"> • Choose with whom to communicate • Choose who can communicate with him/her • Initiate discussions and collaborations
E. Control of tasks	The learner (subject) can: <ul style="list-style-type: none"> • Specify own needs (e.g. user profile) • Self-monitor own progress • Adjust performance based on (peer) feedback

The examples of learner control in Table 1 indicate that the concept of learner control in PLEs envisages learner control far beyond skipping forwards and backwards as part of a pre-programmed sequencing strategy or choosing between viewing examples or consulting a glossary as part of a display strategy. The notion of learner control in the PLE approach goes as far as allowing learners to determine their own learning goals, selecting and aggregating a wide range of available (not necessarily pre-selected) tools, negotiating rules, initiating (and not only engaging in) discussions and collaborations

and adjusting learning based on self-monitoring the learning progress (versus automated recommendations). In comparison to earlier instructional principles of learner control, the PLE approach resembles more of an activity of “building a house” rather than “furnishing a house”. Thus, while instructional design approaches have focused on *micro-level strategies of learner control* within a pre-determined system (manipulation of small instructional elements), the PLE approach has focused on *meta-level strategies of learner control* within an open system (management of the entire learning process) with learner control being inherent to the construction of PLEs.

Learner control is related to the concept of ownership, and both concepts are related to the notion of “agency” in terms of the human capacity to make choices and to impose those choices on the world (Buchem, Attwell and Torres, 2011). Ownership has been considered as a critical issue for learning. Allowing learners to own their learning process means to allow learners to engage with the process itself, which is a crucial factor for the effectiveness of the learning process (Biggs and Tang, 2011). In context of technology-enhanced learning, a number of approaches consider ownership as a crucial concept for learning. For example, the “folio thinking” approach to ePortfolio practice has emphasised the role of ownership of ePortfolio for ensuring the use of ePortfolio as a basic learning strategy, integrated into all educational activities and sustainable in the lifetime (Cousin, 2006; Joyes, Gray and Harnell Young, 2009; Chen, 2009; Chen & Light, 2010; Shepherd and Skarbut, 2011). In this research context, the relationship between control, motivation and ownership have been considered to be mutually supportive. For example, the study by Shroff, Trent and Ng (2013) rooted in the Milner-Bolotin's (2001) framework of ownership, showed that students and teachers considered the feeling of control as vital for the ownership of ePortfolio. As Barrett and Wilkerson

(2004) argue, the greater the control of students over their ePortfolio, the more intrinsic motivation towards learning they develop.

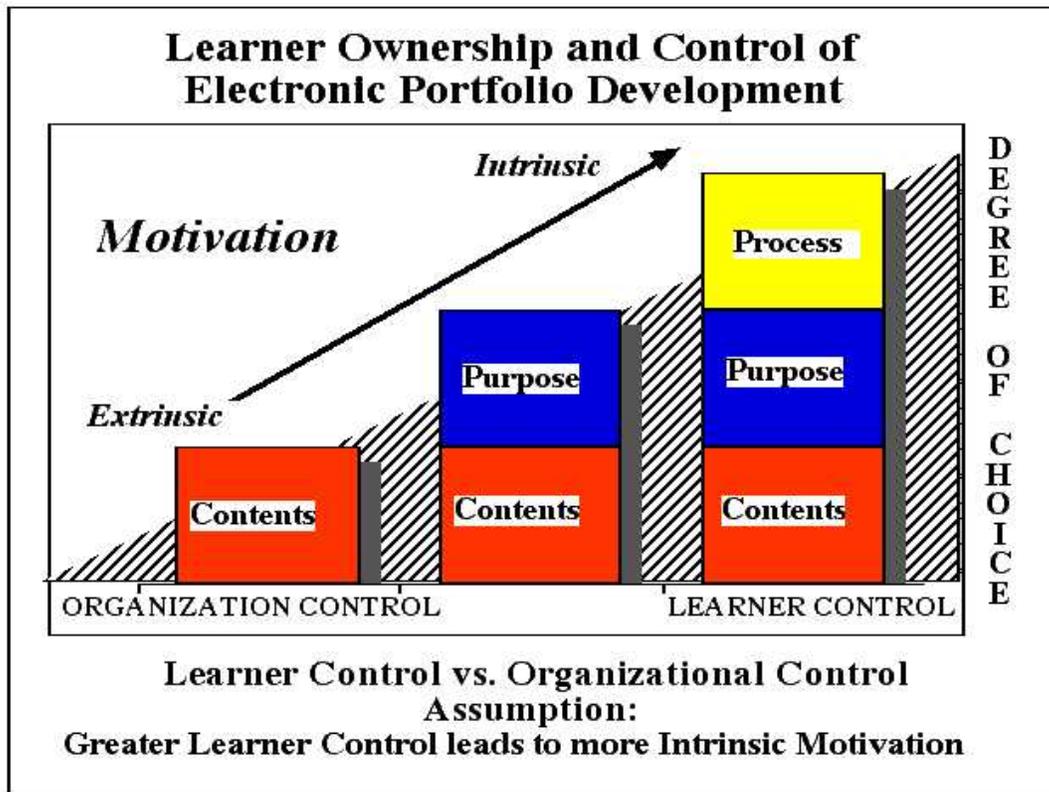


Figure 1. Learner ownership and control of ePortfolio (Barrett & Wilkerson, 2004)

However, the varying forms and degrees ownership have been seldom differentiated both in literature related to PLEs and ePortfolios as well as in publications addressing the ownership of learning in general. Also there has been little clarity about what type of ownership and control (e.g. technical, legal, psychological, social) and over what elements (e.g. goals, information, services) may be effective for learning. As Buchem, Attwell and Torres (2011) point out, it is possible to conceive of ownership of learning from various perspectives, e.g. in a *technical* sense (e.g. the learner is technically responsible for aggregating and configuring services), *legal* sense (e.g. the data and content legally belongs to the learner) or *psychological* sense (e.g. the learner feels an

owner of the learning environment). As the study by Buchem (2012) indicated, it is also possible that the learner can “control” the environment (e.g. select sources of information, reuse and remix content) without actually “owning” all its constituting parts. In context of ePortfolios, Attwell (2005, 2007) highlighted some important issues related to ownership by distinguishing different agents owing different ePortfolio processes (Attwell, 2012). Attwell focused on the ownership of different processes related to learning and pointed out that in educational settings different ePortfolio processes are owned by different agents. For example, reflecting is “owned” by the learner (the learner controls this process), assessment is “owned” both by the learner and external agents whilst accreditation is “owned” only by external agents, such as educational institutions.

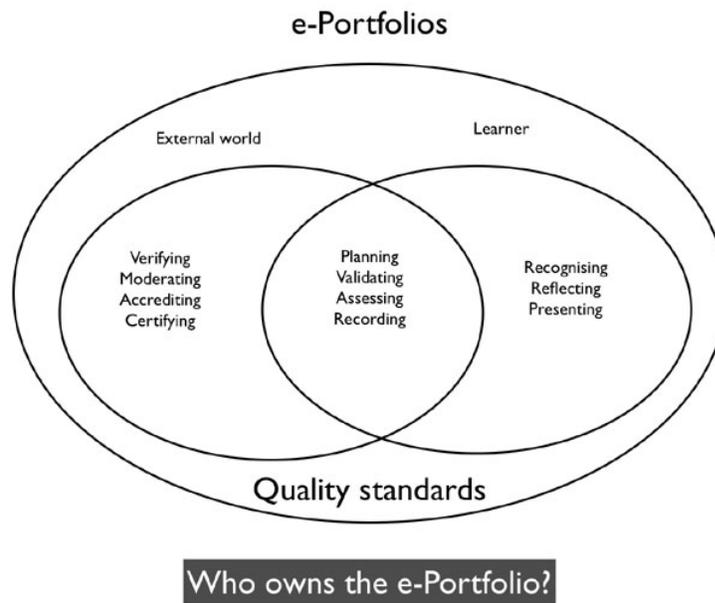


Figure 2. ePortfolio processes ownership (Attwell, 2005, 2007, 2012)

However, ownership in context of PLE comprises both processes and elements of learning, such as digital tools used to construct a PLE. Nowadays, the nature of the relationships brought about by social networks, as well as the shift of the external world's learning agents,

has highlighted the importance of the control of intangible elements of learning including personal data in order to improve the sense of ownership (cf. Attwell, 2012). This is the central point of interest explored by Buchem (2012) and in this paper.

To explore the relation between ownership and control one can refer to philosophical investigations about ownership in general and self-ownership in particular (e.g. Dan-Cohen, 1992; Brown, 1993). For example, the concept of self-ownership, which is related to the individual autonomy (Pateman, 2002), can be defined as a psychological condition of a person (disposition), which is expressed in actions and in the general attitude towards oneself and the world (Dworkin, 1988). Personal “autonomy” in the sense of self-governance or self-rule (“autos” meaning self and “nomos” meaning rule), involves choosing, defining, being able to make preferences and take decisions (Dworkin, 1988). As such the notions of personal ownership and personal autonomy are closely linked to the notion of control. Learner autonomy regarded as learner's psychological relation to the process of learning (Little, 1991), is also closely linked to taking responsibility for one's learning. Autonomous learners are capable of independently setting learning goals, choosing learning materials and methods, making choices in organizing learning and defining criteria for evaluation (Knowles, 1975, 1980). Owning a learning environment is to some extent similar to owning physical objects such as books or digital devices. In context of PLEs, ownership is rooted in a learner-controlled use of technology, especially the ability to create, design, and operate an environment according to personal preferences (Buchem, Attwell and Torres, 2011; Buchem, 2012). According to moral and philosophical investigations about ownership, the dependency between the learner and the environment can be characterized as “control ownership”, whereas “control” may be used to refer to the ability of a person to be the final arbiter of what is to be done with

an object (Christman 1994, p. 128). In this sense to own a learning environment means to be able to use, control, modify or even destroy it in an independent way without the consent of others. Ownership in terms of control means a private use of an object. In addition the common meaning of ownership also implies the ability to sell or gain income from ones property. Thus ownership and control are part of individual autonomy (Christman 1994, p. 167). This is yet to emphasize that the concept of learner control pertinent to the concept of PLEs radically differs from previous conceptualizations of learner control in technology-based learning. In the PLE sense of learner control, the learner can build, use, change, adjust, abandon, lend, cede or even destroy a learning environment or its parts without the consent of a teacher or another external agent.

Research design

The study presented in this paper is guided by the following research questions:

How are control and ownership of learning environments perceived by learners from different national and academic cultures and how do these perceptions impact learning?

The conceptual model applied in the present research study used the Antecedents-Consequences Model (ACM) proposed by Buchem (2012). Based on theoretical underpinning of psychological ownership, the underlying assumption of the ACM is that psychological ownership is influenced by a number of factors (antecedents, such as students' perceived control of different elements of a learning environment) and leads to certain outcomes (consequences, such as level of engagement, creativity and productive uses of media). Based on the results of the first study, it was expected that a learning environment is perceived as a PLE if learners

develop a feeling of ownership towards the elements of this environment. The present study encompassed three main groups of variables, i.e. (a) perceived control as a factor influencing psychological ownership (Antecedents), (b) the measure of psychological ownership itself, and (c) learning effects (Consequences) resulting from ownership (Figure 3).

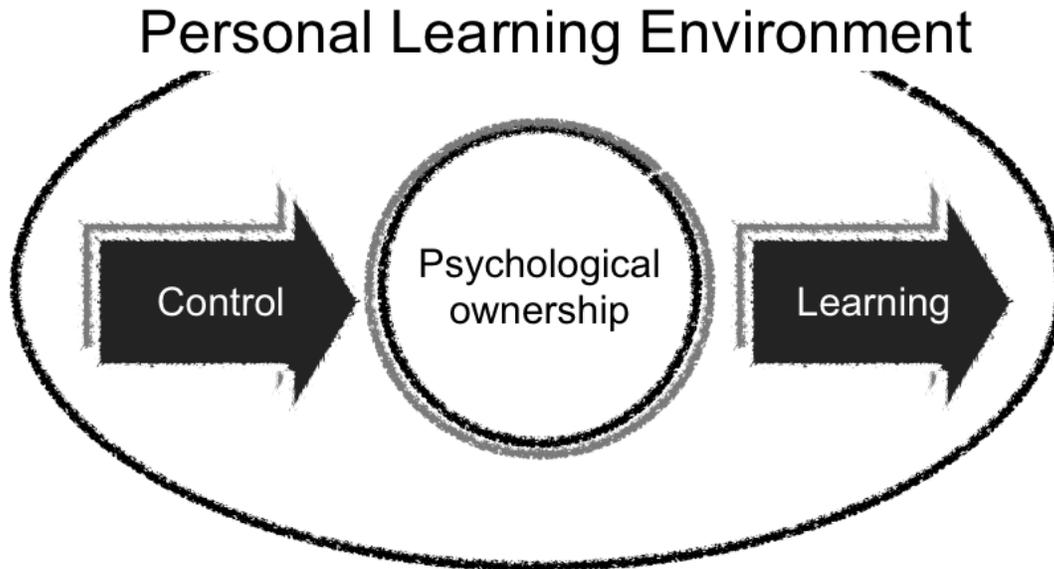


Figure 3. The Antecedents-Consequences-Model (ACM) of the study.

The study incorporated the concept of psychological ownership by Pierce et al. (2001) applied in the study by Buchem (2012). According to this model, ownership comprises *five dimensions*, i.e. (1) sense of responsibility, (2) sense of self-identity, (3) sense of accountability, (4) sense of self-efficacy, and (5) sense of belongingness. *Sense of responsibility* is related to protecting and enhancing the object of possession, which may include improvement, control and limiting access to others. *Sense of identity* is viewed as part of the self-concept and is established, maintained, reproduced and transformed through interactions with tangible and intangible objects of possession. *Sense of accountability* can be defined as an expectation to hold others accountable and to be held accountable for what happens to and with objects of possession. *Sense of*

self-efficacy is based on the concept developed by Bandura (1997) and describes the belief in one's ability to reach goals, master difficult situations and succeed in relation to both tangible and intangible objects of possession. *Sense of belongingness* relates the feeling of attachment to places, objects and people (Pierce et al., 2001; Avey et al., 2009).

Research method

The present study is an extension of an earlier study by Buchem (2012), which was conducted at two universities in Germany with 50 students from three different university courses and disciplines. An online survey including three scales, i.e. psychological ownership scale, control scale and learning effects scale, was applied to collect data. The present study revised and adjusted the three scales from the study by Buchem (2012) based on reliability measures from the first study and on feedback from experts in the PLE community. The current study was conducted with a wider and more diverse group of learners in terms of age, language, cultural background and the area of study. Given the international study sample, the survey was created in two language versions (English and Catalan) and conducted using online tools LimeSurvey and Google Forms. The research applied quantitative and qualitative methods to triangulate conclusions. Quantitative data was analysed with SPSS and R software. Qualitative data obtained by means of open questions in the survey was analysed and discussed with students in respective courses.

Despite different educational contexts of learners participating in the study, all students in the sample used Web 2.0 tools to construct their PLEs as part of ePortfolio practice in university course. Students from all courses used different Web 2.0 tools to support and document their learning during one semester. Following the idea

formulated by Conole and Alevizou (2010) about the need for systematical integration of the social web in higher education, Web 2.0 tools were introduced as instruments for learning, knowledge construction and collaboration. The study sample included 76 students from the following courses:

(1) General Studies Program at Beuth University of Applied Sciences Berlin

(Germany): The general studies program (Studium Generale) at Beuth University is an open, university-wide program aiming at academic and career development of students from all accredited programs. Students who participated in the study were enrolled in two courses in media sociology, i.e. “Web 2.0 and the Society” and “Mobile Web and the Society”. The sample for this research study included 45 bachelor and master students from various programs including economics, computer sciences, engineering and media design. Both courses integrate the concept of PLEs and ePortfolios into their coursework. ePortfolios are primarily used to support research-based learning as students work in small groups on own research projects throughout the semester. The aim is to foster the use of digital media to create own PLE beyond the requirements of the course. Students in the course “Web 2.0 and the Society” created their ePortfolios combining different Web 2.0 tools, such as Wordpress, Tumblr, Twitter, Flickr, Storify, Prezi, ScoopIt and SlideShare. Students in the course “Mobile Web and the Society” used Mahara as a main hub in which different artefacts and media (e.g. YouTube videos, RSS feeds) were mashed and aggregated to create ePortfolios.

(2) Teacher Education Programme at the University of the Balearic Islands (Spain):

This program integrates the concept of PLEs and ePortfolios into coursework. ePortfolios are created by students using Web 2.0 tools, in this way extending their PLEs. The aim is to develop a positive attitude towards using technology in education. The study sample comprised of 24 student teachers consisting of first and second-year

students who study to become Infant Education Teachers. Student teachers at the local branch in Ibiza of the Balearic Islands University create and maintain their ePortfolios throughout their stay at the university. In this way students document their learning and identity development as Infant Education teachers as well as use ICT for learning during their education as teachers so that the experience is consistent enough to use ICT as future teachers. The project has run since 2009/2010 and its evolution has been positive (Tur, 2011; Tur and Urbina, 2012a and 2012b; Tur, 2013). The ePortfolio project is based on three approaches by Barrett, (2009, 2010, 2011), Cambridge (2009, 2010) and Zubizarreta (2009). First, based on Barrett's work, students build their ePortfolio in three main steps: students create artefacts, document learning in a chronological order and finally present their ePortfolios. Second, based on Cambridge's work, ePortfolios are used to foster the development of students' *networked selves* and *symphonic selves* which are closely related to Barrett's three steps. Third, based on Zubizarreta, students collaborate and reflect while documenting their learning.

(3) *Online Master Programs at the University Duisburg-Essen (Germany)*: The master programs "Educational Media" and "Educational Leadership" are designed as part time study and blended learning with one or two on-campus events per semester. The programs count around 100 participants per semester and are held in German language. Participants mainly come from Germany and German speaking countries. The sample from these courses comprised of 7 students from different courses. These courses integrate the concept of PLEs into their coursework. New students are introduced to the learning systems and become acquainted with a personal weblog. According to the concept of a "social hub", the social learning management system of the study program focuses on connecting students' PLEs (Hölterhof, Nattland & Kerres 2012). A basic set of tools is offered by the system for learners including a collaborative synchronous text

editing tool, an internal personal weblog, a poll tool, a messaging system. In discovering the potential of Web 2.0 for collaboration and synchronous communication, students can choose an internal weblog managed by the learning system or an external weblog hosted on the web. Weblogs are used as tools to express the learning process which corresponds with the ePortfolio approach. As part of ePortfolio students form groups and cooperate to work on assignments. Students are given assignments for blogging, reflecting and discussions in their weblogs. Using weblogs is required in order to be permitted to the examination at the end of the course.

Research results

The study comprised a cross-cultural sample of 76 students from three different universities and courses as described in the previous section (i.e. “Berlin sample”, “Ibiza sample” and “Duisburg sample”). Descriptive statistics related to these samples are summarized in Table 2.

Table 2: Descriptive statistics of the study sample, n = 76

	Berlin (Germany)	Ibiza (Spain)	Duisburg (Germany)
Language	German	Catalan	German
Study area	General Studies	Teacher Education	Online Master
Sample size	45 students	24 students	7 students

Below the results of several statistical tests are summarized following the key research question: *How are control and ownership of learning environments perceived by*

learners from different national and academic cultures and how do these perceptions impact learning?

(A) Psychological ownership: These five dimensions of psychological ownership, i.e. sense of responsibility, sense of self-identity, sense of accountability, sense of self-efficacy, and sense of belongingness, were measured across the three samples based on the scale with five items rated on the Likert scale from 1 (fully agree) to 5 (fully disagree). Thus the lower the values, the more positive the result. Table 3 summarizes statistical results for ownership scale.

Table 3: Statistics of psychological ownership (m = mean, sd = standard deviation), n = 76. Likert scale 1-5: 1 = fully agree, 5 = fully disagree

	Berlin	Ibiza	Duisburg	Total
	n = 45	n = 24	n = 7	n = 76
1.1 Sense of responsibility	m = 1.78 sd = .95	m = 2.29 sd = .91	m = 2.14 sd = .90	m = 1.97 sd = .95
1.2 Sense of self-identity	m = 2.41 sd = .99	m = 1.83 sd = .96	m = 2.71 sd = .96	m = 2.29 sd = 1.02
1.3 Sense of accountability	m = 2.36 sd = .80	m = 1.92 sd = 1.02	m = 2.86 sd = .69	m = 2.26 sd = .90
1.4 Sense of self-efficacy	m = 2.23 sd = 1.03	m = 1.75 sd = .79	m = 3.29 sd = 1.5	m = 2.28 sd = 1.09
1.5 Sense of	m = 2.07	m = 2.38	m = 3.86	m = 2.33

	Berlin	Ibiza	Duisburg	Total
	n = 45	n = 24	n = 7	n = 76
belongingness	sd = .86	sd = .77	sd = 1.07	sd = .95
Total of 5	m = 2.21	m = 2.03	m = 2.97	m = 2.23
items	sd = .96	sd = .92	sd = 1.15	sd = .99

As Table 3 shows, the lowest (most positive) values across all five items measuring the five dimensions of psychological ownership were reached by the Ibiza sample with $m = 2.03$ and the lowest standard deviation of $sd = .92$. This means that Ibizan students developed the strongest feeling of ownership of their learning environments. In general, students in all three samples developed a sound sense of ownership towards their learning environment with the $m = 2.23$ and $sd = 0.99$. These results may indicate that students perceived their ePortfolio based learning environment as their PLE, for example students felt responsible for it, could identify with it, felt accountable for and attached to the learning environment they created. Yet, the cut-off point for a learning environment becoming a PLE to the individual learner is not straightforward. Further studies should investigate the relationship between the ownership values and PLE in more detail. As far as results for single dimensions are concerned, the lowest (most positive) values across all three samples were reached for dimension “sense of responsibility” with the $m = 1.97$ and $sd = .95$. In this respect, most positive values were reached for Berlin students with $m = 1.78$ and $sd = .95$, meaning that students in Berlin felt more responsible for their learning environment than students in other two samples. Since the sense of responsibility (item 1.1) towards the learning environment was the most salient dimension of psychological ownership in all three samples,

especially in Berlin sample, a possible interpretation is that ePortfolio practice promotes the responsibility of own learning, independent from the national or academic culture. It is also interesting to highlight the fact that the lowest values related to accountability (item 1.3) are achieved by Ibiza students, who are assessed to 50% based on their ePortfolio performance. Further research should further investigate the question raised by this result: Is there a relationship between type of assessment (e.g. ePortfolio) and ownership, especially the sense of accountability?

(B) Learner control: The theory of psychological ownership by Pierce et al. (2001, 2003) defines control as one of the three key mechanisms (besides engagement and identity) through which psychological ownership develops. The overall aim of ePortfolio work in the courses participating in the study was to enhance learner control in the sense of the PLE concept of learner control. However, the intended design may be realised otherwise in situ or perceived differently by students. Therefore, it was not the “designed control” but “perceived control” that was measured to explore students' perceptions. The concept of perceived control was defined to encompass seven dimensions of control with items derived from the research by Buchem, Attwell and Torres (2011) and applied in the first study by Buchem (2012). These seven dimensions were: (1) control of technology, (2) control of objectives, (3) control of content, (4) control of planning, (5) control of design, (6) control of access rights, and (7) control of personal data. Altogether 7 items were applied to measure perceived control. Table 4 summarises the values for perceived learner control across the three samples.

Table 4: Statistics of perceived learner control (m = Mean, sd = Standard Deviation), n = 76; Likert scale 1-5: 1 = fully agree, 5 = fully disagree

	Berlin	Ibiza	Duisburg	Total
	n = 45	n = 24	n = 7	n = 76
2.1 Control of technology	m = 2.2 sd = 1.1	m = 2.63 sd = .77	m = 3.57 sd = 1.4	m = 2.46 sd = 1.1
2.2 Control of objectives	m = 2.47 sd = 1.06	m = 2.5 sd = .88	m = 2.86 sd = 1.46	m = 2.51 sd = 1.04
2.3 Control of content	m = 2.36 sd = 1.13	m = 2.42 sd = .78	m = 1.71 sd = 1.89	m = 2.41 sd = 1.11
2.4 Control of planning	m = 1.78 sd = .93	m = 2.67 sd = 1.13	m = 2.14 sd = 1.95	m = 2.09 sd = 1.17
2.5 Control of design	m = 2.33 sd = 1.13	m = 1.88 sd = 1.33	m = 3.86 sd = 1.21	m = 2.33 sd = 1.3
2.6 Control of access right	m = 2.16 sd = 1.21	m = 2.88 sd = 1.3	m = 2.71 sd = 1.6	m = 2.53 sd = 1.35
2.7 Control of personal data	m = 2.49 sd = 1.22	m = 2.42 sd = 1.34	m = 3.43 sd = 1.62	m = 2.55 sd = 1.3
Total 7 items	m = 2.25 sd = 1.13	m = 2.48 sd = 1.12	m = 3.13 sd = 1.64	m = 2.43 sd = 1.22

As Table 4 shows, the lowest (most positive) values across the seven dimensions of perceived learner control were reached by the Berlin sample with the average value of

$m = 2.25$. This result raises the question why Berlin students felt more in control of their learning environments than students in other samples? It seems that differences in instructional design are a more plausible explanation than cultural differences.

Differences in perception of control can be further explored in specific dimensions. For example, students in Berlin felt strongly in control of planning (item 2.4), while students in Ibiza felt strongly in control of design (item 2.5) and students in Duisburg felt strongly in control of content (item 2.3). These differences may be related to different instructional designs in respective courses. For example, it may be that students in Berlin were given more freedom to plan while students in Ibiza were given more freedom to design. These also could be cultural differences related to educational principles of course instructors. At the same time the values of perceived control in terms of visual and structural design (item 2.5) are in general negative for the Duisburg sample. The reason may be that students used tools embedded in the learning management system that allowed for only little customisation of the look and feel. Furthermore, the blog functionality used by students in Duisburg was for technical reasons readable by all other students in the study program, which may explain negative values of perceived control of access rights and data privacy (items 2.6 and 2.7) in the Duisburg sample. These results compared to positive values of ownership may indicate that although students in Duisburg felt the owners of their learning environments, there were technological limitations which negatively affected the perception of control. However, the *ex ante* examination of the relationship between different instructional designs and different perceptions of control has certain limits as freedom to make choices which educators grant to students is to a large extent determined in context. Granting control is a negotiation process and takes place in interaction between instructors and students. Further studies could therefore apply other

methodologies, such as interactional analysis, to determine the degrees of freedom granted to students in practice and compare these with measures of perceived control. Nevertheless, the differences in perceived control could be attributed to cultural differences, especially related to discipline cultures. A possible explanation is that students of technical disciplines in Berlin attached more value to control of planning (item 2.4), while students of pedagogy in Ibiza attached more value to control of design (item 2.5). These hypotheses should be tested in further studies, as the implications of cross-cultural differences are relevant for culture-sensitive designs of learning environments. Since perceived control related to planning was the most salient dimension of learner control among all students in the all three samples, control of planning seems to be an important design feature independent of national or discipline culture. The negative values, however, were reached for control of objectives, control of access rights and control of personal data. In general, these results can be understood both in terms of instructional designs and cultural differences, such as learner control versus institutional control. As learning objectives may have been imposed and perceived as compulsory by students, further research on PLE designs in formal education should attempt to explore new ways of establishing learning objectives with students. It should be explored further, if institutional control related to learning objectives is meaningful in context of PLEs at all and how a balance between educational objectives and learner autonomy could be reached.

Further, negative results were reached for perceived control of personal data. This again may be the result of institutional applications of technology which from students' perspective lack flexibility and transparency. However, it could also be a cultural issue, especially in terms of data privacy concerns in the academic culture.

Further research on PLE designs should try to improve perceived learner control in relation to personal data.

The comparison of results in Tables 3 and 4 reveals some interesting findings of possible relationships between perceived control and ownership. First, students in Duisburg achieved most positive results in control of content (item 2.3) and at the same time most negative results in the feeling of responsibility (item 1.1). This may mean that being able to control the content has no significant effect on the feeling of responsibility. The correlation analysis seems to support this interpretation. At the same time, there is a strong relation between the sense of self-efficacy (item 1.4) and the control of personal data (item 2.7) in the Duisburg sample ($r = .835$). However, these observations would need to be further tested, e.g. by means of regression analysis. Also students in Duisburg did not achieve any significant values in any item related to psychological ownership despite – or perhaps because of - the fact that ePortfolio assignments were compulsory. Further research should try to understand how compulsory tasks in context of PLEs affect learner control and ownership. Second, findings reveal that students in Berlin obtained most positive values in control of planning (item 2.4) and at the same time most positive values in the sense of responsibility (item 1.1). Further research should investigate how perceived control of planning affects the sense of responsibility. Third, students from Ibiza achieved the most positive values in control of design (item 2.5) of their ePortfolio and at the same time the most positive values in the sense of self-identity (item 1.2). The correlation analysis confirms this relationship, $r = .425$. This may mean that Ibiza students focused on designing the representations of their identity in their ePortfolio practice. Further research should explore the role of perceived control of design on the sense of self-identity and the PLE becoming a part of the self-concept.

(C) Cross-cultural differences: Beyond descriptive statistics and correlation analysis, t test for independent means were computed to compare parameter values of the three key variable sets, i.e. learner control, psychological ownership and learning effects, across the three samples representing different cultures in terms of fields of study and nationality. Altogether nine t tests were calculated for pairs of independent samples and the significance assessed at the .05 level. The results of the t tests are summarized in Table 5.

Table 5: T test results (m = mean, df = degree of freedom, p = probability), n = 76

	Statistics
Learner control	Berlin (m = 2.25) & Duisburg (m = 3.18): $t = -3.2174$, df = 50, $p < .05^{**}$
	Berlin (m = 2.25) & Ibiza (m = 2.48): $t = -1.4716$, df = 67, $p > .05^*$
	Duisburg (m = 3.18) & Ibiza (m = 2.48): $t = 1.9635$, df = 29, $p < .05^{**}$
Psychological ownership	Berlin (m = 2.21) & Duisburg (m = 2.97): $t = -2.9571$, df = 50, $p < .05^{**}$
	Berlin (m = 2.21) & Ibiza (m = 2.03): $t = 1.1396$, df = 67, $p > .05^*$
	Duisburg (m = 2.97) & Ibiza (m = 2.03): $t = 3.3174$, df = 29, $p < .05^{**}$
Learning effects	Berlin (m = 2.99) and Duisburg (m = 3.30): $t = -0.9281$, df = 50, $p > .05^*$
	Berlin (m = 2.99) & Ibiza (m = 2.26): $t = 4.0059$, df = 67, $p < .05^{**}$
	Duisburg (m = 3.30) & Ibiza (m = 2.26): $t = 4.0787$, df = 29, $p < .05^{**}$

* $p > .05$ = non significant

** $p < .05$ = significant

Results in table 5 indicate that there was no significant difference in how students in Berlin and Ibiza perceived learner control and psychological ownership. This may indicate that instructional designs in Berlin and Ibiza did not differ in a significant way. However, due to significant differences in perceived control and ownership in the Duisburg sample, instructional design in Duisburg was explored in more detail. In fact, instructional design in Duisburg was different as most students could not freely choose a tool to create their ePortfolios but had to use a blogging tool embedded in the learning management system. The t-tests also reveal significant differences in learning effects of students in Berlin and Duisburg compared to students in Ibiza. Possible predictors are explored in the section below.

(D) Learning effects: The Antecedents-Consequences-Model of the study considers learning effect as a consequence of ownership and control. This is based on the assumption that the sense of ownership and perceived learner control influence how students engage and develop their learning environments. Learning effects in the study were explored using a measure with six dimensions: (1) time invested (students willingly invested time in learning), (2) student engagement (students did more than was required by the teacher), (3) student creativity (students tried something new), (4) interest orientation (students followed their interests), (5) self-direction (students felt they were learning for themselves), (6) intrinsic motivation (learning was more important than grades), (7) social learning (students collaborated to learn), (8) future use (students expect to create a similar learning environment in the future), (9) continued use (students expect to continue to use their learning environment after the course), (10) transfer (students expect to transfer the PLE idea to other areas), and (11) transformation (PLE practice changed the way students learn). Since psychological ownership and control have been viewed as positive resources for impacting attitudes,

e.g. higher commitment, responsibility (Avey, et al., 2009; Priece et al., 2001, 2003; Van Dyne & Priece, 2004), it was expected that both ownership and control had a positive impact on the learning effects. Learning effect statistics are summarised in Table 8.

Table 8: Statistics of learning effects (m = mean, sd = standard deviation), n = 76;

Likert scale 1-5: 1 = fully agree, 5 = fully disagree

Learning effects	Berlin	Ibiza	Duisburg	Total
	n = 45	n = 24	n = 7	n = 76
3.1 Time invested	m = 2.6 sd = 1.07	m = 2.58 sd = .72	m = 2.86 sd = 1.35	m = 2.62, sd = .99
3.2 Student engagement	m = 2.78 sd = 1.33	m = 2.54 sd = 1.02	m = 3.71 sd = 1.38	m = 2.79, sd = 1.27
3.3 Creativity	m = 2.71 sd = 1.12	m = 2.08 sd = .78	m = 3.14 sd = 1.21	m = 2.55, sd = 1.08
3.4 Interest orientation	m = 2.42 sd = .99	m = 2.13 sd = .9	m = 2.71 sd = 1.38	m = 2.36, sd = 1.0
3.5 Self-direction	m = 2.71 sd = 1.2	m = 2.38 sd = .71	m = 3.86 sd = 1.21	m = 2.71, sd = 1.13
3.6 Intrinsic motivation	m = 3.29 sd = 1.2	m = 2.54 sd = .78	m = 4.29 sd = .76	m = 3.14, sd = 1.15
3.7 Social	m = 3.06	m = 2.46	m = 2.86	m = 2.86,

Learning effects	Berlin	Ibiza	Duisburg	Total
	n = 45	n = 24	n = 7	n = 76
learning	sd = 1.05	sd = .78	sd = 1.21	sd = 1.02
3.8 Future application	m = 2.96 sd = 1.20	m = 1.91 sd = .93	m = 2.86 sd = 1.57	m = 2.62, sd = 1.24
3.9 Continued use	m = 3.6 sd = 1.21	m = 2.33 sd = .96	m = 3.43 sd = 1.13	m = 3.18, sd = 1.26
3.10 Learning transfer	m = 3.4 sd = 1.29	m = 2.33 sd = .87	m = 3.14 sd = 1.57	m = 3.04, sd = 1.28
3.11 Learning transformed	m = 3.33 sd = 1.07	m = 1.58 sd = .83	m = 3.43 sd = .97	m = 2.79, sd = 1.28
Total of 7 items	m = 2.99 sd = 1.21	m = 2.26 sd = 0.88	m = 3.3 sd = 1.28	m = 2.79, sd = 1.18

As Table 8 shows the self-assessment of learning effects in general among students from all three samples reached on average slightly higher (more negative) values ($m = 2.79$) than ownership ($m = 2.23$) and control ($m = 2.43$). Students in Berlin and Ibiza (compared to students in Duisburg) invested more time in the development of their learning environments, were more engaged and more creative, followed their interests more strongly and felt more strongly that they were learning for themselves. These are interesting results which may indicate that the instructional design in Duisburg, which was more compulsory and allowed for less freedom of choice, contributed to less

positive learning effects. However, intrinsic motivation, social learning, future applications, continued use, learning transfer and transformation of learning as dimensions of learning effects reached positive values only in the Ibiza sample. There is a striking difference especially in the perception that ePortfolio practice transformed own learning (item 3.11). This indicates that the ePortfolio practice in the Ibiza sample had the deepest impact on learning as it transformed the way students learn.

In general, highest (most negative) values were reached for dimensions “continued use” ($m = 3.18$) and “intrinsic motivation” ($m = 3.14$). This means that on average students in all three samples felt it was rather unlikely they will continue to use their learning environments created during the course and that grades (extrinsic value) were no less important than learning (intrinsic value). Lowest (most positive) values were reached for dimensions “interest orientation” ($m = 2.36$) and “students creativity” ($m = 2.55$). This means that students in all three samples followed their interests and engaged in creative practice.

In order to explore the impact of perceived learner control and psychological ownership on learning effects, several statistical tests were conducted, i.e. bivariate correlations and regression analysis. The correlation analysis shows that there is an overall significant correlation between control and ownership ($r = .41, p < .01$) and a significant relationship between learning effects and ownership variables across all samples ($r = .68, p < .01$). These results can be interpreted as of validation of the Antecedents-Consequences Model applied in this study. Table 9 summarizes correlation coefficients.

Table 9: Correlation results of the Antecedents-Consequences Model

	Perceived control and ownership (means)	Ownership and learning effects (means)
All samples	$r = .41, p < .001^{***}$	$r = .68, p < .001^{***}$

*** $p < .001$ = highly significant

Also the results of the linear regression analysis with learning effects as dependent variable and ownership as independent variable for all samples indicate that psychological ownership is a good predictor of learning effects (R Square = .46), explaining almost 50% of variance. Perceived control, on the other hand, explained under 20% of variance (R Square = .17). The proposed model should however be tested in further studies with larger samples.

Discussion

This paper presented the concept of learner control and ownership in context of Personal Learning Environments and the results of a cross-cultural study aiming at exploring possible differences in perception of control and ownership of learning environments by learners from different national and academic cultures. The study presented in this paper also proposed a measure of “learning effects” which can be used to explore the impact of perceived control and ownership on learning. The results of the study indicate that there may be certain cultural differences in perception of control and ownership of learning environments, such as attaching more value to planning in technical academic cultures rather than to control of design as compared to other discipline cultures, including pedagogy. These differences should be, however, explored in more detail in further studies, as the implications may be important for promoting PLE design and practice by students from different academic backgrounds. However, it

seems that a number of differences in perceptions of control and ownership may be best explained by differences in instructional designs, especially in relation to how much freedom of choice and thus control is granted to students in their PLE practice in formal settings, e.g. higher education.

As the results of the study indicate, compulsory tasks and choice of media, little possibilities to adjust the look and feel of PLE tools as well as application of institutional tools such as learning management systems which from students' perspective provide little control and transparency of personal data, may have a negative impact on learning. The responses in the survey express a disjunction between the instructional design aimed at activating students for ePortfolio work by formal (compulsory) assignments and the student perception of their ePortfolio as a PLE. On the other hand, as survey responses indicate, especially control of planning and control of design have a positive impact on learning. This is reflected, among others, in willingly investing time in learning, following their interests and being creative in ePortfolio practice or even the perception that ePortfolio practice altogether transform the way they learn. Thus perceived learner control, especially control of planning and control of design (both intangible elements of Personal Learning Environments) should be considered an important element of PLE practice and PLE design.

Conclusions

This paper provides a contribution to the discussion on learner control in context of Personal Learning Environments. In line with the study by Buchem (2012), the results presented in this paper point out to the fact that perceived control of intangible elements, such as planning and design, may have more positive effects on learning than

control of tangible elements, such as technical tools. This study also reveals the impact of different PLE designs on learning.

It seems that more freedom of choice (e.g. objectives, tools) as well as flexibility (e.g. planning) and transparency (e.g. personal data) may be beneficial to learning effects. The future implication may be that learner control as postulated by the PLE approach can be advanced to the next level, at which learners are able not only to choose but also to create, for example developing the components of their PLE. This would require learners to develop new skills, such as coding, as well as technical tools to become low-threshold and user-friendly. Finally, this paper uncovers the topic of control and ownership from a cross-cultural perspective and indicates that specific elements of control may be more valued by learners from different national and academic cultures. As a recommendation for further research, future studies should also explore the possibilities of mobile technologies for enhancing perceived learner control and psychological ownership in relation to Personal Learning Environments and its impact on learning.

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