

Towards the Formative Accompaniment Border in Distance Education – Introduction of a Social Mechanism between Computational Contexts: Learning Management Systems and Personal Learning Environments

Ivanildo José de Melo Filho
IFPE – Belo Jardim Campus
UFPE – Informatics Centre
Brazil

Rosângela Saraiva Carvalho
UFPE – Informatics Centre
Brazil

Alex Sandro Gomes
UFPE – Informatics Centre
Brazil

Enio Luiz Costa Tavares
IF SERTÃO – Ouricuri
Campus – Brazil

Rosangela Maria de Melo
IFPE – Belo Jardim Campus
UFPE – Informatics Centre
Brazil

Luma da Rocha Seixas
UFPE – Informatics Centre
Brazil

Abstract

This paper is about a doctoral project which is underdevelopment and also has the objective of conceiving a social mechanism between the educational contexts Learning Management Systems (LMS) and Personal Learning Environments (PLE) with a purpose of allowing teachers and tutors immersed in distance education modality to formatively accompany the learners in formal and informal learning situations. The review of literature evinces the difficulties of the LMS in joining with other educational contexts, as the example of the PLE, mainly according to: Interoperability. Integration of activities, Traceability, Single-sign-on execution and Security. The review also allowed conceiving a conceptual model to this social mechanism. The result leads to a model made of four stages and its conception was originated through the literature which referred to the characteristics and limitations between these contexts.

1. Introduction

The Learning Management System (LMS) is the most representative tools in the field of distance education [1]. According to Bogdanov, the LMS are controlled and managed by teaching institutions [2]. They can be found in almost all the institutions, and consequently, students, tutors, and teachers use them. The LMS is widely established and must stay in the learning field [3]. It means that, whichever it is the teaching modality, this tool is completely consolidated in the educational range. Although, despite its extensive acceptance, Brown et al. call our attention to the fact it has not reached the expected improvements [4]. To Conde, the fundamental reasons to this panorama are related to [1]: a) The learning process ought to be focused on the learner not on the institution or even the course [5]; b) In the necessity to offer lifelong learning support to learners [6]; c) It is essential to consider the informal learning and the support to 2.0 tools which foster this

learning pattern [7]; e) The learning systems must be able to proceed with the new technologies [8].

The LMS became prominent 20 years ago, in view of the World Wide Web general use [9]. According to the authors, The technologies which are used by LMS have a standard specification, whether they are commercial, for instance the WebCT, REDU and Blackboard or Open Source as the Moodle, ATutor and LMS AMADEUS among other ones. Whichever the perspective, they all introduce basically similar functionalities and a set of pedagogical approaches which may be developed.

These environments intrinsically have the characteristic of providing a set of benefits to students and employees at an institution. To those who manage an LMS environment it is allowed to provide a set of tools that enable the addition of new contents, a cut-off of an existing content in order to create new courses. The student is managed efficiently, besides offering a unique integration point with the student's records systems.

However, the LMS are considered a conservative technology, it happens due to the fact they are idealised to be a solution to a set of institutional problems. Whether it is in the learners' management, or it is in providing the tools, or even it is in delivering the contents. From this point of view, the LMS work efficiently to the necessities of the institutions. On the other hand, according to Colin, they are frequently badly adapted to the learners' necessities [9].

In the attempt to solve these problems the Personal Learning Environment (PLE) arise. These learning environments are idealised to be able to fulfil the brand new necessities, although, it is necessary to consider how to integrate formal tendencies, and informal ones in the learning process. It is assured by Conde that the PLE represent an opportunity to management, searching for higher efficiency in the learning process [1].

A lot of PLE solutions in a wide array of fields are conceived to the learning support, although, a great number of them are focused on providing autonomy to learners, without keeping any relation

to the systematic monitoring of their activities out of the LMS environment.

In the pursuit of his research, Harmelen introduces the potentials associated to the PLEs and He exposes that this kind of technology is in itself a type of increasing phenomenon, and it has attracted the interest in the distance education field due to its multidimensional characteristic [10]. Up to 2006, the definition to the PLE term remained unclear, that is what assures [11]. The author shows that the concept about what must compose a PLE depends on the viewpoint and its use.

It suggests that the priorities to an PLE propose themselves to be different to an undergraduate student, a technical education student, to a university coordinator, to a professor, to an specific assignment, or even to any individual who looks for an alternative way of learning during one's lifetime.

On referring to the PLE, it is bringing up the idea to provide autonomy to individuals who use them. A PLE is coordinated by the student himself/herself and, according to Mota, the notion related to the PLE means the union of a lot of the aspects that refer to social and cultural changings which have been provoked by the technological development [12] [13]. As we observe, it has a very strong impact in education, and in the learning conception. As per Mota, Cap. 5 [13]: *The PLEs represent, as we wish, the willing to operate the principles of E-learning 2.0 in this area, of power and autonomy of the user/learner, of the opening to sharing and partnership, of permanent learning in a lifetime, of importance and value of informal learning, of the social software potentialities, having the internet working just like a place for sharing knowledge and learning.* To Mattar, pg.115 [12]: *The PLEs represent a space in which individuals in a learning community can share their work on a personal publishing platform upon the ones the individual keeps as a property.*

The authors also point out that, even with the development of technology, the students may select and organise their own learning environment, choosing the platforms, tools and contents which are more interesting, and the ones which are in tune with their learning style [12] [13]. The author Mattar complements the remarks of Downes and Olivier asserting that the LMS are centred environments in the institutions [12] [14] [15]. Besides this, according to Valtonen the PLE have been announced to be the following step of the LMS [16]. In Mott it is described that the most well-known authors in the area suggest that the PLE are the following step in the development of educational technology, a way to replace the LMS, providing tools and learning to fulfil the necessities of the society of knowledge [8].

This paper aims to introduce a conclusion of an initial study and make way for reflection on existing limitations and difficulties in the Learning

Management System (LMS) literature opposing the Personal Learning Environment (PLE). Besides the introduction to the limitations, it is also designed a social mechanism between the computational contexts LMS and PLE for formative accompaniment in distance education.

This article is organized as follows: in section II are discussed the integration perspectives between LMS and PLE contexts. The section III is presented the conception of social mechanism. And, finally, section IV brings the final considerations of this work in progress.

2. Integration Perspectives between LMS and PLE

The limitation characteristics of the LMS have been discussed since 2001, when Olivier evinced that architectures based on LMS do not meet the students' learning needs completely during their lives, hampering them to manage their own learning [15]. Moreover, these architectures do not seem adequate to provide the learners with continuity, even if it is temporary, once they themselves are unplugged from these environments. The authors Downes reinforces that the LMS are mainly tools to deliver and organise the content "built up" by the teacher to the course, placing the students at a very passive role, simply as followers of the modules of a course at a pre-determined rhythm [14].

In step with Attwell the authors complement that the PLE are on the way to bring two institutional walls down, making solutions essential to integrate the institutional and non-institutional worlds, which means the formal, not formal, and in the informal learning process [5]. However, some determined tasks need to be done because of some difficulties – shown in Table 1 – keep on existing in the relation.

Table 1. Difficulties associated with the process of integration between LMS and PLE – Adapted [1]

Difficulties	Description
Interoperability	The LMS have difficulties to add interoperability patterns [3].
Integration of activities	The formation of integration of activities between LMS and PLE are not adequate, once the PLE are conceived to representation, sorting, and accompaniment in other platforms [17].
Traceability	Difficulties in the traceability of the user activities in the PLE. Therefore, it generates problems in the activities which are considered formal [18].
Single-sign-on	The difficulty to establish a

execution	unique entry point among the systems involved [19].
Security	Difficulties to ensure the security of information due to lack of interoperability [20].

In light of the diversity of resources, solutions and existing device make the coexistence possible between the PLE and LMS in order to promote its integration has been a continuous challenge in the scientific community. To Bogdanov, bringing flexibility and extensibility to the LMS is crucial, this is because it provides a free choice of technologies and pedagogical material to teachers and learners in their courses [2].

Even according to Conde there are lots of initiatives, although, none of them provide efficient methods to assure a complete integration and interaction in between LMS and PLE [1]. To that extend Palmér proposed 3 (three) sceneries to the coexistence: Scenery 1: Parallel existence of the LMS and the PLE [17]. The PLE is a kind of dominant conception in informal learning environments or even in learning based on competences. Meanwhile, the LMS would remain as a key technology of the formal teaching systems. Scenery 2: The LMS would make available its structures, establishing an interoperability with the PLE. Scenery 3: Adding the PLE characteristics to LMS ones, this way, allowing in this way to incorporate the existing transforming power in the PLE.

Based on proposals which belongs to Palmér, Conde shows that Scenery 1 does not considerate the integration, simply the simultaneous companionship [1] [17]. Scenery 2 refers to the releasing of the LMS throughout Web services and interoperability initiatives, such as: initiatives based on iGoogle, social networks connected to the LMS, possibility to the LMS to offer support to the implementation of interoperability specifications, for instance the IMS, the PLE could be conceived with a specific protocol of communication [10]. Or even to have the integration based on Service Oriented Architecture (SOA). Finally, Scenery 3, in which Conde calls the attention to the fact that he considers the external tool integrations in the LMS [1]. This way, the learners could not be able to decide which tools would be used, this way being restricted to institutional decisions.

3. Introduction of Social Mechanism between Computational Contexts: LMS and PLE

The term "Social Mechanism" has its origin in the social sciences and, according to Gross, it is related

to a structure or process that due to an event or changing of one or more variables of entrance made a changing in the state of variable or in the event itself. The author emphasises that one social mechanism is a tool that measures the relation of cause and effect in a process [21].

This research considers that the formative accompaniment is an integrated part, in order to, the formative evaluation in the E-learning happen. In accordance with another source, the evaluation is an existing practice in all domains of human activities [22]. They may happen in conscious processes, intentional processes, organised processes, and even, delimited temporarily processes, but also through diffuse, less structured and visible, in the plurality of time and space during people's daily activities. When this plurality is related to E-learning, it makes us perceive that current practices to evaluation , mainly from the formative point of view, need to be reviewed, it means, they ought to allow learners, tutors, teachers, and institutions to represent their performances.

Assess formatively as per Bloom happens during the whole teaching-learning process and it aims to identify what and when the students mastered an specific content, as well as, how and what was not mastered by the students [23]. According to Black this phenomenon occurs in so far as the evidence on students' performance is stimulated, interpreted, and used by teachers, students or whoever is involved [24]. In order to make decisions about the following steps on the learning process. And, according to [25], the formative evaluation provides pieces of information about the learning process, so that, teachers may use in their teaching decisions and students may use to improve their performance.

The term "formative accompaniment" which was used in this research is different of the term "monitoring learning" which can be found in the current literature. Despite the fact they are almost synonyms, the term "monitoring learning" suggests an observation of an specific phenomenon during some time, aiming to verify if the established conditions are according to the desired standard [26] [27]. The term "formative accompaniment", handled here, is tuned with other sources [28] [29] [30]. It has the purpose to bring some closeness to the phenomenon to be observed, in terms of being close to. To provide assistance, guide, show the way, personalise this support along the process.

The social mechanism has the purpose to investigate the phenomena which derive from the insertion among the educational contexts LMS and PLE throughout the formative accompaniment. Its conception is based on the difficulties presented in table 1. To such a degree that the main idea of the mechanism is to use a non-intrusive to collect and register information about the events related to the learning activities in their PLE, mainly in learning

informal activities. So that, it allows the learners to perform independently, as well as, share learning experiences and contents, they may help and receive some help from other activity groups. And, mainly, they may provide to teachers and tutors essential and meaningful information to have an effective formative accompaniment of these activities.

In doing so, the social mechanism to the formative accompaniment in E-learning – proposed

in this research and represented by the Figure 1 – adds in its development the conceptual characteristics of Gross, as well, the operational ones described by Wilson in the “Scenario 2” when it refers to the LMS opening in the proposal of support to implementations and specification of interoperation with the PLE [18] [21]. The scenario represented by the Figure 1 has three references, as it follows:

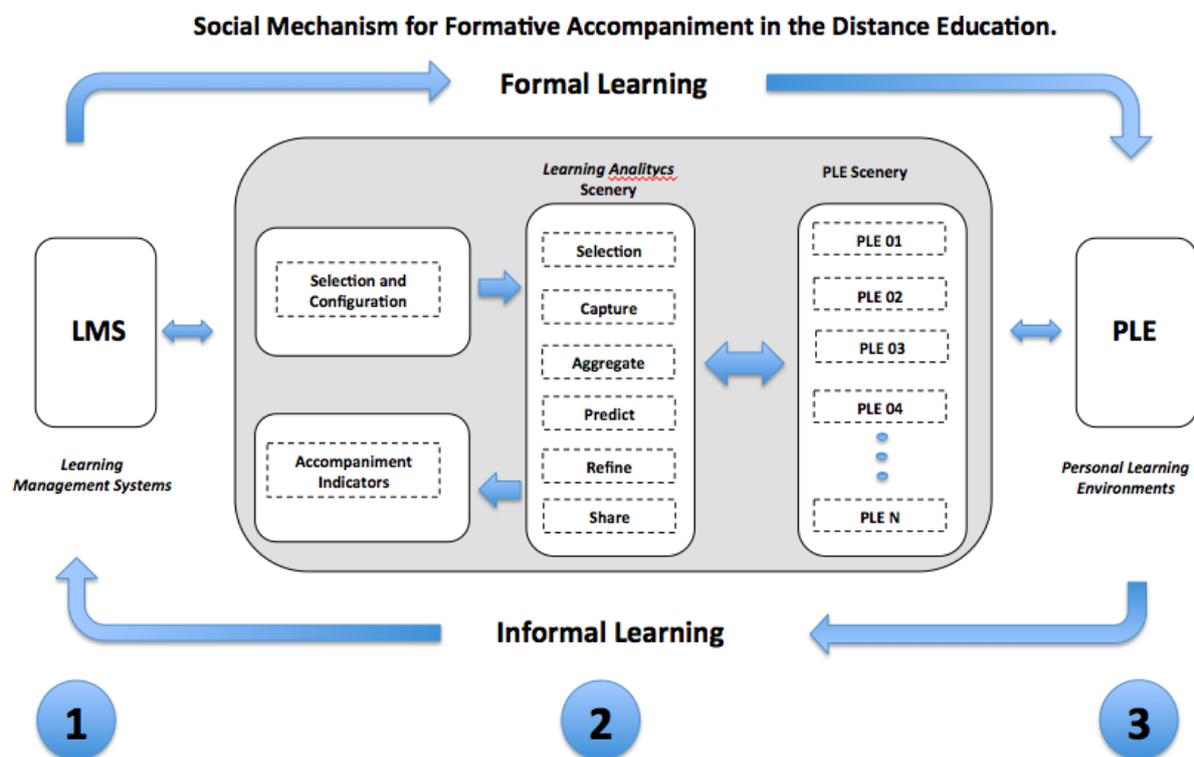


Figure 1. Social Mechanism for Formative Accompaniment in Distance Learning – [28]; [29]; [30]

educational contexts PLE and LMS. The reference “1” is about the formal teaching environments, as well titled as institutional environments. In the proposed scenario, the social mechanism considers that one institution may have one or more than one LMS working. The reference “3” refers to a context in which the PLE may be inserted. This way, they are represented by the resources of the web and by the mobile devices. And, the reference “2” represents the social mechanism to the formative accompaniment which is made of 4 (four) stages, as it follows:

- **Stage 01** – Selection and Configuration => This stage has the objective to allow the teacher or tutor to select and configure properly which events related to the learners’ activities are relevant to be pointed out.
- **Stage 02** – Learning Analytics Scenario => made of 6 (six) elements which intention is: select the PLE scenario to be considered,

and capture pieces of information related to the learners’ activities, adding information based on the definitions of stage 01, be able to predict possible future actions of the learners’ activities, refine the obtained information and share the refined results.

- **Stage 03** – PLE Scenario => refers to the definition on which elements and/or technologies are going to be considered as PLE from the point of view of the social mechanism.
- **Stage 04** – Accompaniment Indicator => it has the purpose to provide the accompaniment indicators, based on previous selections defined in stage 01, so that, the support to the learners’ could be endeavored to.

The stages which build up the social mechanism search for exclusively investigation of the phenomena between the educational contexts, so that

it allows the teachers and and/or tutors to have elements or indicators to the individual knowledge or even in group. Furthermore, it helps to perceive who is in trouble along the whole learning process, and at last, it may make easier a deeper analyses of the formative accompaniment, allowing that decisions may be made in agreement with profile and learners' learning context.

4. Conclusions

It is known that formal teaching institutions practise in their courses a traditional way of evaluation, where at the end of each module or at the end of the course grades are given. Within the researched literature, it was not identified any aspect directly related to the formative accompaniment of the learners with activities when they are out of their formal learning environments. In this research, it is understood that formative accompaniment is the possibility in which the teacher or the tutor is able to arrange to his pupils activities that could be done out of the LMS.

This context allows us to understand the importance of the link the LMS must have with the PLE. Provide conditions that enable the teacher or even the tutor to keep up with the learners along their path, mainly in activities out of the LMS environment which are related to activities in their formal courses.

Due to the vast number of possibilities which may be created using the PLE, its process of analysis, accompaniment, and evaluation, from both the operational point of view in which the tools will be selected and used, and also in the accompaniment of the learners on which activities in their PLEs have been done and that have a link with the current activities in the LMS.

The results arising from the literature allow us to consider that the insertion of the social mechanism which was proposed among these educational contexts will contribute to the formative accompaniment of the learners' activities could be executed by teachers and tutors, allowing them to make adequate decisions and actions or personalised during the procedures of one or more formations. These mechanism qualifies, in a row, the PLE as social and helpful tools which are able to investigate and/or capture meaningful information to the learners' formative accompaniment in activities related to the LMS or even out of them.

At this moment, the research is directed to identification of the existent necessities in the E-learning upon the formative accompaniment of activities in order to detail each stage which compound the proposed social mechanism. So that, an ethnographic study with teachers, tutors and students of the vocational education is under development. From this study on, the identified

necessities are going to be categorised and it is observed which stages and their elements are going to be inserted, changed or excluded, allowing the initial prototype generation of the mechanism.

6. Acknowledgements

This work is supported by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES/BRAZIL) through the "Doctoral Lecturer Training Program" – Ministerial Ordinance N°. 140, of October 2nd, 2013 and by Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq/BRAZIL) – Public Call CNPq/SETEC/MEC N°. 041/2014 – “Teachers for the Future Program” – Finland II.

5. References

- [1] Conde, Miguel Ángel; García-Peñalvo, Francisco José; Casany, María José; Forment, Marc Alier. (2013) Personal Learning Environments and the Integration with Learning Management Systems. Information Systems, E-learning, and Knowledge Management Research Communications in Computer and Information Science Volume 278, 2013, pp 16-21. Available in: <http://link.springer.com/chapter/10.1007/978-3-642-35879-1_3>. Last visit: December 26, 2014.
- [2] Bogdanov, Evgeny; Ullrich, Carsten; Isaksson, Erik; Palmér, Matthias; Gillet, Denis. From LMS to PLE: a Step Forward through OpenSocial Apps in Moodle. (2012). Presented at: The 11th International Conference on Web-based Learning ICWL, 2012. Available in: <http://link.springer.com/chapter/10.1007%2F978-3-642-33642-3_8>. Last visit: December 26, 2014.
- [3] Sclater, Niall. “Web 2.0, Personal Learning Environments, and the Future of Learning Management Systems” (Research Bulletin, Issue 13). (2008). Boulder, CO: EDUCAUSE Center for Analysis and Research, 2008. Available in: <<https://net.educause.edu/ir/library/pdf/ERB0813.pdf>>. Last visit: December 26, 2014.
- [4] Brown, J.S. & Adler, R.P. (2008). “Minds on Fire: Open Education, the Long Tail, and Learning 2.0”. In *Educause Review*, January/February 2008, 43 (1), 16–32. Boulder: Educause. Retrieved January 20, 2008. Available in: <<http://www.educause.edu/ir/library/pdf/ERM0811.pdf>>. Last visit: December 26, 2014.
- [5] Attwell (a), G.: The Personal Learning Environments - the future of eLearning? *eLearning Papers 2* (2007). Available in: <<http://www.elearningpapers.eu/index.php?>>>. Last visit: December 26, 2014.
- [6] Attwell (b), G.: e-Portfolios – the DNA of the Personal Learning Environment? *Journal of e-Learning and Knowledge Society* 3 (2007). Available in: <<http://www.pontydysgu.org/wp->

content/uploads/2008/02/eportfolioDNAofPLEjournal.pdf
>. Last visit: December 26, 2014.

[7] Ajjan, H., Hartshorne, R.: Investigating faculty decisions to adopt Web 2.0 technologies: Theory and Empirical Tests. (2008). *The Internet and Higher Education* 11, 71–80 (2008).

[8] Mott, J., Wiley, D.: Open for Learning: The CMS and the Open Learning Network.(2009). In: *Education - Exploring Our Connective Educational Landscape*. University of Regina, Saskatchewan.

[9] Colin D. Milligan, Phillip Beauvoir, Mark W. Johnson, Paul Sharples, Scott Wilson, Oleg Liber. (2006). Developing a Reference Model to Describe the Personal Learning Environment. *Innovative Approaches for Learning and Knowledge Sharing Lecture Notes in Computer Science Volume 4227*, 2006, pp 506-511. Available in: <[#](http://link.springer.com/chapter/10.1007%2F11876663_44)>. Last visit: December 26, 2014.

[10] Van Harmelen, M. (2006). Personal Learning Environments. In: Computer Society (Eds.) *Sixth IEEE International Conference on Advanced Learning Technologies (ICALT06)*, (pp.815-816) London, England, 02 April, 06 June, 2006. London: UK.

[11] Lubensky, R. The present and future of Personal Learning Environments (PLE). (2006). *Deliberations: Reflecting on learning and deliberating about democracy*. 2006. Available in: <[#](http://www.deliberations.com.au/2006/12/present-and-future-of-personal-learning.html)>. Last visit: December 26, 2014.

[12] Mattar, J. (2012). *Tutoria e Interação em Educação a Distância – Série Educação e tecnologias – 1a. Edição – Editora Cengage Learning*. São Paulo. 2012.

[13] Mota, José. (2009). *Da Web 2.0 ao e-Learning 2.0: Aprender na Rede*. Dissertação de Mestrado. Versão Online, Universidade Aberta. Portugal. 2009. Last visit: December 26, 2014.

[14] Downes, S. (2005). e-Learning 2.0. Retrieved September 14, 2008, from *elearn*. Magazine. Available in: <[#](http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1)>. Last visit: December 26, 2014.

[15] Olivier, B. and O. Liber. (2002). “Lifelong learning: the need for portable personal learning environments and supporting interoperability standards”. *SSGRR 2002w International Conference on Advances in Infrastructure for Electronic Business, Education, Science and Medicine on the Internet*, L'Aquila, Italy. 2001. Available in: <[#](http://ssgrr2002w.atSPACE.com/papers/14.pdf)>. Last visit: December 26, 2014.

[16] Valtonen, T.; Hacklin, S.; Dillon, P., Vesisenaho, M.; Kukkonen J.; Hietanen A. (2012). Perspectives on personal learning environments held by vocational students, *Computers & Education*, Volume 58, Issue 2, Pages 732-739, ISSN 0360-1315, 10.1016/j.compedu.2011.09.025.

[17] Palmér, M., Sire, S., Bogdanov, E., Gillet, D., Wild, F.: (2009). Mapping Web Personal Learning Environments. In: Wild, F., Kalz, M., Palmér, M., Müller, D. (eds.) *Second International Workshop on Mashup Personal Learning Environments (MUPPLE 2009)*, vol. 506, pp. 31–46. CEUR-WS.org, Nize (2009).

[18] Wilson, S., Liber, O., Johnson, M., Beauvoir, P., Sharples, P., Milligan, C.: (2007). Personal Learning Environments: Challenging the dominant design of educational systems. *Journal of e-Learning and Knowledge Society* 3, 27–38 (2007). Available in: <[#](http://services.economia.unitn.it/ojs/index.php/Je-LKS_EN/article/view/247)>. Last visit: December 26, 2014.

[19] Severance, C., Hardin, J., Whyte, A. (2008). The coming functionality mash-up in Personal Learning Environments. *Interactive Learning Environments* 16, 47–62 (2008).

[20] Casquero, O., Portillo, J., Ovelar, R., Benito, M., Romo, J. (2010). iPLE Network: an integrated eLearning 2.0 architecture from University’s perspective. *Interactive Learning Environments Vol. 18, Iss. 3*, 2010. Available in: <[#](http://www.tandfonline.com/doi/abs/10.1080/10494820.2010.500553#U1Sg01VdWSq)>. Last visit: April 16, 2014.

[21] Gross, Neil. (2009). A Pragmatist Theory of Social Mechanisms. *American Sociological Review*, Vol. 74, No. 3 (Jun., 2009), pp. 358-379. American Sociological Association. Disponível em: <[#](http://www.jstor.org/stable/27736068)>. Last visit: December 26, 2014.

[22] AFIRSE. XXII Colóquio AFIRSE – 2014. Associação de Estudos e Investigação em Educação. Portugal.

[23] Bloom, Benjamin Samuel; Hastings, J. Thomas; Madaus, George F. (1983). *Manual de Avaliação Formativa e Somativa do Aprendizado Escolar*. São Paulo/SP: Pioneira, 1983.

[24] Black, Paul; Wiliam, Dylan.(2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability (formerly: Journal of Personnel Evaluation in Education)* February 2009, Volume 21, Issue 1, pp 5-31.

[25] Brookhart, S. M. (2007). Expanding views about formative classroom assessment: A review of the literature. In J. H. McMillan (Ed.), *Formative classroom assessment: Research, theory and practice*. New York, NY. 2007. Teachers College Press.

[26] Lam, Paul; Keing, Christina, McNaught, Carmel, Cheng, Kin-Fai. (2006). Monitoring eLearning environments through analysingweb logs of institution-wide eLearning platforms. 2006. *Proceedings of the 23rd annual ascilite conference: Who’s learning? Whose technology?*.

[27] Yatian, Chen; Xiaomeng, Lv; Yufeng, Jiang; Tongxiang, Wu. (2013). "Research on learning-monitoring system for E-Learning," *Computer Science & Education*

(ICCSE), 2013 8th International Conference on , vol., no., pp.16,18, 26-28 April 2013.

[28] Melo Filho, I. J. ; Gomes, A.S. ; Carvalho, R. S. . Acompanhamento formativo no e-learning viabilizados pela integração entre Learning Management Systems e Personal Learning Environments. (2014). In: Anais do DesafIE - III Workshop de Desafios da Computação Aplicada à Educação - DesafiE2014 -. Brasília: SBC - Sociedade Brasileira de Computação, 2014. v. 01. p. 607-617.

[29] Melo Filho, I. J.; Gomes, A.S.; Carvalho, R. S.; Tavares, E. L. C. (2014). Formative Accompaniment Border in E-Learning: Integration between LMS and PLE. In: Ireland International Conference on Education (IICE-2014), 2014, Ireland. Proceedings of Ireland International Conference on Education (IICE-2014). Dublin/Ireland: Copyright IICE-2014 Published by Infonomics Society, 2014. v. I. p. 302-305.

[30] Melo Filho, I. J.; Carvalho, R. S.; Tavares, E. L. C.; Gomes, A.S. (2014). Towards the Formative Accompaniment in E-Learning: Conception of a Social Mechanism Between the Educational Contexts LMS and PLE. In: E-LEARN 2014 - World Conference on E-Learning, 2014, New Orleans/United States. Proceedings of E-LEARN 2014 - World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2014. New Orleans/Louisiana/USA: Association for the Advancement of Computing in Education (AACE), 2014. v. I. p. 1330-1339.