Valorization of Non-Formal Learning Situations Using IMS-LD Specification

Aminata Wague
Université Iba Der Thiam de Thiès

Mamadou Bousso
Université Iba Der Thiam de Thiès

Laurence Capus
Université Laval

In recent years, innovative technologies that are not exclusively intended for learning have appeared and have been very well assimilated by learners who use them for a learning objective in a non-formal setting. Thus, learning is no longer limited to the LMS (Learning Management Systems) used in a formal setting but extends to various digital applications. However, the design of devices instrumented by technologies in an educational context focuses on formal learning situations describing how the learner should learn to the detriment of those that showing how the learner actually learns. Because of this, the current LMS do not fit the autonomy of the main actor in learning and therefore do not promote his/her motivation. In order to promote these different learning situations jointly, we formalize non-formal learning situations by developing their conceptual model in this paper.

Keywords: formal learning situation, non-formal learning situation, autonomy, digital and social media, formalization, IMS-LD specification

INTRODUCTION

The emergence of technologies in education opens up rapid access to an important part of human knowledge. Knowledge acquisition, sharing and creation are therefore transformed; it is the expansion of learning towards broader horizons of time, place and action. Indeed, in addition to institutional LMS (Learning Management Systems), other tools such as digital and social media are used for learning and are very well assimilated by learners. Consequently, all these systems exploit learning situations although different in their form but equally important for acquiring knowledge. One can observe two situations: one formal dedicated to "make people learn" and another non-formal one for learning activities undertaken by learners themselves. However, the design of devices instrumented by technologies focuses only on formal situations describing how the learner should learn to the detriment of those showing how the learner actually learns namely non-formal situations. We therefore believe that, in order to place the learner at the core of learning process, with effective devices adapted to current learning realities, it is necessary to take non-formal situations into account in the same way as formal ones in the design process. In this paper, we tackle the problem of non-formal learning situations promotion by developing the conceptual model of a non-

formal learning situation using the educational modeling language IMS-LD (IMS Global Learning Consortium, 2003). We give a brief overview of the instructional design and propose the conceptual model to specify non-formal learning situations as well as its advantages. We present current learning practices that define the actual uses of technology for learning. Finally, a non-formal learning activity widely observed on African campuses, which takes place independently of the institutional LMS, illustrates how the model could be used.

METHODOLOGY

The engineering of technology-instrumented learning devices was approached with an interest in learning objects and then in learning scenarios. Thus, in this section, we present instructional design's state of art, which allows us to state non-formal learning situation prominence for the learners. Then, to promote the latter, we present its conceptual model as a formalization proposal.

Instructional Design, Overview of the Situation

Studies ICT's (Information and Communication Technologies) deployment in learning highlights imprints of two approaches: the documentary and the instructional engineering one. These approaches respectively focused on the content and the learning process and experienced a succession of standards for describing educational resources and modeling languages. Indeed, starting from the observation that the sole use of description standards such as LOM (IEEE, 2002) is not sufficient to describe learning situations instrumented by ICT, Koper's work (Koper, 2001) led to the development of EMLs (Educational Modeling Languages). However, we note that as important as these languages may be, they only focus on formal learning situations to the detriment of non-formal learning situations which in our opinion merit reconsideration. Dedicated to "make people learn", formal learning situations linked to the learning process organized through institutions such as universities (Alawawdeh & Kowalski, 2015) describe how the learner should learn. Nevertheless, we believe that to optimize learning it is necessary to put the learner at the core of this process, taking non-formal learning situations into account in the same way as formal ones in the instructional design. Certainly, non-formal situations relate to the learning activities undertaken by the learners themselves and describe how the learner actually learns. They highlight the actual uses of technology for learning, thus reflecting the current learning realities. Indeed, in recent years, innovative technologies not exclusively intended for learning have appeared and have been very well assimilated by learners who use them for a project, a learning objective. There are consultation, collaboration and production tools that boil down to digital and social media used in a learning context, although they have not been designed for educational purposes like institutional learning platforms or LMS (Learning Management System) as well as multimedia tools. As Peraya and Bonfils (Peraya & Bonfils, 2012) underline, we are witnessing the coexistence between institutional digital devices in face-to-face or distance learning and personal learning environments, based on Web 2.0 type technologies, set up and managed by learners themselves. Whitty and Anane (Whitty & Anane, 2014) proposed to use social networks to facilitate social interaction and collaboration between learners, which gives them the control of their learning process and the opportunity to explore topics outside of restricted LMS structures. Also with the aim of improving the learning process, researchers (Caminero et al., 2012; Madge et al., 2009) have proposed the integration of the most used social network (Facebook) with the open source LMS (Moodle). Therefore, much work attests to the importance of non-formal learning. Thus, to assert this learning in conjunction with formal learning, we deal with its formalization in the next subsection.

Formalization of Non-Formal Learning Situations

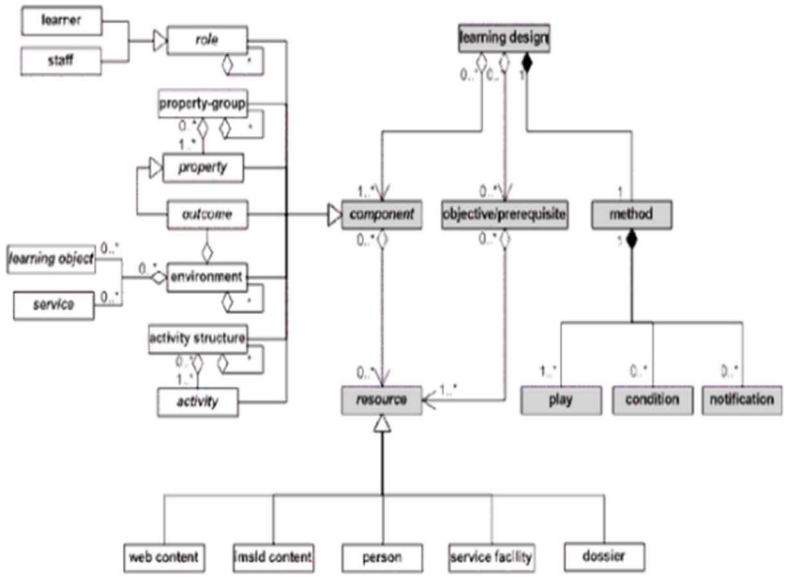
Resulting from Koper's work (Koper, 2001), formalization consists in describing a priori learning situations instrumented by ICT, using educational modeling languages such as IMS-LD. Recall that the objective of IMS-LD is to provide a conceptual framework for modeling unit of learning[1] or instrumented learning situation and ensures the automation of the learning process. Thus, using the Unified Modeling

Language (UML) class diagram, IMS-LD provides a unit of learning model representing aggregation (including compositions) and specializations relationships of abstract classes.

Fig. 1 describes the formal learning situation or unit of learning (*Learning Design* in the figure) from three elements:

- The *Components* describe entities necessary for setting up the unit of learning.
- The *Objectives* and *prerequisites* define the setting of use in terms of knowledge or skills.
- The *Method* describes the unit of learning progress and how the different actors will be brought to use the resources to which it refers.

FIGURE 1
CONCEPTUAL MODEL OF THE SEMANTIC AGGREGATION LEVELS OF A FORMAL UNIT OF LEARNING



(IMS Global Learning Consortium, Inc., 2003)

Right away, the model shows three levels of semantic aggregation; the three horizontal layers of the gray color classes. Semantically, the highest level is the unit of learning, it brings together a collection of components, learning objectives and prerequisites, and a method. The lowest level of aggregation is Resource, Play, Condition, and Notification. The resources are grouped into components and objectives / prerequisites. Plays, conditions, and notifications are aggregated in the method. This learning situation thus formalized by IMS-LD shows on the one hand that it is well promoted; on the other hand, it reveals the underestimation of the non-formal situation despite the fact that it highlights the actual uses of technology for learning that reflects today's learning realities. Therefore, to assert these different learning situations together, we propose the formalization of the non-formal situation using IMS-LD. Drawing inspiration from the conceptual model of formal learning situation presented by IMS-LD, we develop the conceptual model of non-formal learning situation (see Fig. 2).

FIGURE 2
CONCEPTUAL MODEL OF NON-FORMAL UNIT OF LEARNING

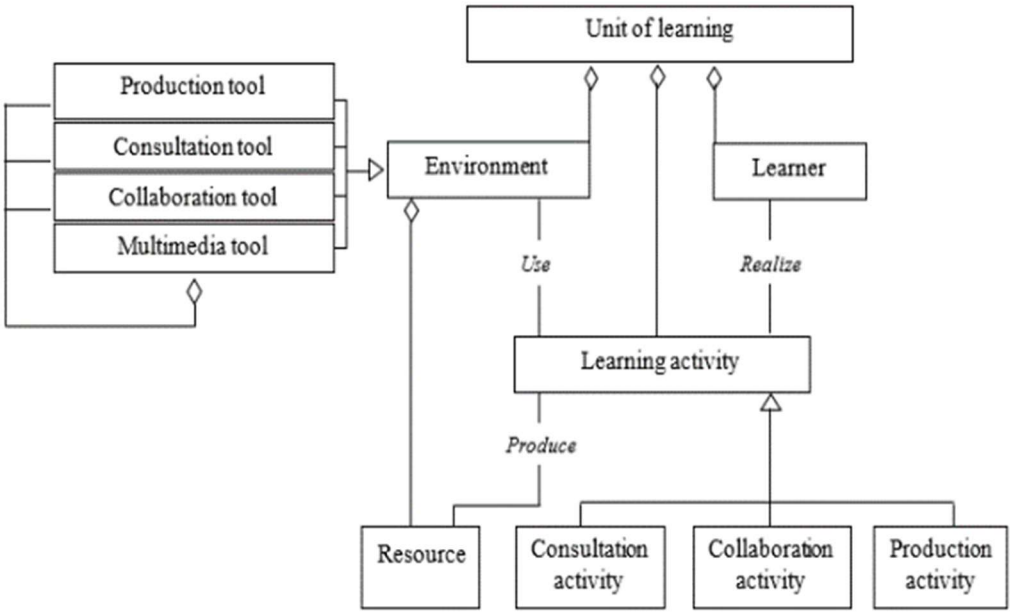


Fig. 2 in turn describes the non-formal learning situation from three elements:

- The *Learner* describes the actor of the non-formal learning situation.
- The *Learning Activity* represents the tasks using the different tools and resources of the environment.
- The *Environment* (*Components* of the formal situation) describes the tools and resources necessary for carrying out the learning activity.

The model presents the non-formal unit of learning, which aggregates the learner, the learning activity and the environment. The learner is the exclusive actor in the non-formal unit of learning unlike the formal one where there is, in addition to the learner, the Staff (teacher, administrator, mediator, assistant, etc.). For this reason, the formal unit of learning describes the *role* element (*learner* and *staff*) as well as the *activity* element which, symmetrically to the distinction of the former, is labeled according to its nature as *support* or *learning*. In addition, conversely, the non-formal unit of learning describes only *learning activity* which can be a *consultation activity*[2], a *collaborative activity*[3] or a *production activity*[4]. From this learning activity results the *resource* aggregated by the *environment*; created and shared by learners, the *resource* can be in text, audio, video or image format. The *environment* used in the learning activity extends to various digital and social media, in particular, *consultation tools* (electronic messaging, YouTube, Google, Dictionary), *collaboration tools* (Skype, Facebook, Twitter), *production tools* (Office, Blogs) as well as *multimedia tools* (televisions, computers, smartphones and tablets). As for the hardware multimedia tools, they in turn combine consultation, collaboration and production tools which are software programs.

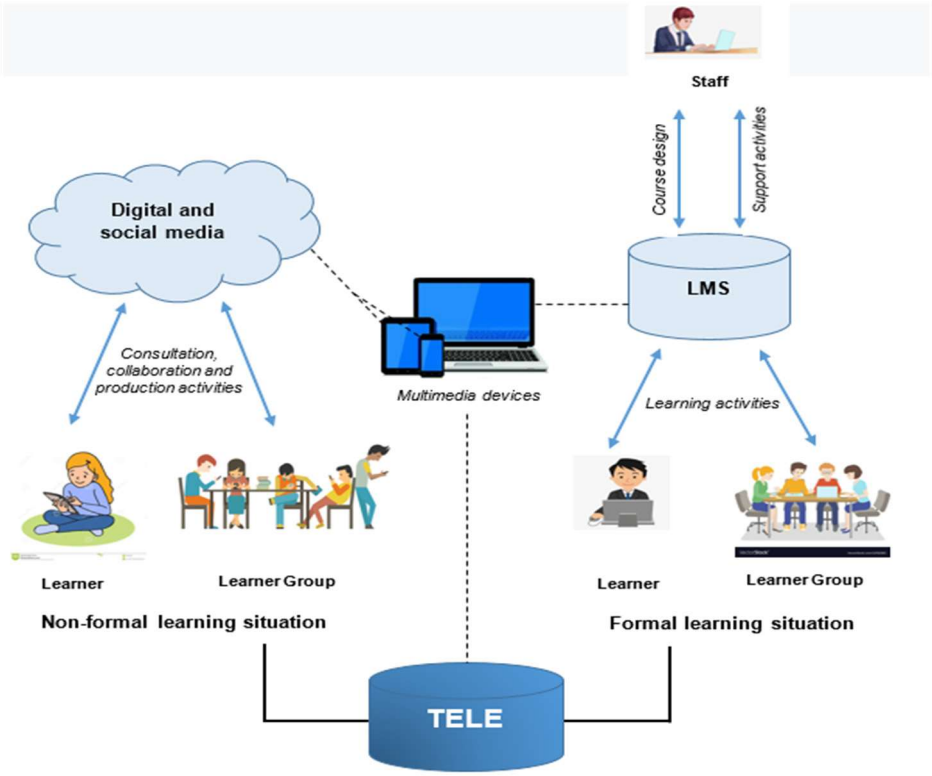
Moreover, by analyzing the definition of the six elements of description of these different learning situations, we can note that the formal learning situation is characterized by prescriptions. Indeed, the objectives, prerequisites and method part represents prescriptions, which reflect the intention to "make people learn" thus determining the formal character of the learning situation but also, its restrictive nature related to knowledge acquisition, creation and sharing process. Conversely, the non-formal learning situation consists only of *components part* and does not have any prescriptions; therefore, it is not subject to the description of execution control elements. The learning environment is the key element in the comparison of these two learning situations. It highlights changes brought by digital and social media in the sphere of knowledge acquisition, sharing and creation. In reality, for the formal situation, which is

implemented through an institutional LMS, all the educational resources and services necessary for the activities are enacted, which implies a limited, restricted learning framework. In the non-formal situation, these resources and services are not planned or prescribed taking into account objectives, prerequisites or a method. Thus, unlike the formal situation, the non-formal situation reflects the expansion of learning towards broader horizons of time, place and action. It opens up access to personal learning environments, based on technologies implemented and managed by the learners themselves. We therefore believe that this conceptual model of the non-formal learning situation is an important means of promoting the learning process undertaken by the learner himself/herself and allowing him/her to develop a certain autonomy. To justify the importance of this formalization that we propose, we first show the current learning practices that define the actual uses of technology for learning. Next, we illustrate how our model could be used by describing a non-formal learning activity widely observed on African campuses, which takes place independent of the institutional LMS.

RESULTS

LMS or learning platforms that exploit formal situations have aroused real enthusiasm in the world of education by allowing teachers and learners to loosen spatial and temporal constraints among other advantages. At Université Iba Der Thiam de Thiès and Université Norbert Zongo, two African universities, the Moodle platform has made it possible to institute distance learning, however, it is suited neither to students needs nor to those of teachers. Indeed, this runtime environment of formal learning situations only offers fixed training courses obeying a very strict didactic program, thus restricting the learner's autonomy. The part of freedom and initiative is reduced for both learners and teachers (in the construction of courses) since all the resources, services and learning activities are prescribed. In addition, we note a low use of the platform in these two universities. In reality, we are in a context where mobile technology is very widespread and where learners, on their own initiative, use their smartphones as a priority in learning activities. Several other innovative technologies (peer-to-peer systems, blogs, wikis and social networks) although marginalized, not supported and even sometimes banned in educational institutions, were simultaneously adopted and well assimilated by learners (Downes, 2004). This means that the Moodle platform does not perfectly represent an TELE (Technology Enhanced Learning Environment) which, in addition to the formal institutional framework, would take into account non-formal learning situations and would make it possible to express the current learning realities as shown in Fig. 3.

FIGURE 3
TELE SIMULTANEOUSLY INTEGRATING FORMAL AND NON-FORMAL LEARNING SITUATIONS



Thus through the *LMS*, the *Staff* (teacher, administrator and / or tutor, instructor, facilitator, assistant) subjects the *Learner* or the *Learner group* to *Learning activities* in accordance with a *Course design*. It is also through the *LMS* that learning *Support activities* are offered by the *Staff*, to learners but also to Staff. By illustrating the TELE at its true value, Fig. 3 shows that learning through *Multimedia devices/tools* is no longer limited to institutional LMS, but extends to *Digital and social media*, which offer learners different activities of *consultation*, *collaboration*, *production* in a non-formal setting. As described by the conceptual model, the non-formal situation consists of different types of learning activities. To illustrate how our model can be used, we have chosen a sequence of *consultation activity* widely observed on African campuses and which takes place independently of the institutional LMS. During a *consultation activity* such as a *presentation's follow-up* in a non-formal learning situation, the learner with his/her *smartphone* (*multimedia tool/device*), is led to shoot a *photo* (*resource*) of the presentation's outlines that contribute to his/her understanding of a course given in a formal setting. Note that this *photo* also serves as a *resource* for all learners since it is shared on *social networks* (*collaboration tools*). In addition, this consultation activity can create another type of activity and vice versa. Indeed, comments made on the photo by other learners lead to a *collaborative activity*. So, in addition to an activity prescribed in a formal situation, namely *text writing*, the learner may find it useful to integrate a *consultation*, *collaboration* and/or *production activity* necessary for his/her comprehension's strengthening, for optimal achievement of this formal activity. Thus, non-formal situations allow learners to access more autonomy and educational material that meets their needs and which they are authors. Therefore, educational material as a whole consists of contents made accessible by teachers and those shared by the learners themselves. Despite their importance demonstrated by the example, non-formal situations are not taken into account in the learning process. This is particularly the case in the two African universities mentioned above, since they use an LMS instead of a device that would exploit non-formal situations created by the learners as well as prescribed formal

situations namely a TELE. We assess that, to remedy this state of affairs, it is necessary to raise the LMS to the TELE's level by intervening in their design process, thus the importance of the conceptual model proposed. Indeed, this model is a translation of our observations into a visual and graphic representation system, describing the different interacting entities in a non-formal learning situation. By facilitating the analysis and comprehension of the future device intended to deploy non-formal situations, this model serves as a basis for the TELE's design, which would involve learners more in their learning. Therefore, through the motivation it arouses in learners, we could consider that the model constitutes a direct contribution to the studies success. Moreover, despite these advantages, we consider that the only use of Internet, of mobile technology, is insufficient to learn. Faced with this plethora of tools available, learners must exercise judgment to optimize the use of these tools and contents production. Also, teachers evaluation of the contents developed by learners remains to be taken into account.

CONCLUSION

The advent of Internet has significantly revolutionized teaching and learning methods. It has fostered the development of institutional LMS but also, of innovative technologies not exclusively intended for learning, very well assimilated by learners who use them for a learning objective in particular, digital and social media. Thus, these different systems exploit respectively formal learning situations and non-formal learning situations, which are equally important for acquiring knowledge. As a result, current institutional LMS do not suit the autonomy of learning's main actor and therefore do not promote his/her motivation. This is what can be observed in African universities in particular, at Université Iba Der Thiam de Thiès and Université Norbert Zongo. Thus, through the conceptual model developed, formalization makes it possible to remedy this state of affairs. Indeed, this model describing the different entities that interact in non-formal learning situation allows analysis and comprehension of the future device intended to unfold non-formal situations thus serving as a basis for designing TELE adapted to current learning practices. These TELE, integrating mobile technology that learners use in priority, would involve them more in the construct of educational material, therefore in their learning and allow them to access more autonomy. Thus, through the motivation it arouses in learners, the conceptual model of the non-formal learning situation could constitute a direct contribution to the studies success.

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ENDNOTES

1. A "unit of learning" refer to any delimited teaching or training element, such as a course, module, lesson, etc.
2. Allows to acquire information from educational material or from a person: interrogation of a database, reading, questioning of an expert, listening to a presentation.
3. Aims to share information, resources or roles: sharing an experience, discussion, exchange of ideas, solving a problem as a team.
4. Aims to build information diagrams or material objects: practical work in the composition of a musical piece, a text.

REFERENCES

Alawawdeh, A.M.H., & Kowalski, S.J. (2015). Facebook as a Learning Tool in Formal Learning Process. In C. Stephanidis (Éd.), *HCI International 2015—Posters' Extended Abstracts* (p. 212-217). Springer International Publishing. https://doi.org/10.1007/978-3-319-21383-5_36

Caminero, A.C., Ros, S., Robles-Gómez, A., Tobarra, L., Hernández, R., Pastor, R., . . . Tawfik, M. (2012). Work in progress : Extending a LMS with social capabilities: Integrating Moodle into Facebook. *2012 Frontiers in Education Conference Proceedings*, pp. 1-2.

Downes, S. (2004). Educational Blogging. *EDUCAUSE Review*. Retrieved from https://www.academia.edu/2869410/Educational_Blogging

IEEE. (2002). *IEEE 1484.12.1-2002—IEEE Standard for Learning Object Metadata*. Retrieved from https://standards.ieee.org/standard/1484_12_1-2002.html

IMS Global Learning Consortium. (2003). *Learning Design Specification | IMS Global Learning Consortium*. Retrieved from http://www.imsglobal.org/learningdesign/index.html

IMS Global Learning Consortium, Inc. (2003, janvier 20). *IMS Learning Design Information Model Version 1.0 Final | IMS Global Learning Consortium*. Retrieved from https://www.imsglobal.org/learningdesign/ldv1p0/imsld_infov1p0.html

Koper, R. (2001). *Modeling units of study from a pedagogical perspective: The pedagogical meta-model behind EML*.

Madge, C., Meek, J., Wellens, J., & Hooley, T. (2009). Facebook, social integration and informal learning at university: 'It is more for socialising and talking to friends about work than for actually doing work'. *Learning, Media and Technology*, *34*(2), 141-155. https://doi.org/10.1080/17439880902923606

Peraya, D., & Bonfils, P. (2012). *L'usage des nouveaux dispositifs médiatiques | Archive ouverte UNIGE*. Retrieved from https://archive-ouverte.unige.ch/unige:23904

Whitty, C., & Anane, R. (2014). Social Network Enhancement for Non-formal Learning. *2014 47th Hawaii International Conference on System Sciences*, pp. 1645-1654. https://doi.org/10.1109/HICSS.2014.210