Models, Process and Tool to Assist Cooperative Scenarization of Distant Learning Modules

Christophe Marquesuzaà, Patrick Etcheverry, Pantxika Dagorret, Philippe Lopistéguy, Thierry Nodenot, Marta Fontenla

MODELS, PROCESS AND TOOL TO ASSIST COOPERATIVE SCENARIZATION OF DISTANT LEARNING MODULES

Christophe Marquesuzaà, Patrick Etcheverry, Pantxika Dagorret, Philippe Lopistéguy, Thierry Nodenot
UNIV PAU & PAYS ADOUR/ E2S UPPA,
LABORATOIRE D'INFORMATIQUE DE L'UNIVERSITE DE PAU ET DES PAYS DEL'ADOUR, EA3000
2, allée du Parc Montaury, 64600 ANGLET, France
Email : christophe.marquesuzaa | patrick.etcheverry | pantxika.dagorret | philippe.lopisteguy | thierry.nodenot@iutbayonne.univ-pau.fr

Marta Toribio Fontenla
IUT de BAYONNE et du PAYS BASQUE, service TICE
2, allée du Parc Montaury, 64600 ANGLET, France
Email : marta.toribio@iutbayonne.univ-pau.fr

ABSTRACT

This paper deals with cooperative pedagogical scenarization. It presents a work carried out after an experience aiming at creating online training courses for an university degree. In the experience, lecturers had no experience in designing full online courses, and needed the support of pedagogical engineers to adapt their courses to suit online learner's requirements. The paper presents several models allowing pedagogical engineers to specify scenarios and also the process to be carried out in order to design these scenarios with lecturers.
These models have been integrated in an online platform allowing pedagogical engineers to assist lecturers all along the design process to export the produced scenarios on the Moodle platform.

KEYWORDS

Pedagogical scenarization, scenario models, scenarization platform, Moodle.

1. INTRODUCTION

Digital competences are becoming increasingly important, whether in the daily lives of the general public, in companies or in the educational field from elementary school to University.

For example, the private french Orange telecommunications company aims to train 50% of its 100 000 employees by using MOOC platforms.On March 5, 2018, Muriel Pénicaud, the French Minister of Labour, unveiled the outline of her professional training reform project to facilitate access to any kind of training programs. In this reform, the use of MOOC platforms is promoted and become eligible by employees as part of their Training Personal Account (CPF in French). The designers of these MOOCs would have to provide high-quality educational pathways that would be assessed by a National Agency.

Within the university sector, lecturers have recognized skills and long-standing experience in creating face-to-face courses. Many educational institutions now offer online workspaces allowing at least access to digital resources in the course of traditional classroom (teaching/learning sessions). These resources can be used before classes, for example in the context of "flipped classrooms", during the class to access non-photocopied documents or after the class, for revision. The hybrid form (face-to-face + online support) aims at making people work better together in order to smooth the training time, not to contract it. Generally, these pedagogical resources have strong dependences with the classroom teaching/learning session in which they

are used and they often lose their relevance when one tries to exploit them on learning platforms such as MOOCs where classroom teaching/learning sessions disappear.

If lecturers have no difficulties in elaborating educational pathways for classroom teaching/learning session, their experience is currently quite limited when it is about designing courses that are fully online and not including any classroom session. In this context, they need the support of pedagogical engineers to see to what extent existing or new courses can be adapted to suit e-learner's requirements.

While (Bakki, A. *et al*, 2017) proposes a model to assist pedagogical scenario building process for MOOCs in a connectivist approach, in this paper we propose a methodology and an associated online platform allowing pedagogical engineers to assist lecturers all along the process aiming at designing online learning modules in a constructivist approach.

The expected spinoffs are numerous. From the learner's point of view, it means improving the learning modes and their arrangement and enhancing their motivation by diversifying available teaching methods. As regards lecturers, the aim is to expand their teaching practice by diversifying the ways to share their knowledge. As to the educational institutions, the main interest is to be equipped with a methodological framework facilitating the development of online courses and also to participate actively in the process of raising the level of knowledge and skills of all the actors involved, from the design to the implementation of an education offer.

This paper is structured as follows. In section 2, we present a feedback on a scenarization process used to set up an online degree course. Considering this experience, in section 3 we present related works dealing with pedagogical scenarios modelling but also design processes aiming at elaborating pedagogical scenarios. Section 4 presents several models to deal with both (1) educational scenarios, (2) scenarization methodologies. In section 5, we describe an online environment implementing the previous models. This platform allows lecturers and pedagogical engineers to design, remotely and cooperatively, online learning modules. Finally, we conclude this paper by presenting several ideas concerning potential future work.

2. FEEDBACK CONCERNING THE IMPLEMENTATION OF A REAL DESIGN PROCESS

We conducted a design work aiming at creating a university degree that can be obtained through an online degree course. This university degree, called DU ASR in French, focuses on systems and network administration. The target audience consists of adult learners living in Latin America and wishing to acquire knowledge and skills related to networking and operating systems in order to work as high-level technicians.

Trainers involved in the design of the pedagogical modules forming this university degree come from various higher education institutions from France (IUT de Bayonne et du Pays Basque), Spain (Universidad del País Vasco / Euskal Herriko Unibertsitatea UPV/EHU), Argentina (ITU Mendoza), Chile (CEDUC Universidad Católica del Norte) and Colombia (Universidad Tecnológica de Pereira).

The design process carried out to elaborate all these online modules has been developed by a pedagogical engineer who worked in cooperation with 18 trainers. Each elaborated modules corresponding to 30 or 60 hours of learning/training that learners can follow remotely and in total autonomy.

For each pedagogical module, the scenarization process is composed of three main steps:

1. Contacting concerned trainers in order to identify the objective of the module
2. Establishing a synthetic description of the chapters composing the module
3. Designing the scenario describing accurately the contents of each chapter.

The first step takes the form of a questionnaire composed of 50 questions to the course author. The aim of this questionnaire is to help the pedagogical engineer get acquainted with the author and identify some of his/her pedagogical practices. This questionnaire also allows the pedagogical engineer to identify the level of the trainer's skills and personal practice related to e-teaching/learning.

The second step deals with the general structure of the course. The pedagogical engineer provides the trainer with a commented and illustrated form aiming at formalizing a full specification of the module to bring online. This form allows the trainer to specify the target audiences, the necessary prerequisites,

knowledge and skills to be acquired, equipment and software needed, the planned assessment method and a first list of pedagogical sequences (chapters).

Basing on this list of pedagogical sequences, the third step of the design process details the pedagogical scenario of the course. It consists of:

- Dividing each chapter into activities while checking that each activity objective contributes to the general objective of the chapter;
- Defining the pedagogical resources which must be mediatized for each activity;
- Defining when and how each resource must be produced.

An extract of the documents produced at each step can be obtained at the following URL: https://goo.gl/nYnzay.

This scenarization task takes the form of an iterative specification process resulting in several exchanges in which the pedagogical engineer brings his/her expertise and his/her recommendations in order to assist lecturers elaborating a qualitative pedagogical scenario adapted to distance learning to be implemented on the Moodle platform. This platform has been chosen for two main reasons:

- it supports a social constructivism design approach which favours rich interactions between pedagogical engineers and lecturers ;
- it provides adaptivity to address users requirements when designing e-education courses (Despotovic-Zrakic, M. *et al*, 2012) ;
- it is based on open source code and may be easily customized.

The scenarization process carried out to elaborate the DU ASR learning modules presents undeniable qualities which allowed the pedagogical engineer to remotely design each module with lecturers located in several countries and with different practices. The first learning modules were put online in September 2015 and since March 2017, the 11 modules composing the whole diploma course are available online (https://elearn.univ-pau.fr/course/index.php?categoryid=6).

Despite these satisfactory results, the work carried out to design this online degree course has allowed us to characterize several improvable points:

- The forms currently used at each design stage (Word and Excel files sent by e-mail) are ill-adapted to a cooperative scenarization task which requires several exchanges between lecturers and pedagogical engineers but also sometimes between lecturers themselves when several lecturers are involved in a same learning module). All these exchanges imply to manage the different versions of each document and it is sometimes tiresome to produce a document satisfying at the same time the pedagogical engineers and all the lecturers implied in the design process.
- The scenarization design process is currently formalized through document models which offer little flexibility when it becomes necessary to adapt some stages/questions to take into account the specific features of some modules or the profile and/or language of lecturers implied in the scenarization process.
- The online publication of a new learning module is tiresome and time-consuming because it is carried out manually and it implies to gather and to take into account all pedagogical elements specified in the documents describing the scenario.

From these observations, we have elaborated models and a platform support:

- allowing pedagogical engineers to create, adapt and make scenarization processes evolve;
- facilitating cooperative work between pedagogical engineers and lecturers;
- automating the export of a pedagogical scenario towards the Moodle LMS (Learning System Management) to facilitate the publication of the corresponding course.

These different contributions are presented in the following sections

3. RELATED WORK

As defined in (Schneider, D. K. *et al*, 2003) and (Peter, Y. *et al*, 2008) a pedagogical scenario is an ordered set of learning activities implying actors who use and produce resources (or “learning objects”). A pedagogical scenario can take several forms (text, audio or narrative video) and aims at describing the

sequences, and sometimes the objectives, the actors, the stages, even the instructions, the tools and documents used or to be produced. These concepts are also described in (Alario-Hoyos, C. and Muñoz Cristóbal, J., 2012) and (Martel, C. *et al*, 2006).

There are two standards to describe a scenario where each scenario is a pedagogical "design" which can be recorded into an XML file:

- The SCORM (Sharable Content Object Reference Model) standard (http://www. scorm.fr) is a compromise between several proposals aiming at standardizing the contents aggregation and data exchanges between a course and a compatible LMS. However, this standard presents various drawbacks concerning learner tracking or the choice of the teaching methods (mono-actor, simple sequencing)
- The IMS-LD (Instructional Management Systems Learning Design) (www. imsglobal.org/learningdesign) is a generalization of SCORM with a multiactor model. This model is more flexible and supports an approach which focuses on activities and collaborations rather than on a succession of contents. However, this standard is relatively technical and also has some limitations concerning the management of actors and their production, informal definition of learning goals or prerequisites). So, the most complete models are not necessarily the best and they must be customized to pedagogical practices and needs while making them accessible to the users.

These pedagogical scenario models are integrated into scenarization tools like SCENARI - OPALE (Crozat, S., 2011), LAMS (Dalziel, J. and Cameron, L., 2014) or G-MOT/TELOS (http://lice.licef.ca/) but also into an LMS such as Moodle.

As part of the experiment conducted for the DU ASR, and because the diploma had to be available on a Moodle platform, the pedagogical engineer scripted the pedagogical scenario of each learning module on the base of his/her own knowledge of the underlying scenario of Moodle (Loiseau, E. *et al*, 2014). Moodle's built in scenario model operationalizes a scenario with entities like courses, composed of sections in which learners will find resources (files, directories…) and tools (ambiguously referred to as "activities") such as MCQs, forums, wikis, etc.

From a methodological point of view, the pedagogical engineer elaborated each learning module of the DU ASR degree in five steps, according to the ADDIE model (Analysis, Design, Development, Implementation and Evaluation).

ADDIE model has provided the basis for many methods of pedagogical design (Gagne, R.M., 1992), because it identifies the life cycle phases of a learning system according to a classic approach used in software design methods (Serhat, K., 2017). ADDIE model leads to a directive design approach. It differs to SAM, the Successive Approximation Models (Allen, M. *et al*, 2012), which proposes an iterative design approach close to agile methods and relying on three stages: Evaluation, Design and Development, with a set of iterations on the whole process. Iterations can lead to the reconsideration of each result and may lead to carry out the evaluation step at each milestone.

The particular context of DU ASR project (various institutions and interlocutors, different native languages, different pedagogical approaches) led the pedagogical engineer to choose ADDIE model and its structuring character where each step can be repeated as often as necessary to improve the obtained result but necessarily ends with a validation before taking the next step.

Based on the experience gained on the DU ASR degree, our goal is to design models for developing educational scenarios garanteeing the operationalization of these scenarios on Moodle. We distinguish two types of approaches to tackle this problem:

- Design approaches with ad hoc tools allowing pedagogical engineers to elaborate pedagogical scenarios whose specification must, afterwards, be matched with data expected by Moodle (Alario-Hoyos, C. and Muñoz Cristóbal, J., 2012), (Gagne, R.M., 1992). Considering the important dissimilarity between the scenarization language and the data model of the LMS, these approaches often entail modifications and semantic losses during the mapping process.
- Design approaches based on IDM to transform a given scenario according to a given model towards a specification compliant with the Moodle model. However, these transformations are complex and often induce a manual intervention and semantic losses.

To avoid these semantic losses, we decided as in (Loiseau, E. *et al*, 2014), to take Moodle's scenario model directly as a basis and to offer pedagogical engineers facilities to elaborate tailor-made design processes aiming at specifying scenarios in accordance with this model.

The pedagogical scenario is led by the teachers' intentions and in accordance with their values (Emin, V. and Pernin, J.P., 2009). It is therefore important to be able to adapt the scenarisation approach in order to take into account teachers pedagogical requirements. To this end, we propose a design approach model that is flexible and can be adapted by the pedagogical engineer according to the needs of the teachers with whom he/she cooperates.

We expect that the elaborated design processes be both rigorous and structuring like ADDIE but also flexible like SAM to allow pedagogical engineers to adapt their manner to assist lecturers during the design process as suggested in (Peter, Y. *et al*, 2008). With this purpose, we propose a design process model allowing pedagogical engineers to elaborate design processes producing pedagogical scenario descriptions compliant with the scenario model integrated in Moodle.

4. PEDAGOGICAL SCENARIZATION MODELS

The scenarization models we propose include two aspects: modelling the description of a pedagogical scenario in terms of components, and modelling the scenarization approach, it means the steps followed by the pedagogical engineer when building a new course.

4.1 A scenario model

The definition of the elements making up a pedagogical scenario has been achieved in tight cooperation with the pedagogical engineer, who settled a vocabulary derived from the experience she acquired during the DU ASR project and her knowledge of the Moodle platform where the scenario had to be implemented.

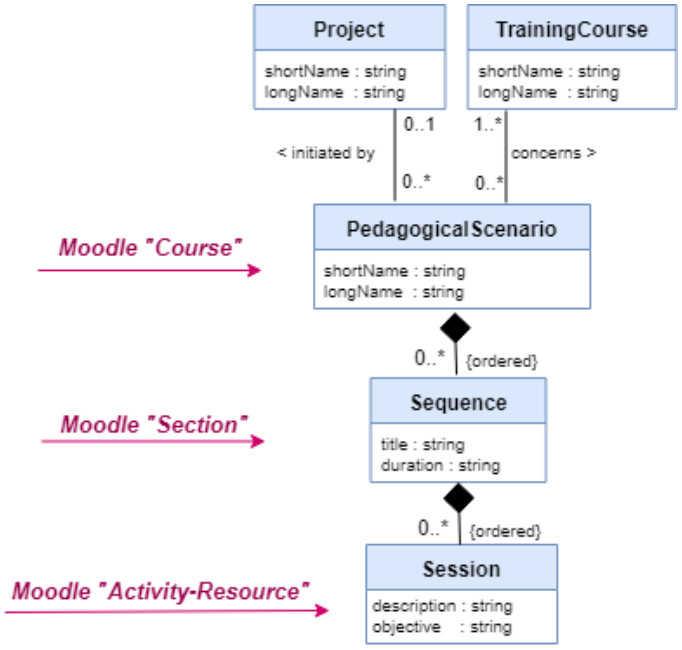

Figure 1. Scenario model

The model includes the following terminology (Figure 1): a pedagogical scenario (or course module) is composed of a set of chapters (or sections / pedagogical sequences). Each chapter may be composed of

sessions where learners use resources (PDF files, videos, MCQs, forums, chats…) to carry out a given activity.

Then, in order to allow the exportation of all scenarios items defined by the pedagogical engineer and lecturers to a Moodle platform, we built a correlation table between this terminology and the concepts which are specific to the Moodle platform (Table 1).

Pedagogical engineer vocabulary	Corresponding Moodle concepts
Module – Pedagogical Scenario	Course
Chapter – Pedagogical Sequence	Section
Session	Activity - Resource

Table 1. Matching pedagogical items with Moodle artefacts

4.2 A Scenarization approach model

In order to facilitate the capitalization and reuse of the formerly described pedagogical engineer's scenarization approach, we first formalized it. Then, we generalized the concept of scenarization approach to allow the pedagogical engineers to customize their scenarization approach, or to develop their own new approach(es).

According to our point of view, a scenarization approach has to be developed by a pedagogical engineer. The application of an approach is cooperatively implemented between one or more lecturers and one or more pedagogical engineers assisting them in the scenario specification task. The experiment conducted as part of the definition of the modules on the DU ASR showed that it was important to appoint a lecturer as a supervisor when several lecturers participate in the scenarization of a same module. As a supervisor, this person is the privileged interlocutor of the pedagogical engineer for the synchronisation and coordination of the specification task led by the teaching staff.

Hence, the term "pedagogical engineer", as used hereafter may refer to a single or more person coordinating the specification task. Similarly, the word "lecturer" may refer to a unique lecturer or the lecturer responsible for the coordination of a teaching staff.

Our scenarization approach model is presented in the right hand of Figure 2. In this model, a scenarization approach is composed of a set of ordered steps, each intented to specify part of a scenario. The specification objective of each step is defined by the pedagogical engineer. He/She also, depending on the step of the scripting work, defines whether this step is currently accessible or not to the lecturer. As suggested in ADDIE, this property allows the pedagogical engineer to manage the progress of the specification task by giving access to a new step only if the specification work of the previous one is considered satisfactory and completed.

A scenarization step is composed of a set of questions whose content and order are defined by the pedagogical engineer. These questions will be asked to the lecturer in order to let him/her specify the properties of his/her pedagogical scenario. Since we considered that a scenario (module) was composed of chapters which are composed of sessions (Table 1), the questions defined by the pedagogical engineer will have to lead the lecturer to specify these items.

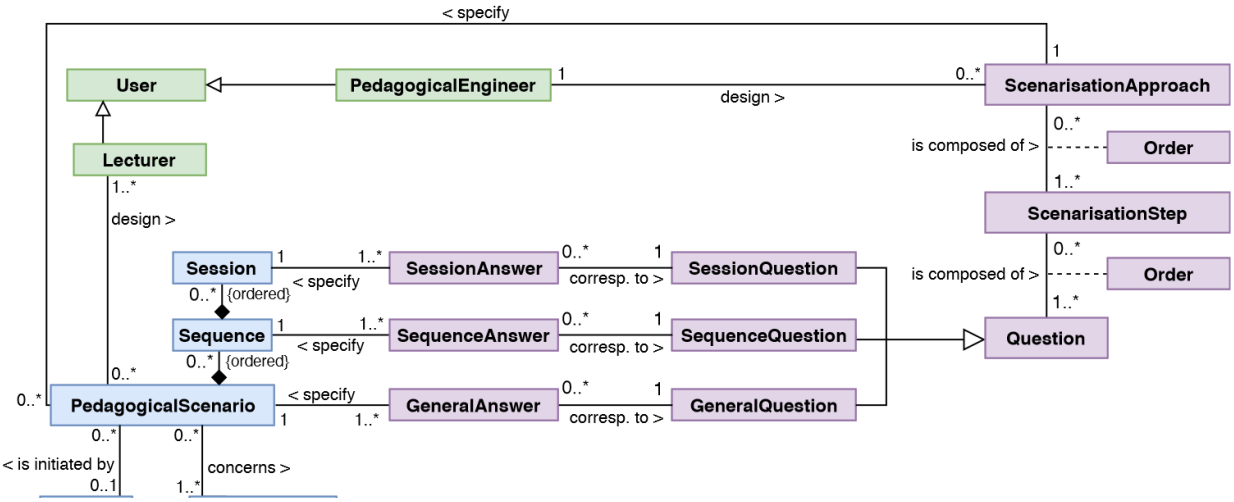

Figure 2. General model

Our model distinguishes three types of questions:

- General questions are not directly related to the scenario (module) to develop. These may be questions that allow the pedagogical engineer to better understand the lecturer with whom he/she is working (scenarization abilities, ICTE skills…) or questions that will prepare the lecturer for the identification of chapters and sessions composing his/her scenario (module);
- Sequence-type questions aim at precisely specifying the chapters composing his/her scenario (module);
- Session-type questions aim at defining the sessions composing each chapter.

As shown in Figure 2, the answers given to sequence-type and session-type questions match the specifications of chapters and sessions of the scenario (module) which will later be implemented on the educational platform.

Our study's final model gathers the two former models and some additional classes, like Lecturer and PedagogicalEngineer, and relationships between them. The lecturer is responsible for coordinating the proposals of his/her colleagues when the module is designed by several lecturers. It is he/she who is in direct relationship with the pedagogical engineer.

5. A PLATFORM FOR COOPERATIVE DESIGN OF DISTANCE OR MIXED LEARNING MODULES

To evaluate the interest and relevance of our approach, we have integrated our models into a cooperative scenarization platform in order to determine their relevance during the design of new modules. The platform allows pedagogical engineers to design their own scenarization approach and implement it while cooperating with lecturers. The design of scenarization approaches is flexible and may be led according to different ways:

- Top-down: firstly defining the goals of the approach, next producing the steps composing the approach and lastly specifying the questions to be asked to the lecturers at each step;
- Bottom-up: firstly defining the relevant questions to specify a scenario (module), next sharing these questions according to each step;
- Mixed: creating for example a first step and then defining the associated questions, next creating a second step and its associated questions, and so forth.

To support this flexible designing approach, the scenarization platform allows the pedagogical engineers to define in any order:

- The questions to add to a bank of questions and which can later be associated with a step.
- The steps to add to a bank of steps and which can later be used to design a specific approach step.

If the scenarization approach is top-down, then the pedagogical engineer will:

1. Give a name to the approach to be created;
2. Integrate in his/her approach the necessary steps while selecting them from the bank of steps or creating them on the fly (in the latter case, the design approach is mixed);
3. Define for each step the questions to answer while choosing them in the bank of questions or creating them on the fly (mixed approach).

If the scenarization approach is bottom-up, then the pedagogical engineer will:

1. Define the questions to be used in his/her approach;
2. Create (name) the steps composing his/her approach;
3. Associate the questions with each created step;
4. Merge and order the previously created steps to complete his/her approach.

This flexible design approach has been used to create new learning modules dedicated to ICT for business (https://www.iutbayonne.univ-pau. fr/espace-entreprises/modules-formation.html).

6. CONCLUSION AND FUTURE WORK

The design models implemented on our scenarization platform are currently being evaluated. The evaluation focuses on the relevance (and the limitations) of the models allowing to design new scenarization approaches or to customize existing approaches.

The above scenario model and the scenarization approaches model are both a first stage allowing pedagogical engineers and lecturers to design the frame of a scenario/module (sessions and chapters) and to export it to the educational platform. The proposed models do not currently allow to specify/create the educational resources involved in each learning module. These resources are therefore currently defined directly on Moodle and not on the scenarization platform. Future works therefore aim at extending the scenario model to support the specification of the educational resources involved in each educational activity. This also implies to extend the scenarization approaches model in order to specify this dimension of the scenario.

In order to cover a wider range of educational practices and to streamline the progression of the activities to be conducted to create the learning modules, the general model should be extended to also take into account the pedagogical roles which are commonly identified in the literature. We may here cite for example the roles identified in (Peter, Y and Vantroys, T., 2005): module manager, module author, scriptwriter, media creator, tutor, administrative manager…

More broadly, it is necessary to define more precisely the type of scenarization approaches that can be designed with our models to identify the teaching practices that are not covered and make our models evolve accordingly.

REFERENCES

(Allen, M. *et al*, 2012) Leaving ADDIE for SAM: An Agile Model for Developing the Best Learning Experiences. *American Society for Training & Development.*

(Alario-Hoyos, C. and Muñoz Cristóbal, J., 2012) GLUE! - GLUE!-PS: An approach to deploy non-trivial collaborative learning situations that require the integration of external tools in VLEs. *In 1st Moodle Research Conference*, pp. 77–85.

(Bakki, A. *et al*, 2017) A Model to Assist Pedagogical Scenario Building Process in cMOOCs. *IEEE 17th International Conference on AdvancedLearning Technologies (ICALT)*, Timisouara, Romania. hal-01646823

(Crozat, S., 2011) *Scenari - La chaîne éditoriale libre : Structurer et publier textes, images et son*. Accès libre. Eyrolles.

(Dalziel, J. and Cameron, L., 2014) *Proceedings of the 9th International LAMS and Learning Design Conference*, Nanyang Technological University, Singapore.

(Despotovic-Zrakic, M. *et al*, 2012) Providing adaptivity in moodle lms courses. *Educational Technology & Society*, 15(1), pp. 326–338.

(Emin, V. and Pernin, J.P., 2009) Model and tool to clarify intentions and strategies in learning scenarios design. In Learning in the Synergy of Multiple Disciplines, *4th European Conference on Technology Enhanced Learning (EC-TEL)*, Nice, France, pp. 462–476.

(Gagne, R.M., 1992) *Principles of Instructional Design.* Wadsworth Publishing, fourth edition.

(Katsamani, M. *et al*, 2012) Designing a Moodle course with the CADMOS learning design tool. *Educational Media International*, 49(4): pp. 317–331.

(http://lice.licef.ca/) LICÉ – Laboratoire en ingénierie cognitive et éducative, Centre de recherche LICEF, Université TELUQ

(Koper, R. and Olivier, B., 2004) Representing the learning design of units of learning. *Journal of Educational Technology & Society*, 7(3): pp. 97–111.

(Loiseau, E. *et al*, 2014) Abstraction of learning management systems instructional design semantics: A meta-modeling approach applied to the moodle case-study. *In Open Learning and Teaching in Educational Communities - 9th European Conference on Technology Enhanced Learning, (EC-TEL)*, Graz, Austria, pp. 249–262.

(Martel, C. *et al*, 2006) Modeling collaborative learning activities on e-learning platforms. *In IEEE International Conference on Advanced Learning Technologies (ICALT)*, Kerkrade, Netherlands, pp. 707–709.

(Peter, Y and Vantroys, T., 2005) Platform support for pedagogical scenarios. *Educational Technology & Society*, 8(3): pp. 122–137.

(Peter, Y. *et al*, 2008) *Pedagogical scenario modelling, deployment, execution and evolution.* In Architecture Solutions for E-Learning Systems, IGI Global, pp. 283–305.

(Schneider, D. K. *et al*, 2003) Conception and implementation of rich pedagogical scenarios through collaborative portal sites: clear focus and fuzzy edges. *In International Conference on Open Online Learning (ICOOL)*, pp. 243–268.

(Serhat, K., 2017) *ADDIE Model: Instructional Design*, web site, https://educationaltechnology.net/the-addie-model-instructional-design/