

# Using Blended Learning to Support Community Development - Lessons Learnt from a Platform for Accessibility Experts

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**Abstract:** Blended learning, mixing both online and face-to-face learning, is now a well established trend in higher education and also increasingly used in companies and public sector. While preserving direct contact with the teacher/trainer, it also provides additional electronic channels to easily share training material and to support interactions among all actors. This paper focuses on specificities of adult training such as their goal-orientation, the higher level of practicality and the higher level of collaboration. We also deal with the explicit goal of building communities where learners are progressively sharing their growing experience. Our work is driven by a real-world case study. We report about how generic e-learning tools available on the market can be adapted to address the needs of such a use case and also present some lessons learnt.

## 1 INTRODUCTION

E-learning can be broadly defined as the use of Internet technologies to deliver a large array of solutions that enhance knowledge and performance (Rosenberg, 2001). It covers a wide range of tools enabling to access online teaching material under written, audio and video formats. It also provides new communication channels among and between learners, teachers and tutors, such as forums and instant messaging. Blended (or hybrid) learning covers the wide mixed spectrum of teaching and learning styles between the traditional face-to-face teaching in classrooms and the pure online course (Stein and Graham, 2014).

E-learning developed originally in universities and higher schools thanks the combination of need, technological readiness and Internet connectivity. With the extension of Internet and more recently the mobile connectivity, it has reached adults inside companies and public sector. A recent survey has reported that more than 40% of the biggest companies use some form of technology to instruct their employees (eLearning Infographics, 2013). The learning adult has a number of known specificities, as reported in the literature (Knowles, 1984). The main differentia-

tors are a greater level of autonomy, the use of its life experience, the need to have clear goals and that such goals make sense while having a practical orientation. Moreover, adult learners like to build collaborative relationships with their educators.

This paper considers the case of collaborative learning with the explicit goal of building a community of expert in a specific domain while taking into account the accessibility of public places. This requires face-to-face learning and field practice, but can also benefit from online tools. This work combines both blended learning and community building aspects. We report about how we designed, built and deployed an on-line platform addressing these needs.

This paper is structured in order to report our experience in a way that can benefit to others. Section 2 presents our case study by highlighting more general requirements. Section 2 details and motivates our design choices. Section 3 describes how we iteratively adapted and validated the suitability of a major Open Source platform with respect to our needs. Section 4 reports about the lessons learnt and Section 5 discusses some related work. Finally, section 6 draws conclusions and presents some further work.

## 2 CASE STUDY AND GENERALISATION

This section presents our case study and identifies general requirements for systems aiming at achieving learning and building communities. A number of key driving properties are also highlighted in **bold case**.

In Belgium, as in many countries, the level of physical accessibility of buildings open to public is generally poor, thus hindering the access to people with reduced mobility. Assessing the accessibility of buildings requires a specific expertise only developed by few associations (Ponsard and Snoeck, 2006). The total available expertise does not allow to deal with huge amounts of places. This leaves the associations with two options: either (i) conduct a few targeted assessments with a high level of quality, or (ii) rely on a large number of people with only basic skills to conduct low quality assessments, and use the effect of mass (crowd-sourcing) (Prandi et al., 2014).

Neither option is really satisfactory but introducing the training and community building dimension can bridge the gap as there is a **large reservoir of people willing to grow their expertise and possibly get a job in the area**. Another aspect is that there is also a **progressive learning curve**: starting from basic assessments to more complex ones, then issuing indicative and finally authoritative recommendations. Another characteristics is that the **domain of expertise is quite sharp**, as consequence physical training sessions are not very frequent and only organized at specific times (twice a year) and places. In order to **optimize the time spent in physical course**, it is important to have a maximum of support for on-line learning. Finally, **the application domain itself is increasingly relying on IT tools** for conducting assessment (use of digital cameras, tablets, GPS, etc).

In order to support the on-line learning, the following requirements were collected. On the functional side, it should:

- FR1 - support different courses and dependencies
- FR2 - support different types of training materials (text, audio, video...)
- FR3 - provide communication channels such as blogs, forums, chats, off-line messages.

The following non-functional requirement were also identified. The system should be:

- NFR1 - web-based, i.e. run in a standard browser without requiring any installation in the trainee side
- NFR2 - providing a simple user interface for the trainee

- NFR3 - relying solely on Open-Source components
- NFR4 - secured (authentication, access control enforcement, privacy)
- NFR5 - compliant with e-accessibility standards, like WCAG (Reid and Snow-Weaver, 2008)

The last requirements is especially important given the domain, but should not be neglected anyway in all learning solutions.

## 3 ITERATIVE DESIGN, DEVELOPMENT AND VALIDATION OF THE IT PLATFORM

In order to produce an adequate IT platform, an Agile process was conducted in preparation of a new training session (Moran, 2015). The platform design, development and validation was conducted in three sprints (agile iterations), each lasting one month. It involved the following profiles:

- domain experts (trainers of previous sessions)
- trainees selected from previous sessions based on their results and motivation
- an IT architect with some experience in e-learning software
- a web developer and system administrator
- an (external) e-accessibility expert from the AnySurfer association (AnySurfer, 2000)

The first sprint was devoted to the **problem analysis (i.e. requirements of previous section), the review of available technologies and the production of a solution design**. A specific workshop devoted to the design yielded the idea to structure the design around the familiar terms borrowed to the school and

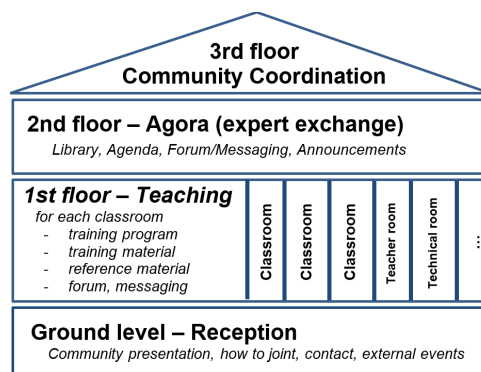


Figure 1: School Metaphor.



Figure 2: Homepage.

library terminologies (e.g. classroom, machine room, agora,...). It also introduced the metaphor of a building with different floors corresponding to the different levels of expertise acquired, as depicted in Figure 1.

- the ground floor is the public floor. It is accessible to everybody (i.e. no specific credentials required to view the page content). It provides general public information and, more importantly, information specifically targeting potential new learners on how to join, the planning and organization of future sessions, etc.
- the first floor corresponds to the training sessions organized (so far only a basic level and a second (more advanced) level). It is accessible upon accepted registration based on a few prerequisites. Each classroom has a similar structure with an agenda of the planned physical lectures, some material (course, preparation, follow-up exercises), addition specific references and a specific forum. Additional rooms are available, such as a teacher room to ease the sharing of material when preparing a new course or new sessions of an existing course.
- the second floor is accessible upon the completion of at least the basic course. It corresponds to the community level of the platform. People can share their opinion on different cases that are made available through a repository. The level of expertise is made visible in the interaction.
- the third and last floor is reserved to the platform coordinator and is dedicated to the platform management activities, including registering students, enrolling them, creating new "classrooms", assigning teachers, announcing events, etc.

During this phase, a comparative analysis of dif-

ferent Learning Management Systems (LMS) platforms such Moodle (Dougiamas, 2002) and Claroline (UCL/IPM, 2000) were also conducted. Some demonstration of the raw possibilities of the platform were organized.

**The second sprint was devoted to build a first prototype by focusing on functional requirements and supporting a simple set of users stories,** mostly focused on the learner. The selected platform was Moodle, as it ranked better at covering the required features and also because of its large community, rich support and substantial plugin ecosystem. It was deployed on a LAMP (Linux-Apache-Mysql-PHP) configuration based on an Ubuntu virtual machine hosted by the IT project partner. As the initial performance was poor, a PHP opcode cache was used and the RAM size was increased.

Figure 2 illustrates the resulting homepage while Figure 3 shows the structure of a course as it was configured. The navigation structure shows the structure of the course, composed of a number of modules. The central part shows the details. The first section contains the course introduction and common tools such as the agenda, references, messaging and forums. It is followed by the module details and its own specific content.

At the end of this session, a validation was conducted with selected trainees. It resulted in the identification of a number of potential improvements to carry out in the next phase. At that point, a major issue in terms of usability emerged as the default layout of the Moodle platform was felt far too complex (see lessons learnt).

**The third sprint was devoted to improving the prototype in order to support more user stories and**

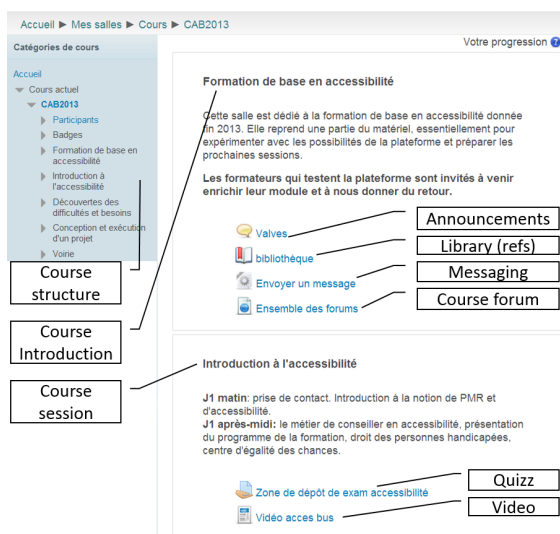


Figure 3: Course structure.

**non-functional requirements.** The considered user stories focused on the work of the teachers (lecture design, message classes, etc) and platform managers (registrations, announcements, etc). A large effort was devoted to usability improvements (see lessons learnt). Most of the effort focused on configuration tuning and the specific development of an improved forum presentation module. Figure 4 shows the Agora level with simplified layout and the custom forum module. As the management level functions are only used by a few people, the standard Moodle functions were kept. We just added some integration with a registration form managed through a Google form.

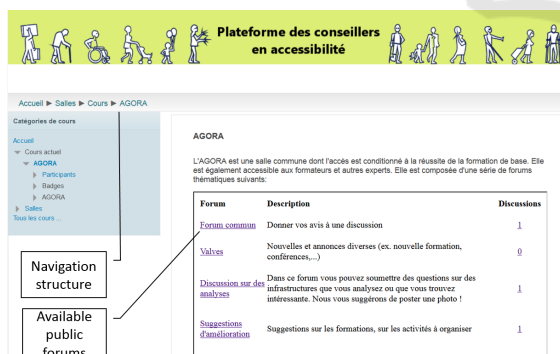


Figure 4: Agora module.

At the end of this sprint, a complete validation session was conducted. A complete schedule of the next planned session was encoded, the first two lectures were encoded and a complete rehearsal was organized with former students. The final feedback was very positive, as the users truly felt that the new simplified interface was clearer and easier to use.

## 4 LESSONS LEARNT

Beyond achieving the success of a training programme, our goal is also to build a long term community. We identified the following lessons and formulate them in more general terms.

**Have all community stakeholders on board.** For this using an Agile approach mixing different platform stakeholders proved very effective. The level of commitment was high and all the validation could be conducted within the agreed schedule despite the high load of many partners. The sprint period could even be shorter provided more resources are allocated. We could rely on the following key parties:

- a network of experts (CAWAB association of accessibility expert in our case). The existence of such a network is an important success factor. The project itself also contributed to reinforce it.
- trainees issued from previous training programmes: although there was some form of "keeping in touch" by newsletters, emails, social-network groups, or specific forms of collaboration, a collaborative platform was definitely missing. Previously trained people were very keen to volunteer to get involved in the design and validation process of the platform and were very effective at giving high quality feedback. Such people also greatly help in sow more seeds to grow the community thanks to their own contacts.

**Platform usability is a key point.** On the technical level, the Moodle platform provided all the required features either natively or as plugins. Only a few functional adaptations were necessary to complete the functional scope: a contact form and better module to structure forums. However the first validation revealed that many unnecessary features were exposed and resulted in a strong degradation of the user experience. Improving usability was identified as a key point to avoid rejection. So an important lesson learned was to **avoid feature creep and use the KISS (Keep It Simple, Stupid) principle** (Raymond and Steele, 1991). So, an important effort was devoted to simplify the user interface by switching to another template and deactivating a number of useless features. Actually some adaptations proved not trivial at all to achieve with Moodle and the effort devoted to this step should not be underestimated. In our case it can be estimated to one third of the development effort.

**Adapt to the community specificities.** As the domain is accessibility, we can expect also mobility

impaired people to get involved as expert, thus e-Accessibility was an absolute requirement in our case. Unfortunately, this specific requirement of e-Accessibility could only be partially be achieved although the Belgian AnySurfer association provided some help (AnySurfer, 2000). The main barrier was the lack of accessibility to blind users of specific forms directly managed by Moodle. The only possible action was to report this to the Moodle community. Although this requirement was identified, the ease of adaptation was not well validated enough at design time and might have impacted the choice to another platform. Other communities might have other requirements, for example for multilingual support. Actually in our case, as some trainees are not fluent in French, a specific form of support is being studied.

## 5 RELATED WORK AND DISCUSSION

Structuring the platform based on the familiar school metaphor has been quite common since the early years of e-learning. It was however criticized for its pedagogical limits, trying to adhere too much to its physical model (Carliner and Shank, 2008). The situation nowadays is however different because most people have a extensive experience of the web and social media tools. There is therefore little chance of people just behaving like in the real world. Moreover, our use of this metaphor is not generalized and social communication channels are kept with their usual names. In our implementation of the concept, we were more interested in the remembrance that the terms would evoke, rather than implementing a virtual classroom experience like in (Barab et al., 2001).

A complete vision and roadmap to understand what can be done by blending face-to-face and online learning in order to produce engaging and meaningful learning experiences is reported in (Kitchenham, 2011). It describes a number of scenarios, guidelines, strategies and tools. This book however focuses on higher education, whereas our focus is rather community-driven than academic.

Expertise networks in on-line communities have been extensively studied. Automatic expertise ranking algorithms are available and commonly used in help forums (Noll et al., 2009). In our case, we rely on a blended learning with a mix of on-line and physical interactions, there is no needs for automatic assessment. First, only people with a basic training level can access the Agora level. Second, the expertise level is assessed by the training outcome. It results in the production of "badges" that are displayed in people

on-line profile. Third, people also have the opportunity to meet physically and learn to know each other. Nevertheless, it remains interesting to analyse the dynamics of the interaction on our forums, for example using tools like (Zhang et al., 2007), especially in the perspective of a direct channel with infrastructure owners.

Guidelines for achieving the best mix of on-line and face-to-face learning are proposed in (Garrison and Vaughan, 2011). It provides a detailed roadmap for achieving an effective and efficient blended learning environments at different stages (design, instruction, assessment). Our work relies on similar principles and design decision were generally easy to take because a number of assessment activities have to be carried out in the physical world. Transforming some activities in electronic activities like conducting photo-based assessment actually also makes sense because assessors only spend a few hours on-site and then the work is finalised off-site. Sometimes it also involves people that did not visit the infrastructure.

## 6 CONCLUSION AND PERSPECTIVES

In this paper, we have shown how to address the needs for a platform supporting both blended e-learning and community building for accessibility experts. In order to share our experience in the most reusable form, we used generic terms to report our work across the different conducted phases of requirements, design, development and validation. We also identified interesting lessons learnt to help other e-learning managers or community builders that face similar needs. Our prototype is available online at <http://cena.accessible-it.org> (Chouassi and Ponsard, 2015).

Our future work includes the continuous improvement of the platform based on the upcoming training sessions, the management of evolving training material through time and the organization of more specific material for the second level of training, the latter being organized in smaller groups (for instance reduced to pairs of expert/trainee conducting standard assessments). The development of a specific picture annotation tool, in order to comment on the accessibility of pictures gathered by experts, is also planned since such a specific tool will undeniably bring greater added value to the platform in terms of knowledge sharing. Finally, opening a direct channel where infrastructure owners can report and get advice about their accessibility problems is also being considered.

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