

SMART ENVIRONMENTS DESIGN: THE SPLASH PROJECT CASE

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This paper describes the process of collaborative design of a Smart Environment developed for the school context.

The Living Lab project entitled “SPLASH” (“Smart platform for learning and active social habitat”) will be presented in the following pages. We will describe the whole process of the platform design: from the implementation of the layout and the functionalities of the digital environment, up to the first steps of prototype use.

A research team composed mainly by an ICT company, teachers and students of two secondary school, and academic researchers, has been involved in a complex process of collaborative design, in order to create the prototype of a smart, social, innovative learning environment.

Finally, assessment tools provided within the platform will be described. They have been co-designed with teachers and students of the schools involved in the project.

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1 Introduction

“Smart platform for learning and active social habitat” (SPLASH) is the name of an applied research project involving the University of Foggia, an ICT company and two secondary schools in the design and development of a personalized and cooperative learning environment¹. The activities have been carried out during the past school year (2013-2014), through an iterative process involving different actors and design tools.

The aim of the project was the creation of a Smart platform: a physical and virtual space for the school community; a learning resource; a place for deep interaction between teachers and students, a flywheel for authorial processes. The starting point was the analysis of the theoretical background related to social learning processes, and the study of existing platforms as best practices. The core action of the project was the collaborative design of the learning environment prototype and the development of strategies for the use in the classroom.

Splash was designed as a smart environment as demonstrated by its dynamic, customizable, open features. As social learning space, it incorporates and links to different learning processes and resources. Splash is a smart environment for its strong adherence to the context. Under specific conditions, it is capable of affecting the learning model, the possibilities of interaction, the reading and creation of multimodal resources, which become more and more deep and social.

2 The design process: the theoretical background and the platform development

The activities carried out by the research team of the University of Foggia were focused on the following elements:

1. A set of strategies and design methodologies involving end-users;
2. The knowledge of the classroom context, as well the best practices developed for other contexts;
3. An iterative process of design, whose stages will continue after the release of the prototype and will be presented in further scientific works.

The theoretical approach supporting the design of the pedagogical

¹ The project was funded by Apulia Region and developed in cooperation with InnovaPuglia, under Regional Operational Programme ERDF 2007-2013, Action 1.4.2, supporting the growth and development of SMEs specialized in the delivery of digital contents and services “Apulian ICT Living Labs”. Project leader was the company Infor2000 Srl (Modugno); partners were ERID Lab (Educational Research & Interaction Design) of the University of Foggia; the University of Bari; two regional secondary schools: *Liceo Classico “Leonardo da Vinci”*, Cassano Murge (BA) and *Istituto Tecnico Commerciale Linguistico “Marco Polo”*, Bari. Pierpaolo Limone was the scientific director of the project for the University of Foggia.

affordances of the platform was the Design-Based Research (Brown, 1992; Collins,

1992). It has a consolidated tradition of use in studies and experiences related to the design of educational resources, processes and environments (e.g. Anderson & Shattuck, 2012; Barab & Squire, 2004; Collins, Joseph, & Bielaczyc, 2004; Design-Based Research Collective, 2003; Jacobson & Reimann, 2010; Kelly, 2004; Kelly, Lesh, & Baek, 2008; Wang & Hannafin, 2005).

The DBR appeared particularly suited for our case because it is:

“a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practitioners in real-world settings” (Wang & Hannafin, 2005, p. 6).

The DBR approach is “pragmatic, grounded, interactive, iterative and flexible, integrative and contextual” (*Ibidem*, p. 7) and it is focused on the complex dynamics of real educational situations (Pellerey, 2005). In order to understand the variables of student learning in domains, the Design Based Implementation Research considers multiple levels of actions, adopted in our project (Fishman *et al.*, 2013, pp. 142-143; Penuel *et al.*, 2011):

- “A focus on persistent problems of practice from multiple stakeholders’ perspectives;
- A commitment to iterative, collaborative design;
- A concern with developing theory and knowledge related to both classroom learning and implementation through systematic inquiry;
- A concern with developing capacity for sustaining change in systems”.

The research team also adopted an extensive notion of learning environment, adopting Michael J. Jacobson and Peter Reimann (2010) definition:

“Whereas the notion of a learning environment has frequently been used to depict technical aspects, such as specific learning software, it has become accepted over the last decade that there is much more to the “environment” than the technology employed. [...] this more holistic view that includes – in addition to the technology – tasks, assessment forms, and social (including organizational) aspects of educational settings such as classrooms”. (Jacobson & Reimann, 2010, p. 2).

So we selected the idea of an “advanced design”, able to bridge the gap between new technological affordances and what most teachers need and can use (Roschelle *et al.*, 2010, p. 233). As already declared, the central element of the project was the design of the platform with the users. During different stages of co-design, a “vision of change” was first shared, then we moved to the collaborative prototyping activity, up to the hypothesis of the integration of the innovation in the specific school context.

The actors involved in the design of Splash platform were both external and internal to the school context, according to the Living Lab model: the stakeholders were represented by an inter-institutional committee joined by more than 20 teachers and 30 students from the 2 secondary schools involved in the different phases of the project. In order to foster users’ contribution, several techniques were adopted:

- Focus group sessions;
- Online forums;
- Workshops;
- Research group meetings;
- Scenarios;
- Self and guided navigation of the platform (shown below, Figg. 1 and 2).



Fig. 1 Splash platform: homepage

Selected best practices of social learning environments for schools were also explored. Among the examples: Scholar platform, Oilproject, Fidenia, the Google app called Classroom. The platform Eduthinktag, adopted in the previous school year by the school “Marco Polo”, was a further design example. During the first meetings some needs were expressed by teachers:

- A specific area for the upload of thematic educational projects;
- E-portfolio tools, with a multimedia format;
- Different levels of platform access and simplified processes of content sharing (e.g. public resource, resource shared with the school, or with the class, or with a larger group, etc.);
- Clear dynamics of online reputation;
- Connection with external social networks.

Forum principale		
	Uso delle ICT nelle pratiche didattiche quotidiane Quale uso i docenti fanno degli strumenti digitali nella vita di classe? Hanno una formazione adeguata su tali temi? Il ruolo degli studenti in tali attività è quello di protagonisti o spettatori?	2 Argomento
	Uso degli strumenti di social networking per la didattica Ha senso utilizzare gli strumenti di comunicazione online a scopi didattici? Quali vantaggi si possono ottenere dalla costruzione di reti di comunicazione fra docenti e studenti anche in ambito informale e al di fuori dei tradizionali tempi scolastici?	3 Argomento
	Caratteristiche grafiche e contenuti dei prodotti didattici multimediali Quali caratteristiche "strutturali" deve possedere un oggetto multimediale per l'apprendimento? Quali tipologie di contenuti dovrebbe ospitare un ambiente di apprendimento?	2 Argomento
	Strumenti di valutazione e ICT È possibile utilizzare le ICT per l'assessment e l'evaluation nei contesti didattici? Quali caratteristiche devono possedere tali strumenti per un uso corretto ed efficace nella didattica?	3 Argomento
	Caratteristiche del market place, delle biblioteche on line, dei volumi digitali Come rendere efficace lo scambio di informazioni in merito alle novità editoriali e semplificare i processi di vendita e scambio delle versioni digitali dei volumi/materiali scolastici?	2 Argomento
	Richieste di chiarimenti / segnalazioni di bug e malfunzionamenti Segnalateci i vostri dubbi sulle funzionalità del social e la presenza di eventuali bug o malfunzionamenti.	1 Argomento
	Richieste di miglioramenti o nuove funzionalità Suggeriteci le vostre opinioni sui possibili miglioramenti o su nuove funzionalità da aggiungere in futuro.	4 Argomento

Fig. 2 Splash platform: section Forum

The focus group sessions contributed to detect user needs, expectations, proposals for innovation. The involvement of potential users also allowed self-analysis and functional analysis of the adoption of technology in the educational context, as well as the sharing of a pedagogical model suited to this new learning environment.

For the focus group sessions a “mixed” group of participants was selected: students (18) and teachers (16), men and women, with different technological expertise and age. Focus sessions were joined by a platform individual and group navigation of 20-30 minutes. Finally, through some thematic forums the co-design process continued online, in order to activate a widespread debate.

2.1 The design with the teachers

The first focus group session with teachers investigated four main areas:

- Web uses and representations;
- The web as an educational resource;
- Social networks for schools;
- The ideal social network.

Teachers declared to have active profiles on social networks (Facebook and Twitter), as “regular” or “moderate” users. The rare online friendship with students was accepted for a faster communication, through chat tools for example.

Teachers declared to use the web for educational purposes: in particular for data searching and storage, creation of conceptual maps, storytelling, production and sharing of multimedia resources. They recognize that the web modified the relationship with the textbook, also through the use of web-based resources made available by national publishers. The digital media contributed to amplify and open the “close”, even if authoritative, medium of the book. The most appreciated social network resources were listed:

- The deeper interaction between teachers and students, through the timeline and through varied opportunities of resources organization.
- The simplified process of loading of materials.
- The self-evaluation tools.
- The creation of virtual groups.

The teachers also mentioned the strengths of Splash platform: its similarity with the Facebook interface; the social tools for the creation of a personal profile, for the information sharing and for a fast communication, also with learning purposes (e.g. storytelling, foreign languages, etc.); the spaces for storage and classification of resources that simplify the organization of tasks and learning materials.

A guided exploration of the platform was the final stage of the design process here briefly outlined. Teachers detected the advantages and the weaknesses of the platform, its educational affordances, the didactic use of the tools provided.

They also proposed some additional functions and tools for the platform; the main ones are described below:

- Automatic correction of students’ homework, also assuming a cooperation with publishers in order to implement error detection systems;
- Tools for quick sharing of photos or movies, more similar to WhatsApp (the Messenger cross-platform mobile messaging app) dynamics;
- Splash application, also for tablets or smartphones;
- Synchronous communication tools.

The teachers expressed great interest and high expectations related to the

On the contrary, students expressed doubts about the “invasion” of privacy, the distracting activities (loss of time) and the overlap of time and space between school and home, which are perceived as disadvantages. The main risks they detected, instead, is the workload due to the homework assigned through the platform, the difficulty in accomplishing some tasks. Finally, the distinction between study and leisure and the attention for privacy were core issues discussed during the focus groups.

The suggestions for the platform improvement are:

- To expand the files size that could be loaded on the platform;
- To implement a research tool for the web resources;
- To add guides and aids to facilitate the learning on the platform;
- To improve the chat tools;
- To create a specific area for learning materials storage (for assessment processes);
- To enlarge the resources type options;
- To increase the layout options.

The technologies are considered a learning resource and, from a relational point of view, students appreciate the way in which technology and social networks can foster multiple interaction with peers and teachers. Nevertheless, they strongly believe in a clear separation between private space and the space of school. A well-designed ubiquitous learning environment, adapted for specific school contexts, could undoubtedly win these doubts and could scaffold actions of both formal and informal learning. The results here presented are just the initial step of this long process.

3 Designing methods and tools for the assessment of learning

One of the topics that has found large interest and participation from the teachers involved in the project is the assessment of students' learning in the learning environment SPLASH.

Starting from the analysis of training needs of teachers, a considerable part of their training was dedicated to reflection on practices and processes of assessment. Since the preliminary design stage, it was expected to devote a section to the certification of the student competences through the implementation of an e-portfolio and the analysis and implementation of a series of activities and tools that would allow an assessment on three levels: teacher-assessment, student self-assessment and peer-assessment.

Therefore, they were planned and carried out intensive workshops, activities of analysis and interpretation of training needs, co-design workshops, in order to:

- Training teachers to use authentic assessment practices;
- Co-design the structure of the e-portfolio to implement in SPLASH;
- Assess the needs related to the learning assessment in a smart environment.

The multiple training activities implemented, have provided the dynamic involvement and active participation of teachers in order to define the co-design methods and tools to be adopted within Splash platform.

A deep analysis of the scientific literature highlights the variety of assessment strategies and their close correlation with teaching strategies. As Davide Parmigiani says (Parmigiani, 2014, p. 41), “The evaluation accompanies even implicitly moments of planning and action learning”. The most recent studies in the field of evaluation research are characterized by a recurrence of key words such as: recursive feedback (Cope *et al.*, 2013), student involvement (Falchikov, 2013), peer and self-assessment (Boud *et al.*, 2014; Van Zundert *et al.*, 2010), collaborative assessment (Kollar & Fischer, 2010).

According to Bill Cope and Mary Kalantzis (2013), the social knowledge technologies refer to a very far away from design of the evaluation testing culture, so that they define tests as “the strangest artefacts of traditional schooling” (*Ibidem*, p. 344). In line with this perspective, the team of teachers involved in the design of the environment Splash has confirmed the need to refer to tools and methods of assessment that could put emphasis on the collaborative dimension and on the use of e-portfolio as assessment tool in order to improve their overall knowledge and skills within an innovative learning online environment (Chang *et al.*, 2012).

In detail, the training activities addressed to the group of teachers about assessment strategies included:

- participation in the theoretical and practical workshop in presence;
- Interaction and discussion in the Forum thematic related to teaching activities carried out during the on-site activities;
- Participation in educational workshops co-design of training activities to be carried out in the SPLASH;
- Production of contents and resources to share with colleagues for collaborative design of the structure of the e-portfolio.

In the specific area of the learning assessment, the active involvement of teachers occurred mainly during the seventh, eighth, ninth and tenth workshop in which they were always related posts in the forum SPLASH platform in order to continue the online discussion launched during the training onsite. The following table is a summary of both the themes of the workshops that have been conducted, both of the proposed post in the forums.

Table 1
SUMMARY OF WORKSHOP ACTIVITIES

Title	Objectives	Forum	Resource
Processes of participatory assessment. Hypothesis of an e-portfolio design.	Presentation of theoretical references about authentic assessment and benefits of using an e-portfolio.	Discussion on the design of educational activities in SPLASH	Link to an open source software for simulation of the design of an e-portfolio. Research material about self and peer- assessment.
The co-design of assessment rubric	Reflecting and analyzing the assessment rubric to be connected to the use of e-portfolio.	Co-design the structure of the e-portfolio	Examples of rubric. Software for the creation of rubric
Definition and design of the structure of the e-portfolio assessment	To deepen sections of an e-portfolio and design the structure for the environment SPLASH	Reflect on whether to use an authentic form of learning assessment.	Research Material
Rubric assessment and authentic tasks	Designing assessment rubric to be connected to authentic tasks according to the model of Herrington (2006).	Sharing a Google document for collaborative design of the structure of the portfolio to implement. Discussion on the model "GRASPS." Space-sharing and implementation of authentic tasks used by teachers.	Grasps Format (Wiggins <i>et al.</i> , 2005). Sample of an authentic interdisciplinary task.

The most important needs identified during the workshop and the co-designing with teachers were allowed to highlight a series of recommendations and suggestions that represent a fundamental starting point for the continuation and follow up of the project Splash. The main indications emerged can be summarized in the following points:

- Learning platforms can encourage a multiplicity of approaches to teaching and learning, in and beyond schools. With new representation of school time and space, flexible learning recognises that learning experiences could be planned and organised, or spontaneous and opportunistic.
- It is necessary that the educational activities planned and scheduled in the platform, provide feedback by peers and teachers, in a dimension of formative assessment. As suggested by Bill Cope *et al.* (2011) "research shows that situated assessment in the form of regular and multiple forms of feedback produces enhanced learning outcomes".

Hattie (2013) found that the most powerful single influence affecting achievement is feedback, and not only from teachers to their students. It is most important to create situations for teachers to receive more feedback about their teaching, which then creates a ripple effect back to students (Hattie *et al.*, 2007).

- The e-portfolio represents a valid tool to support and encourage the participation of students in the activities proposed in the platform, but also to act on motivation by activating processes of personal and collective growth. In particular, the teachers share the idea of e-portfolio as a tool that can offer learners the opportunity to organize documentation of the learning processes, keep track of individual learning and growth in the training path, and so provide the opportunity to direct and manage their own learning (Harteis *et al.*, 2014).
- The e-portfolio should include all training activities of the student and not limited only to those educational activities proposed in the platform. The e-portfolio could be a product created by learners, a collection of digital artefacts articulating learning (both formal and informal), experiences and achievements.
- The activities to be proposed in the platform should be designed according to the model and the principles of authentic tasks (Herrington, 2006). The model Grasps (Wiggins *et al.*, 2005) is an excellent track for the design of learning activities through which student's interdisciplinary engagement, understanding, and development of process and inquiry skills are nurtured.
- Students could use a rubric or checklist of grading criteria before doing the work. For authentic assessments and projects students are given a rubric or grading criteria before doing the work. A variety of assessment tools could be employed to get the most accurate understanding of individual student achievement possible.
- Teacher-assessment, student self-assessment and peer-assessment in a Web-based portfolio assessment environment represent a dynamic system that could support an active learning.
- To promote student achievement it need to support, encourage, and provide immediate and specific feedback to students.
- There is a growing need to evaluate new teaching approaches assessment models and determine how to best support collaboration, interaction, deep learning experiences and assessment at scale.

Instances associated with the assessment should well consider that learning is a non-linear process and self-reflective. The learner develops metacognitive skills of self-monitoring and self-reflection that can involve processes and

products of their own learning: e-portfolio encourages self-reflection that will have to be designed to make the student acquire skills of argument the validity of his thesis and operational strategies.

All indications have emerged, agree on the need to undertake a model of didactic planning that consider assessment as an ongoing process of gathering, analysing and reflecting on evidence to make informed and consistent judgments to plan for and improve future learning and development.

Conclusion

The Splash platform represents a smart environment planned to support active and deep learning through/and collaborative practices. The main value of this environment includes its ability to allow social networks and educational communities to be promoted in ways where there is an accent on creation rather than consumption, and on the decentralisation of content and control. Over the last decade, the knowledge of the important relationship between feedback and learning has considerably augmented. If correctly used and if teachers conveniently supported, Splash could be a strategic environment to support and monitor a student deep learning.

One of the key elements of the experiment was the role of co-designing activities with teachers and students involved. According to Salvatore Colazzo (2008), the co-production and sharing of meanings and practices involve learning in a circular and reflective process improving the training intervention and giving awareness in a logic of empowerment, to the subjects involved.

One of the major limitations encountered during the project is related to the difficulty of involving the teachers in training activities and to co-design and participation in the discussions activated within the online forum.

The idea of co-designing that was launched in this project does not end at this point but it is scheduled to begin a longitudinal study that will monitor the use of the platform in order to evaluate the effects of teaching and assessment actions proposed by the team of experts within constant and integrated use of the platform into daily curricular activities

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