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Proceedings of the workshop

Design for Learning in Practice

EC-TEL, Toledo, Sept. 18, 2015

edited by Muriel Garreta-Domingo, Peter Sloep, Slavi Stoyanov, Davinia Hernández-Leo & Yishay Mor



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Teacher Continuous Professional Development and full-lifecycle Learning Design: first reflections

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Abstract. Effective Continuous Professional Development (CPD) strategies are needed for fostering the adoption of Learning Design (LD) practices, with the ultimate goal of improving teaching quality. This paper presents a CPD approach based on a novel LD platform (ILDE, Integrated Learning Design Environment). The ILDE guides teachers along a full-lifecycle LD process and incorporates social features that facilitate team co-design, as well as easy interactions among trainees and facilitators in CPD actions. The paper summarizes some first reflections after the evaluation of a set of ILDE-supported CPD actions with teachers from Adult Education and Higher Education. Such reflections provide clues on how to design LD training workshops, and on the need for close monitoring of initial attempts to enact learning designs with students.

Keywords: Learning Design, Professional Development, workshop design

1 Introduction

Learning Design (LD) can be defined as the process by means of which teachers create effective conditions for learners to learn, making explicit and shareable pedagogical design decisions [1]. LD expects teachers to go beyond the role of being mere providers of knowledge [2], thus adopting a new role as designers: “devising new practices, plans of activity, resources and tools aimed at achieving particular educational aims in a given context” [3]. However, how to foster the adoption of a “designer mindset” by teachers [2] is still an open issue [4] that implies not only the provision of LD supporting tools and representations, but also further research on effective LD-based continuous professional development (CPD) actions. Recent studies (see, e.g., [4, 5]) have started to provide significant clues on requirements for CPD actions and associated supporting tools aimed at training “teachers as designers” (an approach that builds upon the long tradition of CPD based on “action research” [6]): LD practices are influenced by teaching disciplines and contexts and thus LD tooling should be “flexible” (in terms of supported pedagogical approaches, design representations,

etc.); CPD actions should “support dialogue between teachers” and thus LD tooling should be “social” [4]; CPD actions should support the “scaffolding of the design process”, guiding teachers along different design phases, providing design principles, etc. that need to be reflected in the provided LD tooling; and, finally, CPD actions should be aimed at designing for “real-world” use.

This paper presents a particular CPD approach developed within the METIS EU-funded project (“Meeting teachers’ co-design needs by integrated learning environments”, 2012-15). The CPD approach is built around the tooling, design phases and social features provided by the Integrated Learning Design Environment (ILDE¹), a community environment for teachers that integrates a set of existing LD tools covering a wide range of LD representations and pedagogical approaches in a single platform [7]. The METIS CPD approach includes all the abovementioned requirements reported in the literature for CPD actions in LD, but is also novel in two important aspects. First of all, the use of the ILDE allows CPD actions to guide teachers throughout a “full lifecycle” of LD that includes: the sketchy **conceptualizations** of the learning situations (reflecting pedagogical intentions, contextual constraints, etc.); the detailed descriptions of the designs using **authoring** tools that also generate computer-interpretable representations; and, the automatic setting up (also called **implementation**) of the technological learning environments to be used by the students (e.g., those based on mainstream Virtual Learning Environments, VLEs, such as Moodle). The automatic implementation phase facilitates teachers becoming “designers of technology-enhanced learning” [5], thus making it possible, in the same CPD action, the training of teachers both in pedagogical-oriented LD aspects (e.g., how to design collaborative learning situations), and in the use of ICT for education (e.g., using VLEs and web 2.0 tools for collaborative learning). A second novel aspect to underline is that the ILDE includes social features that enable the co-construction, sharing and reusing of learning designs, thus facilitating the interactions among teams of teacher-designers, but also among teachers and facilitators during CPD actions.

The paper describes the METIS approach to CPD (section 2) and also reports (section 3) on the evaluation of the METIS ILDE-based CPD approach in two educational levels: Higher Education (HE) and Adult Education (AE).

2 The METIS approach to Professional Development in Learning Design practices

The METIS approach to CPD is a two-step process that includes: teacher **training workshops** on the use of ILDE for completing “full-lifecycle” designs of situations following specific pedagogical approaches; and, **enactments with real students** of designs created and implemented, with the help of facilitators, using the ILDE. METIS teacher training workshops are based on a generic template or “meta-design” that is depicted in Fig. 1 [8]. METIS workshops begin with an introduction to the aims of the workshop and the ILDE. Then, participants (working in small groups) are

¹ <http://ilde.upf.edu/about>, last access: June 2015.

guided through the stages in the “full-lifecycle” LD process, using the ILDE as support. The LD cycle is first illustrated by a sample learning situation, and then participants are requested to work on a situation framed within their own contexts.

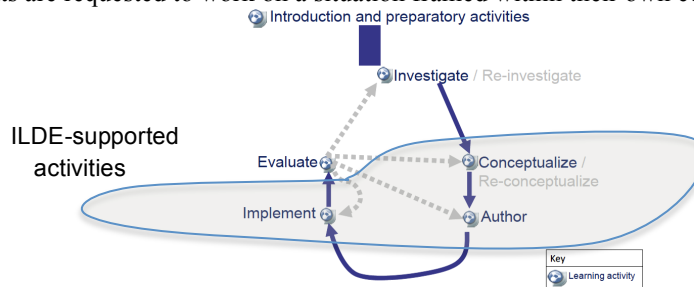


Fig. 1. The METIS meta-design for teacher training workshops.

The METIS project produced a set of guidelines about how to customize the “meta-design” for generating the structure of training workshops adapted to different educational levels and teaching contexts (see [8] for details).

After participating in a teacher training workshop, volunteering teachers (individually or in teams) are then engaged in a complete LD process aimed at enacting a learning design with actual students. Again, the ILDE scaffolds the LD process, which is closely monitored by facilitators. Facilitators meet regularly with the teachers to discuss the progress of the design, to sort out ILDE usability problems, and to provide pedagogical consultancy. The teachers themselves carry out the enactment of the designed learning situation, once it is implemented (automatically, thanks to the ILDE) in the institutional technological learning platform.

3 Evaluating the METIS approach

A set of CPD actions were facilitated by the authors, from September 2014 to February 2015, involving a total of 37 teachers that provided valuable data for drawing a first set of “reflections” about the use of the ILDE for teacher training in LD. Two teacher training workshops were run (one 8-hour workshop for AE and one 12-hour workshop for HE, both in September 2014) on the topic of using ICT educational tools for collaborative learning situations. After the workshops, five design teams (also called “enactors”) were engaged in a full-lifecycle learning design process that ended up in actual enactments with students. Two AE enactments were carried out: “A trip to Dublin” (introductory English course with 9 students, 10 hours), and “Pros and cons in the use of ICT” (course on ICT, 14 students, 8 hours). In the case of HE, there were three enactments: “Healthcare Education” (128 students, Degree on Nursing, 4 hours), “Radiodetermination” (13 students, Telecommunications Engineering, 6 hours), “Land Planning” (11 students, Degree on Geography, 22 hours).

Observations, questionnaires and interviews provided evaluation data that was analyzed using a model based on [9]. Details about the evaluation methodology and results can be found in [10], but it is worth mentioning some “first reflections” from this CPD process: the ILDE was perceived by teachers in AE and HE as a key support

platform, underlying its independence with respect to specific pedagogical approaches, and its capability to support the whole learning design lifecycle (although the transition from conceptualization to authoring phases should be improved); the use of the ILDE introduced, in the CPD process, a set of new concepts and terms that were not always easy to grasp by teachers during the workshops (although teachers involved in enactment processes, following a longer training process, were able to overcome this difficulty in all cases); although the ILDE plays a crucial role in the CPD approach, training workshops need to focus on pedagogy (rather than technology). This conclusion is also reinforced by the fact that most of the help provided by facilitators to “enactors” dealt with design techniques for specific pedagogies behind the tools; “enactors” need continuous support before and during the enactment, but they can better appreciate the advantages of LD (and the ILDE) than the colleagues that only participated in the training workshops. In fact, all the “enactors” expressed their willingness to use the ILDE again for designing similar (or new) learning situations in the following academic term. However, although tools like the ILDE and CPD approaches such as the one presented in this paper are necessary to ease adoption, that it is not sufficient. Further research is needed to understand how cultural aspects, including teachers' beliefs, can be affected by tooling and training, among other interrelated aspects.

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Orchestrating teacher training on TEL as a community design activity

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Abstract. In this paper, based on a design rationale for constructivist pre-service teacher training on TEL, we consider teachers as designers of innovative content, working individually and/or collaboratively, discussing and interacting with the instructor, the technology and their peers. In this context, a challenging issue is the content and structure of appropriate activities for cultivating various types of synthetic knowledge combining technology, pedagogy and content through asynchronous collaboration. As a first step, we elaborate on the social orchestration of a training course around collaborative design activities and on the emerging challenges from two successive cycles of implementation, through three case studies. Initial evidence about the various types of TPACK knowledge developed as well as the degree to which the teaching, social and cognitive presences were cultivated according to trainees' perceptions, is provided.

Keywords: Teacher training on technology enhanced learning, Technological Pedagogical Content Knowledge, Learning design, Communities of Inquiry

1 Introduction

It is acknowledged that Technology Enhanced Learning (TEL) design by trainee teachers is inherently challenging. Ideally, a TEL design course “for beginners” should aim at synthesizing different areas of teacher knowledge [1] and at integrating meaningful ways of engagement with design tasks in a natural way [2]. The pedagogical engineering underlying the course design rationale for pre service teachers needs to target complex, synthetic fields of knowledge following the Technological Pedagogical Content Knowledge (TPACK) framework [1], such as Technological, Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) and TPACK instead of focusing on simpler, separate constituents (such as Technological, Pedagogical and Content Knowledge). To this end, constant interaction between teachers' understanding of technologies and pedagogical content

knowledge is required. But how can this be translated in meaningful activities that lead to new experiences for trainees in an authentic and interactive training context? Our proposal includes learning through (a) interaction with state-of-the-art technology such as Web 2.0 tools and learning design environments stimulating trainees to reflect on their own pedagogical perspective in course design and experiment with new ones, and (b) collaboration with peers to design TEL artefacts through successive cycles of practical inquiry. These are organised around specific challenges stimulating reflection on the underlying principles that guide the matching of appropriate pedagogical and technological tools.

Several factors that have been considered as affecting and facilitating collaboration in an asynchronous context are teachers' interventions [3], the topic/problem/question under investigation [4], the structure of the activities proposed [5], the relations among the members of the group and their motivation to learning. In this paper, as the focus is on teacher training, we elaborate on the type and structure of activities that synthesize two or three knowledge areas (technological, pedagogical, content) following the TPACK framework and cultivate community processes in terms of the cognitive, teaching and social dimensions of the Community of Inquiry [6] model.

2 A teacher training course on TEL design

In [7] we proposed a design rationale for constructivist pre-service teacher training on TEL, based on a synthesis of TPACK and Communities of Inquiry (CoI). Whilst both models are widely recognised as influential, there is scarce evidence on how a synergy between the two would promote research and practice in the field of online and blended learning. TPACK was used as the basis for designing an activity-based curriculum including learning design activities for trainees. CoI was used as a blueprint for organising f-2-f interaction, asynchronous discussions and collaboration, feedback and support for participants and activities that promote higher levels of inquiry in a blended learning context [8]. Throughout the course, trainees worked individually and in groups. Individual work had a limited duration and aimed at allowing participants to appropriate themselves with the online environment; it gave its place, at an early stage, to collaboration in small groups, formed on the basis of the trainees' individual characteristics such as personality traits (based on the five-factor personality model), and other psychological variables, such as self-efficacy, anxiety and attitudes [9].

This blended learning scenario was tested in two successive cycles (see section 3, case studies), cycle 1 revealing two main challenges guiding the design of cycle 2: the first challenge was a difficulty in maintaining participation and communication flow in asynchronous discussions; this was attributed to the blended character of the course and the fact that most issues were resolved in f-2-f seminars and to trainees' inexperience with asynchronous collaboration. The second had to do with achieving a gradual progress from activities targeting simpler knowledge areas (such as TK or PK) to more complex (such as TPK, TCK and TPACK). In cycle 1, trainees tended to

focus their attention on technology or pedagogy separately, facing difficulty in more complex activities aiming at the integration of both with their subject.

To deal with these issues, in cycle 2, synthetic types of knowledge such as TPK, TCK and TPACK were cultivated almost from the beginning of the course synchronously and asynchronously, with specific forum activities focusing on design issues initially through the evaluation of artifacts and then through the design of new artifacts. Emphasis was given on the collaborative development of a technology-enhanced lesson (learning design) throughout the course. Trainees' collaboration was organised in successive stages around specific challenges. These would initiate cycles of practical inquiry that would gradually lead to the integration of elements into a more generic lesson structure cultivating various synthetic types of knowledge. Practical inquiry starts with a triggering event, continues with exploration and integration and results to resolution. In this case, the forum functioned as a transcription of the evolution of each group's design choices, also enabling peer evaluation activities. It was organised in topics, labeled with the name of each group. This way the group area was also accessible by the whole class, allowing peer review activities.

Thus, trainees working in groups of three had to initially decide on the roles they would undertake (among "the teacher", "the researcher" and "the computer scientist"), the topic of the lesson they would develop (interdisciplinary in the case of mixed-discipline groups) and the target group (1st triggering event). Then they were assigned to design a learning activity for the particular topic, focusing on a specific knowledge process involving Web 2.0 tools and web-based resources (2nd triggering event). Finally the design of a lesson as a sequence of learning activities and the authoring of appropriate content was the 3rd triggering event they had to face. In this process, trainees used dedicated learning design and authoring environments (such as Learning Designer, and INSPIREus or LAMS) to help them design and reflect on their artefacts and develop appropriate content. The final deliverable was a technology-enhanced lesson which included discrete learning activities of various types [10], integrating digital resources and objects developed with Web 2.0 technologies, aiming at various knowledge processes (using the New Learning [11] framework).

3 Case studies in TEL training

Methodology. The study was performed in the context of one semester TEL courses for two subsequent academic years where the above blended learning scenarios were implemented to three different target groups: (a) students of a one-year postgraduate certificate in education of the Higher School of Pedagogical and Technological Education (ASPETE) and postgraduate students of the department of Informatics of the university of Athens, (b) undergraduate students of the department of civil engineering educators of ASPETE, (c) undergraduate students of the department of Informatics of the Technological Educational Institute of Central Greece.

The Moodle VLE was used for class administration, content delivery, and communication/collaboration beyond the regular f-2-f meetings/workshops.

Asynchronous discussions are valuable resources for assessing the learning and design process. Moreover, through the course, the trainees completed several questionnaires such as (a) the TPACK instrument measuring pre-service teachers' self-assessment of the seven knowledge domains included within TPACK [12], (b) the CoI instrument assessing students' perceptions about the development of the teaching, social and cognitive presences [13], (c) questionnaires evaluating their collaboration experience and their willingness to introduce technologies in their teaching practice in the future, (d) questionnaires assessing their psychological characteristics.

Results. In this paper we provide initial evidence for the effectiveness of the activities employed starting from the trainees' perspective. To this end, we analysed trainees' answers to the TPACK and CoI questionnaires collected during the 2013-2014 academic year in order to assess their perceptions about the knowledge they developed as well as the collaboration experience.

At first we evaluated the development of particular types of knowledge proposed by TPACK based on trainees' perceptions by comparing undergraduate students' of ASPETE knowledge before and after the course since the particular group completed the TPACK instrument at the beginning and at the end of the course. Table 1 presents the mean differences between TPACK scores of undergraduates of ASPETE before and after the training course and the results of the t-tests for paired samples which were performed on them (all differences were statistically significant at the .001 level). These initial results reveal a significant increase in their technological and pedagogical knowledge (TK, PK) as well as in synthetic areas of knowledge including technology (TCK, TPK, TPACK).

Table 1. Descriptive and inferential statistics for TPACK mean differences before and after the training course of (N=98) undergraduates of ASPETE

	Pre-Post Mean Dif.	s.d.	t-test
Technological Knowledge	-.47	.5	t(97)=-8.68, p<.001
Pedagogical Knowledge	-.25	.6	t(96)=-4.27, p<.001
Technological Content Knowledge	-.41	1.1	t(96)=-3.87, p<.001
Technological Pedagogical Knowledge	-.31	.6	t(96)=-5.29, p<.001
TPACK	-.26	.6	t(96)=-4.43, p<.001

Challenging future goals are to compare the trainees' perceptions with the teachers' evaluation of the group product as a more objective measure, as well as to trace the development of trainees' knowledge through their contributions to the forum.

As far as the development of the community is concerned, this is evaluated in terms of the cognitive, social and teaching dimensions of CoI, based on trainees' perceptions of all the three groups. Analysis was based on the approach proposed in [13]. In Figure 2 appear the levels of cognitive and teaching presence, as evaluated by the trainees of the three courses, indicating a degree of success of the design implemented during cycle 2.

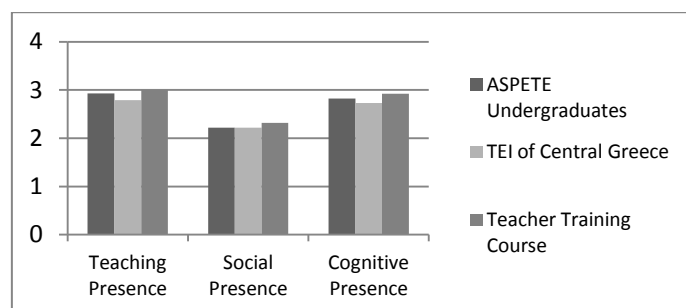


Fig. 1. Teaching, Social and Cognitive Presence in all three courses: undergraduates of ASPETE (N=98), undergraduates of TEI of central Greece (N=64), and of postgraduates of ASPETE (N=54).

One-way ANOVAs for independent samples were performed to test the effect of group on CoI scores and the results indicated that none of them was statistically significant. However, a one-way ANOVA for repeated measures which was performed on the three CoI scores demonstrated a significant difference [$F(2, 432)=220.71, p<.001, \eta^2_p=.65$]. Specifically, the levels of cognitive and teaching presence were higher than that of the social presence (mean scores = 2.91, 2.82 and 2.27 respectively). The lower level of social presence can be attributed to the blended character of the courses since social interaction also took place in f-2-f settings.

A challenging future goal is the content analysis of the contributions of all the participants to the forum, in terms of the types of knowledge that seem to promote. In addition, a more organic integration of TPACK and CoI models, pointing towards potential relations of types of knowledge and their development through the CoI stages.

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A Teacher Toolkit for the Mobile Learning Age

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Abstract

In the endlessly changing landscape that pervades education, mobile technologies have been described as ‘boundary’ objects which enable teachers and learners to transcend many of the barriers such as space and time which have hitherto characterised traditional forms of education. If such boundless learning is to become commonplace, however, educators need to better understand how to design learning scenarios and experiences which genuinely exploit the unique affordances of mobile technologies rather than replicating existing patterns and modes of behaviour. The authors of this paper have recently been awarded funding from the European Union under the Erasmus+ funding stream to develop a mobile toolkit for teacher education to realise this vision. This paper presents the theoretical underpinnings for the toolkit and introduces the different tools and instruments that are being developed.

Keywords: m-learning, teacher education, pedagogy, toolkit

1. Introduction

Mobile learning (m-learning) considers the process of learning mediated by handheld devices such as smart phones, tablet computers and game consoles (Schuler, Winters & West 2012). The ubiquity, flexibility and increasingly diverse capabilities of these technologies have created considerable interest amongst educators (Authors 2012b; Foley & Reveles 2014; Johnson, Adams Becker, Estrada & Martín 2013) who have begun to investigate their application for learning ‘on the move’ (Sharples 2013) across a variety of formal and informal contexts. Claims of enhanced collaboration, social interactivity, in situ communication and sharing between peers, teachers and experts, and customisation of individuals’ learning have been reported (Mifsud, 2014). A high level of personal ownership of the devices (Authors 2015c) can leverage these benefits, especially in BYOD environments. However, there has been a tendency for teachers to default to traditional teaching approaches in formal classroom or virtual settings, focusing on teacher-directed approaches and content delivery (Rushby, 2012). One main aim in our Erasmus Project is to help teachers and teacher educators build knowledge and understanding of more diverse mobile pedagogical approaches.

2. Background

In the digital culture, teacher candidates are already well-versed and comfortable using mobile technology for entertainment and “as tools for productivity in their non-academic lives” (Broda, Schmidt & Wereley, 2015, p3151). The challenge for teacher educators is to facilitate the pre-service teachers’ ability to enhance their learning and teaching process through implementing and integrating mobile technology to support teaching practices. Teacher educators themselves need to model this technology integration in their own teaching allowing for sound theoretical and pedagogical decisions

to be made (Broda et al., 2011) . The toolkit produced in this project will act as a catalyst for developing such practices.

Some teacher education academics are engaged in creatively investigating the potential pedagogical benefits of mobile learning. Broda et al. (2011) explored meaningful strategies for using iPads both in pre-service teacher education and within K-12 contexts. They emphasised the need for educators to adopt a “progressive ethic for teaching and learning, supporting efforts to think differently and use the technology tools to explore and embody the fluid nature of learning and teaching” (p. 3150). Hodges et al., (2012) explored possibilities for pre-service teachers to develop their technological, pedagogical and content knowledge (or TPACK – see Mishra & Koehler, 2006) through the use of iPads in teacher education, including the transfer of relevant skills and techniques to K-12 settings. While Bannon, Martin and Nunes-Bufford (2012) and Authors (2013), found that both pre-service and in-service teachers saw value in integrating iPads into Maths education as a tool to promote student learning. For example, supporting learning through the use of Maths games applications (‘apps’) targeting specific concepts. Both projects noted the need for careful preparation in iPad implementation to initiate transformation in teacher education.

3. iPAC Model

The design of the toolkit emerging from this project is underpinned by a pedagogical framework of mobile learning (Authors, 2012a). This framework is informed by a socio-cultural perspective (Wertsch, 1991), highlighting three central and distinctive pedagogical features of mobile learning: personalisation, authenticity and collaboration (or ‘PAC’). How learners experience these distinctive characteristics is strongly influenced by the use of ‘time-space’: the organisation of the temporal (scheduled/flexible; synchronous/asynchronous) and spatial (e.g. formal/informal, physical/virtual) aspects of the m-learning environment.

The rationale behind these 3 scales is provided through the use of sub-themes under each of the central features and which pinpoints the critical features of m-learning from a pedagogical perspective. Personalisation consists of the sub-themes of agency and customisation. High levels of personalisation would mean the learner is able to enjoy a “high degree of agency in appropriately designed m-learning experiences” (p. 9) together with the ability to customise and tailor both tools and activities, leading to a strong sense of ownership. In the case of authenticity, the sub-themes of contextualisation and situatedness bring to bear the significance of rich, contextual tasks both in formal and informal settings. More recently, Authors (2015b) have further unpacked this dimension in light of differing teacher perceptions of authenticity in other m-learning studies (e.g. Authors 2015a). Thirdly, collaboration consists of conversation and data sharing sub-themes, as “people engage in negotiating meaning” (mediated by a mobile device) potentially ‘making rich networking connections to other people and sharing information and resources across time and space’ (p. 10). The authors emphasise that the framework provides a useful lens to explore how technology in the form of mobile handheld devices works in a range of formal and informal learning settings. Hence, it is used to inform the development of this professional mobile learning toolkit.

This framework has recently been used to inform research on m-learning in school education (Authors 2012; Authors 2015a), teacher education (Authors 2013), and other areas of higher education (Kinash, Brand & Mathew 2012). For example, Green, Hechter, Tysinger and Chassereau (2014) used the framework to inform the development of their own instrument—the ‘Mobile App Selection for Science’ (MASS) rubric—to aid teachers’ rigorous selection and evaluation of K-12 science applications (or ‘apps’). While Viberg and Grönlund (2013) used the framework to develop a survey instrument in their examination of students’ attitudes toward mobile technology use for second and foreign language learning in higher education. Their findings showed most respondents (345 Chinese and Swedish university students) held positive attitudes towards m-learning, with personalization being most positive (83%), followed by collaboration (74%) and authenticity (73%).

4. The Mobile Learning Toolkit for Educators

The m-learning toolkit includes two rigorous and validated online survey instruments to be demonstrated at the conference: one for teachers and one for students. The teacher version will be used by educators to evaluate their own m-learning activities, particularly their use of distinctive pedagogical features of mobile learning, which include collaboration, personalisation and authenticity. An equivalent instrument for students will be used in order to triangulate the perceptions of teachers. This student version of the survey will give a voice to learners. It is particularly important to gauge

notions of authenticity, as ultimately, authenticity “lies in the learner-perceived relations between the practices they are carrying out and the use value of these practices” (Barab, Squire & Dueber, 2000, 38). Data from participants’ responses to these two surveys will eventually provide a detailed summary at both the individual and institutional level about how mobile technologies are currently being used and how this use might be developed in the future.

The toolkit also includes a selection of m-learning best-practice multimedia scenarios depicting a range of activities across a variety of disciplines (English, Science and History). A sample of these cases will be presented in an e-book format at the conference, along with recommendations for particular tools and apps that can support these scenarios. Finally, an evaluation rubric to help evaluate, select and use apps is included in the toolkit. This rubric is informed by other rubrics underpinned by socio-cultural theory (e.g. Green et al., 2014; Hirsh-Pasek et al., 2015). A review of emerging contemporary apps, using the above rubric completes the toolkit. These apps will have the potential to be used by teachers and students in pedagogically innovative ways.

5. Conclusion

There is a burgeoning interest in mobile learning approaches in teacher education and consequently academics are involved in sharing and exchanging information on research and potential uses of mobile technologies through communities of practice, working groups and professional learning communities (e.g. Authors, 2012a). This project endeavors to galvanise these efforts to stimulate widespread, pedagogically sound m-learning practices in teacher education and ultimately in schools. The m-learning toolkit for educators introduced in this paper in will act as a catalyst for this development.

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“From Making to Learning”: Dev Camps as a Blueprint for Re-inventing Project-based Learning

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Abstract. Dev Camps are events that enable participants to tackle challenges using software tools and different kinds of hardware devices in collaborative project-style activities. The participants conceptualize and develop their solutions in a self-directed way, involving technical, organizational and social skills. In this sense, they are autonomous producers or “makers”. The Dev Camp activity format resonates with skills such as communication, critical thinking, creativity, decision-making and planning and can be considered as a bridge between education and industry. In this paper we present and analyze experience from a series of such events that were co-organized between an industrial partner acting as a host and several university partners. We take this as an indication to envision new opportunities for project-based learning in more formal educational scenarios.

Keywords: maker movement, dev camps, project-based learning

1 Introduction

During the past decade, we have witnessed the emergence of the modern maker movement: driven by new technologies a community of makers has established shared spaces and created web-environments for sharing ideas and realizing innovative projects [1]. This leads to the creation of a learning community willing to share ideas along with experience and tools. In this paper, we present our experience with organizing and supporting Dev Camps and the chance to integrate them as parts of project-based learning activities to foster 21st century learning skills. We demonstrate an example of a sustainable dev camp (providing common ground for industry and academia to experimentation, practice, training and reflection) involving heterogeneous groups of students from different universities and subject areas in an informal setting. Although the definition of the term 21st century skills is still debated, scholars, policy makers and practitioners tend to converge on the notion that students need to develop higher-order, domain-independent skills such as critical thinking, reflection, collaboration, and self-regulation. This calls for educational formats that foster such inter-dependent skills on the part of the learners. We see project-based learning as particularly well suited in this respect. The idea of project-based education is can be traced back to Kilpatrick’s description from 1918 [2] that was later taken up by Dewey while Schneider, Synteta and Frété adopted the idea project-based learning for web-based educational approaches [3].

adfa, p. 1, 2011.

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Although not primarily devoted to learning, the maker movement relies on very similar principles. We see this as an opportunity for defining new types of project-oriented learning scenarios in technology-rich contexts. One of the big chances is the transition from an informal setting to formal education in schools and also for vocational and workplace learning. Peppler argues that “the maker movement is an innovative way to reimagine education” [4]. Particularly, we see the chance in establishing Dev Camps using software tools and easily available hardware devices to connect this idea of making with project-oriented education. Latest trends in the USA demonstrate the usefulness and economic value of Dev Camps, and some companies have established such camps as a means for vocational training (as reported in New York Times, [5]).

2 Summer Dev Camps

The Océ Dev Camp brings together university students from various disciplines and involves them in R&D projects. It was first organized in 2011 and takes place annually in the Netherlands. The event is organized and sponsored by Océ (one of the leading providers of document management and printing for professionals) and four participating universities (Duisburg-Essen, Radboud University of Nijmegen, Eindhoven University of Technology, and Delft University of Technology). The participating universities and Océ provided the Dev Camp with technical equipment, project ideas and coaches for the supervision of projects. The participants usually are bachelor and master students from various disciplines, such as Computer Science, Cognitive Artificial Intelligence, Applied Cognition and Media Science etc. The event lasts for 5 days and the participants are collocated in a group accommodation close to Océ. In 2014, 25 participants formed small teams of about 5 students. Students are free to choose a project with respect to their own preferences and skills. Small groups are formed by students who choose the same projects. They are supervised by coaches from the universities, both from a technical and a pedagogical perspective. The coaches are appointed to certain projects according to their field of expertise. The activity plan is organized by the students themselves. In analogy to real IT projects, the students have to design and develop their approaches. A final presentation involved a bigger audience, consisting of both technical and management staff of Océ. In order to support coordination of the groups, we used a typical project management platform (*Redmine* - www.redmine.org). The platform was used to distribute resources and to collect material and output from the projects. Furthermore, it provided additional functionality to students to organize their practice, such as an *svn* repository, Gantt Charts, a ticketing system, wiki and discussion boards. The projects presented in past Dev Camps can be divided into two main categories: a) the “hardware+software” (H+S) projects - projects that involve the implementation of an innovative product incorporating the technical equipment provided by the Dev Camp – and b) the “data analytics” (DA) projects - projects that focus on the syndication and aggregation of social media resources, big data analysis and meaningful visualizations of the results. In this paper, we study six projects, 4 H+S (*amar*, *hr3d*, *manuela*, *smartIES*) and 2 DA (*alibi*, *mescal*), that took place during the Océ Dev Camps.

3 Analysis of the Dev Camp Activities

The project management platform recorded the activities of students per project in log-files. We used this information to analyze the practice of groups and gain potential insight about how to effectively support similar activities. We argue that the tools that support such activities reflect the practice of users in terms of engagement and contribution and may also affect the overall outcome. Thus, such metrics can provide insight with respect to skills such as communication, planning and self-regulation. Additionally, we interviewed senior coaches who provided information about the activity planning and quality of work. The coaches pointed out that all groups met successfully the projects' goal and they were impressed from the quality of group work and the efficient management of time and resources.

Table 1. Statistics of groups' activity as captured by the project management platform

	amar	h3rd	manuela	smartIES	alibi	mescal
Members' participation (%)	100	50	71	100	60	50
Symmetry of Participation	0.55	0.47	0.57	0.79	0.41	0.55
Head revisions:	38	22	63	120	76	11
Changes	338	1012	385	4353	3205	500
Total Files:	267	424	248	96	1141	459

In Table 1, we present a small part of the activity's analysis, as captured by the platform and the *svn* repository. The Gini coefficient was used to compute the symmetry of participation (group members' contribution to project's changes) [6]. Gini coefficient ranges within $[0, 1]$ where 0 corresponds to perfect symmetry and 1 to perfect asymmetry of members' participation in group work. One would expect that technical projects require more intense face-to-face interaction while on the contrary analytical projects would be carried out online. However, this was not confirmed. The smartIES project (H+S type) scored the highest number of changes and revisions.

Table 2. SWOT analysis of the proposed approach

	Positive	Negative
Internal factors	Strengths - Motivation, creativity, innovation scaffolding - Alternative take on IT skills	Weaknesses - No support for systematization and standardization of knowledge - Need of attractive incentives for the participants (learners and teachers)
External Factors	Opportunities - Integration of current technological trends in learning scenarios - Promoting collaboration and co-operation	Threats - Possible reinforcement of gender differences or excessive competition between participants - Deviation from routine work and organizational overhead for teachers

All group members used the platform to collectively edit the source code and to share resources. The mescal project (DA type) scored the lowest number of head revisions and only half of the group members used the platform. From the analysis, we found that the activity per group member was similar for all projects (about 20% per group member). This shows that the projects are comparable with respect to scale. We should note

that not all group members were similarly active on the platform (symmetry of participation). The group activity was also analyzed with respect to time management, efficiency and quality of the outcome. In order to evaluate the strengths, weaknesses, opportunities and threats, we have specified internal and external factors that might affect the success of the pedagogical approach positively or negatively following the method of SWOT analysis. A SWOT analysis can provide meaningful insights and information for the later steps of planning towards achieving certain objectives [7]. The analysis on a 2x2 matrix is presented in Table 2.

4 Conclusion and Future Work

In this paper, we presented our experience from the organization and support of projects during a summer Dev Camp for university students. The purpose of this Dev Camp was to challenge learners at a high level, beyond average routine tasks, trigger creativity and innovation and study the inter-relation of individual contributions and cooperation in creative teamwork. Based on a number of “programming challenges”, students collaborated in small teams for about a week to plan, elaborate and deliver creative solutions to the given problems. The teams had to self-organize their schedule and distribution of work. Whereas hardware devices (Arduino kits, 3D printers, etc.) were provided, the choice of software tools and development methods was entirely up to the participants. The analysis of the activities showed that the participants were able to plan their resources and actions in an optimal way and present innovative solutions for technical and analytical projects. Furthermore, most participants were actively involved in the project and worked effectively within a collaborative context. We argue that Dev Camps can act as a bridge between workplace, informal/formal learning that needs to be further studied. In future work, we plan to integrate characteristics of Dev Camps into project-based learning scenarios and study the effect in real classrooms.

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Deep Learning Design for Social Innovation: Participatory Radio for Developing 21C Skills with Disenfranchised Learners

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Abstract. Deep Learning Design has been proposed as an approach to Technology Enhanced Learning (TEL) that foregrounds principles of learning and context over simply extrapolating the affordances of new technologies. An original application of this approach has been within contexts necessitating social innovation to promote the inclusion, non-formal learning and employability of disenfranchised learners across Europe – RadioActive101. This approach has actively developed, implemented and evaluated five radio hubs with at-risk young people and other disenfranchised groups to develop digital competencies and employability skills for the 21st Century. This Learning Design and associated competencies are mapped to a progression and accreditation model linking EU key competencies to RadioActive101 activities and performances that are recognised through open electronic 'badges'. Evaluation findings showed particularly positive results, and impact and value beyond the non-formal learning of technical and employability skills, such as improvements in confidence, self-esteem and general self-efficacy of individuals and organisational learning and development. We conclude this article by asking how and whether current approaches to learning design can accommodate such essential psychosocial dimensions of learning.

Keywords: deep learning design, non-formal learning, 21C skills, participatory radio, co-design, evaluation.

1 Introduction: Deep Learning Design of Participatory Radio

Deep Learning Design [1] has been proposed as an approach to Technology Enhanced Learning (TEL) that foregrounds principles of learning and context over simply extrapolating the affordances of new technologies.

Deep learning design applies profound insights from the learning disciplines to exploit the affordances of the technology in order to empower learners to achieve educational goals. (Boyle & Ravenscroft, 2012)

This definition was expanded through a set of principles proposed by Ravenscroft and Boyle [2], stating that Deep Learning Design (DLD) involves:

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1. A contemporary articulation of appropriate theory, or suitable conceptual framework;
2. Design that is not predicated on latest technologies but does clearly operationalise the functionalities and affordances of these technologies;
3. Learning as interaction in context;
4. An evaluative approach linked to the theoretical or conceptual foundations and the design process.

An original application of this approach has been within contexts necessitating social innovation to promote the inclusion, non-formal learning and employability of disenfranchised learners across Europe – RadioActive101. DLD is particularly relevant to these contexts because conventional learning design that is usually predicated on traditional learning institutions is simply not suitable for these groups that are typically excluded and at-risk, and therefore we need a much richer understanding of their particular learning contexts. Learning Design in these contexts has to look well beyond instructional design, and instead address contextual barriers, opportunities and complexities whilst also addressing the psychosocial platform for education, such as engagement, motivation [5] and the role of confidence and self-efficacy. The RadioActive101 initiative operationalised DLD through:

1. Having its theoretical foundation on a combination of Friere's [3] approach of emancipatory learning through lived experience and Vygotsky's [4] notion of scaffolding in the zone of proximal development;
2. Articulating the affordances of internet radio in terms of the 'whole space' of surrounding activities related to radio production, broadcasting and promotion;
3. All learning occurring within the organisational and 'real life' contexts of the learners – such as youth and other community organisations;
4. An evaluative approach that begins with a problematisation of the contexts linked to a Friirian and Vygotskian articulation of practices, followed by formative and summative evaluations.

So, specifically, RadioActive101 is an innovative education project that has developed and implemented a radical technology-enabled Learning Design to promote the inclusion, engagement and non-formal learning of those at-risk of exclusion, across Europe. It does this through harnessing primarily internet radio, or, as our motto states: *RadioActive101: Learning through radio, learning for life!*

2 DLD, Evolving Contexts and the Implementation of RadioActive101

Through adopting a DLD approach, and accepting the primacy of context, we realised that the incorporation of a new technology and its affordances (the 'whole space' of participatory radio) meant that we had to iteratively co-design the learning approach with the learners and their organisations. This led to implementing five national RadioActive101 'stations' (or hubs) accessible via a European Support Hub (radioactive101.eu). Through making the radio shows the target groups are developing

digital competencies and employability skills 'in vivo' that are transferable to the 21st Century workplace. These competencies and skills align with six of the EU Key Competencies for Lifelong Learning, namely: Communication in Mother Tongue; Digital Competence; Learning to Learn; Social and Civic Competencies; Censure of Initiative and Entrepreneurship; and, Cultural Awareness and Expression. We have developed a progression and accreditation model linking these competencies to RadioActive101 activities that are recognised through electronic badges. These badges provide digital recognition measures and represent proficiencies relevant to further education or employment, in particular related to the knowledge and creative and digital industries. But, to realise these learning activities there was evolution and co-development of the learning context, or design, following three overlapping phases:

- Phase 1 Piloting: Problematisation, Training, local Hub setup and initial shows;
- Phase 2 Professionalising: *in situ* Training, greater Quality Control of shows and Badge negotiation and awarding;
- Phase 3 Operationalising: sustaining, embedding and expanding.

During Piloting in Phase 1, which typically lasts 2-3 months, the contexts (e.g. youth organisations, schools, multi-generational centres, HE settings) are investigated, understood and engaged through a process of 'Problematisation' [5], which means 'conceptualise in order to change'. Once this has been performed and the discourses and relationships between all key actors have been established, an initial intensive two day training workshop is performed that results in the key actors (e.g. young people, youth workers, school children in deprived areas, learning disabled young people) in the organisations being trained in essential skills that include: planning & organisation; understanding copyright, file management & record keeping; journalistic methods; creating, performing and arranging content; audio editing and promotion and reflection. These skills are acquired to a level where these can be developed through further scaffolding from the core RadioActive101 team.

During Professionalising in Phase 2, which runs up to 12 months, the Radio Hubs are producing, broadcasting and archiving live, typically monthly, radio shows, the themes and topics for which are decided by the learners themselves based on important issues in their lives (e.g. knife crime, women and body image, mental health, *etc.*). During this phase the core team give greater responsibility and activity to the key actors in the organisations, and scaffold contingently based on the need. For example, building on core technical skills to improve the 'sound levelling' and guiding on how to organise content items to achieve a tighter and defined 'narrative flow'. And similarly, the key 'radio actors' in the organisations cascade their skills to others locally without the direct involvement of the core team that initially trained them. A concrete pedagogy is realised through the key radio activities being linked to competencies via our (electronic) badge negotiation and awarding system - linked to 13 bronze, 13 silver and 13 gold badges. To date we have awarded 176 badges to our radio-activists – who may be the young people attending an organisation and the staff who also take on roles and responsibilities to deliver RadioActive101. Further scaffolding through 'training in action' and facilitation improves the level of competencies gained through the production of shows of increasing sophistication, variety and quality.

During Operationalising in Phase 3, which overlaps with Phase 2 and runs continuously, measures are taken to sustain, embed and extend RadioActive101. The ongoing improvements in competencies linked to the radio production processes are realised and tracked through the radio-activists' progression from bronze through to gold badges.

3 Evaluation of RadioActive101

The design and evaluation of RadioActive101 was intertwined and followed three phases that informed one another. This progressed from Problematisation (Phase 1) - that is similar to what has been previously called 'illuminative evaluation' [6], formative evaluation (Phase 2) of the developing radio hubs, and then a summative evaluation (Phases 3). The first two phases of the evaluation have been reported elsewhere [7] so in this paper we focus on the summative evaluation that followed an 'Appreciative Inquiry' approach [8]. This focused on the impact of the RadioActive101 project at the level of beneficiaries, involved organisations, project partners and the community – through an online survey of 89 actors, approx. 17% of those involved throughout the entire project. It was a challenge to get a higher response rate because the population was, by their nature, difficult to engage and easily distracted, often 'digitally excluded' and their participation in some cases lay too far outside of the evaluation period. The main hypothesis of the evaluation methodology [9] was based on the pedagogical dimension that internet radio and social media could play a major role in supporting engagement and non-formal learning of people at risk of exclusion. The outcomes clearly show that the highest impact is perceived on self-confidence and motivation, creativity, management skills and communication. In the words of one young person involved, the project provided a "*sense of freedom, sense of self-value, sense of co-creation*".

Giving more detail – the highest level of impact was reported for the direct beneficiaries, our radio-activists (92.1%), followed by project staff (86.8%), the organisation (84.2%) and the community (76.3%). The highest reported impact was on self-confidence and motivation (90.8%), followed by creative skills and abilities (88.2%) and then some specific employability and communication skills (both 85.5%). The lowest impact was on mathematical competencies (35%), which supports the validity of responses, as this was the least emphasised aspect of the project.

4 Conclusions: Deep Learning Design and Relevance, Engagement and Motivation

This paper has shown how Deep Learning Design (DLD) is applicable to designing innovative learning contexts that address significant learning problems, namely the inclusion and non-formal learning and employability of disenfranchised learners. It has also demonstrated a number of dimensions in which traditional learning design is weak, such as: rigorously understanding what the learning problem is (problematisation); iteratively co-developing a design in ways that engages learners in their 'real-life' situations; addressing the reality of practically and intellectually including and engaging

disenfranchised learners; and, generally, addressing how the psychosocial and motivational platform for learning, based on dimensions like confidence and self-efficacy are the 'engine' for learning and development. TEL research will need to embrace these dimensions and the complexities they give rise to if it is to acknowledge that education is for all, and should empower people to change their lives for the better.

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The Learning Design Studio in a 5-weeks MOOC format

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Abstract. The present paper reports on a Massive Open Online Courses (MOOCs) for teacher professional development that uses the Learning Design Studio methodology as a pedagogical framework. It explains the training activities and supporting technologies used and discusses the findings obtained weekly from the analysis of participants' opinions. MOOCs appear to serve the professional development needs of teachers quite well and the action-based process based on a set of design activities are perceived as a useful by educators.

Keywords: learning design, MOOC, online learning, teacher communities, continuous professional development, digital competences, peer-mentoring

1 Introduction

Recognizing the value of MOOCs' for the Continuous Professional Development of educators [1, 2], the HANDSON project aimed at engaging teachers in a massively collaborative design inquiry of learning. The primary focus was on improving the professional practice of teachers, by guiding them in developing their competences as designers of learning and as innovators in the educational use of ICT. To this effect, the project adopted a pragmatic view of learning design based on the Learning Design Studio (LDS) approach [3]. As [4] argue, engaging teachers in design not only enhances their practical skills, but also solidifies their theoretical and pedagogical knowledge. The LDS methodology leads participants through a design inquiry cycle in which they identify an educational challenge they wish to address, investigate the context in which it is situated and the relevant pedagogical and theoretical approaches, review examples of past innovations, conceptualise a solution, prototype and evaluate it, and reflect on the process and its outcomes.

An initial analysis of the preferences and constraints of prospective MOOC participants led the HANDSON team to develop a condensed version of the LDS. This version was designed to engage participants in five weeks of activity; with an estimate of four to eight hours work a week.

1.1 The design activities and ILDE

The activities rooted in the LDS ‘walk’ educators through the design process of an ICT-based learning activity that, at the end of the course, is ready to be used in their classrooms (see Table 1). Two pilots or editions of the MOOCs were delivered, both using ILDE as the learning design environment. The HANDSON MOOC activities involved the use of the ILDE conceptualization templates together with additional tools for prototyping (participants were free to choose any tool). For the second one of these pilots, ILDE was extended with additional learning design tools as required by the LDS activities proposed for the MOOC.

Table 1. LDS activities, course and tools

Goal for each week’s activity	Activities
INITIATE (week 1)	Design Studio Journal (ILDE, Canvas) Dream Bazaar (ILDE) Convergence session (Google Hangouts)
INVESTIGATE (week 2)	Get familiar with persona concept (Moodle, Canvas) Create your own persona (ILDE) Analyzing context (ILDE) Objective of your learning activities (ILDE) Revisit your dream (ILDE) Convergence session (Google Hangouts)
INSIRE & IDEATE (week 3)	Search for other learning activities (Moodle, repositories) Define the heuristics (ILDE) Learn about scenarios (Moodle, Canvas) Create scenario (ILDE) Convergence session (Google Hangouts)
PROTOTYPE (week 4)	Prototype your artefact (Web 2.0 tools) Test your prototype (Web 2.0 tools) Consolidate your prototype (Web 2.0 tools) Convergence session (Google Hangouts)
EVALUATE & REFLECT (week 5)	Publish your learning activity (ILDE) Peer feedback (Moodle, ILDE, Canvas) Convergence session (Google Hangouts)

2 Results from two HANDSON MOOC pilots

The focus of the study is on the perceived usefulness of the MOOC approach as a mechanism to understand its probability for adoption and as indicators to assess its value [5]. It is a complement to the paper on the perceived usefulness the MOOC tools [6]. Data was collected by weekly surveys that used a five item Likert scale. Additional global questions about the approach were included in a post-survey after the completion. The 2nd used a traceability system that allows analysing and comparing the responses from participants that finished against those that did not.

To frame the analysis and interpretation of the data and to offer some first insights, we outline the impact of the MOOCs in terms of the number of participants in both pilots and the level of learning design activity originating in ILDE.

2.2 Key figures and level of activity reached

Between both pilots, over 4500 educators registered in the MOOC platform (1690 for 2nd LDS pilot, 743 for 1st LDS pilot), out of them over 1000 registered in ILDE (396 and 323 respectively) and created over 3700 design artefacts and over 1400 peer-review comments (889 and 603 respectively) to the designs. Overall, there was more activity going on in the second pilot than in the first one, both in terms of number active participants in ILDE, the number of comments added, and especially the number of designs created (more data is available in [6]). In the second pilot, the activity was also more stable as the weeks went by (e.g. 288 Design Narratives created the fifth week). All the produced designs are available in the ILDE installations for both pilots (links at <http://ilde.upf.edu/about/>).

2.3 Teachers' perceived utility and usability of MOOC approach

Teachers' answers to the weekly questions about the utility of MOOCs activities show a stable trend (Fig. 1): the proposed activities are valued as useful both by participants that finished and those who did not. The 2nd pilot obtained more neutral responses, decreasing the number of positive perceptions but not increasing the quantity of negative perceptions. Interestingly, in the 1st pilot the activities related to context and scenarios were the best valued as compared to the 2nd LDS pilot, in which the activity found more useful was to prototype the artefact.

These data show that the activities devised to guide educators through a design process were considered useful by them. A perception of utility of the approach is also supported by teachers' answer to the global question "Will you use in your classroom the learning activity you have created during the MOOC. In the 1st LDS MOOC, 88.5 % of respondents answered positively; 10.3% responded "not yet". For the 2nd LDS MOOC, 95.5% of the respondents answered affirmatively; 9 said "not yet" and only 2 said "no".

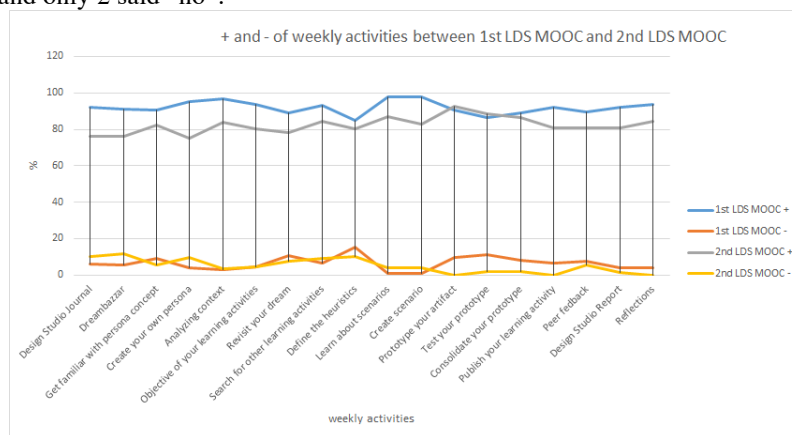


Fig. 1. Percentage of positive (+) and negative (-) perceptions of LDS activities

In both editions of the MOOC, the comfort level with LDS, as the methodology behind the proposed activities, started at a similar level - around 40% - and again increased more for participants in the 2nd LDS pilot. This tallies with the previous results and the fact that the originated activity in the 2nd LDS pilot was higher (more designs created, more comments). The post-survey used in the 2nd LDS pilot also confirms this positive level of perceived usability and utility of Learning Design Studio and technological support as a whole approach: 78.1% of respondents agreed with “The Learning Design Studio is a valuable resource to include ICT in education”, 74.4% agreed that “The tools and templates provided to work with Learning Design Studio were appropriate” and 73.1% said that “Using Learning Design Studio can help me improve my educational practices”.

4 Conclusions

The results show that teachers perceive the HANDSON MOOC as a useful opportunity to develop their design skills for the inclusion of ICT in their teaching practices. The LDS approach broken down in a set of learning activities for each of the five weeks ending in a ready-to-use ICT-based learning activity has proved to be a useful and meaningful way to help educators decide what are the best activities that will permit students to learn, and which ICT tools and resources can adequately support those activities.

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