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**Abstract.** The evaluation of flexible and personal learning environments is extremely challenging. It should not be limited to the assessment of products, but should address the quality of educative experience with close monitoring. The evaluation of a PLE using digital storytelling is even more complicated, due to the unpredictability of the usage scenarios. This paper presents an evaluation methodology for PLEs using digital storytelling, using a participatory design approach. The results from an open validation trial indicate that this methodology is able to incorporate all necessary factors and that the selected evaluation tools are appropriate for addressing the quality of educative experience.

**Keywords:** PLE, Digital Storytelling, Participatory Design, Learning Object, Story Frameworks, Educational Scenarios, Evaluation

## 1 Introduction

There isn't an official definition for personal learning environments (PLEs), but technically, the PLE represents the integration of a number of "Web 2.0" technologies like blogs, Wikis, RSS feeds, Twitter, Facebook, etc., around the independent learner. According to Downes [1] a PLE is "a personal learning center, where content is reused and remixed according to the student's own needs and interests". PLEs are built upon an interoperability framework that allows learning components (i.e. services, tools, and resources) to be easily adapted and new systems to be assembled in a responsive way. Pedagogically, open design accommodating the unpredictability of the usage scenarios becomes essential [2]. PLEs embrace open design, which allows experiences to be shaped in a way that meet learners' needs and values. Accordingly, the processes should have a high degree of flexibility and adaptability and trajectories of tools and services usage are not always predictable [3].

The evaluation of such flexible personal learning environments (FPLEs) which will constantly change and be adopted by diverse user groups is extremely challenging. Evaluation of PLEs should not be limited to the assessment of products, but should address the quality of educative experience with close monitoring [4]. The usefulness and effectiveness of the traditional evaluation methods and tools are questioned. It is important to examine whether and how the existing evaluation methods from the field

of Technology-enhanced Learning (TEL) and Human-computer Interaction (HCI) should be extended to address specific requirements of FPLEs.

In this paper we focus on presenting an evaluation approach implemented in POLITICS project, aiming at evaluating, a PLE called LAP Platform, the created training content and the inquiry based training approach which is based on digital storytelling. The evaluation methodology adopts a Participatory Design (PD) approach, involving the end users and stakeholders and combines qualitative and quantitative methods to ensure dependable feedback. It has a Formative Evaluation phase, focused on the improvement of the training content and the LAP Platform during the development phase and a Summative Evaluation phase with open pilot trials.

Section 1 provides an overview of this paper, providing its scope, Section 2 describes the background of the paper and Section 3 provides an overview of the evaluation methodology and describes the evaluation methods and tools used. Section 4 presents the results of the implementation of the method to an initial pilot trail and Section 5 provides the conclusions of the paper.

## 2 Background

According to O'Hear [5] the "traditional approach to e-learning tends to be structured around courses, timetables, and testing an approach that is too often driven by the needs of the institution rather than the individual learner". Course management systems (CMSs), the predominant learning software, are focused on the management of individual courses. The course-oriented nature of a CMS automatically entails certain divisions within the learning process and seeks to replicate the teacher-centered paradigm of the traditional classroom [6]. CMS organize materials based around the course, and student work does not have a life beyond that course [7].

The idea behind the personal learning environment is that the management of learning migrates from the institution to the learner [8]. A PLE is comprised of all the different tools we use in our everyday life for learning [9]. According to Downes [8] "the PLE connects to a number of remote services, some that specialize in learning and some that do not. Access to learning becomes access to the resources and services offered by these remote services. The PLE allows the learner not only to consume learning resources, but to produce them as well. Learning therefore evolves from being a transfer of content and knowledge to the production of content and knowledge". The PLEs [10, 11]:

- do not seek to contain all services but instead connects to many services
- do not restrain but give users control in consuming, publishing, and organizing resources as well as adopting tools
- do not provide one homogenized context but instead give the user control in defining and customizing his own context
- do not protect resources but instead share them, supporting sharing, editing, and republishing
- do not operate within an organizational scope but instead focus on the individual while also connecting at a global level to available services and resources.

A PLE can be based on a variety of learning approaches and a number of them are using Digital Storytelling. Digital storytelling has a huge potential in a modern globalized and connected world. Digital storytelling fosters critical thinking skills, helps learners retain knowledge longer and enhances learning by encouraging them to communicate effectively. In a classroom setting, storytelling on topics such as citizenship fosters discussions and community awareness thus connecting what students do in the classroom with the wider community [12]. As an inquiry-based technique, digital storytelling helps students make a connection between what they learn in the classroom and what goes on outside of the classroom by encouraging creativity, opening up to new ways of thinking and organizing material [13]. This promotes the development of multiple channel intelligence and communication, blending intellectual thought, research, emotion and public communication [14].

POLITICS (<http://www.politics-project.eu>) is a project financed by the Lifelong Learning Programme (LLP) of the European Union, which aims to provide a Personal Learning Environment (PLE) built around the concept of digital storytelling. Addressing school students, trainees in Vocational and Educational Training (VET) programmes and adult learners, especially immigrants undertaking 'citizenship' programmes, POLITICS project hopes to develop a better understanding of how modern society functions and, at the same time, develop skills in problem solving, communication, language learning and writing skills.

To achieve this, the Learning about Politics (LAP) Platform (<http://learningaboutpolitics.eu/>) was built on WordPress and Buddypress. As a PLE, the LAP platform supports learning in different contexts and provides access to educational resources from six (6) educational institutions around Europe, namely UK, Slovenia, Italy, Germany, Estonia and Greece. Far from imposing a unique approach to learning about Politics and Active Citizenship, the LAP platform is based on the idea that the learner is often acquiring knowledge outside the formal context and has an important role in his own learning process. To support this process, the LAP platform offers a variety of Story Frameworks and Educational Scenarios, offering the freedom to the user to select the framework and the learning process that fits best to his needs. It also offers a variety of interconnected Web 2.0 and social networking tools to foster learning together with guiding tutorials hosted at the Politics Wiki page (<http://wiki.agroknow.gr/politics>).

The LAP Platform (Fig. 1) is a space where users can generate, share, use and reuse content. They can do this by creating Digital Stories or Educational Scenarios either individually or collaboratively in teams and sharing them with other users by either posting into one of the six (6) Blogs available with multilingual content. The Platform has also potential for communication and discussion around political issues, political theory or any other social challenging and relevant issues through its Groups and Forums. LAP platform aims at integrating personalization, social exchanges and cultural differences, something that is common for PLEs [14]. More specifically, the LAP Platform offers to its users:

- A collection of **Digital Stories** based on **Story Frameworks**. In POLITICS we define a Story Framework as a skeleton of a story in which the reader decides how to fill in the blanks, or to totally or partially re-shape the story and bring it to life by personalizing it (e.g. becoming the main character of the story). Examples of Story Frameworks include 'Straight into Politics' a story in ten (10) chapters

that invites students to use their creativity and play a team game in which they plan to make a change in their society by organizing an election campaign. By the end of the story students will have learned how to work in teams, how to set common goals, how to be a leader; and they will have gained valuable knowledge about the society around them and the European scene. Another Story Framework is 'Stories of Migrants' that focuses on identities, on being part of the society or being an outsider. Users can choose the Story Framework that best suits their learning needs and build on it individually or collaboratively.

- A collection of **Educational Scenarios** with various activities on Politics and Active Citizenship topics. We define Educational Scenarios as educational activities where the starting point and focus is a real life situation and not a theory. An Educational Scenario refers to learning goals within a topic and consists of several activities that include tasks for the learner, reading materials and resources such as videos, pictures, posters, tag clouds etc.
- A variety of **multilingual Learning Objects (LOs)** (text, images, videos, ppt, etc.) on the topic of Politics and Active Citizenship either created by learners or selected from relevant repositories with learning resources. With the term Learning Object (LO) we define any digital resource that can be reused to support learning [15]. LOs usually address a learning object, contain a learning activity and assessment [16] and can be applied alone or in combination with learning facilitators and learners to meet individual needs [115].
- **Communication channels** such as Groups, Forums, Blogs where users can register, create and personalize their profiles, become friends with other members of the community and exchange resources and opinions.

Accessible from the LAP Platform and hosted by the Politics Wiki page (<http://wiki.agroknow.gr/politics/>) a set of Tutorials are available, such as:

- The **Digital Storytelling Tutorial** that explains how digital stories can be collaboratively created and published online, how to enrich them with the use of Web2.0 tools and digital resources and how to address copyright issues.
- The **Web2.0 Tutorial** that presents eight (8) Web2.0 tools YouTube (video sharing), Wikis, Flickr (image sharing), Facebook (social networking), SlideShare (presentations sharing), Wordle (word clouds), Prezi (interactive presentations) and Smilebox (animated postcards etc.), providing also general instructions on how to use similar Web 2.0 tools.
- The **Copyright Tutorial** that explains how to make sure that sharing and remixing of digital resources respects copyright laws.
- The **Educational Scenario Tutorial** that presents the structure of an educational scenario and how to build one around a topic of interest.

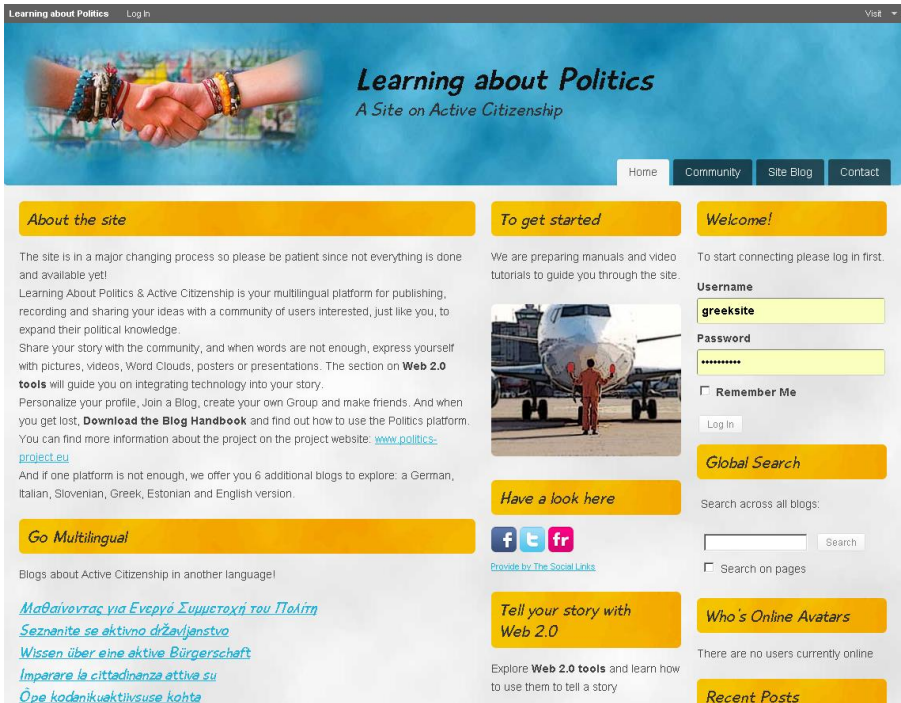


Fig. 1. LAP Platform

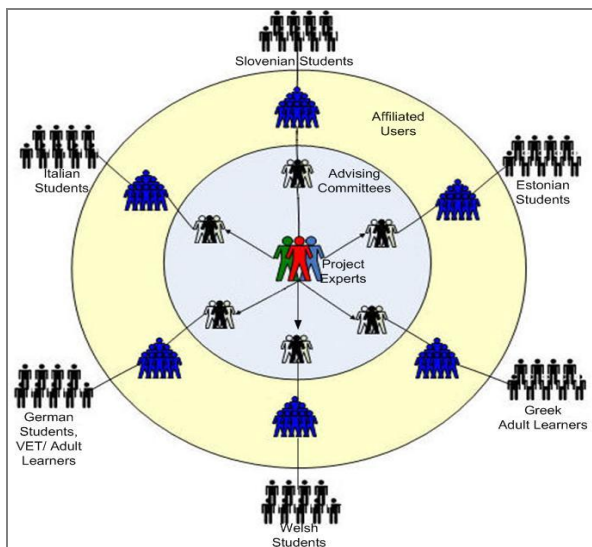
### 3 Evaluation approach, methods and tools

The POLITICS evaluation methodology aims at the evaluation of the technical performance of the project with regards to both the training process and the usability of the LAP Platform. More specifically it focuses on evaluating:

- the LAP Platform (<http://learningaboutpolitics.eu>)
- the Story Frameworks and the Educational Scenarios
- the Learning Objects created or collected from repositories, by both trainers/teachers and learners
- the learning process.

The POLITICS evaluation methodology adopts a Participatory Design (PD) approach. Participatory Design is a set of theories, practices, and studies related to end-users as full participants in activities leading to software and hardware computer products and computer-based activities [17]. Béguin [18] mentions the need to close the gap between designers and end-users through mutual learning, while Reymen et al. [19] considers that diverse knowledge is needed in design. Although “it is not yet clear which kind of user involvement is most appropriate”, the Participatory Design approach has received growing acceptance in the world of research, especially from academic professionals in Europe [20] that started including children in the design of new technologies in the hope of finding more suitable solutions.

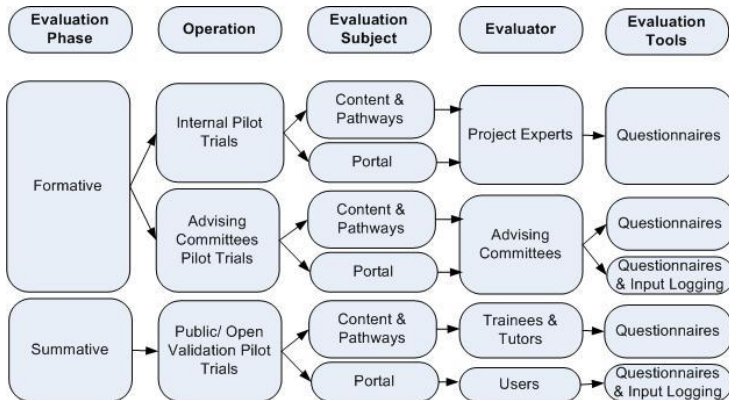
In the case of POLITICS project the end users and stakeholders involved are the project educational experts, teachers and trainers, learners, trainees (school students, VET trainees and adult learners), the “Advising committee of youth” and the “Advising committee of experienced” and other online users (Fig. 2). The project educational experts are associated with the project partners and they participate in the formative evaluation. The trainers who participate in the pilot sessions also participate in the evaluation procedure, completing a questionnaire, after the completion of a training session. The trainees, who are school students, VET trainees and adult learners, participate in the evaluation procedure by filling questionnaires before and after the training sessions.



**Fig. 2.** POLITICS Evaluation Stakeholders

The evaluation methodology adopts a hybrid approach that combines qualitative and quantitative methods to ensure dependable feedback on a wide range of questions; depth of understanding of particular projects; a holistic perspective; and enhancement of the validity, reliability, and usefulness of the full set of findings. The evaluation is considered as an internal-collaborative process that engages project's partners and trainees aiming at the mutual understanding of the training objectives. Based on the need to increase the validity and reliability of evaluation data, the methodology uses a variety of tools for data gathering. Based on the review of the properties of each evaluation method by USINACTS guideline [21], the POLITICS evaluation approach (Fig. 3) includes structured interviews, heuristic evaluation and input logging.

POLITICS evaluation approach includes: a) a Formative Evaluation phase: focusing on the improvement of the Story Frameworks, the training content and the LAP Platform before the open validation trials and b) a Summative Evaluation phase: evaluation of the open pilot training session.



**Fig. 3.** POLITICS Evaluation Methodology Overview

### 3.1 Formative Evaluation

In training related projects, such as the POLITICS project, formative evaluation concerns the content and the PLE where this content is offered and aims at drawing information used for the improvement of the design and development of the training. Formative evaluation focuses on the processes that are inputs for the development of the educational scenarios and content. This approach minimizes the risk of delivering products that do not support properly the pilot sessions and the materialization of the POLITICS aims. Formative evaluation is conducted by experts from the project partners and members of the “Advising Committee of the Youth” and the “Advising Committee of the Experienced”. The two advising committees consist of 5 students/trainees and 5 trainers respectively, all associated with the POLITICS consortium. These are representatives of the LAP platform end users and can provide a valuable insight. One element that is considered as crucial for the successful implementation of the project is that of users’ diversity, which might affect or define the final outcome. Users come from different countries and different levels of education, formal or informal, and thus factors such as the culture, the technical expertise and the e-learning awareness affects the outcome, if they are not managed properly. Formative evaluation assesses whether matters related to users’ diversity were taken into account during the design and development phase of Educational Scenarios and content.

### Content Evaluation

The evaluation of the content including the Story Frameworks, Educational Scenarios and Learning Objects created by both the trainers and the learners and/or collected through repositories, was conducted by experts of the project partners’ teams. The digital storytelling expert of the project evaluated the content that was produced by each partner. At the same time, each country’s content was also evaluated by an expert of a project partner from another country, to ensure objectivity in judgement. The content evaluation tool was based on the Learning Object Review Instrument (LORI), an established, validated and widely used tool [22]. The dimensions

considered are: Content quality, Learning Goal Alignment, Feedback and Adaptation, Motivation, Presentation Design and Reusability.

Gibbs, Graves, and Bernas [23] noted that most of the existing at the time tools used for educational content evaluation "have been criticized for not being comprehensive, understandable, and easy to use". The reliability of LORI was investigated by Akpınar [24], who provided some evidence that LORI may not give such reliable results but due to the lack of a satisfactory sample, the author recommends further research before coming to conclusions. LORI seems to be ideal for evaluating such a great variety of content, therefore it was selected as the most appropriate tool.

### **The LAP Platform Evaluation**

The LAP Platform evaluation effort is focused on the various functionalities of the system. Since the Platform constitutes a web-based application, the selected dimensions are intended to cover performance criteria related to the interface design quality of the LAP Platform. Evaluation aims to provide feedback to the development team about the overall perception of the users about the quality of the Platform, as well as the services and resources that they prefer. In this direction a user-based evaluation of the Platform using an online questionnaire took place. The questionnaire to be used for the online evaluation was originally based on Version 4.0 of the WebQual questionnaire (<http://www.webqual.co.uk/>), which has been used in several evaluation studies of web sites and portals [25, 26].

Beside the questionnaire for user satisfaction, a log files analysis of the Platform took place using the log files of the server and an appropriate log file analyzer. The LAP Platform is built with WordPress and Buddypress, so for the log file analysis we used SlimStat 2.0.1 extension (<http://slimstat.net/>).

### **3.2 Summative Evaluation**

Summative Evaluation focuses on the outcomes of the project and their impact on the stakeholders (Project partners, school students, VET trainees and adult learners, especially immigrants, school teachers and VET trainers) aiming to prove the added value of POLITICS project. This includes the evaluation of the open/public validation pilot trials, Educational Scenarios and learning objects, as well as of the LAP Platform. The questionnaire used for the online evaluation was originally the same that was used during the internal pilot trials. The results from the POLITICS Spring School training event which will be presented in the next section showed that the questionnaire needed further modifications.

Pilot sessions were implemented based both on the Educational Scenarios created for each country and on the Story Frameworks which activate learners from every country. Consortium partners were responsible for the organization of pilot sessions in their countries. They set up testing sample groups of users and provided tutors for the training sessions. They were responsible for the implementation of the pilot sessions and provided the necessary support. Pilot session's evaluation focused on assessing the effectiveness and success of the training procedure as well as the users'



satisfaction regarding the LAP Platform. Effectiveness and success were measured in regards to the various aspects of the training process.

Open/public validation pilot training sessions evaluation included pre-training and post-training (outcome) evaluation. This means that data collection concerned the implementation of the pilot sessions as well as the results of the training process to the trainees which came out of a comparative approach (pre- and post-training situation). Each pilot session was evaluated by the participating tutors and trainees. Trainees answer pre- and post-training session questionnaires based on the model that was proposed by Kirkpatrick [27]. Tutors answered post-training session questionnaires only. Questionnaires evaluated the pilot sessions according to the following dimensions:

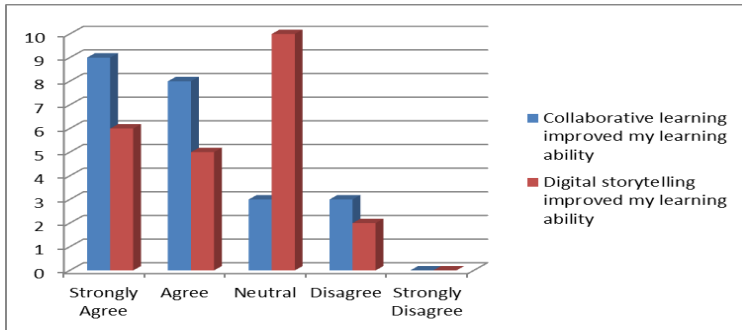
1. Learn effects
2. Training outcomes
3. Teaching practices
4. Trainees' satisfaction
5. Customization of the Educational Scenarios and the content
6. Quality of the content
7. Trainees change in awareness and attitude towards politics
8. Trainees change in awareness and attitude towards Digital Storytelling and Web2.0 tools.

## **4 Results from Initial Trial**

During April 2011, an open validation trial was organised in Crete, Greece. Teachers and Trainers from all over Europe participated to the trial and were introduced to the POLITICS training methodology, the LAP Platform and the produced Story Frameworks and Educational Scenarios. The evaluation tools used were the pre- and post-training questionnaires based on Kirkpatrick's model [27] and the WebQual based questionnaire which were completed by both learners and tutors.

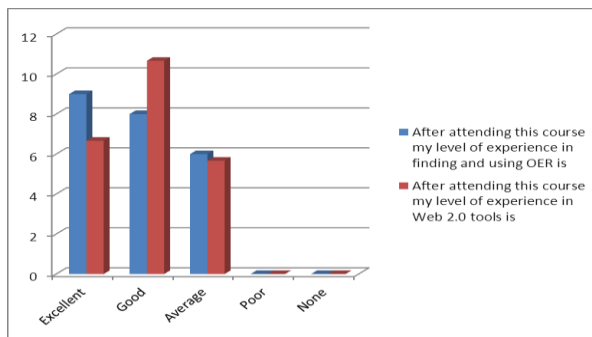
A total of 22 learners participated to the POLITICS Spring School, 15 male and 7 female. 3 participants were less than 25 years old, 3 between 26-30, 3 between 36-40, 5 between 41-45, 4 between 46-50 and 4 more than 50 years old. 1 participant came from Austria, 1 from Belgium, 3 from Estonia, 1 from Finland, 2 from Germany, 3 from Italy, 1 from Latvia, 2 from Romania, 4 from Slovenia, 2 from Turkey and 2 from UK. The participants included 1 entrepreneur, 2 journalists, 4 students, 8 teachers, 4 trainers, 1 UN employee and 2 university professors.

From the 22 participants, 7 worked on Story Frameworks and participated in collaborative story writing activities, whose extent was depended on each selected framework. The other 15 learners worked on Educational Scenarios, choosing a less collaborative learning approach, were the collaboration which was limited mostly on exchanging resources, information and opinions through the provided communication channels.



**Fig. 4.** Learning About Politics PLE Methodology Learn Effect

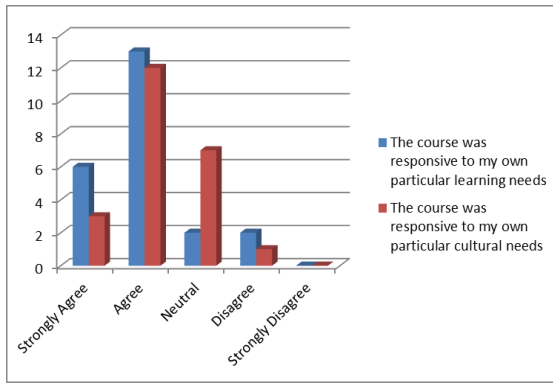
The analysis of the questionnaires showed that according to 73% of the participants the difficulty level of the pilot training session was appropriate, while a 20% had no opinion. Over 90% of the respondents considered that the educational material of the pilot training session was structured properly, it helped learning and that learning materials and activities were directly tied to the scope and objectives of the pilot training session. 67% of the respondents said that the activities of the pilot training session were innovative and stimulated their learning ability, while the remaining 33% were neutral. 74% of the participants said that collaborative learning improved their learning ability, but only 48% said the same thing for digital storytelling. 43% of the participants were neutral regarding the learning effect of this procedure (Fig. 4).



**Fig. 5.** Learning About Politics PLE learn effect on Web 2.0 and OER experience

This is something that needs attention. 100% of participants responded that the activities of the pilot training session require teamwork and made use of many sources (i.e. material from web links, Wiki pages, blogs, YouTube and other Web2.0 tools) to construct knowledge. 80% of the respondents said that after participating to the pilot training session they are more interested in politics and active civic participation, both in their countries and in the European Union. Over 90% of respondents said that participating to the pilot training session has improved their level of experience in using social networking sites like Facebook, collaborative working spaces like Wiki pages, photo and video sharing sites such as Flickr and YouTube and discovering and using OER (Fig. 5). However, 27% declared that their experience is moderate, which

is logical, since users came from different backgrounds, and had the opportunity to use these tools for only 6 days. For those who used them for the first time, it was not possible to gain extensive experience within a few days.



**Fig. 6.** Course/Educational Material Personalisation

82% of the respondents mentioned that the course was responsive to their own particular learning needs (Fig. 6). This is a very good result and it is vital for a PLE. However, only 65% of the respondents said that the course was responsive to their own particular cultural needs. This is also something that calls for improvement, especially in the part of the collaborative story writing. Over 90% of participants said that participation in the pilot training session was successful.

One month after the completion of the activities of the pilot training session we contacted the participants again to ask whether the knowledge they acquired seemed useful, if they are using the tools learned to express their opinions on political issues and other reasons. Over 90% of the respondents said that Web 2.0 tools used and the knowledge acquired proved useful in everyday life. 100% of the participants said they used what they have learned during the pilot training session.

74% of the participants said that it was easy for them to find how to operate the LAP Platform and that their interaction with the Platform is clear and understandable. They also said that the LAP Platform conveys a sense of competency. 65% of the participants found the LAP Platform easy to navigate and easy to use. This indicated that the Platform should be improved in terms of navigation. Further qualitative answers indicated that the collaborative story writing tools were not very handy and they need to be improved. There were no special problems with the content creation functionalities. The participants also hinted that a better connection with the proposed Web2.0 tools could help. Only 52% of the participants said that the LAP Platform has an attractive appearance. This was a problem which needed immediate action. If the PLE is not attractive, especially if we are talking about a less attractive subject like Politics, users will never adopt it. 78% of the participants said that the LAP Platform created a positive experience for them.

The WebQual questionnaire included questions about the information provided by the platform. These questions inquire about the information accuracy, believability, timeliness, relevancy, level of detail and format appropriateness. At least 50-75% of

the participants responded with a neutral answer. This seems to indicate that these questions were covered by other questions related to content and that they do not seem to be so relevant to the PLE platforms. This is why we introduced a revised version which is used in other validation trials and online to evaluate the LAP Platform.

Furthermore 61% of the participants said that the LAP Platform creates a sense of personalization and 70% of them said that the LAP Platform conveys a sense of community. It seems that although the content and the different Story Frameworks give a sense of personalization to the user, the Platform itself did not manage to do this very well. This was also an issue that needed to be addressed in order to have a successful Personal Learning Environment with an active community of users.

The results from the first pilot validation session identified a number of weaknesses and strengths. Some of the identified strengths are the following:

- The educational material is structured properly, it helped learning and learning materials and activities were directly tied to the scope and objectives of the pilot training session.
- The activities of the pilot training session require teamwork and make use of many sources to construct knowledge. The course was responsive to their own particular learning needs.
- Collaborative learning improved their learning ability.
- Web2.0 tools used and the information provided proved useful in everyday life circumstances.

The analysis identified the following weaknesses:

- The navigation of the LAP Platform is not very easy
- The collaborative story writing tools were not very handy
- The LAP Platform doesn't always create a sense of personalization
- The LAP Platform doesn't have a very attractive appearance
- Digital storytelling is not always improving the learning ability of the learners
- The course is not very responsive to the particular cultural needs of the learners

## 5 Conclusion

This paper analyses the methodology and the plan for the evaluation of the LAP Platform, a PLE developed in the scope of POLITICS project, the created content, consisting of Story Frameworks, Educational Scenarios and LOs and the proposed learning process. The methodology presented in this paper includes formative and summative evaluation, the latter including pilot trials. Formative Evaluation assesses the LAP Platform and the created content at the development stage, assuring timely feedback to improve them accordingly before they go public. Summative Evaluation with the pilot trials focuses on testing the integrated methodology and the created content to a target audience.

The selected methodology was able to successfully identify the weaknesses and strengths of the PLE and the learning process. The involvement of end users through the advising committees led to the creation of quality content and an engaging learning approach which satisfy the users' needs. The prototype version and the initial

content used in the open validation trial still needed a number of improvements and this was identified by the pre- and post-implementation questionnaires for assessing the learning process and the training content and the WebQual questionnaire for assessing the LAP platform. The pre- and post-implementation questionnaires were able to assess the learn effect of the learning process and identified a number of weaknesses.

The analysis of the results from the pilot trial allowed us to make improvements to the learning methodology, the content and the Personal Learning Environment, as well as to the evaluation tools themselves. The LAP Platform was improved in terms of appearance and design, facilitating easy access to training Tutorials, to Web2.0 tools and offering additional guidance to its users e.g. through the LAP Platform Handbook that includes a step-by-step tutorial through the use of the platform. Future developments to the Platform include embedding of video tutorials that will focus on the importance of Digital Storytelling for learning; additional platform areas with quick access to the Digital Stories and Educational Scenarios created by other platform users.

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