

# Applying Information Technology in Education: Two Applications on the Web

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**Abstract**—The development of innovative (Information and Communication Technology) ICT-based content, services, pedagogies and practice has become an integral part of today's educational procedure. ICT-based applications in education must be well designed but also manageable and acceptable by their users. PoTrain system and e-TRAWELSPA e-learning platform are two such applications developed at the Intelligent Systems Laboratory of the Technical University of Crete.

**Index Terms**—Education, e-learning, Web application

## I. INTRODUCTION

E-TRAINING refers to using Information Technology to education and learning [1]. The advent of the Web has generated additional interest in applications capable of delivering learning content over the Internet to its users. E-training (or e-learning) applications on the Web are emerging as the most cost-effective learning process by reducing the time, money and teaching resources. Learning is becoming significantly richer as students have access to a variety of information types (e.g., video, graphics along with text in a hypertext format) and can manipulate and communicate such content along with their ideas to their teachers, classmates and friends around the world.

PoTrain is a Web-based application developed on behalf of project 'PoTrain: Positive Thinking Training'<sup>1</sup>. PoTrain aims at encouraging the collection and dissemination of positive (good) news by students across the EU using the Web. The media, especially TV are transmitting mostly negative news, so establishing negative psychology and pessimistic mode to young people. Collecting positive news from different Web sources will counterbalance the flow of negatives news. PoTrain provides non-formal training and aims at assisting in developing useful skills and positive way of thinking. The e-TRAWELSPA<sup>2</sup> e-learning platform is based on

*Moodle*<sup>3</sup>. This is work in progress and aims at supporting the development of innovative ICT-based content and services for lifelong learning in the form of e-learning courses for training in SPA services.

The rest of this paper is organized as follows: The PoTrain project is discussed in Sec. II, focusing on the system architecture and its supported types of users as well as on system design and implementation. The e-TRAWELSPA project is then discussed in Sec. III, giving detailed information on the selected e-learning platform, on user and course management and also on course structure. Follows Sec. IV with conclusions and issues for future research.

## II. THE POTRAIN PROJECT

### A. About the Project

The *Positive Thinking Training (PoTrain)* project aims at encouraging collection and dissemination of positive information about the events that occur every day throughout the world. The PoTrain initiative also aims at contributing towards encouraging young people to envision a better future for themselves and the world they live in. The project took place between the November 2010 and February 2012. The leader of the project was ISMB ('The Bucharest School Inspectorate', Romania), a public authority who assured the quality of education and trained educators. The Intelligence Systems Lab of TUC (the IT expert of the project responsible for the overall system design and development) collaborated with DIAN<sup>4</sup> a highly innovative SME from Greece specializing on products and services for e-Training and schools for secondary and technical education from Bulgaria, Slovakia, Romania and Greece.

The technical objective of the project was to integrate non-formal training methods, services and pedagogical approaches, based on ICT practical applications, in order to train the target user groups, which for this project are, secondary school students and teachers. The goal is to assist the users of this application combine knowledge and skills that they have acquired from their formal school education with the non-formal training the project would offer to them.

During the project students built up a positive way of

<sup>1</sup> 'PoTrain: Positive Thinking Training' (EU Life-Long Learning, Comenius, Project No. 509925).

<sup>2</sup> Developed on behalf of project 'e-TRAWELSPA: e-Training for Wellness in SPA Services' (EU LLP / Leonardo da Vinci – Transfer of Innovation, Ref. No. LLP-LdV-ToI-2011-RO-02)

<sup>3</sup> <http://www.moodle.org>

<sup>4</sup> [www.dian.gr](http://www.dian.gr)

thinking and they also gained experience and satisfaction when they saw the results of their efforts to be realized in the form of a "positive news site". The teachers also played an important part in this project, because they helped students to develop transversal competencies, through subjects of common interest, teaching them how to search and collect positive news by using computer technology, translate them into English, categorize and present them in a positive news Web-site. The broader innovative character of the project also included development and dissemination of positive thinking, which would be cultivated to all participants and visitors of positive news Web-site, with all the positive effects that positive thinking can create to people.

The outcome of this project was the implementation of an ICT application, PoTrain, which will be described in following sections. PoTrain is available on the Web<sup>5</sup>.

### B. PoTrain System

The purpose of PoTrain is to *present the most popular positive news articles* according to the *positive votes* they have taken by the students of the four participated schools, mentioned in previous section. Participated school students were the heart of PoTrain because they were the ones who gathered all these positive news articles and they voted for them in order to contribute for the most popular ones. They also provided valuable feedback for improving both functionality and look and feel. The system, despite its innovative character and the highest possible level of software technology it integrates, had to be user friendly and present its contents in a comprehensive and pedagogical way (even for elementary school students).

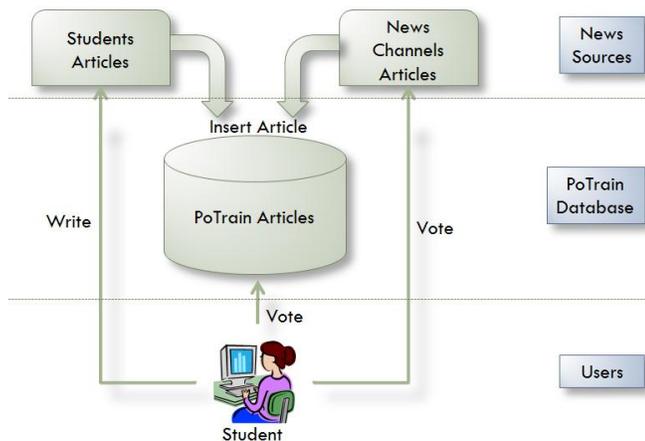


Figure 1: PoTrain System Architecture

Figure 1 illustrates PoTrain system architecture. The system consists of three basic modules:

1. **The Users Module:** The basic type of users are the school students who can be registered in the system and then are able to write their own articles, incorporate articles they have found in specific news sites in the Internet, or vote for existing articles in the system. There are three different types of users that are

supported by the system and will be explained in the next section.

2. **The PoTrain Database Module:** All voted news articles are stored in a database. Each article is associated with
  - the votes it received from the students,
  - a specific *news category* (e.g. nature, technology, education, sports, etc.) depending on its content, and,
  - a number of *comments* that students have made on it.
3. **The News Sources Module:** All these news articles that are gathered by the school students are either
  - Articles written from the students themselves (*students articles*), or
  - Articles from specific news sites in the Internet (*news channels articles*). These news sites are pre-selected sites that are connected with PoTrain and are called *news channels*. These news channels contain information (articles) that is considered appropriate for secondary school students. It is obligatory for these news channels to provide their header news as a Web feed<sup>6</sup> in a specific format (Atom, RSS2.0) in order to be connected to the system. Characteristic news channels already connected to the system are the following: *Discovery News*, *National Geographic*, *Unisef News*, *Archaeology Magazine*, etc. Users have the ability to view all the latest news articles (*header news*) of the connected news channels. The provided header news are primarily external news articles meaning that they are not yet inserted into the PoTrain database until a student gives a positive vote for them.

As already explained, voted news articles (news channels articles, students articles) are grouped together and are organized in *news categories*. These news articles can then be viewed either

- As a whole (all together) e.g. “*view most positive news articles of all categories*” or,
- By category e.g. “*view most positive news articles of category Sports*”.

Special *filters* are also provided in order to

- View selected news channels articles and students articles separately, e.g. “*view positive student news articles of category Sports*” or “*view positive news channels articles of category Technology*”,
- View selected news articles in a specific order (i.e. most popular, least popular, most recent, oldest first), e.g. “*view most (or least) popular positive news articles of all categories*” or “*view most recent positive news articles of category Nature*”.

In order to provide inter lingual content support, the *Google Translator API* is incorporated in PoTrain.

Finally, a smart on line *Help* is also provided in order to give to the user the appropriate information and the actions

<sup>5</sup> <http://www.intelligence.tuc.gr/potrain/>

<sup>6</sup> [http://en.wikipedia.org/wiki/Web\\_feed](http://en.wikipedia.org/wiki/Web_feed)

that can be taken at any point in PoTrain.

### C. Types of Users

There are three types of users in PoTrain:

1. **Visitors (V):** No username and password is required. They are entitled to view all information stored in the PoTrain system (positive news articles and their comments), starting from the system homepage.
2. **Registered Users (U):** They need username and password to login. They are school students and they belong in a specific school of a specific country. Registered users are entitled to perform any of the following actions:
  - a. Vote for news articles. These news articles can either be external news articles by the corresponding news channels, or already voted positive news articles of PoTrain.
  - b. Write news articles (student articles). Students can create their own news article with a completely new content or with a reference to an existing interesting article they have already found somewhere in the Internet. When a new student article is created, it automatically takes one positive vote by the creator.
  - c. Write comments on existing positive news articles of PoTrain.
3. **Administrators (A):** They need username and password to login. They have access to all system functions but, in addition they are entitled to create or erase user accounts and maintain control of the system use by the other user types (visitors and registered users). In addition, they have access to the system data and are authorized to add or update news articles, news channels, news categories, schools, countries, languages and users.

### D. System Design

To meet both operational requirements and the specific requirements arising from different types of users of the system, such as those recorded in the previous section, we need proper planning of both the database supporting the application and the organization of information at dynamic Web pages.

1. **Database Design:** The design of the database supporting the Web application of PoTrain was based on the following criteria:
  - a. To capture system information according to its functional requirements.
  - b. To meet the support of different types of users who have different rights to access and configure information on the system.
  - c. To preserve system information consistency and integrity.
  - d. To support different character sets of different languages.
2. **User Interface Design:** Information in PoTrain is organized in a database. The presentation of this

information is realized via dynamic Web-pages. The organization of the elements of each Web page meets the following criteria:

- a. Homogeneous presentation with the logo of PoTrain, specific colors, specific fonts, etc. This way the user understands that any such Web page belongs to PoTrain.
- b. Easy, uniform and informative presentation of options for the user at each Web page so he/she can easily locate the information he/she seeks through the system.
- c. Informing the user's location at any time within PoTrain so that the user can navigate in it with ease and comfort.



Figure 2: PoTrain User Interface

Figure 2 depicts a typical Web page of the system that follows the above criteria.

### E. System Implementation

For the development of PoTrain the following technologies were used:

- *PHP scripting language*<sup>7</sup>, for the implementation of the system logic and data preparation.
- *HTML* for the Web presentation of the system,
- *Javascript language*<sup>8</sup> for the active components on the Web pages, such as the *on-line help*,
- *CSS technology*<sup>9</sup> for the Web pages layout, and
- *MySQL Relational Database Management System*<sup>10</sup> for the organization of information of PoTrain.

The principles of the *Model-View-Controller (MVC) design pattern* ([2], [3]) were followed for the implementation in PHP<sup>11</sup> of PoTrain. Model-View-Controller (MVC) is a software architecture pattern that separates the representation of information from the user's interaction with it. The model

<sup>7</sup> <http://www.php.net>

<sup>8</sup> <http://en.wikipedia.org/wiki/JavaScript>

<sup>9</sup> <http://www.w3.org/Style/CSS/>

<sup>10</sup> <http://www.mysql.com/>

<sup>11</sup> <http://oreilly.com/pub/a/php/archive/mvc-intro.html>

consists of application data and business rules, and the controller mediates input, converting it to commands for the model or view.

Additionally a news aggregator in PHP was incorporated in the system in order to collect news from the corresponding RSS news channels.

### III. THE E-TRAWELSPA PROJECT

#### A. About the Project

Promoting lifelong learning in the field of health is the result of continuous professional skills development through access to most recent information and a large knowledge data base. Latest international reports reveal that there is an increased therapeutic and social interest for health resorts' spa treatments, which have led to the development of international balneary tourism.

According to specialty EU statistics, the immediate results after treatment reflected significant improvements in subjective and objective symptomatology. Also an important echo was registered after using economic indicators of effectiveness, respectively on temporary incapacity to work, determined by the health conditions for which those spa treatments were being used. The aim is to identify, to diversify, to reorganize and to modernize the physical therapy strategies and tourist services using e-learning products and make these available to the level of treatment facilities within health resorts. The envisaged impact is, sharing experiences and practices of specialist from different countries in a transnational/international context by creating a network platform that will connect partners, beneficiaries (clients and institutions) but also involving target groups and other potential users with an ultimate goal of increasing the dimension and quality of wellness and quality of life in SPA services.

The duration of the project is from December 2011 to the December 2013. Apart from the Intelligence Systems Lab of TUC (the IT expert of the project) the project is being carried out with the participation of Research and Academic partners from Romania (two partners, one serving as project leader), Bulgaria and Austria.

The main objective of the project is to support participants in training and further training activities in the acquisition and the use of knowledge, skills and qualifications to facilitate personal development, employability and participation in the European labor market.

In order to support the development of innovative ICT-based content, services, pedagogies and practice for lifelong learning, an e-learning platform was developed for the needs of the project. The e-TRAWELSPA e-learning platform is available on the Web<sup>12</sup>.

#### B. e-TRAWELSPA e-Learning Platform

An e-learning platform is being developed to fulfill the needs of the project and to incorporate new modules and new methodologies in the form of e-learning courses for training in

SPA services. The e-learning platform of the project is based on *Moodle* which is a Web-based multilingual learning management system that can support both the development of interactive training courses and the management of the users who will participate in the training classes in SPA services. A typical layout of the e-TRAWELSPA e-learning platform is shown in Figure 3.

The e-learning platform of the project provides courses in four different languages: English, Bulgarian, German and Romanian. Each course has a specific structure and contains both static materials in a variety of formats (written, images, sounds, videos) and also active materials such as online quizzes, evaluation feedback, assignment submission, news and announcements.

The participating users of the e-learning platform of the project are categorized in four different roles: Administrators, Teachers, Students and Guests. The enrollment of students in the system and also in specific courses can be done automatically.

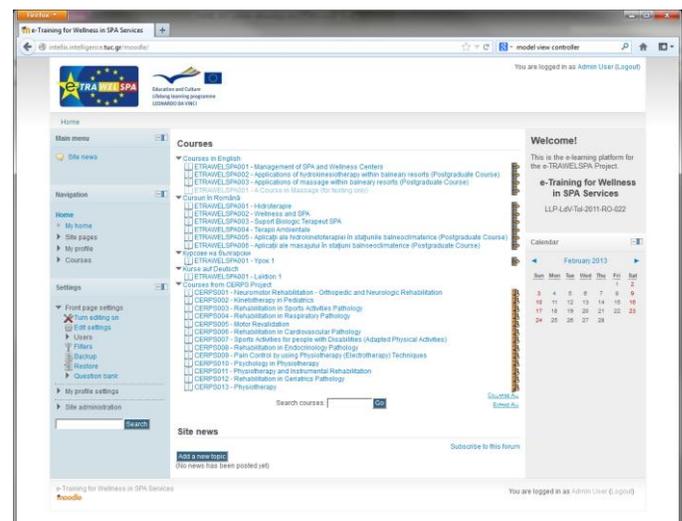


Figure 3: e-TRAWELSPA e-Learning Platform Layout

As already mentioned, the system is being implemented on top of *Moodle* (Modular Object-Oriented Dynamic Learning Environment) a free Web-based application that educators can use to create effective online learning sites. It has become very popular among educators around the world as a tool for creating online dynamic Web sites for their students.

Moodle, like most learning management systems, contains essential tools like discussion forums, quizzes, wikis and file sharing, but it also contains much more than this. One of the key strengths of Moodle is its flexibility. It is modular in nature and can therefore be extended to include extra features relatively easily. In fact, there are over 600 additional modules for Moodle. And because Moodle is open source, these modules are all free for anyone to download and use as often as they like. Moodle has revolutionized the learning process, by offering an advanced and user-friendly solution for encouraging the collaborative work of students and teachers. It comes with a toolbox full of online teaching techniques that facilitate and enhance the proven teaching principles and

<sup>12</sup> <http://www.intelligence.tuc.gr/etrawelspa>

traditional classroom activities.

Figure 4 shows the architecture of the e-learning platform: Through the *Web Interface* and the *User Control System*, a user can manage courses content and users information according to his/her specific role (user type). All information is stored in the *Moodle Repository*.

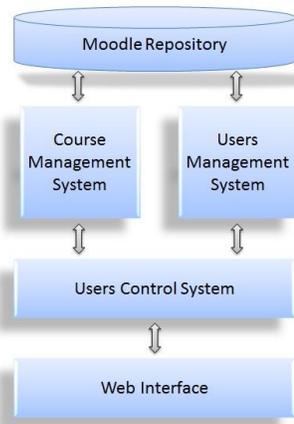


Figure 4: e-Learning Platform Architecture

### C. Users Management

In this project we are concerned with four main types of users (Figure 5): **Administrators, Teachers, Students** and **Guests**.

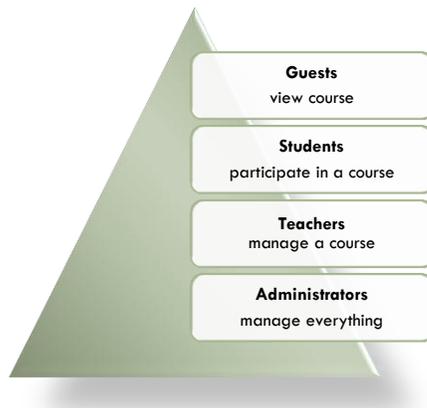


Figure 5: Types of Users

1. **Administrators** can do anything within the e-learning system (e.g. course creation, user's management).
2. **Teachers** can do anything within a course. They are created by the Administrator. They are assigned one or more courses. They can manage and add content to these courses. They can manage the participation of Students to these courses.
3. **Guests** can view courses but not participate.
4. **Students** role can participate in course activities and view resources but not alter them. When students first join Moodle they see all available courses. Once they have enrolled or been enrolled into at least one course they then only see their own courses in the My Courses section of the navigation block or via the My Home link. A student's view and navigation in Moodle will be

different from the course teachers or from students assigned to a different group. Administrators and Teachers determine how a student enrolls, and what they can do or see in a Moodle site. These permissions can vary with each course or with any of Moodle's many kinds of activities. For example, in some contexts, students may correct or grade other students' work, be encouraged to explore everything in a course and interact with other participants. In a different context, the student maybe guided upon a well-defined path, with minimal interaction with others.

### D. Course Management

A course is an area where teachers may add resources and activities for their students to complete. It might be a simple page with downloadable documents or it might be a complex set of tasks where learning progresses through interaction. Progress can be tracked in a number of ways.

The course page is made up of central sections which contain the tasks and (if desired) blocks to the side. The course teacher has control over the course layout and can change it at any time.

Students can be enrolled manually by the teacher and the administrator, or they can be allowed to enroll themselves. Students can also be added to groups if they need to be separated from classes sharing the same course or if tasks need to be differentiated.

### E. Course Structure

Each course consists of an introduction part and a set of modules (or sections or thematic units). Each module consists of a set of topics (or subsections) and each topic can obtain a set of static materials (resources) and a set of active materials (activities). The last module of each course is used for the course evaluation by its students.

#### 1. Course Topics

Each topic can obtain a set of **resources**<sup>13</sup> or **activities**<sup>14</sup>. A **resource** is an item that a teacher can use to support learning, such as a file or link. Moodle supports a range of resource types which teachers can add to their course sections. In edit mode, a teacher can add resources via a drop down menu. Resources appear as a single link with an icon in front of it that represents the type of resource. In this project we are mainly concerned about the following resources:

- **File** - a picture, a pdf document, a spreadsheet, a sound file, a video file.
- **Folder** - folders help organize files and one folder may contain other folders.
- **Label** - can be a few displayed words or an image used to separate resources and activities in a topic section, or can be a lengthy description or instructions.
- **Page** - the student sees a single, scrollable screen that a teacher creates with the robust HTML editor.
- **URL** - a Web address that a student can reach using a Web browser. Flickr, YouTube or Wikipedia are a few

<sup>13</sup> <http://docs.moodle.org/22/en/Resources>

<sup>14</sup> <http://docs.moodle.org/22/en/Activities>

examples.

An **activity** is a general name for a group of features in a Moodle course. Usually an activity is something that a student will do that interacts with other students and or the teacher. There are 14 different types of activities in the standard Moodle that can be found on the "add an activity" drop down menu. In this project we are mainly concerned about the following activities:

- **Assignments**<sup>15</sup> - Enable teachers to grade and give comments on uploaded files and assignments created on and off line.
- **Chat**<sup>16</sup> - Allows participants to have a real-time synchronous discussion.
- **Forum**<sup>17</sup> - Allows participants to have asynchronous discussions.
- **Feedback**<sup>18</sup> - For creating and conducting surveys to collect feedback, e.g. for course evaluation.
- **Survey**<sup>19</sup> - For gathering data from students to help teachers learn about their class and reflect on their own teaching, e.g. questionnaires.
- **Quiz**<sup>20</sup> - allows the teacher to design and set quiz tests, which may be automatically marked and feedback and/or to correct answers shown.
- **Lesson**<sup>21</sup> - for delivering content in flexible ways.

## 2. Course Layout

The course layout is the overall presentation of the course information according to the proposed course structure. All information needed is presented in the following table. Some of this information is required in every course and every supported language and some of it is optional. The existing course information is presented either as static materials (e.g. doc, pdf, ppt files), or as active materials (e.g. online assignments or quizzes).

TABLE I  
COURSE LAYOUT

	Description	Type
1	Course Introduction	
1.1	Full course title	Required
1.2	Course Description	Required
1.3	Characteristic icon or image for the course	Optional
1.4	Course Curricula or Syllabus	Required
1.5	Course teachers	Required
1.6	Images of the course teachers	Optional
1.7	CVs of the course teachers	Required
1.8	Related external links	Optional
2	Modules Area: Each Course may contain one or more Modules	
2.1	Module title	Required

2.2	Module description	Required
2.3	Module teacher name	Optional
2.4	Topics Area: Each Module may contain one or more Topics	
2.4.1	Topic title	Required
2.4.2	Topic presentation	Required
2.4.3	Topic videos	Optional
2.4.4	Topic assignment	Optional
2.4.5	Topic quiz	Optional
3	Course Evaluation	
3.1	Evaluation questionnaire	Required

## IV. CONCLUSION

Two e-training applications are presented and discussed. First, PoTrain is a Web-based application for training students to search and collaborate with other students or their teachers in order to distinguish and highlight positive news articles. Enhancing PoTrain functionality towards a) active involvement of the 'teacher role' (as a special user type) assisting students in developing useful skills and positive way of thinking and, b) search automatically on the Internet for spotting, suggesting and filtering positive news articles, are important directions for future work.

The e-TRAWELSPA e-learning platform relies on Moodle for supporting the development of innovative ICT-based content and services for lifelong learning in regards to SPA services. Developing more interactive and customized e-learning courses is an important next step in future developments of the system.

## ACKNOWLEDGMENT

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<sup>15</sup> [http://docs.moodle.org/22/en/Assignment\\_module](http://docs.moodle.org/22/en/Assignment_module)

<sup>16</sup> [http://docs.moodle.org/22/en/Chat\\_module](http://docs.moodle.org/22/en/Chat_module)

<sup>17</sup> [http://docs.moodle.org/22/en/Forum\\_module](http://docs.moodle.org/22/en/Forum_module)

<sup>18</sup> [http://docs.moodle.org/22/en/Feedback\\_module](http://docs.moodle.org/22/en/Feedback_module)

<sup>19</sup> [http://docs.moodle.org/22/en/Survey\\_module](http://docs.moodle.org/22/en/Survey_module)

<sup>20</sup> [http://docs.moodle.org/22/en/Quiz\\_module](http://docs.moodle.org/22/en/Quiz_module)

<sup>21</sup> [http://docs.moodle.org/22/en/Lesson\\_module](http://docs.moodle.org/22/en/Lesson_module)