PBL WORKING ENVIRONMENT: AN EXPERT SYSTEM TO LEARN THE PROBLEM-BASED LEARNING PEDAGOGY

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Problem-Based Learning (PBL) is perhaps the most innovative instructional method conceived in the history of education. The PBL is a student-cantered pedagogy where learners are actively engaged in real world problems to solve or challenges to meet. Students develop problem-solving, self-directed learning and team skills.

The Problem-Based Learning

The modern history of PBL begins in the early 1960s at the medical school at McMaster University in Canada. Its effectiveness in facilitating student problem-solving and self-directed learning skills has been widely reported in medical education. PBL has also become increasingly popular across disciplines in higher education and K–12 education settings. But, until recently the PBL approach has flourished mainly in medical and professional schools. Slowly the sciences in general have begun taking it up, and even more slowly, the humanities.

The research results on the effects of PBL on learners performance showed that in terms of short-term retention, no difference was found between PBL and traditional learners. However PBL learners consistently outperformed traditional students on long-term retention assessments. In fact the PBL has shown a positive impact on learners' abilities to apply basic science knowledge and transfer problem-solving skills in real world professional or personal situations. The main advantages of PBL pedagogy can be resumed as follow:

1. PBL enhances potential value of real world problems in terms of sustained learning and potential impact on interest;
2. learners don't develop knowledge but capacities to apply knowledge in working context;
3. learners develop deep Problem-solving skills;
4. learners experience self-directed learning skills and team

skills (needed in their professionals lives);
5. students personal involvement is enhanced;
6. fulfilment of tasks and duties is focused on real activities.

PBL working environment

The on line PBL working environment represents the main product of the SCENE project. SCENE "ProfeSsional development for an effeCtive PBL approach: a practical experiENce through ICT-enabled lEarning solutions" (www.sceneproject.eu) is a two years and half project (from January 2012 to June 2014) co-funded by the European Lifelong Learning Program (Key Activity 3: ICT).
The SCENE project aims to prepare headmasters and teachers in European secondary and vocational schools to use Problem-Based Learning (PBL) pedagogy effectively by developing an innovative on line learning environment.
SCENE PBL working environment is an integrated virtual tool, which consists of three distinct elements (e-learning platform; Virtual Facilitator; PBL repository). It allows teachers, trainers, and headmasters/school managers to understand the PBL approach and to be able to apply it efficiently in classroom. With the PBL working environment users can:

• learn the PBL pedagogy by practicing it with an on line course delivered through the inductive method focused on virtual tasks participants have to accomplish (E-learning platform);
• benefit from a guidance and support service after the course attending thanks to a virtual intelligent system (Virtual Facilitator) expert in PBL;
• share problem scenarios and projects of different subjects of studies and with different characteristics uploaded and downloaded in the PBL repository.

Figure 1. "PBL working environment" home page

1. E-Learning Platform and on line course

The SCENE on line course is delivered through the e-learning Platform, created by using the Chamilo open source Learning Management System (LMS).

The SCENE e-course is entitled "Problem-Based Learning in secondary and vocational schools: a student-centered pedagogy based on real-world experiences" and includes 5 modules: Module 0: Familiarization & Socialization; Module 1: Self-reflection and introduction to PBL; Module 2: Designing a Problem Scenario; Module 3: Assessing a Problem Scenario; Module 4: Managing a Problem Scenario.

The SCENE course training methodology, based on a constructivist approach, is the inductive method. It allows learners to experience PBL methodology, by practicing it stage by stage, and then learn to turn practice into theory by abstracting their experience to build a theoretical understanding.

According to the Inductive learning approach each module includes Practical and Theoretical contents. Participants start each module by benefiting from the practical multimedia contents and tasks; following they have the opportunity to reflect on their actions and generate understanding by benefiting from multimedia lessons and lecture notes (Theoretical Learning Objects).

The course total duration is 64 hours. The Practical Session lasts

40 hours and includes links to web interesting documents, articles, videos (as case studies of different subject areas), assignments, and online discussions in national/international virtual classrooms customised each user (teacher, trainer or headmaster/vocational school manager). During these practical sessions (delivered through a virtual forum) the participants are expected to accomplish tasks and solve different problem scenarios according each own subject of study.

National virtual classrooms are arranged among each target group participants (teachers /trainers, and headmasters/school managers) to promote the reflection, discussion, synthesis and integration of the achieved results from practical exercises. As added value at least three international virtual classrooms are arranged among course participants of different countries to allow the sharing of knowledge and experience across national boundaries.

The Theoretical Session of the course lasts 24 hours and includes in-depth study of problem based learning's guiding ideas, main principles, and its theoretical knowledge base (Lecture Notes and Multimedia Lessons).

SCENE partners decided to develop a specific training path for headmasters and vocational school managers. This course has been developed taking into account their specific and actual needs such as the reduced time available and the less flexibility to take part in training courses. In detail, it includes the following modules: Module 0: Familiarization & Socialization; Module 1: Self-reflection and introduction to PBL; Module 2: Designing a Problem Scenario; Module 3: Assessing a Problem Scenario; Module 4: Managing a Problem Scenario; Module 5: Towards a "constructivist school"; Workshop for the PBL promotion in within the school; Research Materials.

2. Virtual Facilitator

Generating the proper scenario is the most critical aspect of problem-based learning. The scenario must invite genuine inquiry and it drives learners to determine what they think they know about the described event, what they will need to know in order to identify problems and how they'll investigate the problem. The design and implementation of appropriate scenarios are central to effective problem-based learning. For this reason, after benefiting from the on line course (e-learning platform) the teachers, trainers

and headmasters/vocational school managers have the opportunity to apply the PBL with their students creating their own problem scenario, but they aren't alone. As "newbies PBL facilitators" the SCENE PBL working environment offers them a further support: the Virtual Facilitator. It is an expert system who guides the teachers, trainers and headmasters/vocational school managers, who (after the course benefiting from) want to apply the PBL methodology, just learned, with their students. We believe that as "newbie PBL facilitators" they need support and guidance from a PBL expert. Thus, the Virtual Facilitator provides a further and pivotal service (in addition to the SCENE e-course) for who wants to use the PBL, featuring two main roles:

> I. ADVISOR: providing tips and hints on how correctly design a problem scenario;
> II. PROFILER: by asking questions to collect data on user's specific needs, the Virtual Facilitator is able to provide a/or more suitable example(s) which match as closest as possible the teacher/ trainer need.

3. PBL repository

The third element of the PBL working environment is the PBL repository, strictly connected to the Virtual Facilitator. It is a sharing area where teachers, trainers and headmasters/vocational school managers can upload their own PBL scenarios/projects and download the others. In particular the PBL repository aims to contain a lot of projects/problems scenario enough to cover all the target group needs.

The Virtual Facilitator role is to retrieve project examples, uploaded in the PBL repository, from a growing set and provide it/them to the teacher/trainer, who are asking its support. This/these project(s)/problem(s) is/are the closest example to the teacher/trainer really needs.

Once the LMS becomes self-sustaining by the end of the project and is opened to the public, the repository aims at becoming a reference to those teachers and trainers who want to find problem scenarios/projects for delivering PBL sessions to their students. This will guarantee a real sustainability of the system also after the project lifetime.