ORIGIN AND FUTURE PERSPECTIVE OF THE PROBLEM-BASED LEARNING (PBL) PEDAGOGY

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ABSTRACT

The profession of teaching is becoming more and more complex at all levels. Teachers, trainers, and university professors need to find always innovative and creative tools and methods to involve students in the learning process. The constructivist-inspired teaching versus more structured (also often qualified as traditional) teaching is a key factor for educational context. Problem Based Learning (PBL), which is based on a constructivist approach, is perhaps the most innovative instructional method conceived in the history of education. It is a student-centered pedagogy where learners are actively engaged in real world problems to solve or challenges to meet. The article describes the Problem Based Learning pedagogy exploring its opportunities and further development, starting from its origin and history including new integrated solutions supported by ICT tools: the PBL working environment. It wants to provide teachers and trainers innovative tools to experience the PBL and get practical guidance and support to apply it in classroom.

KEY WORDS: Active Learning, Constructivism, Problem Based Learning, Virtual Learning Environment, 21st Century Skills

TEACHING PROFESSION MAIN CHALLENGES

The profession of teaching is becoming more and more complex. The quality of education and training, and with it the quality of Teacher Education is one key factor in determining whether the European Union can increase its competitiveness (Communication from the Commission to the Council and the European Parliament COM (2007) 392 final, “Improving the Quality of Teacher Education”). The changing in teaching profession, and further needs of teachers to be equipped with a waste range of new and emergent skilled depend on the society itself development and emergent challenges from different point of views, technological economic and sociological.

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Nowadays, classrooms contain a more heterogeneous mix of young people from different backgrounds and with different levels of ability and disability (OECD’s Teaching and Learning International Survey TALIS, 2010). Additionally, as well as imparting basic knowledge, teachers and trainers are also increasingly called upon to help young people become fully autonomous learners by acquiring key skills, rather than memorising information.

Hence, teachers and trainers have also be able to answer to learners emerging needs. They are required to use the opportunities offered by new technologies and to respond to the demand for individualised learning. They may have to take on additional decision-taking or managerial tasks consequent upon increased school autonomy. So, they are asked to develop more collaborative and constructive approaches to learning and expected to be facilitators and classroom managers rather than ex cathedra trainers. These new roles and tasks require education in a range of teaching approaches and styles and to improve the quality of the whole cycle of teacher education, from initial education to their continuous professional development, is a key factor of the European Commission policies agenda.

In a OECD survey (OECD’s Teaching and Learning International Survey TALIS, 2010), almost all European countries report shortfalls in teaching skills, and difficulties in updating teachers’ skills. Shortages relate especially to a lack of competence to deal with new developments in education (including individualised learning, preparing pupils for autonomous learning, dealing with heterogeneous classrooms, preparing learners to make the most of the ICT, and so on). In detail, the challenges facing the teaching profession are common across the European Union:

- well-qualified profession: all teachers are graduates from higher education institutions;
- profession of lifelong learners: teachers are supported to continue their professional development throughout their careers;
- mobile profession: teachers are encouraged to work or study in other European countries for professional development purposes;
- profession based on partnership: teacher education institutions organise their work collaboratively in partnership with schools, local work environments, work based training providers and other stakeholders.

Initial education cannot provide teachers with the knowledge and skills necessary for a life-time of teaching. The teachers professional development in a lifelong learning perspective is the only answer by allow them to:

- take part in an effective programme of induction during their first three years of career;
- have access to structured guidance and mentoring throughout their career;
- to be supported throughout their careers to develop their competences via formal, informal and non-formal means, and are able to have their relevant formal and non-formal learning recognised (Communication from the Commission to the Council and the European Parliament COM (2007) 392 final, “Improving the Quality of Teacher Education”).

To identify the most relevant specific training needs of teachers for their professional development, it is necessary to analyse the research literature and surveys on teaching effectiveness. In
particular, according to the Eurydice report about the teaching profession in Europe (Eurydice, 2003) the teachers’ perceived need for professional development is mainly related to the following topics: ICT teaching skills, teaching methods, management/school development, special needs, multicultural teaching and conflict/behaviour management. In many European countries teaching methods and instructional strategies of subject areas, ICT and integration of ICT in teaching are perceived from teachers as pivotal for their profession.

According to the TALIS survey (OECD’s Teaching and Learning International Survey TALIS, 2010): “Professional development is defined as activities that develop an individual’s skills, knowledge, expertise and other characteristics as a teacher”. The quality of teaching depend on different variables but according the more recent research literature three of the teacher characteristics deserve particular attention (OECD’s Teaching and Learning International Survey (TALIS), 2010).

The first is pedagogical content knowledge, defined as “subject matter knowledge for teaching” including knowledge of tasks, knowledge of students’ prior knowledge, knowledge of instructional methods (Krauss et al. 2008, pp. 716-725).

The second concerns teacher preference for either a more direct, structured approach to teaching or a constructivist approach. The constructivist-inspired teaching versus more structured (also often qualified as traditional) teaching is a key factor for educational context. According to the constructivism point of view, the student has an active role in his/her learning process (active learning): learning is self-regulated with lots of opportunity for discovery and students’ interpretation of events by applying learning situations such that students are invited to engage in sustained exploration of real-life content or simulated environments (learning from cases) and/or “rich” artificial environments simulated by means of interactive media (Cohen, 1988).

Third, the teachers’ sense of self-efficacy is also pivotal for the quality of teaching. There is a positive relationship between teachers’ beliefs about their efficacy and student achievements in core academic outcomes. Finally, these results underline the importance of motivation in teachers’ work.

**THE PROBLEM-BASED LEARNING (PBL) RESPONSE**

The Problem Based Learning (PBL) is perhaps the most innovative instructional method conceived in the history of education (based on a constructivist approach). It is a student-cantered pedagogy where learners are actively engaged in real world problems to solve or challenges to meet.

The PBL is an instructional methodology in order to learn to solve problems. It is based on the assumption that “when we solve the many problems we face every day, learning occurs” (Barrows, Tamblyn, 1980, p. 1). PBL is any learning environment in which the problem drives the learning. That is, before the users learn some knowledge they are given a problem. The problem is posed so that the users discover that they need to learn some new knowledge before they can solve the problem.

PBL basic motivation consists on the fact that trainees develop the ability to use facts (knowledge) to solve problems. They do not learn about problems but they are challenged by them in order to find out solution to solve them. Knowledge is considered as a mean not as a final achievement.
What is changing in a PBL approach is the angle, the assumptions of the teaching activity: neither a pure lecture based training activity or a practical on the job training, nor a work based training but a learning strategy which exploits cognitive and metacognitive approach. PBL offers the opportunity for moving beyond content acquisition and achieve effective knowledge exploitation.

The main characteristics of the PBL pedagogy are the following:

- Problem focused: the content and skills to be learned are organised around problems, rather than as a hierarchical list of topics. The users begin to learn by addressing simulations of an authentic, ill-structured problem.
- Learner-centered, because they actively create their own knowledge.
- Self-directed, because the learners individually and collaboratively assume responsibility for generating learning processes through self-assessment and peer assessment and access their own learning materials.
- Self-reflective, because the learners monitor their understanding and learn to adjust strategies for learning.
- Tutors are facilitators who help and support reasoning processes, facilitate group process and interpersonal dynamics and never interject content or provide direct answers to questions.

Problem-based learning was first developed in medical education in the 1950s. The development of PBL is generally credited to the work of medical educators at McMaster University in Canada in the 1970s. Moreover the others medical schools developed this pedagogy in the same period, such as the Michigan State University in the United States, Maastricht University in the Netherlands, and Newcastle University in Australia (Barrows, 1996, pp. 3-12). Thomas Corts, president of Samford University, has seen PBL as “a newly recovered style of learning”. In his view, it embraces the question-and-answer dialectical approach associated with Socrates as well as the Hegelian thesis-antithesis-synthesis dialectic. As John Cavanaugh puts it: “It's like discovery-based learning in the 1960s. We knew about it; we didn't do it. Dewey talked about it when he talked about ‘engagement.’ Dewey had it right on the abstract level. We do the details better now, that's all, and that's because of advances in cognitive science and in technology” (Rhem, 1998).

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. PBL does not have a store of transferable techniques or methods like Cooperative Learning, no jigsaw, no think-pair-share or that sort of thing. Opinions vary on whether PBL should be implemented for entire courses or whether it can be used merely to teach certain parts of courses. In general, advocates accept faculty easing into the approach piecemeal, but favour course-long continuity.

**Main Advantages of the PBL Pedagogy**

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 (Gallagher Shelagh, Stepken William, 1996, pp. 257-275). 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 through the following points:

- PBL enhances potential value of real world problems in terms of sustained learning and potential impact on interest;
- learners don't develop knowledge but capacities to apply knowledge in working context;
- learners can develop deep Problem-solving skills;
- learners can experience self-directed learning skills and team skills (needed in their professionals lives);
- students personal involvement is enhanced;
- fulfilment of tasks and duties is focused on real activities.

Barrows (Barrows, 1996, pp 3-12) stated the minimal requirements for a PBL course, both in medical issue and other subjects, as follows:

- learners must have the responsibility for their own learning;
- the problem simulations used in problem-based learning must be ill-structured and allow for free inquiry;
- learning should be integrated from a wide range of disciplines or subjects;
- collaboration is essential, learners must be encouraged to collaborate during their self-directed study;
- what learners learn during their self-directed learning must be applied back to the problem with reanalysis and resolution;
- a closing analysis of what has been learned from work with the problem and a discussion of what concepts and principles have been learned essential;
- self and peer assessment should be carried out at the completion of each problem and the end of every curricular unit;
- the learners must become proficient in assessing their individual learning process and that of their peers;
- the activities carried out in problem-based learning must be those valued in the real world;
- learner examinations must measure learner progress towards the goals of problem-based learning;
- problem-based learning must be the pedagogical base in the curriculum and not part of a didactic curriculum.
**Project-Based Learning (PBL) teaches several strategies for success in the twenty-first century. Students drive their own learning through inquiry, and they work collaboratively to research and create projects that reflect their knowledge. They become proficient communicators and advanced problem solvers.**

The genesis of PBL is an inquiry. Students develop a question and are guided by teacher through research. The result is illustrated by creating a project to share with a select audience. PBL is a key strategy for creating independent thinkers and learners. Students solve real-world problems by designing their own inquiries, planning their learning, organizing their research, and implementing a multitude of learning strategies.

PBL takes place according to a set of sequential stages: firstly, students prepare an inquiry question; then they brainstorm best strategies to research and identify most appropriate materials; next, they choose the way to display the result of their learning and a target audience; finally, they evaluate not only their learning, but also the success of their social interactions, their communication skills, other students' ideas, and their own opinions.

PBL results on learning responsibility, independence, and discipline. In the same time, PBL promotes social learning as students practice and become proficient with the twenty-first-century skills of communication, negotiation, and collaboration. The element of choice is also crucial for students' success, as well as scaffold instruction. On their research, students can use technologies as a tool to engage students in real-world tasks. Students learn from their processes and they reflect on their collaboration and negotiation abilities, as they evaluate their own projects, efforts, motivations, interests, and productivity levels. Students become critical friends by giving constructive feedback to each other, which helps them become aware of their own strengths and improve on their interactions with each other.

**European and Worldwide Best Practices on the Use of PBL**

European context is widely embracing problem-based learning (PBL) as it is considered a successful and innovative method for education. The PBL is widely diffused in medicine and science topics. Besides, it has been introduced in some European engineering education, which in comparison to traditional engineering curricula, the PBL models are regarded as inspiring a higher degree of involvement in learning activities and higher level of complex comprehension. Additionally, to minimize any drawbacks regarding possible gaps in specific knowledge areas, it is suggested that PBL students become lifelong learners who have learned to take responsibility for their own learning process.

Furthermore, considering the actual political conjuncture, European interdependence is leading to policy dimensions that transcend national borders. It is originating an increasing demand for people with problem-solving abilities. A growing number of organizations are expected to look for skilled professionals, who are able to work easily abroad. For this reason, it is important to inform and train students and professionals to enable them to overcome barriers, when facing
other European countries context particularities, related to national structures, institutions and practices. The Maastricht University is a good example of problem-based learning implementation on Master of European Public Affairs Course. Their aim is to combine the knowledge base and methods of scientific disciplines with the skills needed to solve specific problems.

PBL Project is widely implemented in The USA. From there, we have successful examples of several PBL projects that have been taken place, for example at New Utrecht High School in Brooklyn, New York, in the Academy of Hospitality and Tourism. In a math class at City Arts and Technology High School in San Francisco, at Beachwood High School in Ohio, where students in Marketing class produce a showcase at the Community Center designed to raise awareness of environmental responsibility. With 11th grade students of Humanities class, at the ARISE Academy in Oakland, California, who developed an experience a multifaceted project focusing on the question, “What creates change and a movement?” (Larmer, Mergendoller, 2010, pp 34-37). Facing the examples of PBL successful implementation, it is being implemented throughout higher education, as well as in K-12 education. PBL has been applied in a variety of professional schools, such as architecture, business administration, chemical engineering, engineering studies, law schools, leadership education, nursing, social work and teacher education (Hung, Jonassen, Liu, 2008, pp. 485-506). Besides, Moust et al. (2005, cit. in Hung, Jonassen, Liu, 2008) reported that PBL is also often integrated into a wider range of disciplines, from biology to chemists and psychology, among others.

PBL curricula and teacher-training programs for all high-school core subjects were developed by Barrows and Kelson (1993, cit. in Hung, Jonassen, Liu, 2008, pp. 485-506). when they introduced PBL into K-12 education. From this moment on, a number of scholars and practitioners have been promoting PBL use in basic education. In fact, results of PBL implementations have demonstrated to be effective in conveying a variety of content areas (math, science, literature, history, microeconomics). On the other hand, PBL has been implemented effectively in schools in urban, suburban and rural communities and it is effective in a wide variety of student: elementary, middle & high school students, as well as low-income students (Hung, Jonassen, Liu, 2008, pp. 485-506).

PBL AND ICT

Some researchers expressed that PBL problems brought up by paper or oral presentation does not provide sufficient contextual or environmental information to enable students to recognize salient visual, auditory, or nonverbal cues that are crucial in some professions. So, PBL effectiveness can be strongly influenced by Multimedia. An appropriate modality to present learning problems can play a significant role in enhancing students’ problem-solving skills in their fields. Such abilities are one of the focuses of PBL curricula, when training students. Besides, the multimedia-enhanced PBL class showed a significantly higher level of motivation to learn as well as retention of knowledge than did the traditional class (Hung, Jonassen, Liu, 2008, pp. 485-506).

In 2006, The International Research Seminar on Innovating Problem Based Learning through ICT at Aalborg University in Denmark highlighted the link of Problem-based-learning and ICT. The
basis for this research seminar was a number of European projects on ICT and development. From these, the need to rethink teaching and learning and to introduce forms of problem based learning (PBL) especially in developing settings arose. Three major European projects, were presented: 1) The European and Latin American Consortium for IST Enhanced Continued Education in Environmental Management and Planning (ELAC), which is a demonstration project within the EU @LIS-programme and has eight partners from Europe and Latin America; 2) The Mediterranean Virtual University (MVU) which is a collaborative venture between leading institutions in the Mediterranean area and the University of Strathclyde in Scotland and Aalborg University, Denmark, building a network to collaboratively develop and deliver high quality online university courses. 3) The seminar relation to Kaleidoscope, a European Network of Excellence on Technology Enhanced Learning, especially the European Research Team on Conditions for productive learning in Networked Learning Environments (Dirckinck-Holmfeld, 2009, pp. 485-506).

When studying the effects of Internet technology on students’ learning in PBL, Barrows and Orrill (2002, cit. in Hung, Jonassen, Liu, 2008) argued that online environments seemed to fail on fostering collaborative learning, due to unsophisticated and heavy technology. However, the positive effects are mainly highlighted, as for Reznich and Werner studies (2001, cit. Hung, Jonassen, & Liu, 2008), which revealed a general positive effect, especially on the discussion process, when tutors guide students to use electronic resources. One of the most important conditions for learning to occur in multimedia PBL environments is to ensure that PBL should take place in an authentic context to help students encode specificity of information. To overcome this limitation, a prototype of Virtual PBL (VPBL) was developed (Bowdish et al., 2003, cit. in Hung, Jonassen, & Liu, 2008) to facilitate the PBL process by incorporating multiple modalities (including digital video, images, text, questions, and text boxes) to present problem scenarios. In the medical context VPBL environment allowed the students to observe the patient-doctor interactions.

**PBL Within the Educational System**

While it is possible to do PBL in almost any school environment, it is most feasible and most effective when certain school conditions are in place (Larmer, Mergendoller, 2010, pp 34-37). Moreover, teachers need to be prepared to implement PBL. “PBL provides an opportunity for educators to redefine the nature of learning and, in turn, reposition their roles in teaching from a knowledge/information transmitter to a learning/thinking process facilitator” (Hung, Jonassen, Liu, 2008, p. 493). This shift requires PBL tutors reconsider their educational roles. The PBL tutor must balance a degree of participation in students’ learning processes and refrain from the temptation to lecture. The effective communication skills are the necessary assumption for effective tutoring. Tutor’s authentic interactions are revealed in their ability to communicate with students informally while maintaining an empathetic attitude. In addition, effective tutors must be willing to be actively involved with students (Hung, Jonassen, Liu, 2008, pp. 485-506).

PBL prepare students for problem solving and continuous professional development is required for all professions, including trainers and teachers. Self-directed learning, drawing on previous
experiences, valuing learning that integrates into their everyday life and preferring problem-centered learning, learners identifying their own learning objectives, and identifying resources and devising strategies to use them. These assumptions and guidance are integral to learning through PBL, and moreover prepare the student for problem solving and continuous professional development.

PBL model needs schools and classrooms preparation. This preparation must be done in the School level, so that PBL could be consistently and successfully implemented. Moving from individual schools to mass implementation of main course PBL will require vision and leadership at the district, state and eventually, the national level. An example from the USA-West Virginia a multi-faceted initiative to better prepare students to meet 21st century educational goals, by redesigning West Virginia school. It has implied rethinking and revising state standards and assessment, teacher credentialing and professional development. They have included relying on wikis and other technologies to share information, disseminate approved project designs and support teachers, West Virginia educators and students (Larmer, Mergendoller, 2010, pp. 34-37).

THE “PBL WORKING ENVIRONMENT”:
AN EXPERT SYSTEM TO LEARN THE PBL

The on line expert system PBL working environment represents the main product of the SCENE project coordinated by the Interuniversity Consortium FOR.COM. 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.

The SCENE PBL working environment is an expert system, which consists of three distinct components (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 teachers, trainers, and headmasters/school managers 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 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

Would you like to learn the PBL pedagogy by practicing it?
Is it the first time you apply the PBL in your classroom?
Or you know the PBL but you are not enough expert to use it properly.
Would you like to get new ideas and suggestions to design problem scenarios for your subject?
Would you like to share and compare your PBL experiences?

The "PBL WORKING ENVIRONMENT" IS ALL OF THESE THINGS.

The PBL WORKING ENVIRONMENT allows you to:

- EXPERIENCE the PBL by conducting practical activities and then abstract the experience to be a theoretical understanding.
- GET PRACTICAL ADVICE on how to design problem scenarios and manage your PBL classroom.
- GET PROPER EXAMPLES of problem scenarios for different concepts and subject areas.
- Learn from others peers' experience by SHARING YOUR PROBLEM SCENARIOS.

Figure 2. PBL working environment introductory page
The E-Learning Platform is created by using the Chamilo open source Learning Management System (LMS). The e-course is entitled Problem-Based Learning in secondary and vocational schools: a student-centered pedagogy based on real-world experiences (Bastos, Correnti, Dias, Mergendoller, 2012) 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 course training methodology (Correnti, Dias, Edirisingha, Feituri, Mergendoller, 2012) 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. Thus, the Inductive method of learning as part of the constructivist approach to learning allows students to be actively engaged in tasks and to build knowledge on the base of experienced practical examples. 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. This process encourages them to connect their new knowledge and their existing knowledge, thus extending their theoretical understanding (action \rightarrow \text{reflection} \rightarrow \text{new knowledge}).

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 need to know in order to identify problems and how they investigate the problem. For this reason, the expert system offers users a further service for those who want to apply the PBL with their students creating their own problem scenario. The SCENE PBL working environment offers them the Virtual Facilitator support and guidance. It is a virtual expert in PBL (that acts as a real human expert in PBL) by guiding teachers, trainers and professors who (after the course benefiting from) want to apply the PBL methodology, just learned, with their students. 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.

The Virtual Facilitator interviews the user which answers allow the Virtual Facilitator to profile their target group providing tips, scenario examples to best conduct PBL sessions. The Virtual Facilitator allows to further customize the SCENE training services since by profiling each user is able to provide specific support according to each user profile (subject of study, age of students, specific skills they want to develop, etc.).

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 help/support. This/these project(s)/problem(s) is/are the closest example to the teacher/trainer really needs.

**Conclusion**

The expert system PBL working environment was born starting from the emergent need to improve the teachers, trainers and all actors of the educational context who have to overcome the emergent challenges of the teaching profession. Teachers and trainers are required to use the opportunities offered by new technologies and to respond to the demand for individualised and practical learning. The constructivist approach requires students to work actively to build their own understanding instead of passively listening lectures. The Problem Based Learning (PBL) is perhaps the most innovative instructional constructivist approach conceived in the history of education. To train teachers, trainers and all educational actors on the PBL pedagogy could be an important step to modernise the educational system toward a constructivist school.

Starting from these pivotal assumptions the expert system PBL working environment wants to provide teachers and trainers innovative tools to learn the PBL. Following the same principles of the constructivist approach It allows users to experience and practice the PBL through an on line course where participants, according to the inductive learning approach, accomplish several tasks built on real-world cases and following they can infer the theoretical knowledge; the Virtual Facilitator provides an additional guidance and support service to Newby Facilitators (just learned and/or not enough expert on PBL) who want apply the PBL with their students. Designing a problem scenario is a pivotal step for applying the PBL successfully. The Virtual Facilitator provides useful and practical tips on the different steps of the PBL and the user one or more examples of scenarios/projects that best fit with his/her specific need by retrieving them from the PBL repository. Moreover, the PBL repository allow users to share problem scenarios and projects of different subjects of studies and with different characteristics.

The expert system aims to be the benchmark for those who want to learn the Problem-Based Learning pedagogy autonomously or those who already knows the PBL main principles but need a further support and guidance or simply those who apply the PBL regularly in classroom but want to share projects and suggestions with other teachers to improve their practice and find new ideas.

The designing of a genuine problem scenario is essentially linked to the teachers creativity but we believe that the personal creativity have to be enriched and cultivate thanks to the comparison and sharing of experiences with pears.

The PBL working environment is open to the public (asking the personal credentials to the system administrator: info@sceneproject.eu). The future prospective of the expert system PBL working environment is to be continually improved and enriched by its users who, by filling up the PBL repository with different scenarios in different languages, provide the Virtual Facilitator with a higher number of problem scenarios examples to retriever. Then, the Virtual Facilitator will became more and more efficient.
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