

ICT Supported Learning Approaches For Companies

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Abstract:

Small and medium sized companies (SMEs) assure economic growth in Europe. Generally many SMEs are struggling to survive in an ongoing global recession and often they are becoming reluctant to release or pay for staff training. In this paper we present shortly the learning methods in SMEs particularly the Problem Based Learning (PBL) as an efficient form for SMEs and entrepreneurship education. Within a European project with the authors as partners PBL is used. Information and communication technologies (ICT) support the tutors by using an ICT platform which is in the development.

Keywords

SME, e-Learning, PBL, ICT.

1. LEARNING IN SMEs

Small and medium sized companies (SMEs) assure economic growth in Europe [8]. The financial crisis and the economic recession have hit SMEs hard in the Europe 28 (EU28) and the economic conditions remain difficult. Many of these companies are micro enterprises, having few resources and difficulties in facing technological, economic and financial changes.

Referring learning, the most popular form of learning in SMEs is the informal one, which accounts for over 75% of the learning taking place in organizations today. Informal learning is the unofficial, unscheduled, impromptu way people learn to do their jobs. Most learning does not occur during formal training programmes. It happens through processes that are not structured or supported by an employer or an organized formal course. [2], [9]. Most companies, however, focus on and recognize only formal learning programs, losing valuable opportunities and outcomes.

Blended learning can combine the positive aspects of different learning approaches, classroom-based learning and e-Learning, formal and informal ones [6], [13]. By mixing learning styles and different dimensions of learning suitable for SMEs at the course level the usage of blended learning opportunities as a suitable way to learn in SMEs could be improved and so this increases or keeps up competitiveness/surviving of the companies.

The term blended learning is used in the literature for a combination of traditional off-line methods of

learning with online methods (i.e. web-based ones) [13]. Within blended learning, classroom based learning is combined with computer-mediated instructions [10], [11], but also various event-based activities (face-to-face class rooms, live e-Learning, self-paced learning) are combined.

Important aspects of SMEs blended learning could be self-paced learning, mix of methods and media, quality, time flexibility, learner-centered, motivation, flexibility, accessibility and workplace-related learning.

The trainees have the possibility to choose when they study, distance and schedules becoming irrelevant. The students are not required to take into account each other's time restrictions, can also choose content necessary to their tasks. In some projects like SIMPEL [4], the use of e-learning in SMEs has particularly analyzed. The conclusions were that *properly developed training based on e-Learning not only contributes to improve competences of SME staff, but also to create a growing repository of knowledge.*

This knowledge can be continuously provided to employees at a determined time. E-Learning has a great potential for the expansion of educational opportunities but it is to consider that "social presence is a strong enabler of satisfaction also in a computer conference" [14].

Results of projects show that SMEs are restricted in the efficient use of different forms of learning and ICT for learning and in adequate management learning approaches [4]. In the following we present the *Problem Based Learning (PBL) as an efficient form for SMEs and entrepreneurship education and its ICT support* [1], [12].

PBL should be adopted outside academic contexts i.e. as an excellent method of training for SMEs. It allows the learner to develop skills relevant to the needs of the company, it is conducted in a work based environment, it provides them with the skills to sustain the company beyond the initial training, it is low cost and it directly solves problems for the SME providing an immediate return [11]. Donnelly [12] highlighted that little is known about the use of technology in PBL.

2. PBL

Problem Based Learning (PBL) is an educational strategy introduced at McMaster University, Canada in 1969 [6]. *PBL strategy uses real problems to motivate staff and students learning.*

The PBL rationale is compatible with modern educational principles and approaches which will lead to the achievement of the following objectives [7]:

- 1) Better acquisition and retrieval of Knowledge related to context and integrate many disciplines.
- 2) Motivate the students, and provide responsibility of learning
- 3) Develop the ability of self-learning and metacognition
- 4) Adapt the learning needs of the students
- 5) Develop the skills
- 6) Develop interpersonal skills, the ability to work in team

Many factors are needed in order to achieve a successful PBL that leads to achievement of acquisition of retrieval knowledge. Those factors are:

- 1) Prior knowledge and its activation are very important for achievement and increasing the interest in the subject matter.
- 2) Well-constructed problem will stimulate discussions and will increase the time spent in the tutorial group and in self-study.
- 3) Competences and behavior of the tutor that maintains the discussion to the context of the problem
- 4) Student self determination
- 5) A well-functioning team
- 6) Group Dynamics

Educational theory / Element	Application in PBL
Information processing	Students use their prior knowledge to generate learning objectives. The learning regarding the problem will resemble the future situations in which the knowledge acquired will be applied. Students have the opportunity to expand and elaborate their gained knowledge.
Collaborative Learning	The tutorial group gives each student an opportunity to present what he/she finds from different resources during the self-learning process.
Self-determination	The students are motivated during the problem solving process by different factors, both intrinsic.
Control	In PBL, students define the objectives to be achieved, in a certain defined time.
Behaviorism	The problem will stimulate the students to learn (antecedent), students will acquire knowledge (behavior) and students will apply this knowledge to solve the problem (consequence).
Social Cognitive	Learning in PBL is due to interaction between the problem as a stimulus, the needs of the learner, the effectiveness of the tutorial group and the abilities of the student to compile the needed information from different resources and discuss these findings.

3. TEACHING PBL

Steps which will consider in our projects by teaching PBL and corresponding questions are [12], [14]:

1. Clarifying the task – The purpose of the first step is to explain the task, to agree on the meaning of the various words and terms and on the situation described in the problem. Knowledge possessed by the group members or retrieved from a dictionary can be used

Questions:

- Do you understand words, terms and notions?
- Do you agree on what they mean?

2. defining the problem - The group discuss and reach an agreement on the issues, which need explanation.

Questions:

- What are the problems?
- What are the sub problems?
- Select the problems/sub problems

3. Brainstorming - Aspects on basis of prior knowledge are collected and ideas to structure the problem are expressed. Explanations are arranged into tentative solutions.

4. Rating of Brainstorming outcomes

5. Formulating learning objectives to cover knowledge deficits - Group reaches consensus on the learning objectives; tutor ensures learning objectives are focused, achievable, comprehensive, and appropriate.

Questions

- What do you need to learn before you can solve the case problems?
- Write down the learning goals
- Where can you learn about it?

6. Self-study of the group participants. This phase offers students possibility to acquire a more profound knowledge of theories at the root of the problem. The group members collect information individually with respect of defined learning objectives. Information is collected from the literature but also from other sources (library, journals, internet etc.)

7. Rating of possible solutions and working out a final solution - Group shares results of private study. The tutor checks learning and may assess the group.

8. Reflection and feedback of all participants on the case, the process and the tutor, to improve the learning process. Also it is very important the students validate the course and give their comments on the quality of the problem as well as on the quality of the group process and the tutor's performance

Questions:

- What have you learnt?
- Use it for solving the case problem!

The tutors/trainers of the PBL group play a central role as a facilitator in the PBL process, guiding and supporting the students. They should know when to intervene or not in order to get the group working with their own resources.

The tutor / trainer has to check the understanding, ensure group achieves their learning goals, to encourage asking questions and explaining themselves, to introduce use of diagrams and drawings, to foster clinical reasoning and to provide feedback.

In PBL, students need to take a more active part in the organization of the process than in traditional lectures. Students more or less become each other's teachers. They are confronted with the study and evaluating of literature and data, and take responsibility for own learning success.

Referring the most efficient way for PBL to get students to grapple with the subject matter? How can students be held accountable for their work, one of the best methods of teaching will be blended learning.

4. ICT SUPPORT IN PBL

The European Erasmus+ project “Supporting PBL in entrepreneurial education and in small and medium sized enterprises (SMEs) through ICT facilitated mentoring – Archimedes” will develop a framework for organizational problem-based learning and supports the use of this form of learning.

It is expected that these approaches will be widely adopted in entrepreneurial education and SMEs. PBL will be supported by an ICT platform taking into consideration the PBL steps described below.

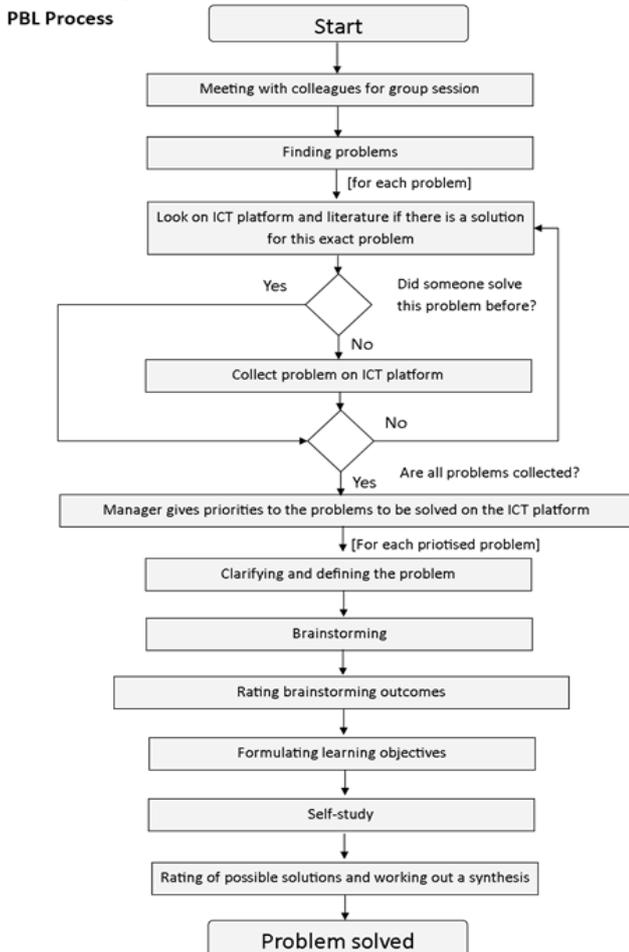


Figure 1. Flow chart of a PBL supporting ICT platform (source IAT)

Step2 - Defining the problem

The problem is that we sold too less printers of the type d4. We wanted to sell 40.000 and only reached 30.000 sold objects. We try to find an improvement of our marketing strategy to increase the amount of sold printers.

Step3 and Step4 - Brainstorming and analysing of possible solutions

Ideas

Idea	Created by	Rating
We invest in advertisement	admin	☆☆☆☆ (1) X
We decrease the price of the printer	admin	☆☆☆☆ (1) X
We enlarge our customer base	admin	☆☆☆☆ (1) X
We observe our competitors	admin	☆☆☆☆ (1) X

Enter an idea

Problem name *

Idea *

Created by *

Rating Number of votes: 0, Average: 0

Fields marked with an * are mandatory

Comments

Comment	Created by
We have to take more time to observe the market strategy of our competitors	Beana
I think the best strategy is to invest in advertisement	admin

Figure 2. Problem overview on the ICT platform

The platform is in development by using TikiWiki. TikiWiki, also known as Tiki, is an open source Content Management System (CMS). It provides many rich features like websites, forum, chat, wiki, blogs, quiz, calendar, document management, social software and many more. It is highly configurable and is mainly used in companies to organize tasks and to work collaboratively.

Tiki was used in some of our former project and has proven to be a good ICT solution for collaborative working and will be used as platform for PBL in the frame of the project Archimedes. The following figures show screenshots of the Archimedes ICT platform supporting PBL. *Implementation of PBL requires some changes in the curriculum of entrepreneurship education and trainers / teachers with special knowledge.*

Rooms should be available for group discussions and the libraries should contain references which allow students to research for their PBL cases.

Figure 3. PBL steps visualized on the ICT platform.

Step5 - Formulating learning objectives

Objective	Created by	Action
We have to analyse our competitors	admin	X
We have to calculate if we can save money for advertisement	admin	X

Enter a new learning objective

Problem name *

Objective *

Created by *

Fields marked with an * are mandatory

Step6 - Self-study

Enter a link or upload a file

Problem name *

Link

File(s)

Upload files

Drop files from your desktop here or browse for them

Keine Dateien ausgewählt.

Comment

Created by

Fields marked with an * are mandatory

Step7 - Working out a synthesis

Enter the synthesis here

Figure 4. PBL steps visualized on the ICT platform.

5. CONCLUSIONS

The paper present the learning methods in SMEs particularly the Problem Based Learning (PBL) as an efficient form for SMEs and entrepreneurship education and its ICT support.

The paper is based on the work within European Project Archimedes under Erasmus+ Programme, where PBL was apply and implemented in more companies from Ireland, Portugal, Romania, Lithuania and Germany.

Properly developed training based on e-Learning not only contributes to improve competences of SME staff, but also to create a growing repository of knowledge.

PBL strategy uses real problems to motivate staff and students learning.

The PBL rationale is compatible with modern educational principles and approaches which will lead to the achievement of more objectives that was presented.

Teaching PBL is under some specific steps which were considered in our projects.

In PBL, students need to take a more active part in the organization of the process than in traditional lectures.

PBL can be supported by an ICT platform taking into consideration the PBL steps described.

Implementation of PBL requires some changes in the curriculum of entrepreneurship education and trainers / teachers with special knowledge.

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Ileana HAMBURG, PhD, has worked for 20 years as a professor for Mathematics and Computer Science at the University of Craiova, Romania. In Germany she worked as a software developer for a company and as a researcher within the Faculty of Informatics at the University of Erlangen, Germany. She is a research fellow at the Institute for Work and Technology (IAT), Westphalian University of Applied Sciences and lecturer for Informatics at the Open University (FU) of Hagen. She works and coordinates German and European projects in the field of eLearning and knowledge management particularly for SMEs and people with special needs. She is an EU Evaluator for projects in different national and European initiatives. Dr. Ileana Hamburg is active on the program committees of a number of international conferences.

More than 140 articles and papers at internationales events, specially in the field of e-learning, leaning for SMEs. innovative e-learning solutions and environments for SMEs, mentoring and diversity coaching on the job, instant learning on demand and communities, readiness for knowledge management, methods and environments for innovation, supporting cross-border knowledge transfer through virtual teams, communities and ICT tools, learning solutions and social media based environments for companies.

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The September 2014 IAT presented the Net Knowing 2.0 Advance Course at the workshop organized by the network Wisnet with representatives of some companies which are interested to train staff by using the advance course. Sascha Bucksch acted as a trainer for the Module 1 of the Advanced Course.

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