
“Teaching methods of the future: E-Learning and Project Based Learning”

BEST Symposium on Education, Aalborg
21st – 28th August 2005



Summary

SUMMARY	2
PEOPLE INVOLVED	3
FACILITATORS.....	3
PROFESSORS.....	3
PARTICIPANTS.....	3
ABSTRACT - SUMMARY	4
INTRODUCTION – E-LEARNING / REVE	5
THE DISCUSSION	6
DISCUSSION GROUP 1.....	6
THE RESULTS OF DISCUSSION GROUP 1.....	8
DISCUSSION GROUP 2.....	8
THE RESULTS OF DISCUSSION GROUP 2.....	9
DISCUSSION GROUP 3.....	9
THE RESULTS OF DISCUSSION GROUP 3.....	12
CONCLUSIONS – E-LEARNING / REVE	13
INTRODUCTION – PROJECT BASED LEARNING	14
THE DISCUSSION	15
DISCUSSION GROUP 1.....	15
THE RESULTS OF DISCUSSION GROUP 1.....	16
DISCUSSION GROUP 2.....	16
THE RESULTS OF DISCUSSION GROUP 2.....	17
DISCUSSION GROUP 3.....	18
THE RESULTS OF DISCUSSION GROUP 3.....	21
CONCLUSIONS – PROJECT BASED LEARNING	22
CREDITS	23

People involved

Facilitators

Stefan Atanasiu (*Bucharest, Romania*)
Tzveta Dimitrova (*Sofia, Bulgaria*)
Amélie Vansteenkiste (*Ghent, Belgium*)

Professors

Chantal Van Oostenrijk (*Geel, Belgium*)
Patricia Keldermans (*Geel, Belgium*)
Ann Bygholm (*Aalborg, Denmark*)
Fink Flemming (*Aalborg, Denmark*)
Ian Semey (*Aalborg, Denmark*)
Helle Baekkelund (*Aalborg, Denmark*)
Palle Qvist (*Aalborg, Denmark*)

Participants

Stijn Baert (*Ghent, Belgium*)
M.Eugenia Garcia Benet (*Barcelona, Spain*)
Kristiana Daugava (*Riga, Latvia*)
Jekaterina Glinskaja (*Tallinn, Estonia*)
Mark Jonas (*Bratislava, Slovakia*)
Piotr Kepka (*Warsaw, Poland*)
Agata Klimek (*Gliwice, Poland*)
Vincent Layec (*ENSTA Paris, France*)
F. Javier Lucas Sanchez (*Valladolid, Spain*)
Sara Machado (*Porto, Portugal*)
Aljaž Osterman (*Ljubljana, Slovenia*)
Silva Palazzari (*Rome Tor Vergata, Italy*)
H. Ibrahim Saygili (*Istanbul, Turkey*)
Marietta Sionti (*Athens, Greece*)
Lina Vaitiekunaite (*Kaunas, Lithuania*)
Vladimir Vakashinski (*Sofia, Bulgaria*)
Oksana Zastavna (*Lviv, Ukraine*)
András Zsuppán (*Budapest, Hungary*)
Slaven Žilić (*Zagreb, Croatia*)

Abstract - Summary

A BEST Symposium on Education is a public event of the Board of European Students of Technology. This event creates a forum in which students from all over Europe can meet for one week, and state their opinions on hot topics of education during roundtable discussions.

A BEST Symposium on Education, is a public event, organised by Board of European Students of Technology. This event creates a forum in which students from all over Europe can meet for one week and state their opinion on hot topics related to education during roundtable-discussions.

This Symposium was organised together with the Educational Project ReVE, which is funded by the European Commission. The topic of the Symposium was teaching methods for the future, especially focussed on "*e-learning / ReVE*" and "*Project Based Learning*" (both topics will be explained later, under the introduction for the working sessions).

A Symposium is mainly run by the Educational Committee of BEST (EduCo), and the hosting Local BEST Group, in this case Aalborg. During the Symposium the discussions were held in three groups all facilitated by EduCo members and notes were taken by BEST members.

During the working sessions, each group received valuable input from one of the professors.

At this Symposium the participants consisted of 18 students from 16 different European countries, all in different stages of their studies from freshmen to PhDs. The participants were ensured to have sufficient background knowledge to participate actively in the discussions by reading the pre-materials provided by EduCo, by participating in the pre-material session and in the topic introduction presentations where several professors gave plenty of information about ReVE/e-learning and about Problem Oriented Project Based Learning.

The outcomes of the working groups will be forwarded to the decision-makers, so that they will get an overview on the students' point of view that could serve as input in the process of improving higher education.

Introduction – E-learning / ReVE

The purpose of the Thematic Network ReVE (Real Virtual Erasmus) is to enhance the impact and the efficiency of the traditional Erasmus programs through the development and support of virtual Erasmus actions. It has two main goals: to complement the traditional Erasmus program and to embed them in the mainstream of higher education.

The expected results of the project are:

1. Real working virtual mobility actions within the real environment of mainstream education of the partners;
2. Concrete and validated procedures as well as recommendations at institutional, network (local as well as trans-national and European level), published in a manual about a global framework for networked e-learning, as a further development of the existing Manual for a Collaborative European Virtual University (finished cEVU project);
3. Tools and techniques that support the virtual mobility actions, including training materials;
4. Effective dissemination to stimulate the uptake of the outcomes inside and outside the partnership.

For more information you can check the web pages:

<http://www.elearningeuropa.info> or <http://reve.europace.org/>

E-learning is any learning that utilizes a network (LAN, WAN or Internet) for information/knowledge delivery, interaction or facilitation. This would include distributed learning, distance learning (other than pure correspondence), CBT (Computer Based Training) delivered over a network, and WBT (Web-Based Training). It can be synchronous (real time), asynchronous (self-paced), instructor-led or computer-based or a combination. It began around 1996 with appearance of the first web courses.

The most important benefits of e-learning are:

- Best-of-both-worlds solutions
- Online flexibility
- Real-world interactivity
- Personalized learning

Until now university management has not been concerned with ICT and e-learning, as they did not think of it as a core business area. But in future e-learning will tend to evolve from individual projects and experiments into an integrated feature of the universities.

The Discussion

In the beginning of the symposium, all students were divided in groups (independently of the group constitutions used for the discussion groups). Each group had to study one specific part of the pre-materials and present this to the other students. In this way, we could guarantee that all students had enough knowledge and understanding about the content of the topics.

Discussion Group 1

The session started with a round-up. Students could share information with the other international students about the situation in their home universities/countries.

- In Kaunas (**Lithuania**), the university has a Distant Learning Centre. All Lithuanian students can apply for the courses. For the major part of the course, the students can work from their computers at home. There are only 2 physical meetings foreseen: one at the start of the course and one at the ending. The assessment consists of cases, solved in groups. At the University of Barcelona (**Spain**), there is also a possibility for local students to take optional virtual courses. The number of students per course is limited and acceptance is done by a first-come-first-served method. Waiting lists are quite long because many students like the concept.
- In countries as **Belgium, Slovenia** and **Denmark**, universities have already some experience with e-learning: learning platforms through intranets are introduced. Students can find course materials, make quizzes on-line to test their knowledge, a forum is available to discuss problem and students are able to check the grades after the exams on those internet platforms.
- Whereas in **France** and **Poland**, students can only find course materials on-line such as the presentations used during the lectures, because this kind of initiative started more recently. As **Bulgaria** just started with a new master program, the old one does not use any virtual tools, whereas the new one is mainly based on e-learning: labs for virtual education, and some of the lectures and exercises are only web based.

Afterwards there was some time foreseen for a short brainstorm session. The participants were suggesting aspects, issues and topics that, in their opinions, are related to e-learning and virtual Erasmus.

<u>Educational</u>	<u>Organisational</u>	<u>Technical</u>
Evaluation & assessments	Forum responsibility	Forum
Contact with teachers	Number of students per course	Expenses
Real-time / on demand	Requirements (pre-courses)	Tools (video conferences, video)
Recognition (credit system)	Fee (participation, application, administration)	Study place
Grades (uniform system)	Contact with teachers	<i>Chat platforms</i>
Language (common one)	Availability (time zones, exams)	<i>Internet access types</i>
<i>Types of tasks</i>	Communication (share the work)	<i>Network responsible, support</i>
<i>Course format</i>	Language (common one)	<i>Differences between countries</i>
<i>Mandatory / optional part of the student's curriculum</i>	Materials (on-line, books, ...)	
<i>Training (computer skills, LLL) for teachers / students</i>	Materials access	
	<i>Quality assessment</i>	
	<i>Course duration</i>	
	<i>Course selection</i>	

From then on, the groups of students discussed some aspects about virtual Erasmus, with very valuable input and very useful questions from the participating professor. This discussion was split in three major topics: organisational, technical and educational aspects.

Educational aspects

The first and one of the most important aspects is communication issue. The students had very different opinions: some students prefer to have someone teaching them the course content, as face to face

contact is required for them. Others prefer to study the materials on their own, with their own pace and when they want to do it.

About the aspect of the contact with the teacher, all students agree that a forum and the possibility of sending e-mails are preferred. From the teacher's point of view, this will result in overloaded mailboxes.

The flexibility was seen as a major advantage comparing to other courses: the students can work whenever and wherever they want. Being able to take very specific or advanced courses which are not provided by the home university, is mentioned as another reason to choose virtual courses, next to following courses (e.g. language courses) as a preparation for an Erasmus exchange. A fourth advantage is that one could acquire skills that might be used for Life Long Learning.

Learning on demand requires materials of very good quality, and the organisation of the course must be very flexible concerning deadlines and so.

Opinions about the language vary: course materials should be available in one common language, English. Some students would prefer to have some extra materials, e.g. lists with technical terminology, in their mother language.

Concerning the assessment, students have a preference for practical tasks such as a case study or project, but a minor theoretical part could be added as well.

The students are somewhat worried about the grade system that should be used: the teachers should be aware of the systems in the different countries. Also the recognition will give some problems: as normal courses hardly get recognised, virtual courses may even be harder to get recognised.

Technical issues

As already mentioned, the students estimate a forum as a necessity. Files can be shared as on a hard disk. What does this phrase mean? Students can post their problems there and ask other students for help. This might work as a filter for the questions in the teacher's mailbox too. Using existing communities as yahoo-groups doesn't take up resources from the universities.

Course materials should be provided in such a way, that they can be downloaded on the students' computers for the sake of flexibility as well as not discriminating students with dial-up or narrow-band connections. Whereas equipment for video conferencing is very expensive, other alternative could be used: students suggested voice-over-IP software and web-cameras for communicating from their own computers. This prevents the universities from needing to buy the equipment for few students. One student suggested that private companies could sponsor this.

Organisational problems and possibilities

The financial implications of the implementation of e-learning and virtual are not slight. Co-operating with private companies could provide universities the required money, funds and equipment.

Asking students or their home universities for a participation fee for a course, or for the administration would not motivate students, neither promote this kind of courses. If a fee is asked, students prefer it to be reasonable and different depending on where in Europe the students come from.

They stress that the amount of the fee should never be used as a criterion to accept students in a virtual course; they prefer admission tests and/or a first-come-first-served rule. A support letter from the home university isn't considered appropriate as selection parameter. Higher grades and more credits are good grounds to base the selection on.

As virtual Erasmus and e-learning are not commonly used yet, their marketing strategy will be important for their future and promotion. Posters, leaflets, links on university websites, international departments at universities are the first and major sources of information for the students.

The students mentioned that the information provided before choosing a course must be sufficiently accurate: a trial page of the exam, a practical example, requirements concerning pre-courses, detailed description of the course content, etc.

For universities, implementing e-courses has benefits too: they can promote their renowned courses for a larger group of students, attract potential Erasmus students and differentiate from other institutions. How do they benefit from being different?

A last organisational issue that was discussed is the availability of the courses. Problems may arise due to holidays, exams and time zones which are different all over Europe. It is impossible to take all universities into account, although this is very important if group projects have to be done. Theory could be studied whenever the students want to work on it.

At end of the session, the students were asked to make a little task. They had to make a fictional course description for a virtual e-learning course, in order to apply and test the solutions and suggestions that popped up during the discussions.

The Results of Discussion Group 1

Self time-management is very important for students: they expect to be able to study whenever they want if they choose a virtual course. Although this requires some skills and a good attitude from the students, training is not very necessary for them. Nevertheless some students like to have some face-to-face contact with teachers, too.

Technology must be chosen to serve the course and the teaching of all the individual students. Students would prefer to use a simple web-camera and a common internet messenger on their own computers, rather than an expensive video conferencing infrastructure at the university.

Discussion Group 2

One of the biggest advantages of e-learning is that it forces the students to be active, at least to some minimal extent. For example, in order to move forward to the next page of a course, at least one click is needed. Moving over to the next chapter of the course can require answering correctly to a few questions. Thus, the student participation is assured.

The students believe that the course structure should contain, beside theoretical issues, many practical issues: exercises, demonstrations and examples. A special emphasis should be placed on examples from real life and real problems/solutions. The use of multimedia features is expected, as well. Animations, video clips and other multimedia tools have an important role in aiding the e-learning process. The students believe that having the course material placed online is an advantage, as only one computer connected to the Internet is needed in order to access it. However, in some cases, offline availability of the materials could be very useful as well. For example, for students commuting, being able to download the materials and study while travelling could prove to be time efficient.

The role of the teacher in such projects would be, on one hand, that of a content producer, and, on the other hand, that of the feedback provider/evaluator. Teachers in e-learning should make the content available for each chapter of the course and allow students a fixed interval of time for mastering that content. For feedback, weekly interaction with the students is necessary. This could take place using forums or e-mail; however it is preferable to have synchronous communication via chat or voice.

It is not considered realistic for a teacher to be able to maintain contact with all of his/her students. As such, students should be divided into groups and assigned a teacher assistant, who will be available for answering questions. Contacting the main teacher however should appear natural to the students. The students think it is important to have interactions with the teaching staff when taking an online course, as this keeps up the motivation for this course. As well, it was suggested that there are some limitations on the number of students that can enrol in an e-learning courses, depending on the number of teachers/assistants assigned to that course. The ratio of students/teachers should be published on the website of the course and made available to the students before they actually register.

Cheating is considered to be an issue with e-learning courses. One suggestion is to ask students to take an exam in a real environment with the teachers that delivered the course. Another solution would be taking the exam online from the home university, but in a supervised environment, which will assure identity check and impossibility of cheating. For continuous evaluation, online quizzes and tests are considered to be a good solution.

One of the biggest advantages of courses delivered via virtual means is the time management for the students. In this way students can log on and study material whenever they have some planned time for it. This flexibility is considered a key advantage; however it should be combined with interactions with

other students or with the teachers. One way of doing this would be through weekly online meetings, online study groups, internet voice calls or forums. In order to work in a team over a virtual medium, collaborative working software should be developed. This software should allow students to browse the same materials together while communicating online or allow them to write a report together.

There should be a balance between the number of virtual courses a student can take and the number of real courses. Thus, a limit for virtual courses should be set, for example no more than 20 credits per year. These limits should be enforced only for full time students and should assure the needed social interactions between students.

E-learning should use the state-of-the-art technology available to ensure optimal results. However, it is important to take into consideration that for some universities funding makes it difficult to have the latest technologies available. As such, the focus should be on the use of computer and networks (Internet), and less on proprietary systems (for example: conference calls via traditional carriers). The students think it is important to try some games, simulations or competitions to the online courses. This will increase their interactivity level, but most importantly will motivate students to keep following the course and eventually finish it.

The main language of use should be English. However, as e-learning can be used to prepare for a virtual mobility, language courses should be available, as well. After the real mobility takes place, it is realistic to consider that the student is proficient in the language of study of the guest university. Thus, it is possible to take courses in other languages, as well.

The students think it is important to be aware of the cultural differences between the people coming from different ethnical backgrounds or cultures. Issues such as name calling (first name or official title) should be made clear at the beginning of the course.

Training should be available for both: teachers and students. For teachers, it is important to consider the way of preparing course materials and communicating with the students, in order to maintain their interest in the course. For students more basic training should be provided, regarding the use of software tools and ways of working. It is preferable that trainings take place in a real environment.

For recognition of the courses problems already exist in traditional courses taken at a foreign university. The solution would be the use of credits and quality assurance in the teaching process.

It is important that e-learning courses are promoted to students. The promotion should focus on the attractiveness of the courses, the advantages they bring to students especially in terms of flexibility and time management. The students believe that eventually these courses will open up the European education market and bring a real competition between universities.

The Results of Discussion Group 2

E-learning is a new method of teaching that certainly has a lot of potential. Although major advantages include self-management and distance learning at the students' own pace, many challenges are still ahead before e-learning becomes a widespread and accepted teaching method. Further development is necessary to allow e-learning methods to reach their full potential.

Discussion Group 3

The discussion started with a sharing session concerning the local situation and development of e-learning methods.

- In **Greece** (Athens), **Italy** (Turin) and **Belgium** (Leuven) e-learning is already applied and it is working quite successfully according to the students. In Greece e-learning is used for language engineering for virtual courses with other universities. This new method is already working even in some high schools in the islands of Greece because of the geographical distances. In Turin and

Leuven video conferences are well known and used methods, and in Belgium e-learning is developed even with some other Universities from abroad.

- In **Spain** (Valladolid), **Hungary** (Budapest) and **Turkey** (Istanbul) the foundations of e-learning are already built. The possibilities for students for downloading exercises and lectures from web sites, the usage of the mailing lists in which all the students studying in one class (group) are included, are some of the virtual methods that the Universities in these countries are using. For that aim Internet access for the students is available and free all days long, but it is good if the students could have Internet access at home as well. Students in these Technical Universities are already used with this virtual approach of education and they are appreciating its future development.
- In **Slovakia** (Bratislava) and **Ukraine** the development of the virtual education methods is still not developed because of different reasons: absence of computers and Internet access in the departments is one of the reasons. Teachers are still too suspicious about the effectiveness of this new method.
During the discussions it was clarified that e-learning has a lot of advantages and even if the new teaching methods don't even exist in some universities, all the students are aware about it.

The possibilities of active learning and self-development were the most often mentioned priorities for the new teaching methods, which students are looking for.

The communication issue seems to be one of the hot topics concerning the future development of e-learning. This method could have different successes in different countries and that depends on the nationality and the culture of the students. There are even some doubts that virtual education cannot be organised properly between countries with a lot of differences and reside far one from other.

The language barrier and the age of the young people could influence quite a lot the efficiency of the virtual education. The communication problem won't be so important in the case of a virtual course organized in the native language. When using other languages, even English, people usually lose and skip part of the information. That "side effect" would influence even more the e-learning courses. But still English is the optimal opportunity after the native language for virtual courses.

In general students still appreciate the traditional educational methods. The personal contact and face-to-face communication is necessary and required from the students and they are considering it as a part of the educational process. Body language is also pedagogical. Even a live video-stream conference can't provide the necessary impression and influence for the students.

People behave in a different way while using virtual tools of communication and that could be a problem, especially during the evaluation process of the courses.

Technical issues

For overcoming the communicational issue, technical tools have really important role. The Most effective way of virtual courses seems to be the videoconference. It is close to the traditional method, but in the case of the camera, which is fixed in one place, quite a lot of important information could be missed. An operator or at least two cameras in different positions could be a solution of that problem. The biggest disadvantage of this method seems to be that is quite expensive and time consuming for the teachers.

Other technical tools could be new software programs, but they would require some training for both students and teachers.

Web based lectures and labs are already used a lot in European universities – and they would be a compulsory part of virtual education.

Everyone agrees on the fact that the next generation of students, even in the next 10 years, would accept easily the virtual communication and on that time e-learning would be even a necessity. Till then it has to be properly developed and implemented.

Organizational problems and possibilities

It would be better if there is a coexistence of real and virtual lectures and labs at least at the beginning of the implementation process. Virtual lectures must have the same influence as the traditional ones. The other possibility is that virtual lectures are complementary to the real ones.

Theoretical lectures are considered as boring from most of the young people. Usually the attention of someone cannot be kept for more than 20 minutes no matter how interesting the subject is. It would be even more difficult with video based lectures and in that case good education process would be a

challenge for both students and teachers. For students it would be a matter of choice and motivation of self-development and studying. For practical lectures it would be not so problematic, since usually they are always interesting, but how practical exercises and labs can be organized virtually is a completely not clear issue. According to most of the students, not all of the educational subjects could be thought only virtually.

One stronger advantage of e-learning is self-time management. As a less time consuming method it is really preferred from the students. (With internet based communication you could reach the point only with one sentence, word or symbol).

Time could be a problem for the organization of e-learning as well. In case of virtual education organized for more than one university time division of the lectures and especially for video live stream conferences would be a problem. It was again recommended not to organize virtual courses between too many countries and universities so as to keep the high quality of the educational process and to facilitate both students' and teachers' work.

Evaluation is always a hot topic especially for the students. Of course they had some doubts how effective it would be if the education is virtually based. Not everyone accepts the idea of online exams. Cheating seems to be a problem so exams organized on the CISCO example could be a good solution. Online exams but made only in the university and an administrator giving permission for the exam and looking if everything is in order and fair for the examination process. The evaluation should be fair for all the students no matter which university they are coming from.

The existence of many kinds of evaluation is possible if there are strictly arranged-online exams, tests, projects between the students of the course.

To choose a virtual course instead of a traditional one is a possible choice for many young people. Reasons for that could be:

- Teachers
- Credits / recognition
- New experience from foreign teachers
- Future educational opportunities abroad
- Interaction with technological innovations
- Attractiveness to add in the students' CV
- Feedback from other students that have already passed such a courses
- Enlarging horizons
- Saving time / possibility for simultaneous working and studying
- Fees for courses

Duration of the virtual live stream lectures has to be no more than one hour. After some break it could continue. For the duration of the whole virtual course it has to be arranged according to the subject and the universities that are going to organise it. The duration is not so important, but virtual courses lasting more than 6 month are considered as not effective.

Virtual lectures are good to be combined with discussions. No more than one lecture per day is recommended. Students appreciate the case in which they would have some papers in front of them during the virtual lecture and if there is the possibility to have the lectures earlier so they could take a look before the lecture and after that follow it easily. Teachers have to follow the students as well.

Fees for education are not accepted in all the countries in Europe. There were quite a lot of opinions to have or not to have fees for virtual courses. Most of the people think that universities have to cover the expenses for that new teaching method. There is an acceptable possibility for a fee for each semester; but in case of cooperation between universities from different counties it is good if the fee is the same for all the students participating in the educational process. If there is a difference between the standards of the

universities and the economical situation in the countries, the difference should be paid from universities, companies, states or the European Union if it is possible. Fees would be necessary since organizing virtual education seem to be more expensive than the traditional one.

Credits for virtual courses have to be the same as the credits for traditional courses. They have to be accepted everywhere in case of cooperation between more universities. Credits could be given for virtual ERASMUS as well.

The selection of the students is necessary as well. They have to be on the same level of knowledge no matter from which university they are. So there should be some requirements for the students participating in virtual courses. The universities cannot afford paying for everyone. Students who are not from the university (graduated working people for example) can participate in virtual courses as well – requirements for them have to be more or less the same. For such students the university usually won't be paying fees; companies could do that.

Virtual ERASMUS courses

Most of the students don't consider pre virtual ERASMUS as a necessity. Choosing a country means one should study the language before. Online language courses could be a possibility for the students, but the fee for them would determinate more or less if they are going to choose it or not. For sure having virtual ERASMUS would facilitate the students. They would get easily aware of the educational system in the other country, the culture, habits and the language. And in that case their visit and studying abroad would be more effective. Almost everybody agree on the fact that virtual technical tools have to be implemented before having the ERASMUS course abroad.

If the ERASMUS program is one year long the virtual ERASMUS shouldn't be more than two years long. Since still virtual ERASMUS is not so popular among the students, the information about it could be spread with e-mails. Details about the pre ERASMUS program could be put on the university web page and students' book with all possible programs for the young people. It could be announced in the conferences and official programs of the universities and the teachers could also spread the information. All the details regarding this advertisement of the virtual ERASMUS should be in the language of the university. Still the best advertisement is the students who have passed such a course, since they could inform their colleagues.

The Results of Discussion Group 3

E-learning would be a challenge for both students and teachers and for both sides it is preferred to be as simple as possible from technical point of view-at least for the beginning.

Communication issue is one of the most important issues in the development of this new educational method. Face to face meetings would be always preferred as a part of the educational process.

One big advantage of e-learning is the self management. It would give the chance to more people to get more educated no matter of their employment and age and this is already one big step ahead in the educational development.

With the implementation of that new teaching method possibilities and informational recourses of the students will highly increase.

The development of e-learning would become a necessity soon and even the language barrier which till now seems to be a problem would be overcome by e-learning tools and methods.

At the present moment students seems to be more opened and ready for the implementation of e-learning classes at least because that is something new and challenging.

Still questions like t fees and evaluation in e-learning have to be discussed and after that applied and carefully since that are one of the sensitive topics for both students and teachers.

Conclusions – E-learning / ReVE

Advantages:

- Flexibility: Possibility of studying anywhere, anytime
- Development of time management skills: saving time by organising our own schedule
- Pro-activity: Student cannot be passive during courses
- Intercultural interaction: Possibility of taking international courses

Challenges:

- Degeneration of social interaction
- Virtual contact replaces physical contact (consequences ?)
- Who will train the coaches?
- Lack of qualified experts
- Standardisation of ECTS credit system
- Motivation ?

Technology:

- Fast Internet connection
- Web-camera, headphones, microphone
- Skype or similar programs
- Videoconference software
- Collaborative working tools (e.g. writing reports together)

Example _ Subject: Taking language course

- Pedagogical
 - Theory: grammar, vocabulary
 - Multi-medial exercises: listening, writing, speaking
 - Forum, chat
 - Related links
- Organisation
 - Website: introduction, downloads, course information, statistics
 - People: linguists (preparation and support), IT specialists
 - Evaluation: tests, final exam
- Technical: Hardware, Audio/Video studio

Main conclusion points:

- Symbiosis of traditional and virtual education
- English language on international level with support of native languages within the countries
- Solving interconnectivity problems (Bologna process) as a side effect of building infrastructure for e-learning
- Possibility of using open-source software

Introduction – Project Based Learning

One of the definitions of PBL is that of: a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks.

Research shows that learners not only respond by feeding back information, but they also actively use what they know to explore, negotiate, interpret, and create. Education has benefited from this research, as teachers have learned how to effectively select content and activities to amplify and extend the skills and capabilities of students.

More important than the definition itself are the attributes of effective projects. Outstanding projects:

- Recognize students' inherent drive to learn, their capability to do important work, and their need to be taken seriously by putting them at the center of the learning process.
- Engage students in the central concepts and principles of a discipline. The project work is central rather than peripheral to the curriculum.
- Highlight provocative issues or questions that lead students to in-depth exploration of authentic and important topics.
- Require the use of essential tools and skills, including technology, for learning, self-management, and project management.
- Specify products that solve problems, explain dilemmas, or present information generated through investigation, research, or reasoning.
- Include multiple products that permit frequent feedback and consistent opportunities for students to learn from experience.
- Use performance-based assessments that communicate high expectations, present rigorous challenges, and require a range of skills and knowledge.
- Encourage collaboration in some form, either through small groups, student-led presentations, or whole-class evaluations of project results.

Many companies have realised that a team for students can do a great job trying to find a good solution to one of their problems even though the goal for the students is to learn; the problem is just a tool. However, students do not want to end their work in a non-finished way. Therefore they work must more than needed to pass the examination – and they become better engineers. In this way very good and intense dialog will be established between the company and the university. The dialog involves engineering staff and project managers in the company and from the university both teachers and students.

Thus it is not just formal contacts on management level, but contact that make things happen on the engineering level.

The Discussion

For this topic as well, the discussions were preceded by a presentation. Prof. Fink Flemming, an authority in the domain of Project Based Learning (PBL), explained the students how PBL is implemented at Aalborg University.

Discussion Group 1

As the group constitutions changed for this second topic, we started with a small introduction and continued with another sharing session. As the concept of PBL isn't so well-known yet, this was reflected by the student's experiences. In many countries group works are added in the course but it is seldom to have it as an independent course in the curriculum. In Ghent (Belgium), the faculty introduced so called "course-crossing projects in the second and third year of the new Bachelor program. Whereas the architectural engineering students have 'design ateliers' in all 5 years, the design should include skills and knowledge acquired in other courses.

Because of the unfamiliarity of this kind of education, a presentation about the PBL implementation at Aalborg University preceded this discussion group. Prof. Flemming gave a good insight about the major aspects and advantages. The discussion was merely based on the current situation in the guest university, which was represented by prof. Palle Qvist in the group.

"What defines a problem? The fact that the solution is missing, or if your needs are contradictory to what you have. To learn how to find a solution is the most important aspect compared to finding it."

PBL in practise

For the project group composition, the students expressed their concerns that in case of imposed group members, it should be a strict division of the work. The students agree that bad or worse co-workers lower the level of the result. Most prefer is the free choice of group member, whereas in real life you can't chose who you work with. The reasoning is used in Aalborg too. In the opinion of the students all groups' members must not have the same background.

A problem arises with foreign students as they join later in the program and aren't used to this kind of education, so they form separate groups. Also free riders can cause much harm to a group...

About the required knowledge for the implementation of PBL in the curriculum, the students agreed that PBL should start in the first years and its importance should increase through the years. Other courses should provide the basic knowledge. The majority decided that these projects should be compulsory but the projects as optional courses might be desirable.

The students prefer real life topics from companies, as well as academic research subjects, and every group of students must have their own topic (to avoid competition between the groups).

Both company staff and researchers (assistants and/or professors) can supervise the project. They follow the group during the project and must have a clear idea of who's working and responding. The assessment (and an individual grade) at the end is a very important but sensitive aspect. In Aalborg, the 'exam' takes about 6 hours: presentation, group and individual questions, all to test how much the students have learnt from the project (theory and practise). In the end the students stay responsible of their own learning. The deal within one group must be sharing knowledge and not to compete with knowledge.

The last part of the discussion was about the major advantages and disadvantages:

Advantages*solve real problems**improve communication skills**responsibility – internal competition**deeper knowledge - career contacts**new possibilities of learning (topic)*Disadvantages*internal competition - less freedom**difficult to integration for foreign students**fairness evaluation system**free riders – less individuality**difficult for teachers**no common knowledge*

The motivation of the students can be triggered by real life problems and personal responsibility.

About internal competition, the group of students agreed that cooperation is much more important for the group and the project outcome.

Free rides and less individuality were initially put as a contra but during the discussion, the end conclusion was that this is a perfect preparation for working life situations where you must deal with similar conditions. Dealing with free riders is the group's responsibility: whether drop them, or try to work with them.

The last aspect touched in the discussion was the evaluation system. All students agreed that the duration of six hours for an exam is too long and very stressful, but the possibility of evaluating students apart is very important to respect the individual. Although some students defended that all group members should get the same grade, other students absolutely rejected this idea.

The Results of Discussion Group 1

- The students agreed that the framework for PBL is well organised in Aalborg. On the other hand they were not totally enthusiasts about learning in such an environment. Some even prefer the traditional way of education with much theory and studying (by heart).
- Internal conflicts and free riders are main concerns for which no solutions could be found. The aspect and organisation of the exam, is another breaking-point: the optimal wasn't found and the current situation does not seem satisfactory.
- Integration with or application within traditional education is very difficult: the problems with foreign students in Aalborg demonstrate how hard it is to switch from one learning environment to another.

Discussion Group 2

PBL is an emerging teaching method and thus is not widely used in European universities. It is not used at all in Poland and Lithuania, while in universities in Denmark, Hungary, Romania and Turkey some project work is used in the curriculum. However, the only university that is fully using PBL is Aalborg University.

Regarding the duration of the project, the students feel that it should not exceed two years. For some more complex projects it may be necessary to work for this longer period of time. Projects shorter than one semester can be used for teaching, but taking into account that they will not reflect a real project. Selection of the project topic is quite different across Europe. In some countries, such as Bulgaria,

teachers expect from students to come up with their own ideas. In other universities students can choose from a list provided by their professor, but also come up with their own topics.

For projects that are more complex, a team of four – five members should be formed. In case the projects require it, more members can take part as long as the group does not exceed six or seven people. It is more difficult to work in larger teams and more conflicts are expected to arise. These are usually managed by the leader of the group. Being the leader means taking responsibility for setting priorities and deadlines, dividing tasks and following up on them and solving conflicts. The group does not choose a leader, as this person gains the place of the leader by the work done and responsibilities assumed. During the lifetime of a project, the leader could be changed, depending on who is taking more responsibilities for the advancement of the project. It is a problem if a person is always the leader in a group, as it will be more difficult for this person to adjust when going to work in the industry. Teachers can normally sense who the leader of the group is and suggest alternative ways of working if necessary. Usually in such a group one member will take the role of the secretary.

Regarding working methods, students feel that this is up to the members of the group. The less people there are in a group, the more they get to know each other and the easier it is to arrange a common schedule and agree on working methods. Some students feel that an authority figure is needed in order to assure a good progress of work. They believe that there is a need for a strong leader, who, if necessary, can push difficult, but necessary decisions. Other students feel that all the members of a group should try to take up the same amount of responsibility, as much as this is possible and that all decisions should be taken by consensus. All students agreed that friendship is important when working together, however they realise that such an approach does not work in all groups.

Regarding trainings and PBL, students feel that some training could be used, especially on the topic of "Project Management". However, most students feel that the biggest challenge is that of teachers'. Thus, a teacher should be training on passing information in a proper way, in becoming a coach or mentor for students. It is believed that the role of the teacher is a difficult one, as he or she has to represent the upper management of the project, yet be close to the students and give them constant feedback. Students feel that it is important for teachers to be able to adapt to their groups, and, at the end of the project, to accept the students' suggestions.

Students think that when it comes to project selections, it is difficult for them to select a good topic. In general, students would like to have a contribution in the selection process, however they expect the teachers to help. The teachers' role is especially important here, because they are experienced and can judge realistically how suited a project may be. It is believed that projects that contain more real life aspects are more attractive for both students and later on, for prospective employers.

Students would like teachers to be easily reachable for quick questions. Also, weekly meetings should be scheduled to discuss about the progress and future plans of the project. Students feel that grading the work in a fair manner is a difficult task. They believe however that each student should be graded individually for his/her effort invested in the project. It was considered that it is not fair to receive a group grade. Some students considered examinations of up to seven hours too long, however others suggested that this type of assessment can prepare students for real life work environments, and are thus desirable. For some it can be a good opportunity to discuss the project and develop some presentation and persuasion skills. A long examination time can pass quickly if the project is complex and the discussions are challenging.

When it comes to cooperating with companies on PBL issues, students feel that companies should get involved in the process as well. Payment for a good project is always a nice option, but it is not the first. Students are primarily interested in learning how to tackle industry problems, how to work professionally, getting support from the company and having the possibility of finding a job.

The Results of Discussion Group 2

PBL is definitely one of the new teaching methods of interest for students. Although slowly emerging, PBL has started to be recognized as an efficient way to motivate students during their learning process. As a consequence, many students are positive towards this new teacher method and prefer it over a classical approach.

Discussion Group 3

The discussion started with a small introduction of the topic of the discussion. The concept of PBL was not familiar to most of the participants in the group.

For the students from Technical Universities in Barcelona, Zagreb, Riga, Ljubljana and Paris this new teaching method was completely new and it has not applied in their countries. Technical University Rome Tor Vergata has just started to implement that method, but till that moment it was not good organized. In Turin after the third year students have to make project in groups of four people. The duration of the project is of two months and it has more or less the same conception as PBL.

Since the students in the group had many questions regarding the real application of PBL as a teaching method in Aalborg, prof. Flemming presented again more detailed overview of the situation in Aalborg University.

When the discussion got the necessary background, it continued with discussion about the optimal structure and concept of PBL.

Concept of PBL

The number of the members in a group for a project varied between three and six, but the optimal was four per group.

In Aalborg University groups with six people were made, as an experiment, and then the number was reduced to three. All the participants agreed that mix a group with students with different skills and background could be a better situation. Each individual has something to "give" for the development of the project and since this group work is not only reading a book, additional skills and knowledge are always considered as an advantage. From experience the group also agreed on the fact that less people in a group achieve results easier and don't loose so much time as in a bigger group.

Implementation of PBL in the students' curriculum

It is always better to work on one project during the semester than to work on two - three smaller projects. The second case is sometimes losing time. Since the first year of studies it is good to start with little projects so the students would easily learn how it works.

Difficulty of the projects appeared to be hot topic. The conclusion is that it is always better to have a little bit more difficult task than expected.

Most of the participants regarded PBL as difficult to be implemented in their universities so they suggested PBL to be obligatory at least in the beginning. But most of the young people don't want that there are exceptions with their educational system, so if there is such a teaching method implemented it would be good only if it is not implemented just in a several Educational Institutions.

No matter of the application and benefits of PBL, the necessity of normal lectures was admitted. So optimal curriculum looks like two - four classical courses per semester and one project.

PBL in practice:

This teaching method has to be used mainly for learning no matter if the subject is given by a company or from the university. During the project some students could try to simulate "company life", which is also learning.

Each project requires meetings between the members and between the members and the supervisor.

Normally it is good if the group meets its supervisor each week. It could be also useful for long projects if each month students present the work that they have done till that moment. Mid-course evaluation would skip the case in which everyone is working on the last moment - so better results afterwards are expected.

What could be the first approach with PBL course? It starts with a research of the topic and after everyone has his/her task. Everyone has to know what has to be done inside the project, and everyone has to find the tools and conditions necessary for his/her part.

"Responsibility" is a key word in PBL.

Normally each project requires supervisors - professors, company representatives or older students. It is always better to have a supervisor who can help the students especially with the things that they can learn only by experience!

The supervisor's part is also sometimes helping to solve the given tasks. Thanks to the supervisors students learn how to ask and use feedbacks.

The teachers' role is to consult students, to give them the asked feedback, to provoke interest and to provide them with sources of information (e.g. textbooks, website).

Evaluation of the PBL could be an exam, but it is better if it is presentation of the results and then an oral exam (questions) directly related with the task. It is better if the audience don't participate in the exams since the professor is the person who evaluates the work after all, not the audience. Sometimes not relevant questions are only time consuming factors.

PBL gives space for cheating, but it is mainly students' problem since at the end they have to present and answer the questions.

All innovations require training and preparations, PBL as well. Students would like to be prepared for that method even before entering the University, but if they are not that could be achieved with leaflets and online training for example. It depends on generations, but sometimes teachers need more training than students. From the other hand training is inside the PBL.

The question would it be challenging for a teacher to be a new position was raised. Maybe not all teachers could manage with that. The solution could come only by cooperation and working together with companies and students.

Students have some concerns if PBL would work in each fields of education. One example could be history.

Could we define what good project is? From all projects students have benefits. The "good project" requires a lot more than just reading and finding information.

The productivity of the PBL can't be evaluated from one side - it has different strong points from teachers' and from companies' side. It was even suggested that in group division could be made - one part working on the academic interest and other for company's interest.

Financial and technical support for the project could be provided from companies and from the European Union. But even when the universities are supported for PBL, it has to be stressed on fact that the objectiveness is to learn, not to provide outcomes for companies.

For subjects and projects given and supported from companies students could apply through exams. For such projects young people could be paid - obviously the combination money and knowledge could be successful.

Advantages

- More effective than classical teaching
- Avoids individualism (there is no leaders normally)
- Students could learn the approach to the work in companies in the university
- Additional knowledge apart form lectures
- People work normally in groups during all their life and it is better to be prepared for that. PBL is a great opportunity
- Share knowledge
- Preparation for a future job
- Team work
- Self management, organization
- Complete evaluation
- Productivity
- Social contacts
- Real life simulation
- Tolerance
- Practice knowledge
- Development of individual knowledge.

Disadvantages

- Projects need more physical place, place where students could work together
- Method is more expensive
- Evaluation could be a problem
- Level of the students in the group has to be equal and that is hard to be achieved. Everyone has to know the people in his/her group in order to work better and that is also difficult
- It is good if that method is applied even before university.
- Difficulties in communication
- High costs
- Time consuming
- Exclusion of some persons in a group
- Frustration
- More work for teachers
- Bad subdivision of the work
- Productivity of the knowledge
- Superficial learning

Big Disadvantages:

- Possibility of absence of cooperation

- Teachers have to agree on the project and sometimes it is difficult to make the project real
- The project doesn't touch all the aspects of an argument
- Spend a lot of time

All the challenges could be somehow overcome by better communication between teachers and students and better cooperation between companies and universities. Since in new teaching methods the European Union and companies are normally interested, that could provoke teachers to work more for implementing that new method in the universities. This idea could find a lot of supporters outside the Educational Institutions.

Normally the knowledge that students receive from projects is deep – practice is always easier to remember. Social life of students won't change with or without PBL.

That is something that all students normally need and achieve no matter of their tasks in the University, so with PBL the expected situation is the same. More social related projects would be appreciated from the students.

The Results of Discussion Group 3

PBL seems to be quite an attractive method for the students. Most of them would like to have such a system applied in their universities. Learning by practice is the missing part of education in most of the Educational institutions.

Implementation of that method doesn't seem to be difficult for both students and teachers. Furthermore, that is one of the ways to involve companies in the education, which makes that method preferred from the young people.

Supervisors for PBL have to be carefully chosen as well as the members in a group.

Topics and their level of difficulty are the milestones which could make PBL attractive or not for the students

Conclusions – Project Based Learning

PBL is still quiet new method for most of the European universities. It seems interesting and attractive not only for the students, but for the teachers and companies as well.

Self management, solving real tasks, working in real environment, team work, leadership-that are some of the main advantages of that method.

Optimal members in a group are 4. What would be the educational level of the other students in the team seems to be quiet important for most of the young people.

Difficulty of the projects is supposed to increase with the years of Education. A little bit more difficult topic than the expected level of the students is preferred.

Supervisors from both companies and universities were also suggested.

Topics given from the companies would be always preferred from the students, but the aim of this tasks would be mainly getting knowledge not only solving companies problems.

Almost all of the students are not sure that this method could be evaluated properly and enough fair.

Fees for PBL could be the same as for traditional education. Big advantage of that method is that it could be supported from other institutions besides the universities.

Advantages of PBL appeared to be more than disadvantages. Furthermore that method is already applied quiet well in some Universities in Europe so maybe it is a subject of time PBL to be considered as a traditional way of teaching soon.

Credits

Author: BEST Educational Committee
Document date: Saturday, the 7th of January 2006.
First published 2006

BEST – Board of European Students of Technology
www.BEST.eu.org

All comments should be addressed to the Educational Committee of BEST at the two following e-mail addresses:
educ@BEST.eu.org, education@BEST.eu.org.

BEST would like to thank the Thematic Networks *ReVE (Real Virtual Erasmus)* and *TREE (Teaching and Research in Engineering in Europe)* for their valuable support for the event. Furthermore, it would like to thank the *Aalborg University* (www.aau.dk) and the Thematic Network *ReVE* for the logistics and financial support. Last but not least, it would like to thank the professors Helle Baekkelund, Ann Bygholm, Fink Flemming, Ian Semey, Patricia Keldermans, Palle Qvist, and Chantal Van Oostenrijk for their kind and significant participation in the Symposium.