



Board of European Students of Technology
Canadian Federation of Engineering Students
Joint Event on Education

**“Improving Engineering Education?
Europe and Canada,
let's do it together!”**

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Abstract

A BEST Event on Education (EoE) is a public event of the Board of European Students of Technology (BEST). A Joint Event on Education (JEoE) is an event that is organized between BEST and another student association.

"Improving Engineering Education? Europe and Canada let's do it together!" JEoE organised by BEST and Canadian Federation of Engineering Students (CFES) was held in Brno between the 28th August and the 5th September 2009.

This event was a forum, where 22 students from Europe and 11 students from Canada met for one week, and expressed their opinions on topics related to education. The Symposium was led by the Educational Committee of BEST (EduCo) with the help of CFES, in order to acquire a better knowledge transfer on this type of events, and the hosting Local BEST Group of Brno. During the Symposium the discussions were usually held in four groups, which were facilitated by BEST and CFES members. Prior to the working sessions, topic presentations were provided to the participants, by experienced professors.

The event was focused on trans-Atlantic mobility of students of technology. We discussed about the existence of programmes sponsored by the EU or Canada, about their requirements and about how someone can use the knowledge earned. Another topic that was discussed was "The Importance of Research and Innovation in Today's Higher Education".

Furthermore, we highlighted the benefits of implementing undergraduate research and its actual status on both continents. We also brought into discussion the new teaching methods (e.g. e-learning, project based learning) and we asked ourselves how new technologies can help us to get a better engineering education.

The students that were involved into discussions received sufficient background knowledge to participate actively; BEST and CFES provided topic introductions and prepared preparatory sessions, where several professors had speeches on subjects as virtual mobility, e-learning, students' mobility in Europe and Canada.



Experiences from Europe and Canada

Introduction

During the sharing sessions, participants exchanged knowledge about the educational system in their home countries. They also learnt about the practices and realities that happen in other countries regarding workplaces, internships and exchange programs for students.

Some other topics appeared in different conversations due to the participants' interest in knowing more about their counterparts; how to get a license to work as a professional engineer or how the examination procedures in different universities are were also topics which were discussed.

In some cases the cultural diversity was obvious; in these conversations, opposite opinions and reactions were showed. Generally speaking, students' life in universities from Europe is not very different from country to country, but compared to the one from Canada, it is radically different.

Outcomes from the sharing session

State-of-the-art of Educational Systems in participants' countries

In *Toronto, Canada*, in order to get accepted in a university a student must have both good grades and a good resume. Volunteer work, organising events/teams and extra curriculum activities are important. After getting accepted to the university, students have to apply to the college they want to go to. An exception is engineering, there they are automatically assigned.

The study program in Toronto is 4 years long and 700 hours of working experience is mandatory during this whole length of the studies. A person can choose to have one more year of working experience which is called professional experience. After 4 years students get a bachelor degree in science. The Master Program in engineering is 1 year long, but it is not possible to apply for a PhD with this degree: for the Third Cycle studies, a Master Program of two years is considered as a prerequisite. The curriculum may have more theoretical courses or more laboratories and projects, depending on the chosen field.

On the other hand in *Waterloo*, the system is quite different. It is very typical to go to university and school in the same province. Depending on the university, some preparatory courses may be mandatory. Here the entry test is not required. Before graduation, a student has to prove that he has done 40 hours of volunteer work. Someone can also do some undergraduate research, working as a research assistant with a professor. In the first years of studies there are more theoretical courses, but in the following years students usually do more practical classes related to their department and field of study. Optional courses are available, but they are not very popular. A two-year master program also exists here, during which the students can be paid for their research work or assistance in courses.

In Canada, education costs on average 10,000 Canadian dollars per year on average.

After the analysis of the different systems in Canada, the discussion moved to the European participants who explained how the system in their countries works.



To begin with, in **Hungary** it is easy to enter the university but is very hard to finish the studies. There is little laboratory work and the teaching is mostly done with lectures. They have 5-years long engineering programs and post graduate programs are not very popular.

In **Spain**, the two last years of high school are used for preparing the candidates for the test they will have to take in order to be admitted into a university. The subjects they need to pass depend on the faculty they want to apply to. In Spain, they have both Bologna and integrated system. There are three-year and five-year cycles for degrees in engineering. After the third year of the three-year long cycle, students can go to the fourth year of the five-year cycle, but they will need complementary courses for about one more year. In other universities students have to pass an exam. After having finished the five years, a student can choose a two-year Master or a PhD. Not many students follow post-graduate studies because universities offer research positions after the 4th year. Internships in Spain are not compulsory, but universities help students to find a company if they want to experience this type of assignment.

The students studying in Spain have to pass a minimum number of credits in the first 2 years; otherwise they are expelled from the university.

The three-year cycle is mostly supported by technical faculties. Master programs for such degrees depend on the universities and they may ask for a tuition fee.

It is difficult to do undergraduate research in Spanish universities. There are research groups that someone can join only after finishing his studies.

In **Portugal**, students choose the direction they want to follow (like Science, Art, Economics) at the age of 15-16, and then they have 3 years of school with courses based on the subjects depending on their choice. Entering the university is based on the average grades and on the national exam students have to pass. The number of students per university is also defined by the Ministry of Education. Students can apply in different fields at the same time. They can also apply to different universities in Portugal of the same field but for a maximum of six fields.

Portugal has implemented Bologna (the two cycles are: 3 years of Bachelor, and 2 years of Master) but the title of "Engineer" does not come after the First Cycle. In the university there are courses being taught in the traditional way, but there are also projects, laboratories and practical work.

Swedish students need four years to obtain a Bachelor Degree in engineering and one more year to follow a Master Program. They can have longer master studies with more credits too. Research is mostly done during PhDs.

In **Turkey**, students have to pass an entry and according to their grades they are accepted to a university. The university chooses the department they will be assigned to. They can have the entry test again the following year. Turkish students study four years for a Bachelor Degree and another two for a Master Degree. If they have excellent grades, professors can choose them as research assistants and thus gain some experience in undergraduate research. It is not something that usually happens, though. Masters in Turkey give students more job opportunities, but, on the other hand, they are very expensive.

Students usually have a 30-days internship during summer.

In **Germany**, students go to school for thirteen years. In the last two years they have to choose some special courses with knowledge they could use during their faculty. Their acceptance in the university is based on their grades. Extra curriculum activities do not matter that much. Everyone goes to school for at least 7 years. Depending on what each student wants to study, there are more or less years of school.



In **Ukraine**, to get to the university, a student has to pass a national exam. Scholarships are also available. The number of laboratories is completely depending on the faculty.

Latvia's system is similar to the one existing in Ukraine. They have preliminary exams in three basic subjects. In order to pass to the engineering faculty, students have also to pass chemistry and biology. The dormitories cost 50€ per month and there are 3 students in each room. There are scholarships but only for the ones with very good grades and they are about 50-60€. There are enough labs in the curriculum, about 4-5 per week, on different subjects. In the first two years, they also have sports in the curriculum, but without credits.

In **Norway** now, after finishing high school students get a grade and a certain average of the courses they have chosen. After the age of 15, they can choose to continue the educational path or not. In the last case, they choose to work on something practical and get working experience which counts together with the school average they already obtained. If they choose to continue their education, and if their family doesn't gain enough money, the government will pay these expenses. If they pass their courses they can get 40% of the fees covered. In addition, if they don't have a job, they can get a loan from the university to finance their studies and pay back 60% of the amount given to them. At the age of 22 students finish their university with a Master.

In **Poland**, there also national exams but they are held only in big cities, so students from towns and villages have to move for some weeks to the closest city, which is quite hard for them. If students pass the exams they are accepted to a university. There is enough laboratory work in the curriculum. Students do not usually attend the lectures and most of them have a part-time job. The universities are trying to solve this problem. The studying program has the duration of five years and students finish University with a master.

In Poland most of the courses are practical, so it's very difficult to cheat in the exams.

To get a university degree in **Russia**, students stay three years in the university. Private universities are not so common. To go to the university, students have to pass some tests based on the faculty they apply to. If they have high results they are accepted. Education is for free in Russia and if a person has good grades (s)he can get a scholarship.

Students can have internships and universities help them find a place in a company, based on what they are studying and on what they are interested in.

In **Bulgaria**, the system is quite different; they study four years in order to get the Bachelor Degree. There are three-week internships too, but not many students are approaching this opportunity properly. If their project in the company goes well, and professor has a good opinion about some students, they could easily get a job in this company. Students have to pass some subjects to go to the university. Each university has each own subjects (exams are held inside the university). In the end of the academic year, student's average has to be above 4 so to pass the year; otherwise they have to take again the semesters.

The lectures are delivered in English, German or Bulgarian.

Romania still has the five-year Integrated Studies, but also the new four-year Bologna Studies appeared. For the new type of cycle (4 years) Masters can be one and a half year or two years long. Generally speaking, it is easy to pass the exams and enter the university, but it is hard to finalize the studies. The Public Education is for free, but it also exist private universities. There are possibilities to have scholarships, if the grades are excellent.



Working and studying

Participants were asked to share their experience on internships or part-time jobs in their university. Situation changed dramatically from country to country for several reasons, like economical crisis as well as the fact that to do an internship is compulsory to become an engineer in certain countries.

Canadian system offers the opportunity to have six Co-Op, or what is the same, six semesters working in a company of their field of studies. Students that choose this option finish their Bachelor degree in five years; and with the fact that not all the Canadian universities encourage their students to do it, makes the situation change a lot from one side of Canada to the other. Universities that promote Co-Op have strong relationships with companies and students are allowed to miss lectures when they are working.

Internships are also strongly promoted in Norway, where companies have a strong image and collaboration with universities (presentations, leisure activities, etc). Good students are usually hired by university in order to do small tasks like correcting exams or tests for a few amount of money.

In some other countries like Russia, Portugal, Poland and Mexico working part time while studying is common but not specially promoted, especially in the summer break, as well as doing the final thesis in a company and getting paid for it. A participant from Poland commented that the university has the right to approve or reject the internships if they don't require certain profile.

On the other hand, Turkey and Ukraine are not promoting internships, and students that work and study at the same time usually have a wrong image. The main reasons are that presence in the lectures is compulsory or is influencing a lot the grades.

There are some special modalities of internship. For example in Germany, the government provides them, and there are special internships for students willing to do research in the future. In Spain, it is possible to do research in a company or in the same university working in research groups. Though students prefer to go to a company for an internship as they get much better paid.

In general, all participants agreed that the best way to find a work is through job fairs held in university where companies are willing to find specific profiles, contacting with professors. Another way also is through organisations like IAESTE or AIESEC which provide from one month up to one year internships all over the world.

They also agreed that doing a really short internship is not worthy and it makes it even more difficult for students to find a company to work in because nobody wants to hire a student for only 3 weeks. This situation makes students skip the internship experience and if it's compulsory they try to cheat university because it is complicated to find an interested company. A good opportunity turns out to be the worst one because of bad timing.

In one of the discussion groups, one Canadian participant proposed talking about the job fairs in universities. This participant felt that job fairs in Canada are exclusively a place to advertise companies but not really effective for students looking for an internship or their first job. He also added that it is possible to find different kind of job fairs regarding the profile the companies were looking for; for example job fair only for internships.

European students explain that job fairs are quite common in their universities, even some of them attended BEST job fairs, and they thought that even if companies here advertising themselves in this kind of events, it was something good for students because companies collected potential employee contact information. Spanish participant pointed out that companies are allowed to have an



office in the university having tasks for students and enabling them to work in university projects financed by the company.

Another topic that worried the participants was the difficulty to find a job once graduated. All of them agreed about this situation which is mainly due to the economical crisis; especially in countries like Spain or the Baltic ones where recession is more noticeable than elsewhere.

European participants explained that marks are not a key point in order to get a job. The kinds of work new graduate engineers are getting also change from one side to the other of the Atlantic. While in Europe is quite easy to get a job in consulting companies, in Canada is hard to get accepted. A specific company was mentioned as an example which employs 40 new engineers out of 4000 applicants every year.

Polish participant also shared that some young engineers go abroad, usually inside Europe, to get paid higher salaries.

Exchange programs

Approximately 60% of the participants had been involved in an exchange program, mostly the European participants. None of the students knew anyone that had experience an exchange program between Europe and Canada, although one Canadian participant applied for it and it was planned for her to study one year in Sweden.

Canadian students do not participate usually in exchange programmes; their universities don't have many agreements with foreign countries. It is more popular to travel inside Canada; in fact the distances are as big as the ones European students are travelling to go on Erasmus in another country. Moreover it is also hard to go through all the bureaucracy as universities are reluctant to recognize other universities credits. Students find it much easier to go in Co-Op somewhere inside Canada or the United States of America. Canadian students that want to travel abroad usually get involved in other activities such as students organisation.

Although this is the situation in Canada, Waterloo University is encouraging students to study abroad and has lots of exchange programs, mainly in Europe and Asia and few of them in United States of America. Students have to accomplish some requirements in order to participate in these programs, for example have at least 70% average in your marks.

Some Canadian participants stated that most of the companies are looking for students coming from certain universities considered more prestigious than others. This is a reason why Canadian students do not wish to go somewhere else to study; clearly another obstacle for transatlantic mobility.

All European participants knew about the ERASMUS programme and some of them had already participated in it. However, some other interesting programs appeared in the conversation.

Portuguese participant explained that his faculty also has special exchange programs with Brazil (under Leonardo Da Vinci program) and also contacts with Mexico and Baltimore.

Spanish participant, studying in Technical University of Catalonia, commented that her university promotes very actively the exchange programs, and apart of ERASMUS is possible to participate in many other exchanges all around the world. Special attention was given to UNITECH program (www.unitech-international.org), from where one can take an exchange experience by working and attending lessons abroad. Only nine universities participate in this program (Technical University of Catalonia, Ecole Central Paris, Chalmers University of Technology, Swiss Federal Institute of Technology, Politecnico di Milano, Aachen University, University of Dublin and Technical University



of Delft). UNITECH is highly demanded by students and the application procedure is very hard including several interviews.

Participants were also informed about exchange programs run by student organisations like AEGEE or IAESTE.

ERASMUS Mundus was explained and considered a possible solution for Europe-Canada student exchanges, even Canadian students were afraid that these credits won't be recognized in their country.

Become a professional engineer

Another topic that participants were discussing about was "how to get a professional license" and "who accredits the universities". Some of the participants didn't know much about the topics as they were in the beginning of their studies, but the ones working in their final project or thesis were well informed about the situation in their countries.

In Canada, "Engineers Canada" accredits the universities every four years.

Students need to pass some courses about ethics and law; moreover they should not have criminal/delinquent record. These courses are difficult to pass and not all the students manage to become professional engineers. In Canada someone can work without the license but cannot sign projects.

In Spain and Portugal, students that want to get a license have to register in a professional association of engineers. This way, engineers can sign projects. But the situation is not the same in both countries. In Portugal engineers need six month working experience while in Spain students can get registered just after finishing their studies. The Spanish participant also mentioned that usually engineering students start to work as engineers and getting paid the same salary without having their studies finished due to the lack of engineers the country is suffering from.

In Romania and France there is no need of special license to work as engineer. On the other hand, in Poland only in the case the engineer is working in crucial security projects there is the need of a license.

Finally, Hungarian participant explained that two years of working experience is asked to have the engineering license and most of engineers get it without problem.

Exams

Eventually, exams topic appeared in the conversation. Surprisingly for some of them, they discovered new kind of exams and the discussion about which one is better was long and heated.

To understand better the results, before discussing the type of exams, participants were discussing about the role of the professor. In general, professor is considered as an important figure in the society but while in Canada professors are distant and it is very difficult for students to talk with them and consult their doubts, in Europe professors are close to students and maintain a good relationship with them. This way, in Canada there is the Teaching Assistants, usually young graduates or PhD students who deliver lessons, labs and correct most of the exams; if a student needs any kind of help to solve their doubts, professor is not available, Teaching Assistant is. Literal words of a Canadian participant are "Professor is like a God, TA is like the priest to the God".



Again cultural differences between Europe and Canada appeared when talking about oral exams. In most of European countries oral exams are used in different subjects, for example in Spain they are used to test your knowledge about the labs, in Italy students are asked about theory in oral exams and in Bulgaria students can have an oral exam in order to test if they really know what they have written in the exam. In all cases, in order to get the final mark, students have to pass a written exam.

European participants defended that oral exams' level is higher, as students cannot cheat anyhow and professors can ask further. Students have to understand really well the topics they are asked for as it is easier for the teacher to find what they haven't understood. Moreover, they said oral exams put students under pressure which will be useful for the future when working in a company.

On the other hand, Canadians explain that oral exams do not exist in Northern America and there is no proof that they are better than written exams. They defended that teachers can be influenced by the physical appearance of students and do not be objective. They also pointed that due to cultural differences between professor and student, there could be a misunderstanding and the marks could be affected.

The very special case was Ukraine, where oral exams exist and the participant did not agree much with them because he had seen cases of bribing in this kind of exams. Apparently, the professors' economical situation is critical and bribing has become a not that rare practice.



Undergraduate Research

Introduction

Undergraduate Research (UR) is research that is carried out by students during the undergraduate studies in Higher Educational Institutes, also known as Universities.

Research, in this context, means systematic and active process of inquiry and collecting information about a particular subject in order to discover, revise or interpret facts, events, theories, behaviours or to make practical applications with the help of the information gathered. It can be divided into Basic Research, whose primary objective is the advancement of knowledge and the theoretical understanding of the relations among variables, and Applied Research, whose goal is to solve specific and practical questions.

Undergraduate students, according to the study model described by the Bologna Process, are the ones studying towards a Bachelor. UR is for the first cycle of studies towards the bachelor degree.

The aim of this discussion was to give the students an insight to the implementation and the state of the development of UR in Europe and Canada, to the work being done and to get feedback and new ideas from them. To achieve this the session started with a round-up sharing session. Students shared information about the current situation of UR in their home universities/ countries regarding the implementation, the purpose, the funding, the quality and ideas of improving.

Afterwards the discussion continued with the benefits and drawbacks of implementing UR in the universities of the participating students, as well as with the comparison of UR against post-graduate research.

Finally we discussed about mobility for researchers and we closed the session with another topic that popped up, mobility for professional engineers.

Outcomes from the discussion session

What could Undergraduate Research be?

In the beginning it was difficult for the participants to understand how undergraduate students could do research. Facilitators gave some examples of what could be UR, like laboratories or innovative projects etc, in order to help them understand.

In most of the European Countries, UR is not that popular. After the explanations given to the participants, it came up that actually UR exist in the form of labs in each semester, through which students are supposed to get the practical knowledge out of the theory they have taught in the auditoriums. On the other hand in Canada, students usually do research in their field in the fourth year of their studies. They choose to do this as it becomes easier for them to continue in a post-graduate program.

In the end a participant came with another form of UR that, the rest haven't thought before, and this is the final thesis you have to deliver in the end of your studies. All participants agreed that as in your thesis you work on an innovative topic, you collect and analyze information and in the end you write a report, this is basic research!



So in the end of this topic participants agreed that there is – in some universities more and in other less – a form of undergraduate Research and they also said universities should work on moving towards this direction, as our society has the need of new researchers with fresh ideas

Quality of Undergraduate Research

While discussing about the drawbacks of UR one of the issues that popped up was the limited time for these projects. An opposed idea was that this is enough, as undergraduate students don't do very detailed research and the primary aim is to make them familiar with the process and not to actually produce results. The aim of the UR was also the answer to the problem that the projects could be very easy. Again it was mentioned that through these easy projects, we want students to understand the steps that a researcher has to follow as well as how someone should write a good report.

The next topic discussed was how we could improve this process. From the European students' point of view, they think that some rewards for the students that practice more advanced research should be given to improve their interest. Canadian students sustain that the students should come with some basic techniques from high school and that the states should get also involved, making some camps for example.

Discussing now about the quality and the efficiency of UR, participants said that the general problem is the scientific equipment which is necessary for the research. The fact that the universities don't spend enough money on the equipment was mentioned by the participants to be a major problem. Another problem is that the level of the laboratories is preliminary so students don't have too much things to do therefore they don't learn too much through this process.

Benefits of the undergraduate research

The involvement of companies, students and universities is the main aspect that was discussed during the session.

The benefits of the undergraduate research for universities include projects in cooperation with the companies, in order to gain financial support for a research program and direct sponsorships from the companies involved. From this kind of co-operation, a lot of output can be gathered: companies can specify to the universities which are the most relevant areas where research is needed, from the industry's point of view.

Students can do real work during their studies and gain professional experience. Nevertheless they can broaden their perspectives and realize what they would like to do after finishing studies. Even if a student decides that the area he/she have been doing undergraduate research is not the one he/she want to head their career to, the practical experience and the soft-skills acquired remain. The students will also gain practical experience that will complete their theoretical background and this could even help them decide for the near future in what master program they would like to take part.

The benefits for the companies, as were mentioned by the participants, rely on the idea of involving undergraduate students in research projects: they are pro-active, can learn quickly and might come up with innovative solutions.

Still, the undergraduate research is not very popular. There should be more possibilities to do undergraduate research than there are now.



Cooperation between universities and companies for research issues

This issue is widely discussed, but generally there are not so many agreements between companies and universities for undergraduate or post-graduate research. When the relation between companies and universities is tight, the cooperation has a lot of advantages for the students: they are taught skills and relevant subjects that are needed in their future work life, the study curricula are in accordance with the companies' requests etc.

There are also advantages for the universities (the research projects can be funded by the companies that require them, laboratories can be equipped with the latest technology by the companies) and for the companies (in addition to the expenses quantum, that is lower when working on projects with students, the companies can meet potential students that they would like to hire after they would finish their studies).

Unfortunately, as in all the fields, there are some specializations in which research has a very low request rate (e.g.: in Mathematics, companies do not initiate research programs very often) and this might be seen as a disadvantage.

Undergraduate research versus postgraduate research

It is known that in undergraduate research, the periods assigned for students to do projects are smaller than in postgraduate research, basically because of the study curricula which is mostly theoretical. Postgraduate research has more impact and quality, because in the undergraduate research, students have less time for practical projects than they will have after finishing the studies.

Even though, the students from our discussion groups showed a greater enthusiasm when speaking about the undergraduate research. This is because postgraduate research is seen as a real work assignment, rather than a study opportunity. In postgraduate research, companies have a stronger word on the desired outputs and the project's length. Copyright and ethics of the postgraduate research were also discussed and the conclusions jumped over the idea that researchers should pay a lot of attention when signing a research contract with a company.

The undergraduate research can be improved by rewarding the excellent students and by having more companies offering this kind of projects. The development of internships of two or three months can raise the awareness of undergraduate research and more and more students may want to benefit from this kind of programs. In any ways, undergraduate research is very important because it can build up the student's skills for becoming an excellent postgraduate researcher.

Mobility for Researchers

Mobility is a very important subject, especially if we talk about researchers. The advantages of researchers' mobility consist in professional development, because researchers tend to go to more specialized departments and areas in order to work on important projects. Even if they will be assigned to universities or they will go to research centres, the researchers will share their knowledge with students or colleagues. In the last case, working in a team with researchers coming from different fields could bring major contribution to a project. However, some problems might appear in countries that have not developed the research field: researchers would choose better working conditions and emigrate from their own countries.



Mobility for Engineers

Before talking about the mobility for engineers, we should have in mind that diplomas are not worldwide recognized. One solution would be to have certificates from professional organisations (e.g.: IEEE) that would be recognized worldwide. On a smaller scale, engineers could register themselves in professional associations / societies and they could try to pass some worldwide recognized tests in order to prove their professional abilities and capabilities. Another idea that popped out was that the company where an engineer wants to work should also be asked about the relevance of the diploma he/she has.

Having this background, we can state that the mobility for Engineers is mostly limited by the bureaucracy for diplomas' recognition among the states. However, there are some associations and organizations (e.g. IAESTE, AIESEC, AEGEE, BEST) that support engineers' mobility and help them finding work places all over the world directly or even by providing them with the necessary skills.



Learning café

Table 1: Motivation to work as Engineer

Participants at this table were focusing on what can motivate an engineer to work in his field after graduation. They discovered a lot of motivational factors which are listed below:

- **Status/ Prestige/Reputation:** it is a profession well known and respected world wide
- **Self realization:** Engineering can be the way to achieve success in life
- **Personal improvement:** engineers are constantly facing challenging situations which lead to developing and improving the personal qualities
- **Possibility for career advancement**
- **Power:** the knowledge and the experience can open the doors for a political career
- **Money:** the engineers are well paid for their knowledge and services
- **Insurance on the job market:** no matter how difficult the job market can get, engineering is always needed.
- **Problem solving:** to deal with difficult problems and finding innovative solutions can be a good challenge for engineers
- **Opportunities:** as engineer, a wide range of doors can open in different fields, it is easier to involve in other domains, than the other way around.
- **Gaining a lot of useful knowledge**
- **Teaching others:** once an engineer gains experience in his field, to share the knowledge with younger engineers can be very rewarding
- **Lifelong learning:** scientific discoveries are made all the time, so there is always space to learn something new about your field.
- **Chance to be an expert** in a niche field
- **Serving society:** by their work engineers are contributing to a better world
- **Influence on other fields** like economics, medicine, politics
- **Entrepreneurship:** once you know how things work in a specific engineering field and you gain the connections with the industry, entrepreneurship is more and more tempting
- **Breaking boundaries/innovation:** we get the chance to make possible things that some years ago where thought impossible.
- **Working with cutting edge technologies**
- **Travelling** around the world with different projects

Table 2: Language barriers and cultural differences

At this table, participants discussed about language barriers, cultural differences and how can be surmounted if an engineer will go and work in a new country or region.



Concerning the language, basic expressions and phrases should be a big plus for the new comers. It is also interesting how body language can differ between countries and one should not be surprised if there are signs or customs with totally different meaning than in the original country. Stereotypes can be a barrier in adaptation because they might be wrong and for sure not true for all the population.

There are a lot of factors that can contribute to a cultural shock:

- Different traditions
- Different lifestyle
- Food
- Stereotypes
- Religion
- Mentality
- Climate
- Prices

What can help a lot to attenuate these differences is a positive and open-minded attitude, making new local friends, going out during holidays and festivals, have a social life integrated in the new society, study the history, become aware of the prejudices that locals have.

Table 3: Teaching methods

Participants at this table did an analysis on the teaching methods existing at this moment, considering some advantages and disadvantage for each of the methods:

Chalk and talk

- Direct contact with professor
- Not suitable for some courses
- Structured format
- Adjustable teaching style
- Different media can be used

E-learning

- Ease of mobility,
- Always available
- Poor feedback and lack of human contact
- Can get students lazy

Guest speaker

- Input from industry involved people
- Networking with the speakers
- Brings outside-university knowledge



Field trips

- Networking
- Get to see industry
- Costs
- Lack of availability

Internships

- Industry experience
- Can be paid
- Time consuming
- Lack of offers

Tutorials and seminars

- practice
- ask questions
- smaller class size
- 2 way communication
- Expansive
- Requires resources

Case studies

- Practical applications of knowledge
- Time consuming
- Present real problems
- Can bring to creative solutions

Group projects

- Team work
- Greater scope of info
- Can get to unfair workloads and teamwork problems
- Bigger projects can be approached

Research

- New ideas to implement (innovation)
- Lack of facilities
- Access is limited

Labs/hands-on

- Practical applications of knowledge
- Lack of facilities



- Demonstrations
- Interactive
- Enhance learning experience
- Can be out of date

Small group workshops

- Easier to discuss
- All members can express their opinions and involve
- Poor group dynamics

Table 4: Student exchanges

At this table, participants talked about their exchange experiences in other countries. The participants present here knew details about the following countries:

Portugal – 1 person

- Coarse language: English
- Program: Erasmus
- Scholarships: 550 Euros/month
- Interaction: with other Erasmus students
- Cost of living: shared flat 360 Euros/month

Italy – 2 persons

- Coarse language: Italian
- Program:
 - Alpip (18 months) - for South American students to study in Torino (<http://www.alpip.polito.it/>)
 - Erasmus (10 months)
- Scholarships: 10 000 Euros/year; for Erasmus 500 Euros/month
- Interaction: mostly with international people
- Cost of living: shared room: 370 Euros/month

Sweden – 5 persons

- Courses language: English
- Programs:
 - T.I.M.E.(for management students),
 - Erasmus,
 - Agreement with universities
- Scholarships: from the program and from government also



- Interaction: with foreign students and locals also
- Cost of living: very expensive

Lithuania – one person

- Courses language: English
- Program: Erasmus (5 months)
- Scholarships: 2175 Euros/5 months
- Interaction: with Erasmus students
- Cost of living: dormitory – 80 Euros/month

Greece – one person

- Courses language: Greek
- Program: Erasmus (7 months)
- Scholarships: Erasmus (2175 Euros/month)
- Interaction: Erasmus students
- Cost of living: included

England

- Courses language: English
- Program: Erasmus (4 months)
- Scholarships: 2000 Euros/4 months
- Interaction: locals and foreign students also
- Cost of living: tuition is included

Summary

- Most expensive country: Sweden
- Least expensive country: Lithuania
- Average duration: one semester
- Most common: Erasmus
- Language used: mostly English
- Scholarships: for everyone
- Average expenses: 500 Euros/month