

IBS Report "Teaching Methods and resources"

IBS Valladolid

International BEST Symposium in cooperation with ETNET 21

ETNET 21 – European Thematic Network on Education and Training in the fields
of Environment and Water

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Abstract - Summary

During this workshop we tried to give an outlook for future European education and to analyze the educational systems in the different countries of Europe. We went into detail and compared the curriculum, the amount of practical work, the status of equipment used in laboratories and practical training / internships. We also discussed methods to improve cooperation and student exchange between schools in different European countries. Also recognition of education performed in another country at own home school. We came to conclusion that the educational systems used throughout Europe are very different from each other and to ease student exchange between European counties there is a need for a more general European educational system.

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Introduction

IBS's are seminars which gather Professors and engineering students from all Europe with the purpose of evaluating and come to conclusions how to improve engineering education within Europe. This IBS was organized in cooperation with ETNET 21, European Thematic Network on Education and Training in the fields of Environment and Water, which is a thematic network between students and academics, where educational topics on the education of engineers are discussed and new solutions are found.

The topic of the discussion was "Teaching Methods and their resources". This topic is a part of ETNET 21's SP1 area concerning the pan-European situation in water-related education teaching resources in the 21st century. How the teaching methods and resources should be developed in research oriented training and education.

During the IBS we tried to analyze the different curriculum used in different European countries. What is the duration of studies for different engineering degrees? Is a system with three different levels of degrees used; Bachelor, Master and Doctor degree's? How do the different systems differ from each other?

Discussed during the IBS was in which proportion the teaching time should be divided into theory and practise? How much practical training do students get doing internships at companies during their education? How much students would like to have teaching in laboratories or in research oriented projects before thesis work? How could we increase and measure the student involvement in research?

What do thesis students think about the current practices in their research oriented training and education? What would they like to change? How much is considered what kind of laboratory work does give students the optimum value to their education and how to improve it?

Professor was interested in knowing about what students expect about the methods and resources used in their university education? Are they effective now?

The discussions started with an introduction of the participants and an opening session of the IBS, then continued by filling out a questionnaire, which would later be the major guideline for the IBS. The idea of the questionnaire was for the Professor and the facilitators to have a better idea and more input on what level to base the future discussions. The discussions were at most time carried out in one group, but towards the end of the second day we divided into two smaller working groups. Before the third and last day presentations about the outcomes of the different topics discussed during the IBS were prepared and then presented the last day. There was also a closing session where we evaluated the IBS.

Questionnaire

A. Sketch the curriculum for your program(s) in terms of division of workload and balance between theory – laboratory work – independent study. What should be changed to this division, in your opinion to improve the study curricula?

B(achelor)%

M(aster)Sc(ience)%

B. Which actions are undertaken by students during their study at your faculty?

Attending lectures
 Practical work
 Computer labs
 Design projects
 Getting tutoring
 Individual projects
 GIS
 Virtual labs

C. What resources do you use in your teaching, both in teaching theory or organizing practical work? And try to describe in what way, according to your opinion, they are effective.

Blackboard
 Overhead projector
 Power point presentations
 Video
 Film
 Demonstrations
 Field visits
 Site/plant visits
 Internet

D. Which (water related) courses taught at your faculty include practical work in laboratories? In what year(s) of study? Tell briefly what kind of work is done. What is the percentage of study load of this practical work in curriculum?

Which courses taught at your faculty include fieldwork? In what year(s) of study? Tell briefly what kind of fieldwork is done. What is the percentage of study load of this fieldwork in the curriculum?

F. Which courses taught at your faculty include computer work? In what year(s) of study? Tell briefly what kind of computer work is done. Try to estimate the percentage of study load of each year.

Simulations
 Exercises
 Report writing

Others

Which courses taught at your faculty include project work? In what year(s) of study? Tell briefly what kind of project work is done. Try to estimate also the percentage of study load of each kind.

Design

Calculations

Problem analysis

Tell something more about the final project carried out at your faculty. Is it compulsory to have a final project at the end of the program(s)? How much credits are given to the final project?... Give the balance between design and research in the final project.

How do students get in touch with research at your faculty? How and how fast are new research results included in the courses and the practical work? What is the importance of research in curricula and teaching?

How much does your faculty work together with industry in the field of environment-water, in terms of students per year and projects per year? How is this reflected in the courses? What do you think about this cooperation. What are the (dis)advantages of this co-operation?

What year is, in your opinion, the perfect year to do an Erasmus-Socrates program? Why? What do you think of an Erasmus-Socrates program?

The Discussion

At the beginning of the discussion everyone was asked to introduce themselves followed by an introduction of ETNET 21 Thematic Network and the goals and aims of this IBS. The topics were introduced then continued by filling out a questionnaire, which would later be the major guideline for the IBS. The idea of the questionnaire was for the Professor and the facilitators to have a better idea and more input on what level to base the future discussions.

Curriculum

Starting with answering section A in the questionnaire, the seven participants were students at the following levels:

Bachelor: 3

Master:4

Curriculum in different countries

Students were asked how the educational system is organized in their home countries.

Spain:

Bachelor 3 years more practical

Master 5 years more theory

Romania:

Long and short term studies

Belgium:

Candidate->Master, Fachhochschule

Greece:

University and Technical Institutions

Master 5 years

Tech Inst 5 years->only Bachelor

Sweden:

Master of Science 4.5 years

Bachelor 3 years, Upgrade to Master->+2.5 years = 5.5 years

Volkshochschule 2 years, usually boarding school

Finland:

Master 5 years

Austria:

Diploma 5 years

Industry demand for not so theoretical education and more practical =>

Polytechnical University

Practical work

Students were asked how practical work is involved in their education.

- Amelie: 1/5 of the time to practical work (projects) focus on design (as she is studying architecture). 12 to 13 credits out of 60. Students complain as they don't have time enough.
- Laura: It depends on the classes. 1 hour of theory and 3 of practical work. But some subjects is the opposite. So it's half per each.
- Oscar: After second year is quite balanced the hours to practical and theory.
- Nelson: Depends on the subjects. But it's around 60% theory.
- Christos: At the laboratories they give them projects to develop but it's around 70% theory. Only two subjects with practical work per year.
- Giorgos: same as Christos (same studies)
- Carolina: not much, only drawing and Materials of Construction in which students can't afford to "work" on the field but only see the teacher making the examples.

Concluding that for everyone the education is not at to work too much on practical work as there is first a need for a good base on theoretical level.

Internships

In Belgium you don't have to do an internship, you can do it on your own at the end of your studies, and maybe you can also balance, even if 50% on each field would be good. The general thought is that the participants don't think they have time get some credits out of it.

In Greece it is not compulsory, but many teachers they provide like Summer internships to students, it is not well paid, but it is a very good experience. There are also some projects coming from companies, but mostly PhD students take them.

In Belgium the time is restricted for one month, because if you work longer then the parents of the students won't get money from the state (money they get when the children are studying) so companies are very reluctant to give internships to students only for a month.

In Sweden you have to work for 17 weeks.

In Timisoara at the end of the year you have to do a certain number of hours, but it is not paid. At the end you have to make a report, and you will receive 4 credits.

Conclusions:

Somehow, the time you spend on practical work depends on the student, the subjects and the degree you are taking.

You need a connection between theory and practical work. So you need a base to understand what you are doing.

Students should have the chance to choose what they want to learn (helped by experts who know what they need to know); in a general way (topics and subject's structure) and also in a personal way (how much time do they have to spend on the practical work).

What do companies want? Do they want experts or open-minded students? Do they prefer bachelor or master students?

Payment is also connected to what you are studying.

Professor presented some results of the evaluation sent to different Universities and the result agreed quite well with what we have concluded. This is the result of the evaluation and we can see that Master degree education has more theory and Bachelor more practical work.

Division of work in studies, defined by workload:

Master:

48% Theory

26% Independent studies

17% Laboratory work

11% Field work

Bachelor:

45% Theory

22% Independent studies

22% Laboratory work

11% Field work

Students' evaluations:

Something that's missing at universities is that they are not up-dated on the tools that we use when we'll get on the field of work. Aim: losing less time to explain the "old methods" and more on the modern technologies.

One purpose of engineers' education is to make them be able to learn a lot in five years, and then to develop themselves and their future job while being at the company. That means leaving university with a wide and open mind of what they can do, so you can cover many areas in a company and become more specialist while working.

Sometimes it's compulsory to work in a company (in co-operation with the university) during the summer to complete your practical education, during three weeks. As an example at Laura's university, in the third year of studies, groups of students are taking to "create" a company to see what kind of papers do they need... they simulate a possible real situation. Companies of constructions are co-operating too providing internships in which you can get credits.

Also it's very interesting that at Amelie's University as practical training they work on a week project and they are helped by professors and company employees, giving the students a good chance to learn and face a working group.

Oscar makes a general question... Do you think that professors should also go from time to time to companies and see how things work?

Teachers at Amelie's University are all working also for the Industry, so they focus their lectures in a very real way.

Nelson: in Spain, full time teachers are not allowed to work. That made from long time ago, the feel to teachers that they don't need to work, and they don't want to look for that possibility.

The fact that teachers can choose the topics to teach sometimes it's not a good method. As things develop and the need to get up-dated it's really important. That's why input from students should be taken in considered.

In the questionnaire, the questions are related to teaching resources, so all the questions are not relevant for the students, but it is good to have their point of view.

We are changing into a 3 level education: B, M Sc, PhD. Some people are still discussion if it should go like this. But maybe this will soon be a fact, so it can be more useful to discuss about the structure.

Not everybody can go and take an M Sc course. At the beginning you start with B or M Sc. Maybe you can pass to M Sc after, but it is not always that easy.

In M Sc. you study some subjects deeper. You have more theory, you get a bigger background.

Sometimes you can take a "bridge" course to pass from B. to M Sc.

In Spain, you don't really have a two level education in many studies, because you have to choose between B. or M. Sc. at the beginning, and it is not very easy to pass from one to another.

It is not a good system: if you finish your B. you should be able to apply for M. Sc., and not based on the marks you have got at the B degree. You have to apply for it, and there are a limited number of places. It is of course not good

that you cannot pass more easily from B. to M Sc. B was supposed in a "lower" position, but nowadays socially is almost on the contrary.

In Romania, the studies are called "long form" and "short form". When you finish high school most of the people want long form, you have to do some exams and depending on the marks, you will enter or not. You cannot go from the long one to the short one. If you want a degree you have to finish all the years.

If you finish the short one, you have to pass some test, and if you get it you can go to the long one (but you also have to make the second one). It is a complicated system in general.

In Belgium: two years of general things (you need the certificate to go on studying, but it doesn't mean anything if you want to work) and after 3 years of engineering (it is more theoretical). After high school you can go to university or to a kind of extended high school (4 years and it is more practical, you don't have entrance exam). A new kind of program is starting. The new and the old system are still working in parallel, if you failed some subjects, you will have problems to adapt to the new system (transitional period). The education in Belgium is divided into Flemish education and French education, so maybe it is different the system.

In Greece: there are universities (5 years and you get a M Sc degree, it was a B degree before), and there are technical universities (4 years, it is considered as a B degree). If you want to continue, you can make an M Sc for 1 or 2 years more. You can also go directly to a PhD.

In Sweden: M Sc degree (4 and a half year). When you finish high school, you can choose between B. (3 years) and then you can go on to M Sc, but you have to do an extra year. B. is more practical exercises. The system is quite parallel, but the approaches are different and in the end you need more time to finish your studies than if it was something consecutive.

In Finland: there is a two way system. You can take only M Sc degree, there is no limitation of time, the optimum is 5 years, but the average is 6. Now there are polytechnic universities that are of 3 years, they are calling themselves as B, but it is not really a B degree. With the Bologna declaration they are trying to introduce this B degree at university, but it is messy because they are not used to do it.

In Austria: at the beginning it was only 5 years course and you got a diploma engineering. Some universities are not very keen on changing. Now there are 5 studies, and there will probably be changed soon. Industry was asking for polytechnic school, with more practical things (when you start you are more or less the guaranty that you will finish in 4 years); in fact, it is something like technician training supported by industry.

General European educational system

What do you think it would be more useful, at the European level? Maybe have a B. system can also help to the mobility of the students (like Socrates program), like take the M Sc system in another place.

It is very difficult sometimes to make an equivalent among the studies of the different universities, so sometimes the mobility it is not very easy. Also, there is a big problem of attitude, because many teachers don't trust in Erasmus programs. Students need some security, that's the reason of the learning agreements between universities before you move to another one to make an Erasmus. The system should be flexible.

Contents of curriculum: how is the schedule divided: lessons vs. practical work? How is throughout the years of the studies? How do you would like it to be?

In Finland the quality should be improved, because Finnish education is also said to be quite theoretical. The quality of the labs is not good.

You also have a minimum of three months of internships in a company; so this can be enough. It is difficult to say if you should move to a more practical based education, or just keep it as it is.

Also teachers might be a bit overloaded, so it should be some kind of understanding at this point. Maybe we can also be helped by other means, like distance learning, web based tools.

In Belgium you can book the tutoring hours with the professors, via web (or e-mail), and this way you are sure they are going to help you, and you don't have to wait queues, etc.

There must be a tutoring system to make life easier to both students and professors.

Belgium: there are studies where the subject is divided into three parts: theory, exercises and independent learning. There is a settled number of hours for each part. In general the theoretical part is more important if we are talking about the marking. The timetable is adjusted to it, and it is easier.

About the workload; would you benefit from a general B-M system? It is an easy way to go a study abroad and then don't have any problem when you are back in your country. It is not a problem of recognition any more. But still, the system doesn't help if recognition is not guaranteed.

Practical work is needed, at least in B. When you go to a work and you find a problem, you feel you have not learned anything when you have been at university. So it should be learnt at the university.

Final project

How fast new research influence in the curriculum of the students? Final projects/thesis: where you do it? At the University, or in cooperation with industry?

Outdated tools; when learning practical skills in school usually older machines are used than what is used at companies. More practical work is needed during education to see how machines and other tools are being used in industry and it is important to get updated information about what kind of tools are being used outside the University. Some teachers talk about state-of-the art technologies, but some others they just stick to their traditional lectures.

Not all of the teachers do research. University Lectors are employed by the Universities only to give and prepare lectures.

Students make their final projects that are based on the research the professor is supposed to be doing.

Final project & research. Cooperation with industry.

In Belgium you have one mentor and two assistants that help you giving feedback to your project. You can also present it to external people. It is not a close group. You can do your final project in a company, so it is more practical work rather than research. Afterwards you have to present your work. Sometimes you can do the project with another person, you can hand it in a shared work, though it is not a common situation. Length of the project, around 15-20 ECTS in Belgium. You start looking for your project the previous year. (30 ECTS = 1 semester)

The amount of credits you get for your project is really ridiculous compared to the work you do for the final project. The students are not supposed to stay much time with the final project. It depends on how much time you want to give it. Teachers should take the responsibility of making the timetable better.

So the way ECTS is implemented is not corresponding to the current situation. The idea is good, because it is supposed to represent all the courses of the studies by workload.

How flexible is your curriculum?

In first years you just follow the curricula, in the last years you have credits that you have to fulfil with subjects related to your studies; there are also some others that you have to fulfil with subjects from the whole university.

It is not very easy to find equivalent in credits when you join a Socrates program. If you get an agreement, at least you have a security.

In Sweden at the beginning you don't have any choice, then you have more and more possibilities to choose the subjects, and the last year you can choose it completely, like a specialization, though there are some requirements, in the way that at the end you have something concrete.

In Spain, at the beginning you cannot choose anything, in higher courses you have "optional" subjects, and you choose between several subjects related to your studies.

If there is no specialization, you choose whatever you want, but it is not very well done, because you may not find places for the subjects you want to do.

In Greece, similar.

In Romania, after the two first years you have to choose the specialization, but it depends on your marks you will end up making one or the other. Inside each specialization you don't have much freedom.

In Finland, it is quite free. The first years you get the basis. You can be divided in parts, one part is really the basis, and the other part is the basis for the type of studies you are taking. After that you can choose the main subject of your studies, and besides you can have other courses. In the end you have something like 30% of freedom in the curriculum.

Mobility

Most of the times you have the opportunity to go somewhere else to study, but in general you have to know the language (that was a bit the idea of the Socrates program).

How easy is to integrate on mobility projects? It is not very easy to go abroad. If you go to make a PhD the situation is easier. In general it is better to make the mobility project at the end of the studies.

Students are not very well informed in general. Teachers don't really care much about students going abroad. Many others put a lot of difficulties to recognize the courses. And even if you want to go to another university apart from those where there are agreements, you have to make everything.

In Sweden they have a very strong international office. It is very important that the International office is active at the school and informs the students about their possibilities to study abroad.

You can only go abroad to universities with which the university has an agreement.

In Greece: there is a lack of information, you have to insist, it is not easy to get it.

In Spain: there is a different access to the information and also the motivation and moral support. Learning agreements are very low equal.

Things to be changed or to improve

About laboratories: more freedom, to define a common network of universities where you can move more free, all these universities should have some common characteristics (unified system). More support for the mobility of students.

A better balance between theory and lab practices: labs take a lot of time, more than theory, and then in the exams the theory is more important, for example, so it is not a balanced system. You can use ECTS system, where the workload is also reflected.

The facilities of the university (like amount of computers) should improve. The quality of the labs should improve (also related with the facilities). More understanding (increasing the flexibility), they don't support extra curricular activities. More support for mobility. More practical labs using state-of-the-art technology. More practical exercises at the first years. Lack of guidance, if we have too much freedom then it is more difficult to choose.

Easier to get the credit recognized, and the possibility of choosing more subjects from outside (more freedom).

More information about opportunities for mobility of students, internships in companies, etc; and more efficiency in the process.

More support for extra curricular activities.

Studies need to be more practical, in the way you have the chances to work in an enterprise before you leave university, or help to have different contacts with them.

Are students heard?

Students in Spain are losing power and they are not listened.

In Chania (Greece), students do have power to make decisions. They are represented not by the Student Union but by organizations of political parties.

In Timisoara, each faculty has a student representation and all of them are controlled by a general Student Union that manages to change things. So they are also quite powerful.

Last day reflections

To start I want to say how happy I am to be here. Now I know more about education and what is going on in other countries. Can now get more involved in for example student union and work for opening doors for students to go abroad and to get broadening courses recognized.

Coming to these kinds of events gives you more encouragement to work for things to change.

I think another good part of the IBS is that I can make a model. Then out good parts from different parts of Europe and make a better model as a whole. In my country schedule is very strict and have now more hope that things can change.

Better view of own system. See that maybe things are not that wrong that I thought. Also, interesting to here about how courses are recognized in different parts of Europe.

I realize that the different school systems in Europe are very different from each other and have given me new perspectives and this will help me in my work for the student union at my University

Found out that many things are good, but also that many things need to improve. Believe that with good support from own school to go abroad will help improving the education in the own school.

We are all from different countries but we are all the same. We expect the same things from our University.

To have one or more days of preparing for the subjects; getting more background information and introduction into the subjects, for example, trainings from professors, other students or companies.

Preparing for the IBS, to get more information from own school about specific details to have to present to the others. Now we are guessing about many things, things that we could have been more up to date with and more into.

Future Events:

Professor is talking about future events with Etnet and informing about participating. These symposiums are more specific into one subject. Next meeting will be in Thessaloniki. There will some money to cover trips going to participant in this event. More information can be found at the ETNET homepage, under Keywater. This is very focused on water relation topics but also give for those interested insight into the education market in Europe.

More information about ETNET will be sent to you at home and also information about how to get more involved for those who are interested.

Conclusions

The Guidelines of Curriculum were discussed for a more general European educational system. One European format need content and a framework. It needs flexibility and transparency. Exchanges between schools need to be easy and to avoid confusion there can not be any parallel situations. Different duration of the Bachelor, Master and Doctor degree's were discussed and we agreed that a Bachelor should be three years and finishing a Master should take 5 years. The duration of the Doctor degree we did not come to any agreement.

To easy mobility there is also need for a general credit recognition system. The ECTS, European Credit Transfer System, where 30 credits equals the workload of one semester was introduced. We all agreed that this system is good, but there are differences between the workload in different countries and no equivalence between courses. Also recognition must be guaranteed. We have talked about the ERASMUS program where you can study at minimum one semester at another University in any country in European Union. We want more trust, information and support from teachers.

We have discussed the flexibility of the education. During the first years there is low possibility to choose courses, the study program is generally strict and you study basic subjects which are mainly theoretical. During your last years you have an increased possibility to choose your own courses and to specialize after own interest. Also, there is more practical work where you put the theory you have learned during your first years into practise. To improve your education there are also chances to choose optional credits at own University where recognition is assured. The final thesis can be performed within the framework of a SOCRATES or ERASMUS program, in cooperation with a company or with your Professors guidance at the University.