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# **“Access to higher Education and Undergraduate Research”**

BEST Symposium on Education, Ljubljana  
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## Summary

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## People involved

### Facilitators

Alice Renault (*Paris, France*)  
Diana Daradici (*Timisoara, Romania*)  
Nicolò Wojewoda (*Rome, Italy*)  
Petros Kaklamanis (*Chania, Greece*)

[Alice.Renault@BEST.eu.org](mailto:Alice.Renault@BEST.eu.org)  
[Diana.Daradici@BEST.eu.org](mailto:Diana.Daradici@BEST.eu.org)  
[Nicolo.Wojewoda@BEST.eu.org](mailto:Nicolo.Wojewoda@BEST.eu.org)  
[Petros.Kaklamanis@BEST.eu.org](mailto:Petros.Kaklamanis@BEST.eu.org)

### Professors

Ivan Leban (*University of Ljubljana, Slovenia*)  
Juha Lindfors (*Helsinki Polytechnic Stadia, Finland*)  
Sylvia Gibbs (*University of Huddersfield, UK*)  
Yanyi Blake (*Institute of Technology Tallaght, Ireland*)

[ivan.leban@fkt.uni-lj.si](mailto:ivan.leban@fkt.uni-lj.si)  
[Juha.Lindfors@stadia.fi](mailto:Juha.Lindfors@stadia.fi)  
[s.gibbs@hud.ac.uk](mailto:s.gibbs@hud.ac.uk)  
[Yanyi.Blake@it-tallaght.ie](mailto:Yanyi.Blake@it-tallaght.ie)

### Participants

Alberto Ruiz (*Paris, France*)  
Alexander Alsén (*Uppsala, Sweden*)  
Alexandros Silaidis (*Athens, Greece*)  
Dijana Vlasisavljevic (*Belgrade, Serbia and Montenegro*)  
Gordana Jovanovska (*Skopje, Macedonia, Former Yugoslav Republic Of*)  
Irena Trajkovska (*Skopje, Macedonia, Former Yugoslav Republic Of*)  
Ivana Zivkovic (*Belgrade, Serbia and Montenegro*)  
Joanna Boquist (*Lund, Sweden*)  
Jorge Gil (*Madrid, Spain*)  
Luis Matos (*Porto, Portugal*)  
Maite Martinez (*Lyon, France*)  
Miroslawa Lapinska (*Gdansk, Poland*)  
Naum Bidzovski (*Belgrade, Serbia and Montenegro*)  
Nicolae Dragusin (*Bucharest, Romania*)  
Olga Gorchakova (*Ekaterinburg, Russian Federation*)  
Olga Smirnova (*Ekaterinburg, Russian Federation*)  
Pedro Carvalho (*Lisbon, Portugal*)  
Stefan Ottinger (*Vienna, Austria*)

[albruiz@hotmail.com](mailto:albruiz@hotmail.com)  
[Alexander.alsen.2353@student.uu.se](mailto:Alexander.alsen.2353@student.uu.se)  
[alesyl027@yahoo.gr](mailto:alesyl027@yahoo.gr)  
[d\\_vlasisavljevic@yahoo.com](mailto:d_vlasisavljevic@yahoo.com)  
[alanis\\_gor@yahoo.com](mailto:alanis_gor@yahoo.com)  
[irenatr@hotmail.com](mailto:irenatr@hotmail.com)  
[ivana2405@yahoo.com](mailto:ivana2405@yahoo.com)  
[aosq@icqmail.com](mailto:aosq@icqmail.com)  
[georgyboy@gmail.com](mailto:georgyboy@gmail.com)  
[c0470053@alunos.fc.up.pt](mailto:c0470053@alunos.fc.up.pt)  
[maitus13@hotmail.com](mailto:maitus13@hotmail.com)  
[apiska@tlen.pl](mailto:apiska@tlen.pl)  
[naum@sbb.co.yu](mailto:naum@sbb.co.yu)  
[nickydragusin@hotmail.com](mailto:nickydragusin@hotmail.com)  
[gorchakovao@yandex.ru](mailto:gorchakovao@yandex.ru)  
[smirnod@rambler.ru](mailto:smirnod@rambler.ru)  
[pedrosc@iol.pt](mailto:pedrosc@iol.pt)  
[ottinger@gmx.at](mailto:ottinger@gmx.at)

## **Abstract - Summary**

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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 round-table discussions.

The topics vary on different educational issues: this Symposium is organized together with the project Teaching and Research in Engineering in Europe, connected to the European Commission, and the European Access Network. The topics of the Symposium were access to higher education and undergraduate research (both topics will be explained later, under the introduction for the working sessions).

The Symposium is mainly run by the Educational Committee of BEST (EduCo), and the hosting local-BEST group, in this case Ljubljana. During the Symposium the discussions were held in three groups facilitated by EduCo members, and notes were taken by BEST members.

During the working sessions, each group was given valuable input by 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's to PhD's. 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 the topic introductions where several professors gave some information about access to higher education and undergraduate research.

The outcomes of the working groups will be brought to the decision-makers, so that they will get a possibility of listening to the students' point of view before changing the concept of education.

## Introduction – Fees

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The main expenses of universities consist in salaries, renewing of the technical equipment, funding the academic research. Fees are supposed to cover some of these expenses such as the renewal of the facilities, internet access, new computers and students' newspapers but they also cover the materials for students and various other expenses connected with students. However, usual fees are only a bonus for universities, as they represent at most ¼ of the costs for the government.

But how do we assure the fees are really used this way? How could the students participate in the final decisions?

## The Discussion

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- **Bulgaria**
  - Universities are mainly state supported, low fees
  - Even low fees are still a problem for some people
  - Government pays teachers as low as possible
- **Croatia**
  - Fees were introduced between 7 and 10 years ago
  - The government supports the faculties
  - For 1000 accepted students supported by the government, 500 have to pay fees
  - Only 1% of the students finish their studies
  - Actually, the education system is in a transition period, possible introduction of fees for everyone in the future
- **Estonia**
  - Half of the universities are financed by the state (no fees)
  - For the others universities, fees can go up to 2000 € per year
- **Finland**
  - No fees for students
  - Students can take a loan for casual expenses (~300 € per month)
  - If there is a fee in a close future, it will be symbolic
  - Universities are funded depending on their number of students
- **France**
  - Promoting flow of international students
  - Grants up to 1200 euros/ month for students with good grades or students with financial problems
- **Greece**
  - No fees
  - 80% students are studying in a different city and have to pay all expenses
- **Ireland**
  - No fees (banned because of student fights)
  - Fees existing only for students who don't pass exams or leave the university before being graduated
- **Italy**
  - Fees approximately 500€/year
  - Technology studies have higher fees
  - Scholarships depend on your parents' annual income

- **Macedonia**
  - Expensive fees (200 – 400 €/year) were introduced 3 years ago
  - Higher fees (up to 1000€) exist for the most wanted courses
  - Credits are given back at the end of faculty for the best students
  - The 3 universities have a very different politics about fees
  - One of them has opened last year in favor of minorities (Albanians)
  - An annual report has to present how the fees are used
- **Portugal**
  - Minimal fee approximately 700€/year
  - Fees go directly to the government
  - A part of the fee provides hosting for students
  - The government distributes the money afterwards to the universities
  - Grants for students with financial problems are available
- **Romania**
  - 30% of the fee goes to the university and 70% to the faculty of the student but there is no actual transparency
  - There are many private universities
  - Fees depend on grades
  - The average fee is about 500 € (which is very high considering the average salary, 100 €)
  - Scholarships between 50 and 100 €
- **Russia**
  - Most people can't afford fees
  - Fees depend on the student's exam results and his faculty status but also on the popularity of the course.
- **Serbia**
  - The number of students financed by government is decreasing
  - Fees are rising
  - There is one state university. Many students apply there so they have to take a test. Good students don't pay fees; the other students pay 1000€/year
  - Private universities are new (arts, management). The fees are 6000-7000€/year but they guarantee a job
  - Students still have to buy books (50€ per book)
- **Slovenia**
  - Free for regular students
  - Fees for foreign students
  - Fees up to 20%-50% for irregular students (working, not passing admittance exams)
  - Talking about introduction of regular fees
  - Problems with graduated students : no professional experience and no jobs available
- **Spain**
  - Public funding system
  - The fee is up to 600 €/year depending on the study program
  - It can become more expensive for students who fail their exams
  - Not many scholarships
- **Sweden**
  - Education is free
  - Low funds for casual expenses
  - Loan: 2/3 have to be paid after starting to work
  - Universities are financed by the government proportionally of the number of graduated student
  - Problems still discussed : should foreign students pay any fee?

As a conclusion, we can notice that higher education is mainly state supported. However, this situation has been decreasing in the past few years, fees are being introduced and they are rising.

Funding higher education can be done either indirectly, through taxes decided by the government, either directly with a system based on fees. In the first case, the whole population is involved in funding higher education, although not everybody will have the chance to go to university. Moreover, the aim of these taxes is not always well defined; funding higher education is only a small part of the total taxes. Fees are more transparent because they are only used by universities for the students. Nevertheless, the proportion of the cost of studies covered by fees, when they are introduced, is very low. For example in Austria, fees were introduced recently. They only cover a very small part of the costs but it made students more aware of the real cost of their studies.

To cover the funding gap, an idea is to think about partnerships between universities and companies. On one side, universities will have the funds to cover the students' expenses, on the other side, the companies will have a chance to be known by the students, who could be their future employees. In Portugal, companies provide a large part of the funds to the faculties dealing with their field, looking forward in having the newest outcomes of the research department and also new employees afterwards. In France, universities work regularly with companies; students have to find an internship at least one time during their studies, from one to six months. The students benefit from these internships by developing their skills by themselves, by preparing themselves for the reality of the market, instead of learning only theory, which is often the case in European countries. The situation in Finland is similar to France; companies offer a small amount to universities, which helps universities in giving loans to students in the need, and by doing this, they improve their image towards students. In Croatia, students can get scholarships from companies, but have to work for them for a couple of years after the end of their studies. In Slovenia, companies can only provide universities for technical equipment for classrooms, laboratories, in order for them not to intervene with the orientation of the faculties. In Ljubljana, 90% of the equipment in the university has been paid by companies. However, the situation in the United States for example has become sometimes extreme. Basic studies, research can suffer from being funded by companies, they can lose their liberty by being too much oriented towards the results expected from the company. Funding by companies can also be a problem for non-technological faculties, scientific faculties can indeed find numerous companies interested, whereas non-technological faculties will have problems finding sponsors.

In the same way some companies are providing scholarships mostly for scientific studies, some countries finance studies in certain fields of studies. For example, in Estonia, 2/3 of the students studying logistics are exempted from paying fees. In this way, the best students are supported during their studies. This would also avoid the problem of having too few students in domains where they are needed. For example, in Slovenia, too many students are studying law and economy, whereas too few are in scientific faculties. This system however restricts the liberty of the choice of the studies and the way universities will use the funds.

Thinking of this issue, the question whether the higher education is a product or a service cannot be avoided. In general, it is better to have the young generation in the education system rather than unemployed; thus, it should be supported by the state. Having an educated population is a true benefit for the development and the economy of a country. However having a majority of the population higher educated is not possible and not to be desired. A balance should be found between vocational education training, which should be today better recognized and appreciated, and higher education. Doing so, students would choose to go to the university not for the insurance of a better quality life afterwards, but because of their high motivation. As long as the education system can assure a good quality, the state shouldn't intervene in limiting students' liberty by offering scholarships or exempting them from paying fees in a restricted number of fields, depending on the need of the state. In any case, students should be

able to choose without any pressure between higher education or vocational education training, and their convenient field of study, only regarding their personal inclination, not their financial status. Thus, if the state decides to introduce fees, it should be done for every faculty and for everybody, providing scholarships or grants to students in the need.

## **Consequences of the introduction of fees**

Introduction of fees in the higher education is differently felt depending on the country, the social situation. As evidence, the introduction of fees can be an obstacle for students without parental support, for persons with knowledge but with financial problems. However, loans and scholarships are more numerous in these cases. So how do fees influence the choice of students to continue in higher education? Can the grants balance rich and poor people? Are grants and loans important enough to cover university fees and living costs?

The presence of fees makes students think twice before choosing to study in the university. Scholarships don't seem to be always the best solution. Indeed, on one hand, the complexity of applications to grants prevent some students from applying, on the other hand, the criteria to choose the candidates to the scholarships are not always reliable. How to be sure of the fairness of such a system? Scholarships depending on merit will encourage students' self-development and development of potential, yet fewer funds will be available for mass education and for students with financial problem. In the Netherlands, grants are given based on performance, but it can turn out into a loan if students don't finish their studies in time. Financial issues disappear but this creates a lot of pressure.

A system, which is more and more widely spread in Europe for funding students in higher education, is the system of student loans. In Great Britain, the loan covers the whole expense of the studies. Students begin to pay back to the government the amount of their loan when their income is greater than a defined limit. Thus, taxes for higher education are only paid by people who have actually been to university. In Sweden, the government funds the costs of the studies through general taxes. Students can ask for a loan to cover their costs of living while studying. As in Great Britain, they will have to pay back only when they are employed and when their income is sufficient. Nevertheless, the funding is cut if the student drops out university before the end, or if he studies more than a fixed number of years. In Portugal, students can demand for help from the government under financial reasons. However, this system leads to great debts after graduation for some students.

Some students ensure their living costs by working at the same time as studying. By finding a job, students get to have a working experience, which is often lacking in universities. Yet, this has often consequences on the duration of the studies, which will be obviously longer due to a lack of time for studying. This would be impossible in countries as Great Britain, where students have a limited of time to finish their studies. In Slovenia, this is a solution commonly used; the work is then exempted of taxes. Germany has taken a different approach, a full time work is forbidden during the studies. An ideal solution would be for the university to provide small jobs for students with financial problems, more or less connected to their field of study (library, research).

The difficulties encountered with the introduction of fees could ensure the motivation of the students. For example, in Canada, students pay high fees but are very interested in learning, they consider this money is an investment for their future. Europeans have generally a very different conception of money and education. Paying fees in order to study at university makes students think twice before they decide to enter higher education instead of finding immediately a job. If they decide to apply for university, fees also make them think better on the choices of their curriculum. However, applications to scholarships are usually complicated, few students are chosen and the long delay for receiving the money discourage students, even very motivated and gifted ones to continue in higher education.

Actual fees in most countries are a very small proportion of the real costs of the studies. If the state or the universities cannot cover the lack of funds, will this lower quality in higher education? Will the quality of the studies in an university with low fees be less than in an university with high fees? Searching for too high quality in the educational system makes it become elitist, which would be very discriminative in case of fees depending on the quality. Students should be accepted in universities based on their grades in high school. Private institutions, with very high entrance fees have proven that fees and quality

is not always correlated. Indeed, in numerous European countries, these institutions are not recognized whether by the state, whether by the companies, as in Spain, in Russia or in Greece. There is an obvious need of implementing international standards in order to ensure quality of the institutions. In any case, the quality of an institution, private or public, is based on the quality of the professors. But how to encourage professors to teach better? A quality assessment made by students is developing in Europe, but has more or less importance depending on the country. In Sweden, professors are paid according to the grades they have been given by the students and to the results they have.

If fees are to be introduced, students must know the purpose of this fee and how it will be spend for their studies. Doing so, students will be more aware of the actual needs of the university, and will accept more easily to invest for their future. In Austria for example, students can choose the final destination of their fee – which is quite small in comparison to the costs of the studies. In Great Britain, one third of the fees provide funds for scholarships. However, students shouldn't have too much power in choosing and voting upon the use of the tuition fees, the aim is not to have universities as supermarkets, but they should be well informed on the use of their money by the university. Transparency is in case of fees the key word.

## Conclusions

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Students seem to be reluctant to the introduction of fees. However, in case of their introduction, these should remain at a reasonable amount, and should be compensated by an increasing number of scholarships. Furthermore, they should not be a barrier to higher education for motivated students, regardless to their financial situation, and be totally transparent to students in the way universities use them. It mustn't be forgotten that education is a public good, the whole society benefits from it, and therefore should be responsible in funding it, depending on each personal financial possibility.

In many European countries, fees in higher education are a burning issue. Some countries already introduced them, some are planning to and others are discussing about them. In Europe where mobility is considerably increasing, fees can represent a obstacle for many students and a threat for universities without fees. For example, before the introduction of fees in Austria, numerous German students came in the country to study in order to avoid paying fees they should have paid in their country. To avoid these types of problems, should the fees in higher education be standardized over the European Union? Standardization would however be complicated to implement, regarding the different living standards in the whole union and the different needs of universities. Increasing agreements between universities, reinforcing and developing the ERASMUS program seems to be an ideal solution. Students should always be dependant of their home university but should be able to go freely in any European country. This can still be improved.

## Introduction – Undergraduate Research

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The research, according to the web-based encyclopedia wikipedia (<http://en.wikipedia.org/wiki/Research>), is an active, diligent, and systematic process of inquiry in order to discover, interpret or revise facts, events, behaviours, or theories, or to make practical applications with the help of such facts, laws, or theories. It can be divided into Basic (Fundamental) Research and Applied Research. The Basic Research has as a primary objective the advancement of knowledge and the theoretical understanding of the relations among variables, while the Applied Research is carried out in order to solve specific and practical questions, and gain knowledge for its own sake.

The Undergraduate Research (UR) is the research conducted by the undergraduate students of the Higher Education Institutes, also known as universities. According to the study model described by the Bologna Process (<http://www.bologna-bergen2005.no/>), the undergraduate students are the ones that are studying towards a Bachelor or a Master degree. This distinction is necessary, since the postgraduate students, who are studying towards a Philosophical Degree, are expected to carry out research during their studies. Thus, the postgraduate research is well regulated, while the concept of the undergraduate research is fairly new. Actually this concept is being investigated and analyzed by the Special Interest Group (SIG) B6, of the TREE Thematic Network (<http://www3.unifi.it/tree/index.php?l=b&s=6>). Last, we note that TREE stands for "Teaching and Research in Engineering in Europe". More information is available on-line: <http://www3.unifi.it/tree/>.

The participation of students in research projects usually takes place within a research team. The students carry out a specific part of the research project. Some other times the students are expected to carry out research during their final Master Thesis. However, not all the students participate in research activities. In fact, their participation depends mainly in their interests and the available opportunities in their academic environment.

These opportunities vary from country to country, and from university to university. They depend on the interest of the academics in doing research in a specific scientific field, the available materials and equipment, the relationship between the universities and the industry and the financial support for conducting research (mainly from the state and the industry).

All these will be examined in the following paragraphs. However, the current document will focus in the Undergraduate Research in the European countries, for the Engineering fields of studies.

## The Discussion

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The beginning of the discussion was dedicated to the existing Undergraduate Research (UR) in the countries of the participants. Some participants admitted that there is no ongoing UR in their education. These participants were commenting on Bulgaria, Poland and the Russian Federation. The other participants indicated that there exists UR in their home countries. Some of them said that the UR is not properly regulated by laws or rules, so it depends solely on the reasoning of the professor conducting the specific Research project. Such countries include Estonia, Germany, Greece, FYROM, Portugal, Romania, Serbia and Montenegro, and Slovenia. Last, there are some countries where UR takes actually place under some regulations, induced mainly by the universities, like Austria, Spain, Sweden, and UK. In these countries there is an effort of having the students participate in the research projects that are normally conducted by the professors and their PhD students.

The most popular ways of establishing the UR is through the Master Thesis of the undergraduate students, special projects conducted with the university research team, or an internship in one industrial company. The UR can be either basic, or applied. The participants were really concerned for the difference between the real participation in research that involves creative and innovative work without expecting some a priori results, and other projects that do not really involve research. Such projects are the ones that can be useful for them in order to learn, as part of their training. Such projects can sometimes be the tasks that are a part of the real research projects performed by an academic or an industrial research

team, because these tasks involve only well-known science (e.g. numerical calculations). Last, the sole compilation of scientific information is not research; the research should be innovative.

Some of the characteristics of the UR were pointed out during the discussion, and will be described in this and the following paragraphs. First, the UR can be theoretical, practical or both. It should be part of the undergraduate studies and the curriculum, but only optional. The students should be free to decide whether they would do it or not, since not all of them are interested in research.

In order for the students to learn the scientific principles and how to do research, the universities should offer such an introductory course. Such a course should include scientific and ethical principles, project management, teamwork, documentation and presentations skills, and discipline.

There was quite a discussion considering the length of the UR. They said that 6 months is the minimum time needed in order to start producing results, after studying the relevant material and learning how to use the essential equipment in the working place. At the same time, the duration of the UR should be flexible in order to allow the students to arrive to some useful results, with the luxury of changing their research methodology during the project, if this is considered necessary.

The research group should be made of at most 6 people, so that the role of every member is distinct and well defined and the group remains very productive. Of course, proper management has to be present, and this is usually the responsibility of the research team leader. Last, the team should comply of professors, PhD students and undergraduate students.

The student participants expressed the opinion that more mature students, in that case the PhD students, are more suitable to work with research. However, they find it unnecessary for the PhD students to have the exclusivity on the research field. In fact, there can be no distinction in the essence of the research performed by the professional researchers and the students. The first are simply more experienced. Thus, the UR would be really feasible during the last year of undergraduate studies, when the students are specialized enough for such a task.

The students insisted that they would like to have some form of accreditation for their research work. In fact, considering the academic part, they would be satisfied with a certain number of ECTS points, according to the amount of the workload. Another challenge for the professors and the academics would be to motivate the students to participate in such projects. The credit points are a start with it, but the level of interest of the scientific field plays the most important part in it. As for the evaluation, their contribution should be announced in a special way, describing exactly what they did in that project.

One of the major factors for performing research are the financial resources of the university. In cases where funds are scarce, research is not a priority. The university research could be supported by the state and sponsored by the industry. Nowadays, there are a lot of students that are studying abroad in order to perform their studies in more financially flourishing educational environment. In order to ensure the proper use of the state funds of the universities, the state is able to establish an administrative bureau for this issue, like the one in UK. Furthermore, the state should focus more on the productivity (teaching and research qualifications) of the professors, like in Finland. Last, some special research funds can also be issued by the European Union, as well.

Afterwards, the participants commented on the relationships that are generated by the research activities in a modern society. The next three paragraphs will describe this briefly.

One of the most interesting covered topics was the cooperation among the students, the universities and the companies in various research projects. The role of the professors is important in these co-operations as well, since the professor can be a great advisor for the whole work. The companies, should comply with the scientific principles, and never modify the results of the research of the students, in order to accomplish their own business and market goals. The result of the collaborative research usually raises complex issues considering the intellectual property and the copyright of the results. All these must be carefully and fairly solved in the beginning of such projects. Such cooperation should bring some practical aspects of engineering research to the universities, without letting them lose their autonomy. Actually, both the companies and the universities benefit from such collaborations. The companies make contacts with a source of young, full of potential, soon-to-be engineers, and the students can use the high-tech

equipment and some financial assistance from the companies to carry out research. Additionally, there is no better gift for the students, than learning how to do research, in a scientific and rational environment.

In fact, there are more advantages coming from the practice of the UR. The students gain experience and they get to apply in praxis the theory they learned in the classroom. This way they will get to know their actual profession. Their scientific and collaborating abilities will be significantly enhanced. The universities will increase their standards and their reputation (public image) by conducting more research and involving more students in it. Companies will certainly benefit from the students that usually represent the fresh ideas in the scientific and engineering fields. Also, the students provide a less costly working force. Last, but not least, the results of research are useful for the whole society and even more the whole country and world civilization.

A short comparison between the USA and the 'common' European educational systems, focusing on the research, showed that the American universities are more research (and thus more UR) oriented. This is due to the relationships between the industry and the universities, as well as the level of specialization. Another advantage of the USA is the fact that it is a single country, and that makes the establishment of laws and regulations easier for all the universities. Europe, on the other hand, is multi-national. So, a common framework of teaching and reaching activities is harder to implement. However, the participants supported the idea of a common framework that would invoke national regulations in all the European countries. They also applauded the idea of regulations considering the whole procedure: funding, copyright, accreditation, the necessary updates in the curricula, and if necessary an administrative authority for all these.

## Conclusions

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The subject of the Undergraduate Research was rather interesting for the participants of this BEST Symposium on Education. In fact, the presentations of the discussion groups were very clear in indicating the possible advantages and disadvantages of the UR, as well as, in proposing their ideas for a more efficient implementation and coordination of the UR throughout Europe.

The main advantages derived from the performance of UR for the students are the hands-on research experience, the research oriented thinking and training, the gained skills (like creativity and team working) and the exploration of an interesting scientific field for them. The professors, the universities and the companies will have the opportunity to work with young people with fresh ideas and possibly high potential, and thus keep up to date more easily with the advancements of the technology, and make contacts with their possible future employees and PhD students. Last, one should not forget that the work of the students is not costly, since usually they have no salary.

The main drawbacks for the Undergraduate Research are dealing mostly with the financial nature of the research activities. In order to have more people carrying out research, more research projects are needed, and thus more resources. This may lead to a stronger influence of the industry to the research activities of the universities. Furthermore, the undergraduate students usually need a longer training period before actually starting conducting research, compared to their postgraduate and more experienced colleagues. Last, since the students are an inexpensive working force, there exists the danger of their exaggerated exploitation. This should be prevented.

The ideas of the participants about the realization of the Undergraduate Research were involving all interested parties. First, they noted the need for an introductory course to teach them the scientific principles and the necessary soft skills. They also expressed the importance of the guidance and mentoring of the supervising professor. The role of the research team and collaborates was also underlined, so that the young students would learn the values of team working and communication. Furthermore, the students expressed that the research activities should be optional in the curricula, since not all students would be interested in them. They claimed that it is very important the formal accreditation and the recognition of the work and effort of the students in the research project. The collaboration among the universities and the companies was given special attention. A good cooperation and a productive research project would be beneficial for everyone: the students, the academics, the company and the state itself. Last, the need for the financial resources for research could be covered partly by the state, partly by the universities, partly the industry and partly the inter-European research agencies.

## Credits

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