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The Erasmus+ Strategic Partnership as a Way to Attract Young People to Engineering

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Abstract. The paper is focused on new educational activities focused on attracting young people for technical education. The idea is based on realization of the project under Erasmus+ Strategic Partnership (Key Action 2). The project based on exchange of good practices involves seven partners. Three of them represents sector of higher education and four are schools located in the neighbor of the technical university. Partners exchange ideas how to increase number of students who starts education in technical area, which seems a bit difficult, but engineers are very expected by the industry. The second project goal is to examine possibilities how the university can contribute in increasing quality of technical education at schools. Main project ideas and results of realized project activities are reported in the paper.

Keywords: Technical education · Cooperation school to academia · Exchange of good practices · Internationalization of young people

1 Introduction

Technological market and industrial development is still growing. It requires number of highly qualified engineering personnel to be employed. Unfortunately, recent years number of candidates entering to technical universities, particularly in Europe, decreases. It causes that unemployment in area of technology and engineering almost vanished [1], but number of graduated engineers is still too low. Companies are asking university to support them with qualified personnel, while students at technical university starts their work as part time employment at mid stage of higher education.

For example, according to official statistic [2] shown in Fig. 1, nowadays, in Estonia a total number of admitted students is decreasing, what can be seen from the line Total. Admission in technical fields decreasing as well, in last decade drop was ca. 25%. What is interesting about the data in Fig. 1, is that due to global financial crisis in 2008 a percentage of students admitted to business (BUS) dropped from ca. 30% in 2006/07 to 20% in 2013/14, at the same time admission on technical specialties (TECH) grows a little between 2008/09 and 2012/13. Despite the negative

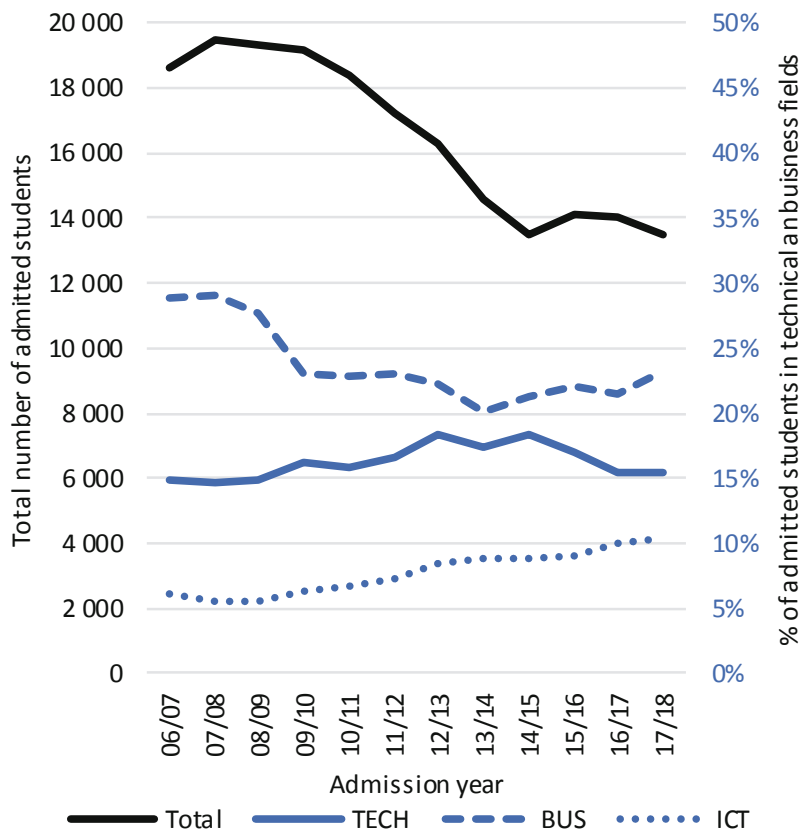


Fig. 1. Total number of admitted students in Estonia vs. percentage in technical (TECH), business (BUS) and information and communications technologies (ICT) fields.

trend of total admission, the number of students applying to information and communications technologies (ICT) in Estonia is increasing.

Such a situation results with decreasing quality of student’s education because of not enough time for self-learning and smaller involvement of students in university live (they spend at the university as small amount of time as possible). It means, that in order to saturate the market with well qualified engineers the situation requires to undertake actions which increase number of students studying technical sciences instead of fields with higher unemployment (recently observed at some sectors) [3].

In order to increase number of young people entering to technical universities a better cooperation between sector of school education (lower level) and university sector of technical sciences (higher education) is needed. It relates mainly to cooperation between educational units located in relative small distance one to each other (neighbor institutions).

Useful method to increase quality of such a cooperation is exchange of good practices between institutions located in different European countries and at different educational levels. Such an activity, reported here, has been realized and supported by the European project funded in frames of Erasmus+ Strategic Partnership program.

2 Project Ideas

As was mentioned in above section, one of the best method to improve cooperation between schools and academia is exchange good practices at international level. Such a method is effective but it requires dedicated funds. There are several possibilities to support such actions. The program which was used to support actions described in the paper is Erasmus+ Strategic Partnership (KA2) under the project entitled: “Efficient cooperation in school education focused on technological development”, with acronym EDUTECH [4]. Mostly, projects for strategic partnership are dedicated to given sector (school education, higher education, VET, etc.). An invention of proposed project is cross-sectorial activity of two sectors: higher education and school education.

It is important to note that direct beneficiaries are primary and secondary schools who participate with students (pupils) and teachers in project activities and trainings. The university sector is an indirect beneficiary group who will benefit from the project with future candidates for technical education.

The project structure is composed of seven educational units. It contains three academic partners (technical universities or general universities technically oriented): the Silesian University of Technology (SUT), Poland (project leader), University of Lorraine (UL), France and Tallinn University of Technology (TTU), Estonia. Each university partner cooperates with schools of primary and/or secondary level. So, the project structure contains also four school partners: two primary schools and two vocational education schools (secondary technical level). The primary schools are Primary School no. 5 from Pyskowice (SP5), Poland and St. Leon IX School Ensemble (SL IX) from Nancy, France. The secondary technical schools are Technical School Ensemble (ZST) from Wodzisław Śląski, Poland and Tallinna Politehnikum (TPT) from Tallinn, Estonia. The age of primary schools participants was between 13 and 15 and the age of secondary school students was between 17 and 19. The structure of consortium is presented in Fig. 2. Such a composition of consortium creates different links (in respect of type of cooperation, level of education and distance between partners) for cooperation which ensure exchange of good practices of cooperation between universities and both primary and secondary schools.

Each of project partners had their own methods and tools in order to advertise advantages of technical education and attract young people to the university. The most popular activities organized by universities are festivals of science, open days, academies of young researcher, etc. Part of this activity is also cooperation with schools that educates future candidates for study. University staff invite schools pupils with teachers for activities at the university or visit schools for lectures or presentations. So, different experience of each of partners can be exchanged in range of good practices between international partners. It allows to obtain the cooperation the most efficient and profitable for everybody.

The project idea is to spread widely project results to introduce project results (good practices) in a number of schools located in the environment of the university. The most important channels for public dissemination to spread the knowledge and share experience are project webpage [5], web pages of project partners and social networks portals as Facebook, Instagram and Twitter.

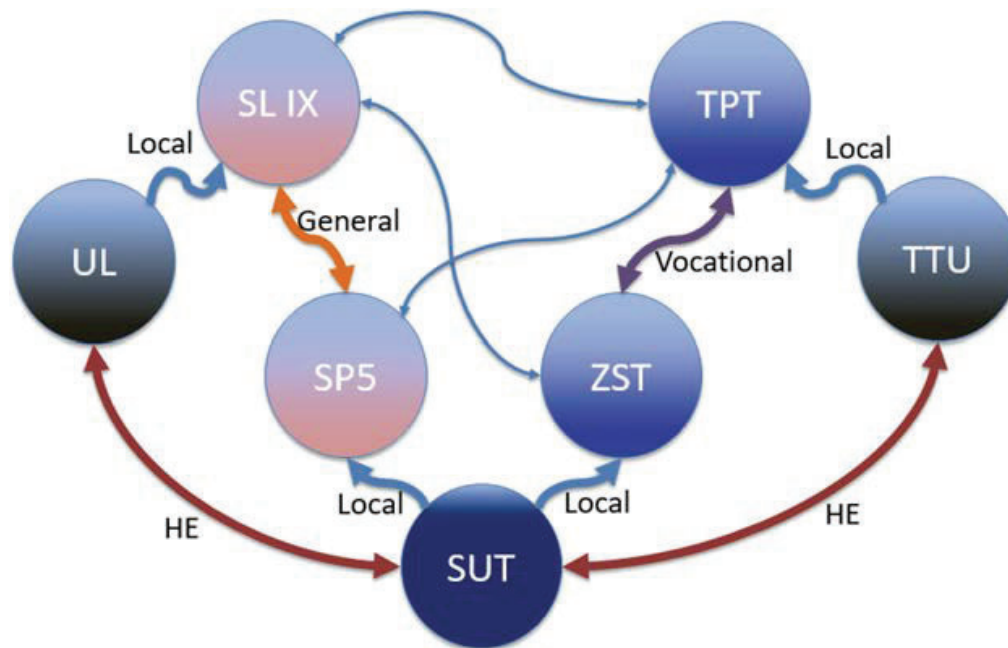


Fig. 2. Structure of project consortium and different links of mutual cooperation: local cooperation between universities and schools, general cooperation between primary schools, vocational cooperation between secondary schools and cooperation at higher education level.

The structure of the partnership presented in Fig. 2 is related to the project management structure. The structure is a hierarchical model. The general management unit is a project leader – SUT. The project coordinator affiliated at SUT animates all project activities and measures results. He also coordinates realization of the project activities at local SUT team. Each project partner has own project coordinator who manage the project activities at given partner. All project coordinators create Project Management Board which is the most important body for the project realization. Administrative and financial administration is supported by proper academic and school units responsible for related areas. Described management structure guarantee smooth decision making process and internal evaluation of the project progress.

3 Project Activities

The project is based on two types of activities – administrative type and training type, both focused on exchange of good practices between participants: teachers and students. The administrative type activities are dedicated mostly to project coordinators and school authorities, and the most important are Transnational Project Meetings (TPM). During such meetings people responsible for project management at different levels meet one to each other, visit partner facility and discuss project objectives and results. Each of project meeting is organized by different project partner. EDUTECH project includes in total five international project meetings. TPMs are a core activities in respect of project management process.

Activities based on trainings include seven events, five of them dedicated for training of school students and two are dedicated for training of teachers. Average length of training is nine days for students and five days for teachers. At the current project stage, three of five activities for students and the one activity for teachers have been already completed. Remaining activities are under preparation, planned for realization in May and June 2019.

The content of the training program is composed to reflect project goals and general (horizontal) goals of program Erasmus+, like social inclusion, networking, internalization etc. Project goals are mainly common for all project activities. They are realized with participation of local and international participants together. Because of project goals, activities are held at hosting school and in a form of workshops at the neighbor university. Part of schedule of activities realized during the first exchange held in Poland are presented in Fig. 3.

A	Y	Gr	8.00 - 9.00	9.00 - 10.00	10.00 - 11.00	11.00 - 12.00	12.00-13.00	13.00-14.00	14.00-15.00	15.00-16.00	16.00-17.00	17.00-18.00	18.00-19.00
Sun	8rd April	Tallinn Nancy	Breakfast	Free time			Outdoor activity (Rudy Monastery & Narrow-Gauge Railway) lunch included						
Mon	9th April	Tallinn Nancy	Breakfast	Mobile robots / levitation		Initial meeting at SUT	Lunch at student canteen	Lecture at SUT	Lecture at SUT	Gliwice City Walk Tour			
				Virtual flying/PLC	Virtual flying/PLC								
Tue	10th April	Tallinn Nancy	Breakfast	School activity	Water Station Karchowice		Lunch	Silver Mine Tamowskie Gory		Kręgle			
								Guido Coal Mine Zabrze		Silesian Museum Katowice			
Wed	11th April	Tallinn Nancy	Breakfast	School activity		Gliwice Radio Station and sensoric parc	Lunch at student canteen	Chemistry lab at SUT		Closing meeting at SUT	Free time		
				School activity									

Fig. 3. Part of a schedule for first training activity realized at Silesian University of Technology and at Silesia region (part of activities divided for primary and secondary level of schools).

Poland participates in the project with three partners – one university, one primary school and one secondary school, so the training activity was created as cross-sectional activity at the university and split for two different levels at schools (Tallinn–secondary level; Nancy–primary level). Additionally cross-sectional type were activities realized outside of school and university, mostly at the “Route of industrial monuments” at Upper Silesia region (the route is dedicated for educational purposes). It included narrow gauge railway, radio tower, silver mine, coal mine, water station and Silesian museum. One of photos done during visit at the “Route of industrial monuments” in the coal mine “Guido” in Zabrze is shown in Fig. 4.

Workshop at the university included: lecture “Touch, understand, remember” of physics and material science, workshop on mobile robots and superconductivity, chemical lab and lecture about DNA and its presence in the environment. At schools students attended chemical games and 3D printing workshop. Part of free time was arranged also as an optional outdoor/social activity having cultural and touristic character, like trip to Krakow (historic capital of Poland) and evening disco party.



Fig. 4. Participants of the EDUTECH training at “Guido” Coal Mine in Zabrze – a monument/museum at the “Route of Industrial Monuments” of Silesia Region.

The second training mobility was held in Nancy, France and was dedicated for exchange of good practices at the level of primary education. Two schools participated in the activity: Primary School of Pyskowice (Poland) and St. Leon IX School from Nancy, France (as a hosting school). Supporting partner was University of Lorraine. The structure of training was similar to first, above described activity in Poland. The training was focused on digitalization of the world. Students attended dedicated workshops at the university and organized students games at school. Supporting activities contained e.g. visit at Nancy aquarium and nature museum and history games in the city. It is important to note that Nancy has a history with interesting links to Poland – one of the most powerful governors of Nancy in eighteenth century was Stanislaw Leszczyński, former king of Poland. So, Polish participants of the exchange explored history of “King Stanislas” (which is his common name in Lorraine) in Nancy.

The third activity took place in Tallinn in Estonia and was dedicated for secondary level of education. The leading topic were media and communication. Students visited laboratory of printing at Tallinna Politehnikum and participated in workshops at Mektory – technology transfer center at Tallinn University of Technology. In the part of culture and history participants visited Museum of Estonian History in Tartu and TV Tower – a historical building constructed for the Olympic Games in Tallinn (organized by Soviet Union in 1980 in Moscow with water games in Tallinn). Student mobility in Estonia was a joint activity with short term exchange training for teachers. A group of teachers from two Polish schools participated in five days trainings organized in parallel to students trainings at the Tallinn University of Technology.

All above described project activities were focused on attracting young people (attending primary and secondary education) to their interests with technical education. Trainings at schools, universities and neighbor institutions technologically oriented was organized in order to show a variety of possibilities and future profits.

4 Assessment Methods and Dissemination

During the project activities different assessment method are applied to measure project success and improve upcoming activities. It included general assessment like visual inspection of project activities and discussion with participants and teachers. Very important was quantitative analysis of project results. It has been done by satisfaction surveys. Analysis of surveys enables to find strong parts and weakness of the project. An example survey results obtained for first project activity in Poland and fulfilled by students from St. Leon IX school is presented in Fig. 5.

How you assess the project meeting in Poland (mark "x" in a proper box):	Excellent	Very good	Good	Moderate	Poor	Very poor	Fail
a) Overall assessment?	8	8					
b) Training program at the university?	3	9	3		1		
c) Technical visits at Industrial Monuments Route?	3	6	5	1	1		
d) Touristic program (e.g. Kraków trip)?	5	8	2	1			
e) Accommodation in the hotel?	9	4	3				
f) Meals?	1	4	4	2		1	

Answer the following questions:	Strongly yes	Yes	Rather yes	neither yes or no	Rather no	No	Strongly no
Have you participated in this type of project for the first time?	===	14	===	===	===	2	===
Was this your first foreign trip?	===	2	===	===	===	14	===
Was it your first trip by plane?	===	3	===	===	===	12	===
Was this your first visit to a university?	===	12	===	===	===	2	===
Have you established any new contacts / connections?	10	4	2				
Have you acquired any new knowledge (something you have learned)?	5	7	4				
Have you learned anything new about local culture / history?	7	7	1			1	
Are you interested in technical sciences?	2	7	2	2	2	1	
Would you like to study at a technical university?	1	3		7	1	4	
Did participation in the project encourage you to technical issues?	1	2	2	3	3	4	1
Would you like to take part in such an activity once again in the future?	13	3					
Did you have problems getting to know other participants?				2	3	7	4
Have you had problems with communication / language?		4	1	2	4	4	1
Did you have any problems understanding the knowledge that was presented?		3	1	5	3	4	

Fig. 5. Results of satisfaction surveys reported by 16 students from St. Leon School (Nancy) after their participation in the first exchange activity organized in Poland.

General conclusions which can be drawn after survey analysis are related to a few different aspects. The first one is general satisfaction. All students assessed the training as very good or excellent. Also all answered that would like participate in such an event

once again. Very important is also that most of them established new contacts and acquired new knowledge. The second group of answers are related to question about technical education and communication. Students answers are spread at the whole range of scale. The answer that 5 participants consider the activity as attracting to technical education and 4 participants who are going to study technical sciences can be considered as the positive result of the training and a success of the project.

The part of the project which is planned for realization at the final stage, but is very important for project's results durability is the project dissemination. Dissemination of the project ideas is planned at partner institutions by dedicated technical science events and also as a seminar dedicated for different educational units located in local environment of project partners. Participants (both teachers and students) who took part in project activities are planned to be involved in dissemination actions.

5 Conclusions

The paper relates to the ongoing project under Erasmus+ programme focused on exchange of good practices (Key Action 2). Current advances of project realization, namely completed three coordinator meetings, three students trainings and one teachers training, allow to draw the most important conclusions. The most important are:

- Attracting young people for technical education requires dedicated actions – most of young people is interested with trainings at technical labs.
- All project partners (as pairs school-academia) established cooperation before the project started, but exchange of international experiences allowed to increase quality of this cooperation. Additionally new alliances were created under the project.
- Analysis of project surveys shows that students are interested to participate such events, create easy new friendships, get new knowledge, both in technical and cultural range. All of participants want to participate again.
- The project seems to be good example how to attract young people for technical education.

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