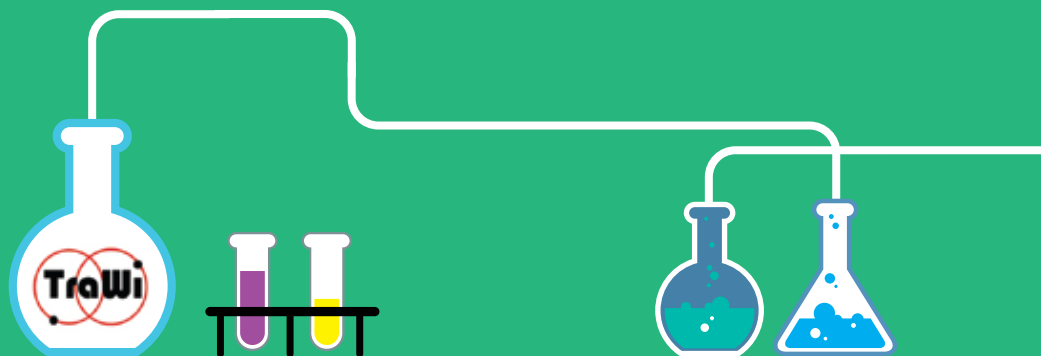




# PRESENT AND FUTURE OF CHEMICAL INDUSTRY FROM THE PERSPECTIVE OF THE TRAWI PROJECT

## PRESENT AND FUTURE OF CHEMICAL INDUSTRY FROM THE PERSPECTIVE OF THE TRAWI PROJECT



Transfer of experience with developing training based VET programmes in school oriented education systems

This text was created during a project meeting as a project outcome. This event took place in Prague, on June 10<sup>th</sup> 2015 with representatives of schools and businesses, and was organized by the National Institute for Education and the Association of Chemical industry.

Presentations and other contributions presented during this meeting are now being brought together in this anthology. We believe it will (at least partially) mediate the content of the meeting.



Transfer of experience with developing training based VET programmes  
in school oriented education systems

Leonardo da Vinci – Transfer of Innovation, project number: DE/13/LLP-LdV/TOI/147629

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# TRAWI PROJECT

International project TRAWI is being implemented as a transfer of innovations project within the Lifelong learning Programme. It follows the outcomes of previously implemented project CREDCHEM (Leonardo da Vinci). TRAWI project was launched on October 1<sup>st</sup> 2013 and will terminate on September 30<sup>th</sup> 2015.

The title of the project is an acronym and it stands for Transfer of experience with developing training based VET programmes in school oriented education systems.

Project is being coordinated by Qualifizierungsförderwerk Chemie (QFC), Germany. Among project partners one can find important representatives of research institutions and VET schools from Czech Republic, Poland and Germany. Associated partners involve representatives of universities and chemical industry from all above mentioned countries and Belgium:

## Poland:

FAVEO – Fundacja Kształcenia Zawodowego i Miedzykulturowego

### **Associated partners:**

Izba Przemysłu Chemicznego

Zespół Szkół Chemicznych im. Ignacego Łukasiewicza w Bydgoszczy

Kuratorium Oświaty w Krakowie

Urząd Miasta Krakowa – Wydział Edukacji

Urząd Marszałkowski Województwa Dolnośląskiego

## Germany:

QFC, SBG – Sächsische Bildungsgesellschaft für Umweltschutz und Chemieberufe, Dresden

### **Associated partners:**

Arbeitgeberverband Nordostchemie

Technische Universität Dresden, Fakultät Erziehungswissenschaften, Berufliche Fachrichtung

Chemietechnik, Umweltschutz und Umwelttechnik

## Czech Republic:

Národní ústav pro vzdělávání

Střední průmyslová škola chemická Pardubice

Střední průmyslová škola chemická Brno

### **Associated partner:**

Svaz chemického průmyslu

Associated partner from Belgium:

European Chemical Industry Council

The main objective of the project is to enhance the cooperation between secondary vocational schools and enterprises in the chemical industry in the Czech Republic and Poland, using examples of good practice and experience from Germany. The project initiated a dialogue between VET providers, social partners and the institutions responsible for the development of educational programs.



Based on this dialogue, methodical and didactic concepts of educational programs were developed, which help improve the attractiveness of vocational training and can contribute to reducing youth unemployment, all of that through a closer interconnection with the expectations and needs of the labour market.

## Main aims of the TRAWI project are:

- Enhance and streamline the cooperation between VET schools and enterprises in the chemical industry in the Czech Republic and Poland, based on good practice examples from Germany;
- Identify the demands put by employers on VET schools graduates, as well as the changes in the process of education could improve their employability and remaining in the field
- Create methodical and didactic concepts (and units of learning outcomes) based on the needs of employers and verified in practice. These concepts (and their parts) are to be in line with national education systems, European qualification framework and ECVET principles.
- Open new opportunities for students to gain professional experience during their studies and practical training and to increase the attractiveness of vocational education. Project brings better chances to VET school graduates in terms of employability and skills development.
- Create a TRAWI platform – an international network of partners (schools and enterprises) from the CR, Poland and Germany, willing to participate in the dialogue in cooperation between schools and enterprises in the chemical industry. The purpose is to intensify cooperation in the development of further methodical and didactic concepts, as well as units of learning outcomes. These will serve as basic building blocks of vocational qualifications, sought after on the labour market.

TRAWI project also contributes to the European dialogue on reforms of vocational education and training, within the Strategy 2020 – strategy for intelligent and sustainable development. This strategy puts emphasis on better quality of vocational education and compliance with the needs of labour market.

## Main outcomes:

- Analysis of the current state of vocational education and its characteristics in the Czech Republic and Poland, with an emphasis on chemistry study programmes
- Questionnaire survey in the CR and PL, aiming on identifying how chemical companies evaluate high school graduates for their knowledge, skills and competence; how and to what extent work businesses and VET schools cooperate in both countries, and then describing the demand put on graduates (in the laboratory and on working place) from the perspective of employers
- Specification of qualifications required by the labour market
- Analysis of job advertisements
- SWOT analysis of existing educational programs in the field of chemical industry
- Referencing qualifications to the EQF and national qualification systems/frameworks
- Defining innovative goals, content, methods and units of learning outcomes
- Positional opinion (agreed on by project partners) on the situation in the vocational education and proposals to improve the situation
- Creating methodical-didactic concepts for creation of educational programs, concepts reflect needs and demands of the labour market and subsequent piloting these modules
- Establishing a network of partners – professional associations, schools and employers etc. in the Czech Republic and linking this network to similar networks in Poland and Germany

# RESULTS OF THE QUESTIONNAIRE SURVEY IN THE CZECH REPUBLIC AND POLAND

*Mgr. Martina Kaňáková,*

*TRAWI project coordinator, National Institute for Education/Narodni ustav pro vzdělávání*



A questionnaire survey was conducted in the Czech Republic and in Poland to help determine how chemical companies evaluate high school graduates for their knowledge, skills and competence. At the same time, the survey outcomes were to show **how and to what extent work businesses and VET schools cooperate in both countries**. Another aim of the survey was to **define the desired profile of demands put on graduates from the perspective of employers**.

The percentage results from the Czech part of the survey are very similar to the Polish ones. Also the views and comments made by representatives of chemical companies are consistent.

The questionnaire was emailed to 181 companies in the CR and PL. 41 completed questionnaires were returned. Rate of return clearly shows that companies which were directly addressed by the Czech Association of Chemical Industry (return in the CR 53%) responded better than those who contacted the project representatives (return in the Czech Republic 14% return in Poland, 8%). Cooperation with the Association of Chemical Industry enabled to address specific employees dealing with human resources agenda. The answers coming from both Czech and Polish respondents suggest that companies perceive the current situation in vocational education as problematic and thinks that there is an urgent need to find effective solutions.

Businesses of all sizes participated in the survey in both countries; from small businesses with 13 employees to companies with 2080 employees. Especially in Poland the coordinators succeeded to involved local branches of major international companies, operating not only in Poland, but also throughout entire Europe. The history of companies involved varied a lot, the respondents cover the variety of newly established companies to businesses with a long time tradition. Czech organizations on average has been in business for 74 years, Polish companies are compared to them younger and have been active on the labour market on average for 43 years.

The answers and comments represented companies across all regions of both countries show, that the educational programs of secondary vocational and technical schools do not meet the requirements of practice and the labour market and the skills and competencies of graduates are insufficient. 83% of respondents in Poland and 69% of respondents in the Czech Republic find currently difficult to hire qualified workers. Schools and their educational programs and facilities are often outdated and cannot keep up with the latest developments in the field. Respondents also suggest that there is a lack of vocational schools and a lack of students who would be interested in chemical study programmes.

Czech companies reported educational excursions and students' competitions as the most common forms of cooperation with secondary schools. Providing equipment for school chemical laboratories was mentioned as the third most common form. Polish employers reported educational excursions on the first place and teacher training and donations as other common forms of cooperation.

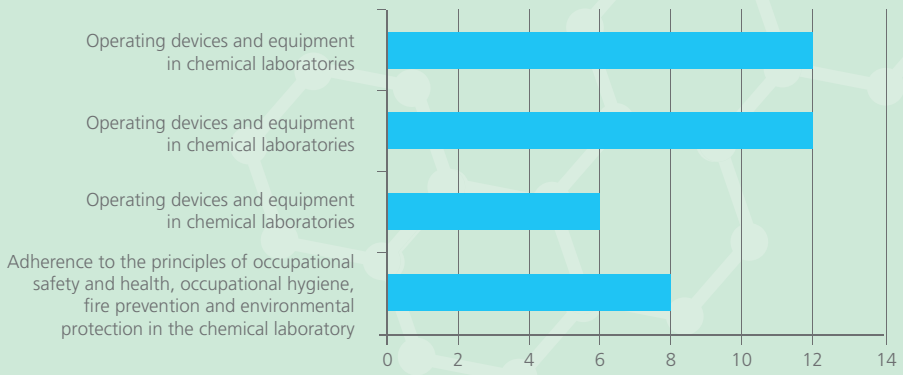
## Linking the world of work with the world of education

This survey clearly showed the need to strive to achieve a better match between the education systems and labour markets. 67% of respondents from Poland and 41% of respondents from the Czech Republic find education programs rather mismatching the needs of the labour market. Besides theoretical knowledge, which in both countries were assessed positively (75% of respondents in Poland and 62% in the Czech Republic think that graduates have sufficient theoretical knowledge), respondents from both countries stressed that graduates lack theoretical knowledge of chemical equipment and appliances and modern technology.

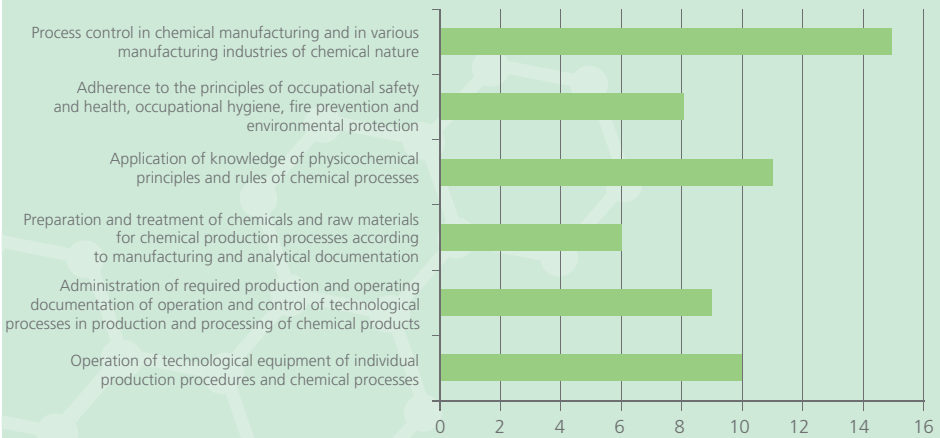
Attention should be paid to acquiring practical skills. 83% of respondents in Poland and 69% of respondents in the Czech Republic think that students do not receive sufficient amount of training, and therefore cannot gain enough practical skills. In particular, respondents emphasize the need of practice in a real environment, which would enable the students to familiarize themselves with tools and equipment. 58% of respondents in Poland and 69% of respondents in the Czech Republic pointed out that graduates lack practical skills. Respondents in both countries also repeatedly mentioned the lack of manual dexterity, unwillingness to perform manual labour and low physical competence of high school graduates. For laboratory work, graduates lack mainly the competence to perform chemical analyses based on manufacturing and analytical documentation. When working in manufacture, two missing competencies are most frequently reported in both countries: process control in chemical manufacturing and in other fields of chemical manufacturing and application of knowledge of physicochemical principles and rules on chemical processes.



Graph 1: Vocational competences needed for laboratory work and most commonly reported by the Czech respondents as lacking

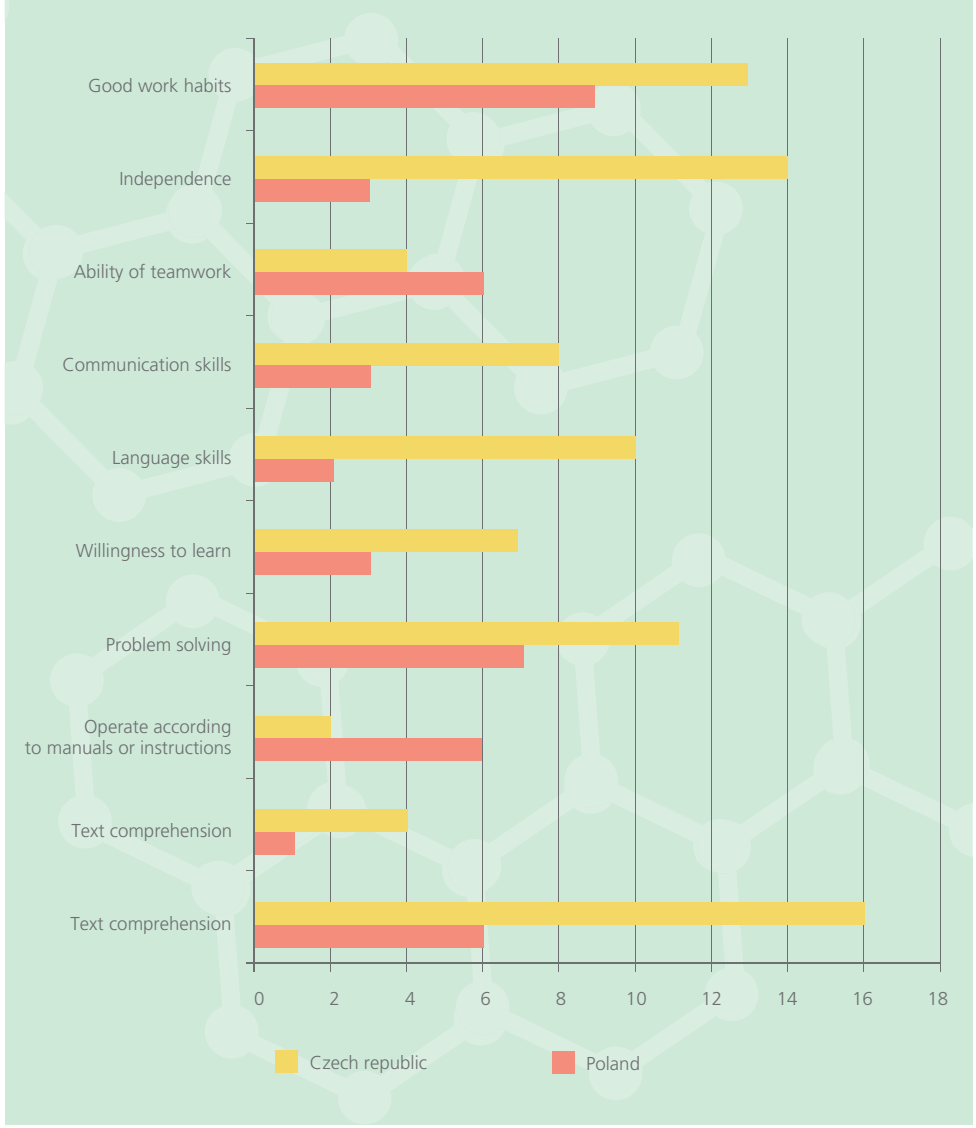


Graph 2: Vocational competences needed for manufacture and most commonly reported by the Czech respondents as lacking



Besides professional competence graduates also very often lack so called soft skills. The answers from Polish and Czech respondents are more or less identical in this topic. Graduates are mainly short on basic decision-making skills and work habits. Czech employers also emphasized that graduates are not sufficiently independent, Polish companies on the contrary report graduates' lack of teamwork abilities.

Graph 3: Competences most commonly reported by the Czech and Polish respondents as lacking

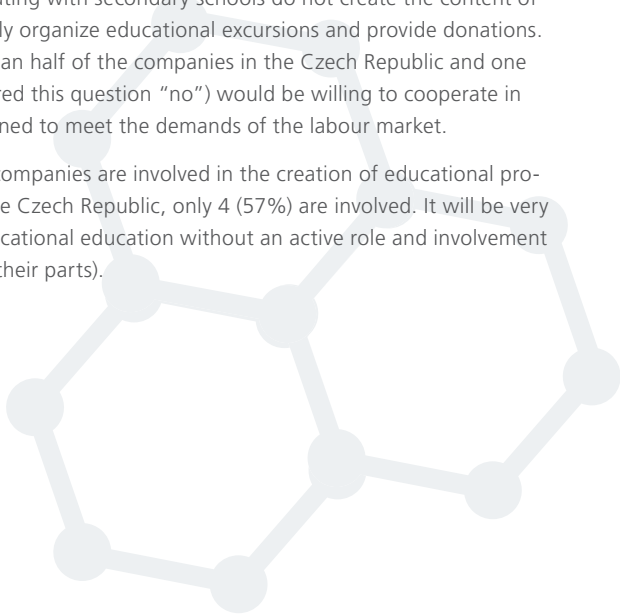


The aim of the survey was to design a profile of demands put on graduates from the perspective of employers. Employers in both countries tagged Performing chemical analysis according to manufacturing and analytical documentation as the most important competency needed for laboratory work. As for the competencies needed for work in manufacturing, the views of representatives of employers differed. Czech companies most commonly reported the competence Process control in chemical manufacturing and in various manufacturing industries of chemical nature. Polish companies on the contrary, think that the most important competence is Preparation and treatment of chemicals and raw materials for chemical production processes according to manufacturing and analytical documentation. Representatives of the labour market in Poland and the Czech Republic agreed that good work habits are the most important soft skills.

## Educational programs meeting the requirements of employers

Based on the results of the survey the TRAWI project is expected to provide solutions to the above problems. Project outcomes are educational programs leading to a profile of graduates, which will meet the demands of employers in theoretical and practical matter. Employers should automatically be involved in making or processing educational programs. However, the survey showed that 66% of respondents in the Czech Republic and 58% in Poland do not participate in the creation of educational programs. Even companies cooperating with secondary schools do not create the content of educational programs. Companies frequently organize educational excursions and provide donations. A good sign is at least the fact that more than half of the companies in the Czech Republic and one third of respondents in Poland (who answered this question “no”) would be willing to cooperate in creating a common training program, designed to meet the demands of the labour market.

Interesting is also a fact, that not even big companies are involved in the creation of educational programs. Out of the 7 largest companies in the Czech Republic, only 4 (57%) are involved. It will be very difficult to make any efficient changes in vocational education without an active role and involvement in the content of educational programs (or their parts).



# SECTORAL AGREEMENT FOR CHEMISTRY – YOUTH FOR CHEMICAL INDUSTRY

**Ing. Ladislav Novák,**

*director of Association of Chemical industry in the Czech Republic and head of steering committee of the National technological platform Suschem.*

Chemistry has always been the field of future in terms of Czech (and Czechoslovakian) industry. It has given opportunities for personal development to many young people, as well as to entire regions – Ustí nad Labem, Litvínov, Pardubice, Ostrava, Olomouc, Přešov, Opava, Brno, Zlín, Valašské Meziříčí etc.

Due to many factors, the chemical industry has been lately facing a lack of qualified professionals.

Over the last two decades the labour market in the Czech Republic has been suffering a shortage of qualified young professionals who would replace the outgoing generation. This problem does not affect only ensuring optimal production in the chemical industry, but also the area of using chemicals and chemical technologies in the national economy, including analysing effects of chemicals on human health and the environment. It is the use in energy, agriculture, health care, pharmaceutical, metallurgy, paper, glass, and engineering, including the automotive industry, but also waste management and especially recycling.

Qualified chemists are needed in the implementation of the new chemical legislation REACH, and in processing chemical substances and their end-users, while special demands are also placed on distributors and freighters of chemicals.

Knowledge of chemistry and characteristics of materials is of a vital importance for the areas of waste management and the prevention of waste, hazardous waste management, recycling and waste disposal. The prescribed waste hierarchy fully complies with the implementation of EU directives into national legislation.

Human resources deficiencies (resulting from above mentioned situation) in the chemistry sector are reinforced by the fact, that vocational education was almost completely destroyed in recent years.



## Students' competition "We are looking for the best young chemist CR"

A number of measures has been taken to at least partially fix the existing problems. Particularly on of these measures should be mentioned in relation to the young generation – since 2012, Association of Chemical Industry of the Czech Republic (ACI CR), in cooperation with its member organizations and other organizations runs and coordinates a **competition "We are looking for the best young chemist CR"**. This contest uses the experience of cooperation between secondary vocational schools and chemical plants in various regions, and aims at students of 8<sup>th</sup> and 9<sup>th</sup> grades of primary schools ([www.mladychemikcr.cz](http://www.mladychemikcr.cz)).

A third year of the competition has been running in the academic year 2014/2015 and interest in participating in it is increasing, which clearly show the number of participants: 3000/7000/10 000. The competition is organized by secondary vocational chemical schools, Faculty of Chemical Technology University of Pardubice and the Association of Chemical Industry as the general partner. The competition currently covers all regions of the country.

We believe this competition will help to re-establish chemistry as a „cool a sexy“ area for the young generation.

**The vision of the sectoral agreements is to introduce chemistry (with all sub-areas i.e. Chemistry, pharmaceuticals, rubber, plastic, petroleum processing, analytical chemistry etc.) to the young generation as a very interesting area of human endeavour, which is currently crucial for the human existence. As such it shall be introduced to the students and shown as a decent choice of future profession. Implementation of this vision will contribute to increasing the number of graduates of chemical schools and associated increased employment of skilled workers in the chemical industry, and not only there.**

## Sectoral agreement as a tool of social dialogue

**Each partner** has the opportunity to sign up to carry out the selected goals and specific actions from the list or suggest additional activity:

### 1. Support for vocational education in chemistry

- 1.1 Prepare and implement competition Young chemist (competitive events for pupils of 8<sup>th</sup> and 9<sup>th</sup> grades of primary school) at regional and national level
- 1.2 Organize excursions to the chemical, waste management and recycling companies for high school students
- 1.3 Implement practical training (internship) in companies
- 1.4 Use laboratories of universities to support chemistry teaching at secondary schools
- 1.5 Stabilize and develop cooperation with vocational schools focused on teaching chemical disciplines
- 1.6 Evaluate training in vocational fields of chemical and propose adjustments of study programmes
- 1.7 Organize lectures and discussions for the dissemination of experience in the transportation of chemicals, and information on the properties of chemical substances available on line
- 1.8 Develop partnerships with chemical schools focusing on in chemistry and recycling

## 2. Popularization of chemistry at elementary schools

- 2.1 Engage elementary students in the Young Chemist
- 2.2 Organize school trips for primary school students at secondary technical schools of chemistry
- 2.3 Organize project days and extra curricula activities for primary school students using laboratory equipment at secondary schools
- 2.4 Promote and expand the use of Lach-Ner laboratory kits and products of other relevant companies at primary schools
- 2.5 Organize open house days at secondary vocational schools and chemicals or recycling businesses

## 3. Popularization of chemistry through the first introduction in preschool classes

- 3.1 Identify suitable preschools
- 3.2 Organize events in preschools, and demonstrated simple experiments and everyday objects

## 4. Chemistry Yesterday, Today and Tomorrow

- 4.1 Organize lectures and presentations about the history of chemistry in the Czech Republic with highlighting of the region for primary and secondary schools with the participation of vocational schools and companies of the chemical industry of the region
- 4.2 Inform the public about important personalities in the field of chemistry
- 4.3 Use documentaries on public broadcasting to popularize chemistry and personalities associated with it
- 4.4 Popularizing examples of good practice from chemical and recycling companies
- 4.5 Popularizing examples of good practice from schools with a focus on chemistry and recycling
- 4.6 Provide reporting on implementation of sectoral agreements
- 4.7 Use and promote the global initiative of the chemical industry, Responsible Care, founded in 1985 and carry out its principles.

Sectoral agreement was created within the project "Sectoral agreements as a tool of social dialogue in solving long-term problems in the area of human resource development". Project Number: CZ.1.04 / 01.01.01 / B9.00013. The team, currently led by Ing. Ladislav Novak, director of the Association of Chemical Industry of the Czech Republic, is negotiating with more than 50 potential partners from manufacturing companies, educational institutions, government bodies, regions etc. The agreement will be published in full and with all signatures on June 11<sup>th</sup> 2015, during the third finals of the nationwide contest "We are looking for the best young chemist," held in Pardubice.

## COOPERATION OF SYNTHESIA, A. S. WITH SCHOOLS

*Mgr. Lucie Bulůšková,  
head of HR department*



In Pardubice, the city of chemical industry, the cooperation with the Secondary Technical School of Chemistry has been a tradition. We are already involved in European projects – such as UNIV project. Project focuses on so called “Professional minimum for a chemist,” which is a program of further education with a main goal of turning schools into lifelong learning centres. In our company more than 100 employees participated in the project and 4 of them received a certificate of apprenticeship. In the past, we were involved in the project “Deepening cooperation of vocational schools and employers in the Pardubice region.” The main objective of this project was to provide training and internships for teachers of the Secondary Technical School of Chemistry in various departments of our company.

Every year our company offers numerous excursions for students, as well as trainings and students jobs in different departments.

The company Synthesia, Inc. also supports students competitions with a chemical theme – for example, competition for the best bachelor thesis and probably the most famous – Competition for the best chemist. It is very encouraging for our company that this contest was in the past initiated on our premises and its output is a development of the Secondary Industrial School of Chemical Technology in Pardubice.

The main purpose of our cooperation is to promote chemistry, opening to both students and schools and, last but not least, the promotion and development of open communication, which is one of the main motto of the Synthesia company.

The cooperation also involves universities; we offer trainings and internships for students, as well as part time jobs, both long term and short term. Besides some additional income, the students have opportunity to gain the much needed practice, which they can then use in their future professional life. After graduation they can apply to tenders within our Assistantship – Trainee program, which is designed for fresh graduates not only from universities, but also in secondary chemical or technical schools.

Synthesia company strongly supports the newly reopened chemical apprentice school, mainly due to a current shortage of candidates for blue-collar positions. First grade students come to our premises for their school field trips, in the second grade students participate in several 2day training which extends in the third grade into a weeklong practice every month. We try to rotate the trainees on various workplaces so each one of them has the opportunity to see different parts of a production and thus practically check a big number of facts they know from theory classes. The ideal goal is to employ future graduates in our company.

Currently we are also struggling with a lack of suitable candidates in engineering and technical fields. We are now launching closer cooperation with engineering faculties of several universities (University of Pardubice, Palacky University Olomouc, Brno University of Technology), willing to offer traineeship to their students, ideally with the perspective of them joining our team in the future. Every year our company representatives also participate in trade fairs dedicated for future graduates.

All above mentioned forms of cooperation are offered not only to students of partner schools, but also to the students of other secondary schools and universities. A number of students were also provided consultation and professional help on their seminar papers, bachelor and masters theses.

Cooperation with schools is strongly supported by the company management, even the CEO often personally attends final exams held either in the Secondary Technical School of Chemistry or in the areas of our company.

The main objective of the cooperation offered by our company is to promote chemistry, approach students and vocational schools and, last but not least, to promotion and develop an open communication, which is one of the main motto of the company Synthesia.





# VOCATIONAL EDUCATION AND TRAINING OF STUDENTS FOR THE CHEMICAL INDUSTRY

or “how the vocational education responds to the development in the chemical industry and what mechanisms are used.”

**Ing. Zorka Husová,**

*TRAWI project team member, National Institute for Education/Narodni ustav pro vzdelavani*

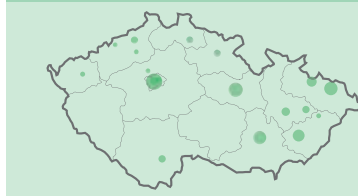
Based on comparison of the current structure of chemical study programmes at secondary schools and the structure 10 to 15 years ago, we can say that there has been a significant change in the composition of study programmes and the overall number of students in chemical study programmes has decreased by about one third.

This situation is partially caused by the curricular reform of VET, which has influenced the composition of chemical study programmes, thanks to a concept based on the principle of two-level curriculum (school curricula vs. national curricula)<sup>1</sup>. The decrease of students in chemical programmes is probably a result of the demanding character of such programmes (consisting of the application of scientific and technological knowledge in practice), small attractiveness of the programmes for both students and their parents and also the unfavourable population development.

A major branch of chemistry education in terms of the increased number of students is the applied chemistry<sup>2</sup> study programme, which according to statistical data for the past four years has an increasing trend. Nearly two thousand students (1989 students) currently attend this programme. The total number of students studying chemistry is 2,284. The number of students of apprenticeship programmes (EQF level 3) has been stable and corresponds to an average of 30 students per year<sup>3</sup>.

There are 21 schools with chemical study programmes (see [www.infoabsolvent.cz](http://www.infoabsolvent.cz)), their distribution in the Czech Republic is quite even, except 2 counties (Vysočina and the Pilsen Region) where there are no chemically oriented schools (see Fig. 1). Two regions on the other hand can offer three VET schools with chemical study programmes – the capital Prague and Usti nad Labem region. The important parameter, however, is the number of students – the highest in Prague, and in Moravian-Silesian region, Pardubice and South Moravia.

Fig. 1: Geographical distribution of VET schools with chemical study programs



<sup>1</sup> Approach consists of general settings of national curricula and following by creating individual school curricula, which take into account regional conditions for teaching and practical training within the relevant field of education, including setting cooperation with relevant companies.

<sup>2</sup> Equivalent to qualification level 4 EQF (European Qualifications Framework).

<sup>3</sup> Source: An overview of the numbers of students according to study programs at secondary VET schools and higher vocational schools. 2014/15, NUV

Currently, schools in addition to initial education (IVET) can offer and exploit opportunities for continuous training (CVET), thanks to their personal capacities, material and technical equipment. CVET is legally embedded in Act no. 179/2006 Coll., On verification and recognition of further education. The principle of CVET is the possibility of validation and recognition of learning outcomes obtained any time during one's lifetime, i.e. non-formal or informal methods in the context of lifelong learning. It is therefore an opportunity to verify "their" knowledge, skills and competencies acquired throughout life, no matter how it is earned – in school, course, practice or self-education. The test is of course standardized according to the law in the form of a so called evaluation standard of vocational qualifications.



## National Register of Qualifications

As part of the National Register of Qualifications (Narodni Soustava Kvalifikaci) qualification and assessment standards for the relevant vocational qualifications are created in accordance with the above mentioned law. If an applicant for examination meets the requirements of the standard, he or she shall receive a national certificate in accordance with the Act. 179/2006 Coll., which should make it easier to enter the labour market and employment.

A key tool in continuous education is the National Register of Qualifications. NSK is gradually being supplemented with qualifications approved by the Ministry of Education.

The portal NSK makes currently accessible 737 professional qualifications ([www.narodnikvalifikace.cz](http://www.narodnikvalifikace.cz)), which can be verified in accordance with the law through so called authorized persons. Since 2007, when this law came into force, more than 114 000 authorized tests were taken and over a thousand companies reflect NSK in their personal agendas. The entire process NSK, including interconnection with other related systems, is being ran under the auspices of the Ministry of Education. The National Institute of Education is in charge of processing concepts and methodologies of NSK and implementation the actual process of creating qualification standards. Qualification standards are created in sectoral councils; there are 29 of the councils and cover most areas of the national economy. The councils' representation of members is the responsibility of Chamber of Commerce and Association of Industry.

## National Register of Qualifications

The council for chemistry has been working since 2006/2007, has 12 members who are representatives of major companies in the chemical industry, such as Semtín Pardubice, Fatra Napajedla, Barum Continental, Agrofert. A need analysis is carried out annually, identifying needs of the market in this sector and suggesting new vocational qualifications which need to be created. The default source for creating and revising qualification standards is the National Register of Occupations ([www.nsp.cz](http://www.nsp.cz), Narodni soustava povolani, NSP), and its

units (occupations and type positions). Sectoral councils propose structure of qualifications in relation to the NSP and the analysis of needs, and creates qualification standards under a supervision of NUV experts.

Sectoral council for chemistry has created 36 qualification standards so far, 18 of which are already approved by the Ministry of Education and published in IS NSK (see link above), other standards are in the approval process.

The implementation process is already underway, 9 authorization<sup>4</sup> have been granted, meaning there are 9 authorized persons (AOs), of which 5 are schools and 4 employers.

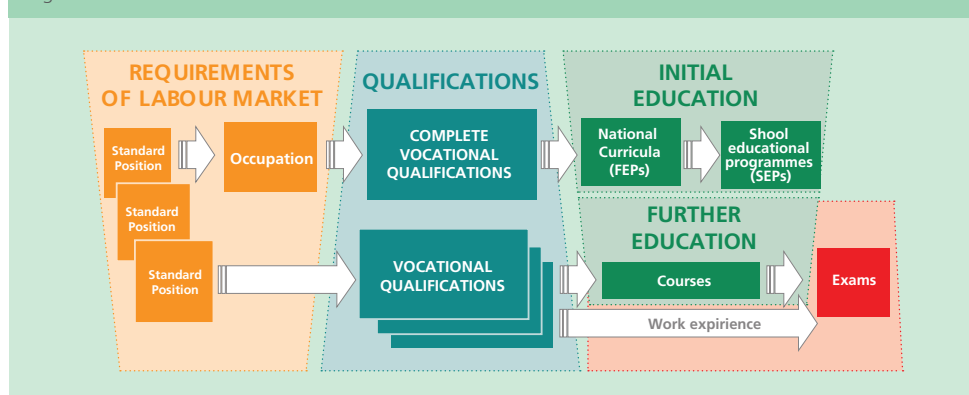
A list of authorized persons can be found in the information system NSK with relevant qualifications ([www.narodnikvalifikace.cz](http://www.narodnikvalifikace.cz)) including contact information, which is important for candidates for the exam.

So far, 116 authorized tests were taken in the chemistry sector; Chemist – laboratory technician (11), Chemist for the device operation (78) and Worker for recycling (27).

## Link between initial and further education

As already mentioned, areas of initial and continuous education are connected through mechanism, described in the following chart:

Fig. 2: Link between initial and further education



The basic line represents the National Register of Occupations – National Register of Qualifications – National Curricula – School Curricula in initial vocational training, or National Register of Occupations – National Register of Qualifications – Retraining courses<sup>5</sup> in continuous education.

<sup>4</sup> The authorization process (under the Act. 179/2006 Coll.) is ensured by the authorizing bodies (relevant ministries under Annex 1 of the Act). For the chemical industry, the relevant authorizing body is the Ministry of Industry and Trade. The administration of the process is organized through an on-line system and provides a support to the authorizing bodies and authorized persons.

<sup>5</sup> Retraining courses are dealt with Reg. 176/2009 Coll. in relation to the Act. 179/2006 Coll., and to the National Register of Qualifications ([www.msmt.cz](http://www.msmt.cz))

Thanks to this mechanism, VET providers (schools) are able to be more flexible and react faster to changes on the labour market, combined with the application of new technologies, materials, technical things in education. Schools can then easily update their school curricula.

National curricula are expected to be reviewed, taking into account labour market demands; schools can then adjust their curricula accordingly.

Crucial factor for a successful employability of VET graduates, i.e. skilled labour force in chemistry, and how to secure it.

- Anticipate skill needs in the sector, with the prospect of at least 5 years
- Offer relevant disciplines / courses according to the needs of the chemical industry with a certain vision for the future
- Projecting current requirements of the chemical industry into the vocational education through the National register of qualifications (National Register of Occupations – National Register of Qualifications – National Curricula – School Curricula) or retraining courses
- Cooperation of all stakeholders: schools – regional employers, the Association of Chemical Industry
- Emphasis on quality education including practical training corresponding to the actual demand for qualified workers in the chemical industry
- Ensuring the quality of outputs to practical use, for example internships in companies for teachers and students, mentoring students in the workplace (prepared qualification standard Instructor of practical training), etc.
- Standardization using the National register of Qualifications – determination and continuous updating of requirements for occupations in the chemical sector with a perspective of at least 5 years
- Attractiveness of the chemical industry, increased interest in studying chemical oriented study programmes, motivation of students, offering scholarships etc.
- Interconnection of IVET and CVET using the National Register of Qualifications – Updates of national curricula through the requirements defined in vocational qualification standards and subsequent implementation in school curricula
- Larger flexibility in education – modularization, special courses focusing on the specifics of the sector
- Setting up a system of counselling services – career counselling and better access to relevant information

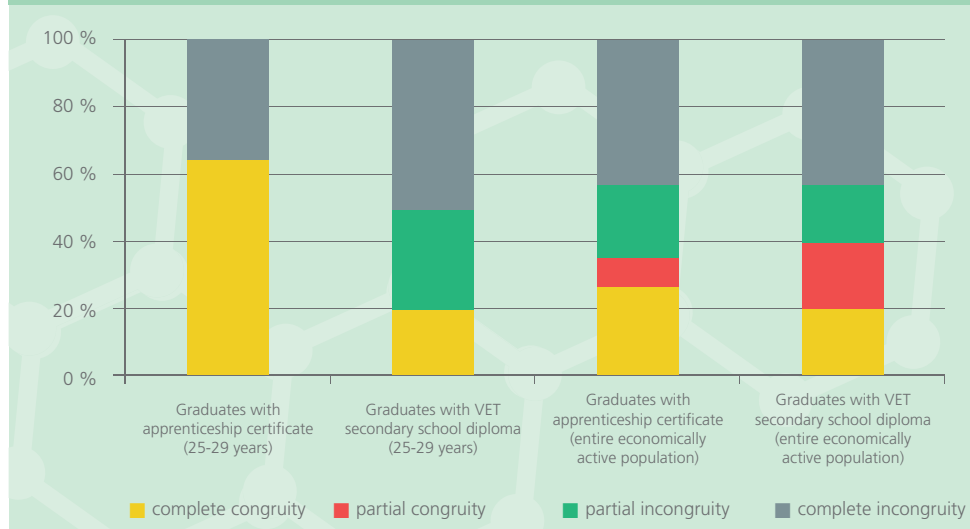
The work on school curricula is the main area of any cooperation between schools and companies where communication among all partners in the region is needed, as well as taking into account conditions, possibilities and needs of students – an important role of a coordinator for collaboration between schools and businesses. Other important areas and issues are as follows: provide space for the implementation of high-quality practical training, i.e. a qualified professional practitioners, appropriate technical equipment; “bonuses” for students and their parents such as scholarships for students, employment

in the company after a successful graduation. Further ways of cooperation are participation in school final exams (field of education chemist, obligation arising from the amendment of the Education Act), propose topics for final papers for students of Applied Chemistry programme, participation in the graduation exam and final paper presentation, as well as development of vocational competences of teachers.

Cooperation with education providers (schools providing CVET programmes) in the area of continuous education is based on common effort on the preparation of training courses and plans for their implementation (incl. Retraining courses in relation to the National Register of Qualifications), the possibility of participation through the sectoral council in the creation / revision of vocational qualification standards, ie. to define qualification requirements, verify vocational qualifications as an authorized person, or its authorized representative.

As a last piece of information some statistics are being introduced in this paragraph, regarding the employment rates of graduates in chemical sector, as well as compliance of education and employment in chemical industries. Graduates of the field of Applied chemistry (qualification level 4) reported 8% unemployment rate, which is nearly 1/3 lower compared with the average unemployment rate (average shows 11.8%). Compliance of education and employment in this sector reports 62% at graduates at the qualification level 3 and 50% for graduates at qualification level 4, which again shows better values than the average values (see the chart below)<sup>6</sup>.

Graph: Relation between education and employment in chemistry study programmes



<sup>6</sup> Source: statistical data processed by NUV

# EUROPEAN TOOLS TO PROMOTE MOBILITY OF STUDENTS

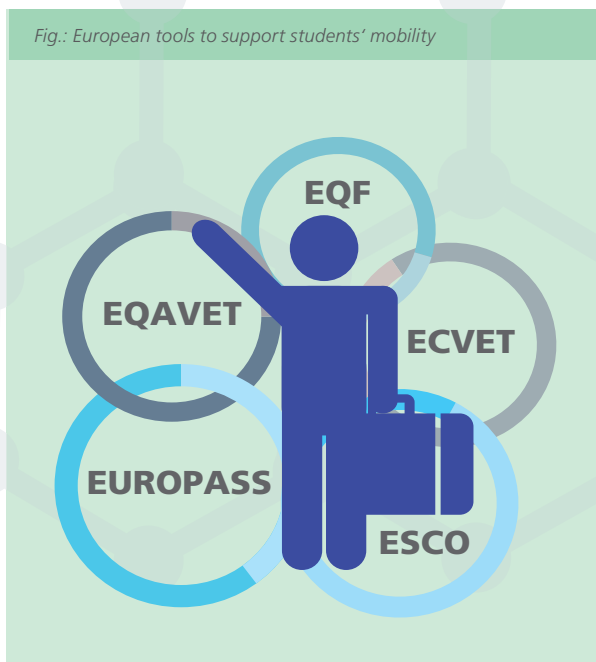
**Mgr. Michala Čičváková,**

*TRAWI project team member, National Institute for Education/Narodni ustav pro vzdelavani*

ECVET belongs to a family of European tools developed by the European Commission. Their common goal is to increase mobility and employability of students / workers in the EU, transparency and clarity of qualifications, narrow the gap between the worlds of work and education and to promote mutual understanding and trust between the countries of the European Union. By 2020, at least 6% of VET students should study or work abroad and an international experience is supposed to become an integral part of vocational training. The number of Europass Mobility issued in the Czech Republic shows that about 3 000 VET students travel abroad thanks to the ERASMUS+ programme. ECVET, EQF, EQAVET, Europass and ESCO belong to the most important European tools seeking to raise both quantity and quality student internships,.

European Qualifications Framework (EQF) is the key instrument, which introduces a concept of a scale of 8 qualification levels described through learning outcomes. It enables the comparison and the assignment of national qualifications. The Czech Republic has published a referencing report in 2011. As a result of the referencing process, secondary education with an apprentice certificate corresponds to Level 3 of the European Qualifications Framework, secondary education with graduation exam corresponds with level 4 and higher vocational education is put on the 6<sup>th</sup> level. Thanks to EQF, employers and education providers gain a quick overview of the level of skills of each applicant. For more information visit [www.eqf.cz](http://www.eqf.cz).

*Fig.: European tools to support students' mobility*



Graph 1: Results of the referencing proces – linking Czech qualification levels to EQF

EQF level	Qualification and education level
8	Doctoral Program
7	Master's Program
6	Tertiary Vocational Education, Education at Conservatories, Bachelor's Programme
5	Short cycle programs (not yet available in the CR)
4	Upper Secondary Education with Maturita Exam, Upper Secondary with Maturita Exam, Supplementary Study leading to a Maturita Exam, Upper Secondary Education with Maturita Exam
3	Upper Secondary Education with Apprenticeship Certificate
2	Lower Secondary Education, Upper Secondary Education, Upper Secondary Education without Apprenticeship Certificate, Upper Secondary Education with Apprenticeship Certificate
1	Special Education

Source: Czech National referencing report, Prague 2011

**The European Framework for Quality Assurance (EQAVET)** aims to define a common quality criteria, indicative descriptors and indicators. Czech School Inspectorate is responsible for the implementation of EQAVET in the Czech Republic (more information at [www.eqavet.eu](http://www.eqavet.eu)). Currently there are no specific recommendations that could be used. It is recommended to apply the quality cycle in all activities related to international or national mobility (such as the creation of units of learning outcomes, writing project applications, students' mobility implementation, etc.) and adhere to the following steps:

- planning
- implementation
- assessment
- revision

Europass is a tool which provides a set of standardised forms for recording skills and competences acquired through formal informal, but also the in-formal learning. Europass Mobility document is used for the purpose of both national and international mobility; the host institution uses this document to reports skills acquired during tudent's stay abroad. Also other Europass documents can be used when organizing mobility (information on all documents can be found on [www.europass.cz](http://www.europass.cz)). Suitable candidates for a mobility can be selected based on a completed resume or cover letter. Europass Certificate Supplement can be used as inspiration for the creation of units of learning outcomes. The benefit of this document is that it contains learning outcomes not only in Czech

language, but can be translated also in English, French or German (upon applicant's request and needs). In the Europass language skills passport, participants of mobility clearly indicate the development of their language skills.

The **European classification of skills, competencies, qualifications and Occupations (ESCO)** is a tool of the future, which would primarily facilitate communication between all actors involved in international mobility. An online available unified terminology shall be developed, which will facilitate the search for vacancies and orientation of the European labour market. Pilot version of this tool is currently available on <https://ec.europa.eu/esco>.

## ERASMUS+ and synergy of European tools

In 2014, the program ERASMUS+ was launched, in which one can apply for a financial support for projects in the areas of vocational, higher and adult education, youth and sport. All mobility projects applicants are advised to use European mobility tools in their projects. The tools are expected to be in synergy. Contents of mobility should thus be transparently described by assessable learning outcomes (unified international terminology ESCO terminology can be used, as well as Europass Certificate Supplement and National Register of Qualifications). Each unit of learning outcomes should have a clear relationship to a relevant qualification and the EQF levels. When creating units special attention must be paid on ensuring its quality. In the case that the implementation of mobility indicates that the unit was too difficult or long, it is necessary to revise this unit together with a partner organization. Obtained and assessed learning outcomes shall be recorded in the Europass mobility or similar document, so the student can add the mobility experience in a portfolio of European Skills Passport (part of Europass documents), and demonstrate practical skills at a job interview.

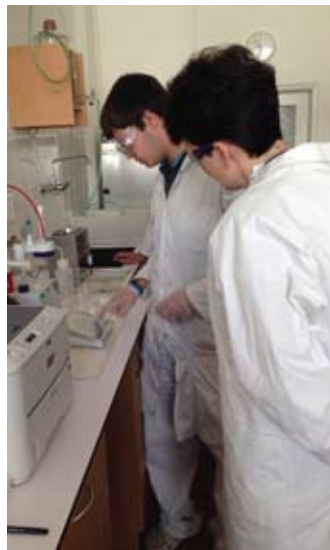


# ECVET UNITS OF LEARNING OUTCOMES

*Mgr. Martina Kaňáková*



The acronym ECVET stands for European System of Credit Transfer in Vocational Education and Training. It is one of the European tools to support vocational education. Along with other tools it was designed to reinforce the attractiveness of vocational education, improve the compliance between education and labour market needs, and to make vocational qualifications more transparent. The main objective of ECVET is to increase the number of internships (national and international) and improve their quality. ECVET facilitates the transfer of knowledge and skills gained by a student to his home school. ECVET thus promotes collaboration between schools and businesses, and also contributes to improving mobility quality and increasing the number of placements of VET students.



## ECVET principles

The building blocks of ECVET are so called learning outcomes, units of learning outcomes, credit, mutual trust and partnership. Partnerships and cooperation between schools and businesses are based on a beforehand agreement between sending and receiving institutions about what the student will learn in accordance with his educational program – what skills and competences should be gained during the mobility. This “content” of the internship is defined in the so-called unit of learning outcomes, a set of expected knowledge, skills and competences.

The unit consists of the following components: the expected learning outcomes, criteria and procedures for the evaluation and assessment of learning outcomes (assessment tasks and assessment criteria, methods of evaluation). The range and number of units of learning outcomes must be set in terms of feasibility within a pre-agreed period of placement, i.e. usually 2–4 weeks.

Units of learning outcomes are then assessed and recorded by the receiving institution, and the sending institution recognizes them, without having to re-authenticate them (for example by making the student re-take a test). Credit in ECVET means added value of what a person learns during internship – students increase their credit by participating in the mobility programme.

Mutual trust between the school and the enterprise is a crucial prerequisite for the above described cooperation. Students should not be assessed twice for the same knowledge, skill or competence, in order not to prolong their education paths just because some part of their vocational training was completed in a different educational context. However, the mutual trust between schools and companies should be ensured by a written contract – namely, a general contract (Memorandum of Understanding between the sending and receiving organizations) and a tripartite learning agreement (or contract) between schools, businesses and the learner (student, teacher). This agreement specifies conditions of mobility, the content of internship / training, expected learning outcomes, assessment, validation and recognition.

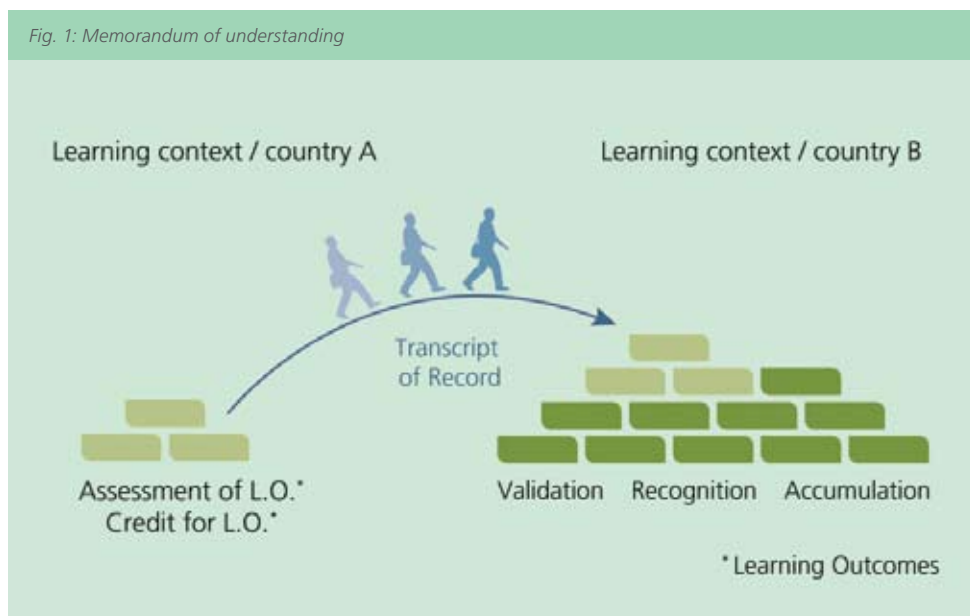
Europass Mobility is the recommended form of personal record. It describes the knowledge, skills and competencies acquired during the internship and the holder can then prove his practical experience during a job interview. Both receiving and sending organization cooperate on completion of the document, together with the Czech National Europass Centre. The document can be issued in any EU language and it can also be issued retrospectively.

Find more information at <http://www.europass.cz/mobilita/>

## Importance and form of units of learning outcomes

Let us pay a little bit more attention to the units of learning outcomes. The unit can be transferred (among educational institutions in one country or abroad), combined and cumulated (for obtaining a qualification).

Fig. 1: Memorandum of understanding



Clearly defined unit helps improve the quality of mobility, helps to meet the required content of internships and enhances transparency of qualifications. Therefore, it is necessary that the learning outcomes are described comprehensively in relation to the real practice. They should be measurable and assessable, described with so called active verbs (eg. student makes, assembles, measures, explains, describes, evaluates, applies...), and avoid vague phrases (oriented, understands, and is able). The greatest obstacles in the definition of units of learning outcomes are vague descriptions of the expected learning outcomes, excessive or, conversely, very small amount of the expected learning outcomes (creators should always take into account the length of the mobility and capability of students and their entry skills) and the lack of description of how to verify the obtained learning outcomes.

What should such a unit of learning outcomes include? Recommended are the following:

- Name
- Code and name of qualification or study programme
- EQF level
- Expected learning outcomes
- Methods of assessment learning outcomes – specific and practical assessment tasks leading to obtaining and verification of learning outcomes
- Other information – length of mobility, assessment criteria

The Centre for International Cooperation in Education recommends this template to the project applicants:

<b>UNIT OF LEARNING OUTCOMES – TEMPLATE PROPOSAL</b>			
<i>Name of qualification/ study programme</i>		<i>EQF level</i>	
<i>Name of unit of learning outcomes</i>			
<i>Expected learning outcomes (knowledge, skills, competences)</i>			
<i>Assessment tasks</i>		<i>Assessment results (passed – failed)</i>	

This pattern, however, is in no way binding. Units of learning outcomes can be adjusted to the needs of each partnership and the field.

Inspiration for defining learning outcomes can be found at the following links:

[www.disco-tools.eu](http://www.disco-tools.eu)

[www.europass.cz](http://www.europass.cz)

[www.narodnikvalifikace.cz](http://www.narodnikvalifikace.cz)

Documents published by The Centre for International Cooperation in Education can also be used; available at:

[www.naerasmusplus.cz](http://www.naerasmusplus.cz)

- How to define a unit of learning outcomes
- ECVET – Questions and answers
- ECVET – ECVET examples in practice

The national team of experts ECVET provides counselling and consultation to all project applicants.



# ANALYSIS OF PROJECT APPLICATIONS WITHIN THE ERASMUS+ 2014 KA1 CALL, FOCUSING ON EXPERIENCE WITH CREATING UNITS OF LEARNING OUTCOMES IN CHEMISTRY

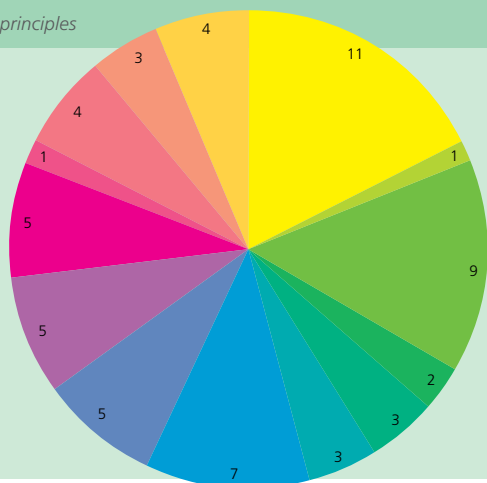
**PhDr. Hana Slámová, PhD.,**  
member of ECVET experts team

This paper summarizes findings on the implementation of ECVET principles, coming from the analysis of project applications within the Erasmus+ 2014 KA1 call. Basic data on planned projects using ECVET is introduced. The author focuses mainly on experience with creating units of learning outcomes in the field of chemistry.

## Analysis outcomes

Out of 147 successful applications 63 projects (42,8%) declared the implementation of ECVET principles. In 95% applications were filed by vocational schools (47 of them offer study programmes on EQF level 4), which offer study programmes mainly in the field of gastronomy, hotel industry and tourism, economy and administration, and ICT. The length of mobility is in most of the projects planned for 2 weeks. Most project applications were submitted by institutions from Prague (total 11).

Graph 1: Geographical distribution of using the ECVET principles



The main evidence of the successful implementation and understanding of ECVET is the creation of the unit / units of learning outcomes. These should be an integral part of the project application. In 2014, the units were submitted by a total of 27% of institutions, 43% of applicants promised to create learning outcomes during the project period. A total of 30% of the project applicants does not mention the UoLs.

## Projects in chemistry

4 projects in the field of chemistry were successful in 2014. A detailed analysis of these project applications shows that in some cases the implementation of ECVET is rather formal, without a coherent implementation, contractual aspects of implementation (Memorandum of Understanding, learning agreements) are missing. Level of work with units of learning outcomes varies. The following weaknesses appeared not only in projects in the field of chemistry, but also in a number of other project applications. The applications particularly lack:

- Formulation of intent that the unit of learning outcomes will be created;
- The name of the unit, or the assigned EQF levels;
- Reference to links with the National Register of Qualifications;
- A description of the process of creating of units of learning outcomes.

3 units of learning outcomes were created in the field of chemistry. The units show different levels of details and different approaches towards description of learning outcomes. Defining units of learning outcomes is for majority of applicants a new and challenging task, in which it is necessary to pay particular attention to:

- Adjusting the scope of units of learning outcomes to the length of mobility (in many cases, the content of the unit is too broad or too vague);
- Appropriate description using vocational activities (assessable active verbs)
- Description of the evaluation process (form, responsible person, criteria).



# UNITS OF LEARNING OUTCOMES AND THEIR PILOT TESTING AT THE SECONDARY TECHNICAL SCHOOL OF CHEMISTRY IN PARDUBICE

**Ing. Miroslava Katzerová,**

*teacher and coordinator of international projects*



Secondary Technical School of Chemistry in Pardubice cooperates on the TraWi project on the activity entitled "Outcomes of practical training." The aim of this activity was to create a teaching concept of practical training and related units of learning outcomes, and pilot testing them in practice. The tasks were implemented by a project team of teachers Jana Šedová, Marcela Burešová, Miroslava Katzerová and František Kopecký. The work was carried out with our long-standing and proven partner, the Synthesia company.

**The work itself was divided into several subsequent steps:**

## Proposal of teaching concept of practical training

The aim of this initial step was to approximate education and industrial training in chemical companies. At the beginning we put together a list of all work assignments for work in school laboratories according to each subject and grade. According to the terms of reference we prepared two draft concepts for study programmes Applied Chemistry (EQF 4) and Operating chemist (EQF 3). A key task was to describe units of learning outcomes, which meant to provide a detailed list of knowledge (theoretical and practical), skills and competences that the student acquires when completing the unit of learning outcomes. Phases of the teaching process (theoretical foundations and their verification, work tasks, evaluation, monitoring and evaluation of results), a brief workflow methodology (organization of teaching) and tools to support learning are introduced and described in the concept.

Based on these concepts, we prepared teaching instructions for teachers and implemented them into recommended template with given breakdown:

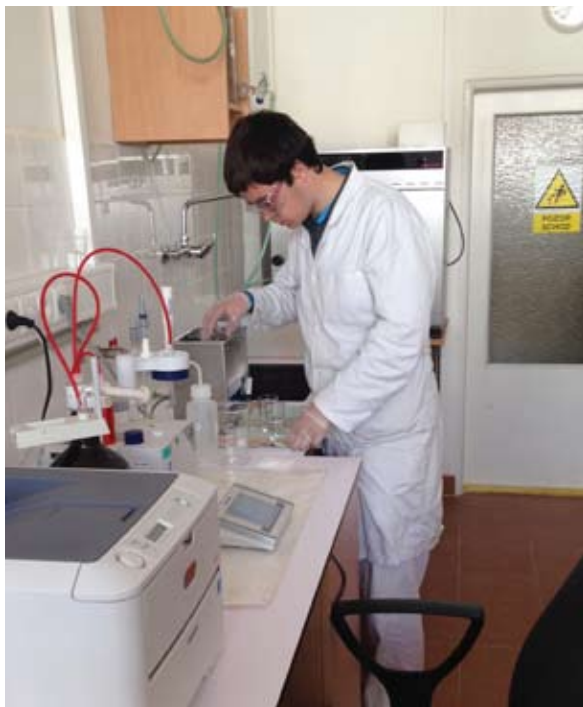
- Formulation of practice – oriented task linked to chemical industry;
- Work steps – task and its analysis, apparatus, equipment and chemicals, process, evaluation results
- Vocational knowledge, skills, competences – their list for individual working steps, a description of links to nature science (theoretical introduction) and technological context (description and operation of measuring devices)

## Two tasks were selected for the study programme Applied Chemistry

1. Measuring the viscosity of glycerol in the cosmetic sample by two methods – Höppler and Ubbelohde viscometer.
2. Determination of 9-anthracene-carboxylic acid (9-ACA) in the final product during final inspection by automatic potentiometric titration – in collaboration with VÚOS Company (Research Institute of Organic Synthesis).

## For the study programme Operating chemist one task was selected (in cooperation with the Synthesia company):

3. Measurement of the pH an aqueous solution of Akardit (N, N-diphenyl-N-methylurea).



A task assignment was developed for students, which included formulation of a task-oriented practice, links to industry, machinery and chemicals, workflow and evaluate the results.

## Pilot testing in practice

Glycerol viscosity measurements were carried out by two students of a 3<sup>rd</sup> grade in school laboratories on May 11<sup>th</sup> 2015.

Determination of 9-anthracenecarboxylic acid (9-ACA) was carried out by a student of a 3<sup>rd</sup> grade in the laboratory of CETA (Centre for Ecology, Toxicology and analysts) in the VÚOS company on May 12<sup>th</sup> 2015.

Measuring the pH of the aqueous solution of Akardit was conducted by a student of a 3<sup>rd</sup> grade in the Synthesia company in Organic chemistry lab on May 12<sup>th</sup> 2015.

After completion of the verification a discussion with evaluators – employees of the Technical University of Dresden and secondary schools SBG Dresden was held.



## Use and benefit

A bigger involvement of companies that have been engaged in selecting and formulating tasks and whose work places we used for verification, seems to be one of the biggest positives. The benefit of UoLs is a clear description of the knowledge, skills and competences, clear evaluation criteria, greater independence of students at work (discussion about the task with built-in problem, the proposed solution of the problem), the planning and organization of activities, results evaluation and their control. A big benefit is also the transferability between schools.

During the development we also alluded to problems – a brief training to the creation of the teaching concept and instruction for teachers and students and to the evaluation criteria, which was conducted in German only. A big problem was the lack of time (development of the teaching concept and instructions is time consuming and difficult to organize).



*Students from a Secondary Technical School of Chemistry working in a lab*

# UNITS OF LEARNING OUTCOMES AND THEIR PILOT TESTING AT THE SECONDARY TECHNICAL SCHOOL OF CHEMISTRY IN BRNO

**Mgr. Kateřina Bilá,**

*TraWi project coordinator at the Secondary Technical School of Chemistry in Brno*



Like other schools participating in the TraWi project, our school is also working on the activity entitled "Outcomes of practical training." Our task was to create a teaching concept of practical training in laboratories, units of learning outcomes and pilot testing them in practice. The work was carried out by a team of teachers Zdena Kučerová Irena Pavlíčková, Jitka Dvořáková and Tomáš Buriánek. When selecting work task, describing them and even processing the verification, we worked with our partners from practice, especially with the company Gumotex, as, which is engaged in manufacturing rubber products and technical foams and is our long-term partner. Ing. David Kubalík, an employee of the company, is also a member of our project team. The company Blansko Synthon, focusing on the supply of affordable medicines through innovation also participated on selecting work tasks to be tested.

Our work consisted of several steps; first we prepared the draft of the teaching concept in our school for the study programme Applied Chemistry. The aim of this proposal was to align education and industrial training in chemical plants. At the beginning we drew up a list of all work assignments to work in school laboratories by each subject and grade. The main task was to describe the results of teaching units with the most important part – the overview of knowledge (theoretical and practical), skills and competences that the student acquires by finishing the learning unit. Phases of the teaching process (theoretical foundations and their verification, work tasks, evaluation, monitoring and evaluation of results), a brief workflow methodology (organization of teaching) and tools to support learning are introduced and described in the concept.

After the development of this teaching concept, we prepared guidelines for teachers in to a template, which included: formulating a practice – oriented task linked to a particular enterprise, work steps – task and its analysis, apparatus, equipment and chemicals, process, evaluation of results and vocational knowledge, skills, competencies – their list for individual working steps, a description of links to science and technological context.

Two tasks were selected for the study programme Applied Chemistry

- 1. Determination of dry matter and moisture as an indicator of quality in the production of rubber**
- 2. Measurement of molecular refraction of liquids for determining the quality of raw materials.**

A task assignment was developed for students, which included formulation of a task-oriented practice, links to industry, machinery and chemicals, workflow and evaluate the results.

**Measurement of molecular refraction of liquids for determining the quality of raw materials** was carried out by two students of a 4<sup>th</sup> grade in school laboratories on March 10<sup>th</sup> 2015.

**Determination of dry matter and moisture as an indicator of quality in the production of rubber** took place in a quality laboratory OZ3 in Gumotex and was carried out by the same students of a 4<sup>th</sup> grade on March 11<sup>th</sup> 2015.

Before the verification stage we received an evaluation of instructions by an evaluator from the Technical University of Dresden. Immediately after verifying a discussion with the evaluators from the Technical University of Dresden and SBG (Saxon Education Company) from Dresden was held, followed by sending the evaluation report.

Perhaps the biggest positive of this project was a collaboration with companies that have been involved in selecting and formulating tasks and whose premises we were able to use for pilot testing. Students then worked on tasks which they knew they could encounter in everyday practice. The benefit of units is undoubtedly a detailed description of knowledge, skills and competences, clear evaluation criteria, greater independence of students at work, planning and organization of activities, their evaluation and monitoring. Because the assignment was drafted in the German language, students were also able to improve their knowledge of a foreign language. The comparison of the vocational training system in Germany, Poland and the Czech Republic was also interesting.

We also encountered problems, mainly the time and organizational demands in developing the concept and the need to use a foreign language.

# INTERNATIONAL MOBILITY AS A WAY TO ECVET IMPLEMENTATION

*Ing. Jana Šedová,*

*teacher at the Secondary Technical School of Chemistry in Pardubice*

The Secondary technical school of chemistry in Pardubice has had already 8 years of experience with VET mobility programmes. It was Leonardo da Vinci in years 2008–2013, now it is Erasmus+, key activity KA1. Our school operates as a sending institution, as well as receiving institution for international students.

Our school is a proud member of CREDCHEM Network, which gathers VET schools cooperating on ECVET implementation in the chemistry field. We implement mobility projects with other members:

- Secondary technical school of chemistry in Pardubice
- Secondary technical school of chemistry in Bratislava
- SBG Dresden
- IIS Scalcerle Padova

Within the project LdV Partnership units of learning outcomes were formed, which are now offered to other partners. They offer such units, which can be technically and personally secured at a very high level. The following units of learning outcomes have been defined and developed during the Partnership project:

- 1: Preparation and follow-up of analysis and synthesis
- 2: Defining of material constants and material characteristics
- 3: Spectroscopic analysing of materials
- 4: Volumetrically / gravimetrically analysing of materials
- 5: Chromatographically separating and analysis of mixed materials
- 6: Production of inorganic and organic materials
- 7: Procedures of synthesis
- 8: Supervising production processes
- 9: microbiological testing of materials

We sign Memorandum of Understanding with our school partners, ECVET Learning agreement and Participation agreement with each student.

All units of learning outcomes (and related tasks) are profession oriented.

Each learning unit describes the learning outcomes that students should acquire upon its completion (knowledge, skills, and competences). A competency level is also assigned for units (A, B or C). Competence level reflects the extent of students' autonomy when fulfilling tasks. The receiving organization ensures programme of a mobility, which is then approved by the sending organization. The sending organization sends the receiving organization "Information about the sending organization and the participants."

Each participant is during mobility monitored by a mentor (on the part of the receiving organization). Participant writes a report on each task he/she completes (in a prescribed form of the Laboratory Report). Mentor evaluates participants in precisely defined criteria on a five point scale from "poor" to "excellent" and this assessment is recorded in the form "Monitoring and Mentoring of the Participant".

If the receiving institution confirms that the student achieved the expected learning outcomes, the sending organization recognizes the unit and issues Europass Mobility to each student. Participant's evaluation shall be included into his/her classification of related subject with an importance corresponding to the ratio of the extent of the work programme on the scope of formal education in the subject.

We find benefits of the cooperation for our school mainly in the following aspects:

- Mutual assurance of the quality of provided education
- Exchange of know-how in vocational education and training
- Introduction of innovative practices in education, ideas for interesting laboratory exercises
- Creation of new units of learning
- Improvement of ECVET tools
- Professional, linguistic and educational growth of teachers in the roles of mentors

As for benefits for students, mobility projects bring these added values:

- Vocational knowledge and competences – new techniques, professionally oriented tasks
- Language skills and competences – communication skills, vocabulary knowledge of technical terminology (working language English)
- Key competences – ability to solve problems, teamwork, work habits, social skills, mathematical and IT skills, civic and cultural competence

# EXPERIENCE WITH USING UNITS OF LEARNING OUTCOMES IN CZECH EDUCATION SYSTEM

**Mgr. Alžběta Kováčiková,**

*Secondary Technical School of Chemistry in Kralupy nad Vltavou, teacher (analytical chemistry, electrical engineering), project coordinator, mentor for partner organisations – consultant for creating units of learning outcomes*

I have learned about ECVET and understood its principles during the implementation of several projects focused on the mobility of students. My initial experience with ECVET was rather tentative. I read all available information and it took me quite a long time before the topic began to be clear. For a long time I was confused with the word credit in the name of the system. One usually associates with a certain number of points, but in ECVET points are not essential.

The official definition ECVET is indeed known, but this acronym can also be seen as efficiency, transparency, clearly defined purpose of education and its quality. ECVET then means this to me:

**E – efektivní (effective)**

**C – cílený (targeted)**

**V – vklad (deposit)**

**E – edukativní (education)**

**T – transparentní (transparent)**

What does ECVET mean for me? First of all, well prepared teaching unit – for us it's laboratory work, including the name, a brief workflow description, calculations, but also information about competences, knowledge and skills gained by a student when completing the unit. Creating units is time consuming. There is also a risk that the creator of a unit does not estimate the complexity and sophistication of the unit and must revise it after testing, which might deter someone. On the other hand, developed unit can be used several times and work invested in its development pays off.



*2013 Students from a Secondary Technical School of Chemistry in Bratislava visiting our labs*

## Who is responsible for creating a unit of learning outcomes?

The process of creating units of learning outcomes can be carried out in three ways. The first possibility is that unit is prepared by the sending institution before the mobility, as a requirement of what is expected from the experience abroad. The sending organisation determines the length of UoL, describes the procedure, competence, skills, knowledge, method of monitoring and evaluation. This is the simplest way for the sending institution, however, it hides many disadvantages and risks. Receiving organizations do not have to accept the unit and can make changes during the internship. It is indeed difficult for the sending organization to correctly estimate the material capabilities of the project partners. For this reason, it is preferable that the unit is prepared by the receiving organization and method of evaluation and recognition of achievements will be then added by the sending organization.

This way, the mobility becomes effective, for both receiving and sending organization. The unit is written in a way that respects the material possibilities of the host organization and also human resources. The receiving organization offers the unit to its potential partners before submitting a grant application, they choose the optimum unit and add methods of evaluation, or other criteria. The third option, which is useful especially at the national level, is that the company (receiving organization) proposes work tasks for students and specifies the skills that students will develop. School turns this proposal into a unit of learning outcomes. Thanks to this approach student's work in the enterprise is efficient, transparent and improve its training. Our school wants to use this procedure in establishing cooperation with Synthos.

## How can the units of learning outcomes be used?

Defining units of learning outcomes is certainly a time-consuming activity. However, the unit can be used not only for international mobility, but also in everyday teaching. The energy invested in the creation of the units then definitely pays off. If vocational training taking place in school laboratories uses units of learning outcomes it becomes effective and transparent, which helps both teachers and students. In case that the school participates in retraining courses (either for business or labour office), the unit pre-determines the range of skills, knowledge and competences for participants of such course, as well as the way to verify the acquired knowledge and methods of evaluation. For all these activities we still use documents – personal records, prepared within an international project, which is a very valuable tool for us.

Units of learning outcomes are very useful for international mobility projects. However, a cooperation of VET schools on national level would be interesting and meaningful as well. For example, a school in the Czech Republic has a well-equipped laboratory on chromatographic methods. It develops a unit of learning outcomes and offers it to schools without this equipment, but on the contrary, they have something different to offer and are willing to offer that in return. It is a new and rewarding experience for students; they work in a different environment, they must overcome fear, learn to listen and respect other people with other demands and requirements than they were accustomed, they collaborate with students from other schools. And that is the acquired credit, which may help them on the labour market.

Fig. 1: Example of a document – personal record, created within an international project

**Střední odborná škola a Střední odborné učiliště**  
Cesta brigádníků 693, 278 01 Kralupy nad Vltavou  
[www.sosasoukralupy.cz](http://www.sosasoukralupy.cz)  
Smlouva číslo: 2014-1-CZ01-KA102-000429



### Monitoring and Mentoring of the Participant

<b>Name of participant:</b> Lucie Kořínková					
<b>Learning Unit:</b> Volumetric analysis					
<b>The task:</b> Stanovení nikotinu titrací v nevodném prostředí (Determination of nicotine by titration in non-aqueous medium.)					
<b>MONITORING</b>					
	<b>Poor</b>	<b>Fairly good</b>	<b>Good</b>	<b>Very good</b>	<b>Excellent</b>
<b>WORK ASSESSMENT</b>					
Ability to finalise given tasks					x
Time-keeping in performing tasks					x
Autonomous organization of work					x
Ability to acquire new skills					x
Respecting workplace safety rules					x
<b>COMMUNICATION</b>					
Ability to understand and respect rules and roles					x
Ability to interact with others					x
<b>LANGUAGE COMPETENCE</b>					
Ability to communicate effectively using routine English					x
Ability to communicate effectively using Technical English					x
<b>ATTITUDE TO THE SPECIFIC JOB</b>					
Quality work of HTML					x
Quality of results presentation					x
Quality of website					x
Saving energy, water and money in lab					x
Proper use of laboratory instruments and equipment					x
Chemical data processing, data analysis skills					x
<b>OVERALL ASSESSMENT</b>					
<b>FURTHER COMMENTS</b>					
Date: 19. 02. 2015			Supervisor: Domotorová		

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Implementing ECVET in cooperation of enterprises and VET schools would be, in my opinion, a breakthrough in education. Ideally, someone from the company defines a unit of learning outcomes and offers them to a school/schools. Schools then would select a unit/units upon their needs and send students to relevant enterprises.

Units of learning outcomes enormously simplify the work of teachers in labs (but it can be easily applied to training kitchens, pastry shops,...), but mainly in control, evaluation and validation. The teacher knows exactly what to tell the students, what should be noticed, corrected, repeated, assessed and evaluated.

ECVET increases transparency of VET mobility and makes them unambiguous. All parties know in advance what they will do, what they are expected to know/do at the beginning and at the end.

I personally would like to implement ECVET into the system of retraining courses. This is also what I am currently trying to do. I teach analytical chemistry at a higher professional school. My students are adults who are either gaining higher level of education, or those who were not able to find a job in their original profession and now are trying to study something else. I suspect they will not study for

too long. That is why I prepare units of learning outcomes for them, distribute them to the students so they can see what exactly they learn. We do the final evaluation together and I try to mentor and motivate them, find a reason to continue with education as long as possible. I explain them that gaining new skills will improve their chances to find a job. To implement this system is not easy, but it is very efficient.



*2011 Explaining the methods of measuring surface tension.*



*2015 Our students in labs in Bratislava, ready for a lesson on isolation of microorganisms*