



## Promotion of Lifelong Learning of Scientific Subjects:

### Challenges, Opportunities and Strategies

### The Czech National Report



This project has been funded with support from the European Commission.  
This material reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



# NATIONAL REPORT OF THE CZECH REPUBLIC

**ANNA MITTNEROVA, HANA STEPANKOVA, PETRA KINZLOVA**

INSTITUTE OF CHEMICAL TECHNOLOGY IN PRAGUE

PRAGUE, CZECH REPUBLIC

[anna.mittnerova@vscht.cz](mailto:anna.mittnerova@vscht.cz)

[petra.kinzlova@vscht.cz](mailto:petra.kinzlova@vscht.cz)

[hana.stepankova@vscht.cz](mailto:hana.stepankova@vscht.cz)

## ABSTRACT

*The Czech Republic is a country with long industrial tradition and highly decentralised administration, country which has an exceptionally long tradition in education – and adult education - attained by all social classes. Until 2013, the Czech Republic is a recipient of the EU Structural Funds, which is reflected also in the development of lifelong learning (there are many projects financially supported from the European Social Fund). The whole area of further education, in both the professional and personal development spheres, has been deeply affected by the social and political changes following 1989. Since 1990s, continuing education, adult education, lifelong education and human resources development have become subject of many strategic documents and projects which prepare measures for their successive implementation. Educational policy and the state and development of the education system are the responsibility of the Ministry of Education, Youth and Sports (MEYS), which collaborates with other institutions and bodies on the fulfilment of its strategic goals. Among long-term policy objectives of the education system in the beginning of the 21<sup>st</sup> century, support of continuing education has its important place. However, despite undisputable positive development and similarly to other European states, the Czech Republic suffers from the lack of interest in natural and technical science in the population. Below, we analyse some of the reasons and some steps that have been taken to improve the situation. We also stress the moments that should be taken into account if we want to change the course towards better image of natural science – and chemistry in particular – in the society. We insist that it will be society itself who benefits from this change of course.*

## 1. Introduction to the National Situation

### 1.1 National Education System in the Czech Republic

The Czech Republic is a small highly developed country located in the centre of Europe. It has a long industrial tradition and highly decentralised administration. The country has an exceptionally long tradition in education attained by all social classes.

From a historical point of view the organisation of the Czech education system began very early. Throughout Czech history, education has been regarded with great respect and groups of people who would not have received any education in other countries often did so here. This was reflected in the organisation of the education system: the first (Charles) university was established in 1348, Czech Technical University (České vysoké učení technické) in 1717, six-year compulsory school attendance was introduced in 1774 and extended to eight years in 1869. As a considerable part of the Czech history is linked to Austria, the history of the Czech education runs parallel to that of Austria, but at the same time it has been marked by a process of linguistic and national emancipation.

After the end of the Cold War and fall of the communist regimes in Central Europe the era of reforms has started in all aspects of life. Also education system has become more decentralised and diverse. A new law on state administration and self-government in education was passed in 1990, when the administration of education was taken out of the general state administration and transferred to the Ministry of Education. With the reform of state administration in 2000, the main feature of which was a major decentralisation of the state administration as a whole, the administration of education was progressively returned to territorial authorities in two phases between 2001 and 2003. The Ministry of Education has retained its conceptual responsibilities.

The organisation and administration of higher education differ from the rest of the education system. A new Higher Education Act was passed in 1990, which restored autonomy and academic freedoms in

higher education and, by reducing state interference to a minimum, provided universities with a high degree of independence. Due to the rapid developments in the tertiary sphere, a new Act was passed in 1998. It brought an important change in the establishment structure and majority of institutions became public institutions with increased autonomy. It also became possible to establish private institutions. This Act was amended ten times, notably in 2000 when the institutions of higher education gained greater autonomy in relation to the disposal of property.

Between 1999 and 2001 the long efforts to formulate educational policy began to bear fruit. The strategic aims of the Government's education policy in the Czech Republic were approved in April 1999. In May 1999 a general Conception of Education and the Development of the Education System was presented for both professional as well as general public consultation. The National Programme for the Development of Education (the White Paper) was the result. The new Education Act was prepared in accordance with these documents. It was approved by the Government in 2003 and after several revisions by Parliament in September 2004 to come into force from 1<sup>st</sup> January 2005, although various provisions were introduced only gradually.

According to its long-term policy objectives the Czech education system focuses in the beginning of the 21<sup>st</sup> century on the following aims:

- equal opportunity in education
- curricular reform
- support of foreign languages and information and communication technologies
- development and implementation of quality assurance system, methods of evaluation and self-evaluation of schools
- increasing professionalism and improving the working conditions of educational staff
- support of continuing education

Educational policy and the state and development of the education system are the responsibility of the Ministry of Education, Youth and Sports (MEYS). It collaborates with the Ministry of Labour and Social Affairs in areas relating to the labour market and guidance, and in some matters with other central bodies of the state administration (Ministry of Interior, Ministry of Defence and Ministry of Health, Ministry of Agriculture, Ministry of Industry and Commerce) and institutions such as Academy of Sciences. Responsibility for the establishment of schools lies primarily with municipalities and regions, which take on several roles of the state administration.

Schools are divided into the following types according to the level of education and the nature of education provided: kindergartens, elementary schools, secondary schools, conservatoires, higher vocational schools (colleges), elementary art schools, language schools authorised to organise state language examination (all these institutions are subject to the Education Act) and the universities (subject to the Higher Education Act).

## **1.2 Lifelong learning**

Similarly to the education in general, the Czech adult education has deep roots. The idea of universal educational activities in the course of human life can be found in the works of J.A. Komenský, the Czech philosopher of the 17th century.

The whole area of further education, in both the professional and personal development spheres, has been deeply affected by the social and political changes following 1989.

The main responsible body in the area of long life education is the Ministry of Education, Youth and Sports. However, there are other ministries involved, for example other ministries are responsible for vocational training in professions within their sectors (such as Ministry of Labour and Social Affairs, Ministry of Industry and Trade and others). There are other institutions besides ministries that have important role in education – government advisory bodies, communities, chambers of commerce, etc.

The competence of the Ministry of Education in further education is stipulated by the Act on Verification and Recognition of Further Education Outcomes issued in 2006. The Act aims to increase motivation for further education. It enables to certificate not only full qualifications but even so called partial qualifications, i.e., competences necessary for carrying out partial activities within an

occupation. The Ministry of Education coordinates activities performed by central administrative authorities under the Act. Retraining is intended mainly for the unemployed and is controlled by the Ministry of Labour and Social Affairs through Labour Offices. It may be provided only by educational institutions with study programmes accredited by the MEYS. The education of employees of enterprises and organisations is managed by the enterprises themselves. There is a wide range of commercial lifelong learning courses, which is not subject to state control.

Since 1990s, continuing education, adult education, lifelong education and human resources development therefore have become subject of many strategic documents and projects which prepare measures for their successive implementation. The first one was the National Programme for the Development of Education in the Czech Republic (White Paper) that put emphasis on legal framework for the development of adult education, financial and non-financial aspects of the development of lifelong learning and systematic development of adult education.

Further legal document on lifelong learning – Education Act adopted in 2004, in force since January 2005 recognizes possibility of learning through life as one of principles of education; it also introduces new instruments with the aim to improve the accessibility of the education system. Provisions on lifelong learning are also included in the Higher Education Act under which schools can organize long life education including professionally oriented or special interest programmes, e.g. universities of the third age. Conditions of long life education courses are specified by internal rules of individual institutions (for example fees that are usually charged for these courses). In accordance with Higher Education Act, participants in long life education are not seen as students as such.

As we do not assume that the above mentioned overview of legal acts concerning long life education is complete, nevertheless we perceive the legal framework for long life learning sufficient. It is also necessary to mention that due to its membership in the EU, the CR's legal framework is in compliance with the EU documents in the area.

Further education and training is provided by schools of all levels, by employers, public administration and self-governing bodies and by their educational institutions, by non-governmental non-profit organisations including professional and commercial organisations.

Because of the dense network of schools, the geographical accessibility of further education provided by schools is relatively good, however easier in and around big cities, more difficult in the country.

Majority of courses organised by employers are most often in economics and accountancy, languages, information and communication technologies and their utilisation and in various technical branches, or in marketing.

Adult education teachers usually do not receive any special training. However, topics relevant to adult education are included in in-service training. There are three university departments training experts in adult education (mostly human resource managers):

- Faculty of Philosophy of Charles University in Prague – The Department of Adult Education and Personal Management
- Faculty of Philosophy of Palacký University in Olomouc – The Department of Sociology and Adult Education and Department of Special Education with a field special adult education
- Vysoká škola Jana Amose Komenského in Prague

Relatively low level of participation of citizens of the Czech Republic in further education in comparison with EU countries is a consequence of a high level of participation in secondary education. Nevertheless, increasing participation is necessary due to the dynamic technological and social development which results in the need to change existing qualifications and broaden them with information and communication technologies and knowledge of languages.

In 2007, the Ministry of Education, Youth and Sports adopted the document The Strategy of Lifelong Learning (SLL) in the Czech Republic (<http://www.msmt.cz/areas-of-work/on-further-education-and-lifelong-learning?lang=2>). SLL in the Czech Republic is a fundamental document that constitutes a comprehensive concept for lifelong learning. Its intention is to gradually establish achievable targets that can be promoted, also by resources from European funds in the 2007 – 2013 programming period. The strategy is based on analysis of the basic strategic documents of the CR and the EU (and

is fully in accord with these documents), which are related to or directly concerned with the aspects of lifelong learning from various points of view. The SLL says that the process of lifelong learning cannot be centrally managed and all the key participants at the level of the government, regions, enterprises and individuals must support lifelong learning as the decisive factor in the competitiveness of the country. The creation of the motivating legal and economic environment that allows funds to be invested effectively is a precondition for the development of lifelong learning.

### Structure of graduates by groups of study fields, all forms of study (2007/2008)

Study programmes groups	Number of graduates	Proportion of total number	Women	Proportion of women in the programme group (%)
All fields total <sup>1)</sup>	73 153	100.00%	41 631	56.91%
Natural sciences	5 322	7.28%	2 425	45.57%
Technical sciences	17 951	24.54%	4 841	26.97%
Agriculture and forestry, veterinary	2 804	3.83%	1 680	59.91%
Health care, medicine and pharmacy	4 244	5.80%	3 393	79.95%
Humanities and social sciences	10 145	13.87%	6 951	68.52%
Economics and administration	18 930	25.88%	12 445	65.74%
Justice, legal and public administration	2 393	3.27%	1 327	55.45%
Pedagogy, teaching and social care	10 029	13.71%	7 779	77.57%
Art and culture	1 567	2.14%	955	60.94%

Source: Institute for Information on Education

- <sup>1)</sup> Estimates of graduates (physical persons) of the public and private universities without state universities

### 1.3 Lifelong learning in natural sciences

In the Implementation Plan to the SLL, adopted in 2008, the MEYS analyses the current situation in the CR and one of its features - low interest of students to continue studies of technical and natural science and low interest in further career in this area. This situation is partly explained by the general attitude of the society that has so far preferred careers in law, economy and management as more prestigious and prospective. However, it must be admitted that this situation is also caused by the way these subject are taught at schools, where the emphasis on passive knowledge prevails over modern scientific approach and students are not motivated enough to continue in further studies. Implementation Plan suggests to take measures to improve this situation in the cooperation of regions, communities and social partners, financed on the grant bases from the European funds (European Social Fund) within the framework of Operational Programme Education for Competitiveness [1].

To fulfil some of the goals, the project Support for Technology and Science Fields [2] has started in the beginning of 2009 (until 2011) at the Ministry of Education under the umbrella of above mentioned Operational Programme Education for Competitiveness, therefore co-funded by the Ministry and by the ESF. The project responds to the ever more evident all-European shortage of professionals oriented on technology and natural sciences; it is aimed at introducing a system of marketing support for technology and science fields of study at universities and other institutions of higher learning. Project activities are divided into three major pillars: motivation activities, science communication and teaching support, and they are both directly and indirectly aimed at the target group of potential applicants for study. The project is to provide among other things a methodology of support for technology and science education, background marketing materials, analyses and case studies to be presented by way of conferences, seminars, workshops, popularization lectures, and particularly by way of pilot motivation activities in all regions.

## 2) Main obstacles to lifelong learning of scientific subjects

Following remarks are based on interviews with teachers carried out within the framework of WP2 of the project.

There are many problems with teaching chemistry at secondary schools as well as at years 8 and 9 of primary schools. From the Interviews with Teachers it is clear that it is a problem; we have to look into many aspects and try to find proper solution that would lead into improvement in teaching technical and natural science subjects.

- „Bad“ teachers

Why do we have bad quality teachers? They are tired, without interest and illusions. Their classes are too big, their wages low and they are not only teaching chemistry, but also concentrating on problems with student's behaviour. Chemistry is usually last popular subject among students.

Some chemistry university graduates want to start teaching chemistry but this career change is quite difficult. They have to study again, at least three years bachelor degree in pedagogy and that usually puts them off. We miss faster pedagogy course for these people. It would be quite suitable as they usually have great chemistry knowledge, but young families cannot afford to spend so much time on studies.

- Lack of requisites and equipment

The situation differs a lot at the secondary schools. Strictly speaking, it is not the biggest problem, but still, there are some schools that are incredibly behind with basic requisites. Some governing bodies do not provide funds for lab equipment, study handbooks, requisites etc. It was very discouraging when during the interview, we met teacher from secondary school specialized in natural sciences, with 10 chemistry lessons per class per week, but with almost no labs and very "ancient" requisites. We assume it would be desirable if there is some kind of check and control from the Ministry of Education, that would at least guarantee some standard level of equipment and requisites. Parents and students should have some kind of quality assurance. It is also true that head teachers and teachers can apply for grants to improve school's equipment but to be honest, even without this activity teachers are almost exhausted and overloaded. They simply do not have the capacity for additional activities.

There would be the possibility to connect schools to local businesses and factories, to scientific institutes etc. Schools could maybe regularly use their labs, students could see the application of science in everyday life. This is very rare in the Czech Republic. These days students have no idea about application of chemistry in real life, do not know the careers in chemistry and science, they even often do not know their parents jobs!

- Lack of motivation

The word „motivation“ in capital letters probably constitutes the "key to success". We have to show students careers in chemistry, introduce them to successful scientists, show the jobs in industry. We were proudly turning the society into services only to see that now there is nobody able to produce drugs, clean water and environment, food and much more, based on chemistry.

Students are motivated by the prospect of lucrative careers and we have to show them, that there ARE such careers in chemistry. At the moment they only know chemistry as boring subject with a lot of theory and memorizing - without understanding what is this good for!

- „Difficult subject”

Difficult, not interesting topics. Lack of time for interesting experiments. Topics with no sign of practical use. Chemistry is also very complex and students have to understand it from the beginning, one topic is based on the previous one so it is necessary to have good teachers all the time and to get students attention also all the time.

First year at secondary schools seems to be crucial and very difficult. There is enormous difference in the students' knowledge of the subject. The ones with excellent teachers at the primary school have to slow down now as the teachers are very busy helping students from primaries with poor quality of chemistry. It can sometimes put off the good ones as well as the bad ones and it is all up to the teacher what the result will be. We would suggest that the students really interested in chemistry should attend some courses at the university already at the secondary school age, some “chemistry – students – incubator”. There they could meet similarly oriented peers, professors, use the labs - as the secondary school teachers usually do not have time and equipment for this.

Another problem is the secondary schools system. We have so called *gymnasium* (grammar school), usually generally oriented secondary schools. These can be 8, 6 or 4 years long. Often the 8 and 6 years long have good, talented students, while the 4-years long have usually students who were not successful to enter the 8 or 6 years long schools. This means that the quality of these schools is lower. Some of the historically very good natural-sciences oriented secondary schools are only 4 years long and their quality is declining as is declining the quality of students.

### **3) Strategies and initiatives developed at national and local level to promote lifelong learning of scientific subjects**

After a thorough analysis of the situation on the field of initiatives and strategies carried out in the area of long life learning of scientific subjects in the Czech Republic that we did within the framework of WP 2 of the CIAAU project, we have identified following projects as good examples of initiatives on national and regional level (for more details, please look at the CIAAU portal to the section of ICT Prague, here we just provide a brief information):

*Scientia Pragensis - Day of Science at Prague Universities* is a one day exhibition and seminars of Prague universities on research in their respective fields (not only technical and natural science). The main objective is to attract secondary school students and public to show them interesting results of research done at the universities. The impact of the event is generally national, but in practice it is more local/regional a one day exhibition in the capital city is visited mostly by people from Prague and surroundings (or students from different parts of the country that study in Prague). This event is both PR and LLL as it can attract students and public to learn more about scientific research and to the young people it can show the prospective of scientific career.

*Gaudeamus – European Education and Lifelong Learning Exhibition* is an annual exhibition accompanied by lectures and presentations where the Czech, European and other international institutions offer the most of study opportunities for students from central Europe. As a major exhibition of its kind (over 30 000 visitors per single event), it offers a unique way to provide a direct personal contact between students and exhibitors in a pleasant and dynamic atmosphere. Exhibition focuses mainly on providing useful information to individual visitors and discussing study opportunities with them. Gaudeamus offers a wide range of business, technology, language, computer and communication studies and therefore provides a good overview of educational possibilities in the Czech Republic. It focuses on secondary school graduates, college and university students, young graduates and executives as well as adults who wish to improve their knowledge or redirect their career.

*Lessons of Modern Chemistry* are organized by students and academic staff from Institute of Chemical Technology in Prague in secondary schools across the Czech Republic. Lessons are interactive, based on dialogue between participants and full of experiments (the idea now is to extend the offer with 3D projections in biochemistry) with the intention to bring a new and modern view of chemistry to

students. Make it more popular, present trends in modern chemistry and practical applications of chemistry in our everyday lives. There is an increasing number of schools and teachers interested in presenting chemistry in modern and innovative way and very positive responses from students and teachers. This initiative also provides a good base for further networking between secondary school teachers and talented and in science interested students with the ICT Prague that serve as a good base for cooperation in other projects related to LLL in chemistry. Lessons of Modern Chemistry are organized outside of Prague on the national level. In Prague, there is a running project *POPuch* (Popularization of Chemistry), co-financed under the European Social Fund, Operational Programme Prague Adaptabilities and the City of Prague (OP PA). The content of the project is very similar to that of Lessons of Modern Chemistry; however it is intended for Prague secondary schools, teachers and students (this division is due to the rules of ESF funding). Therefore, these two initiatives cover Czech secondary schools on the national level.

*Summer School of Modern Chemistry* is a nationwide traditional event (over 20 years of tradition, each year about 100 teachers) organized by the Institute of Chemical Technology as a 3 day workshop for secondary school teachers of chemistry, biology and biochemistry (in August 2010 it is for the first time organized also for 50 talented students – however summer months don't seem to be very good timing for students). The objective of the initiative is to promote and support the idea of LLL among teachers, keep them informed about current state of affairs in research, motivate possible future students of scientific subjects and show them the reality of research and its social impact. Summer school includes lectures and experimental work in labs; social and networking dimension of the event also cannot be neglected. Summer school of Modern Chemistry can be evaluated as very successful and sought after LLL initiative in the field of chemistry carried out by the major education and research player in the field of modern chemistry in the CR. Its participants brings to their lectures spirit of modern research and have the potential to encourage talented and devoted students to continue in their studies of natural science.

Following two projects – *ECHO* and *EURO* – both deal with educative materials for teaching chemistry and both are co-financed from the European sources under the ESF. The main goal of *ECHO* (*Electronic Support for Chemistry Teaching*) is to modernize the teaching of chemistry in three chemical disciplines (inorganic, organic and analytical chemistry) via new support materials created both in electronic version and printed version that represent an excellent complementary tool to current teaching methods. As a further effect, it was expected that through the participation at the project, students become better prepared for chemical universities and that they improve their computer skills. The side effect was the networking among secondary schools and university teachers which opened new topics and opportunities for further cooperation. The quality of teaching of chemistry is in the core of project *EURO* (*Effective Learning through the Reforming of the Secondary Education*). *EURO* is a regional initiative of 9 secondary schools where each of them has chosen its field of expertise and prepared modern and innovative teaching materials to share with other schools.

Ongoing project *ChemPoint* (co-financed by the ESF) wants to establish a contact point that would facilitate the communication between researchers and application area in the field of chemistry. Project is oriented to the area of research – application activities and includes important educational activities for both the researchers (transfer of knowledge), but at the same time it requires constant education on modern outcomes of research on the side of application sphere. Project deals with specific and specialized area of research – industry cooperation on the national level.

The project *Czech Head* exists since 2002 and represents several interconnected activities and initiatives with the objective to support research and technology development in the Czech Republic with the aim to make research and science more popular and enhance the prestige of scientists and researchers within the society. Top event is a Czech Head Award for best individuals of research and technology. The idea of the project resulted from the fact that there is a constant decline in the interest of work in research and from the fact that the level of scientific and technology knowledge across the society doesn't increase in desirable pace which is reflected also in socioeconomic growth of the country. The idea behind the Czech Head project is that the Czech society can become prosperous only if it can create a favourable environment for science, research and knowledge based society.

The project *Open Science* concentrates on secondary school students interested in science; it offers to about 150 of them the possibility to participate at scientific internships in the laboratories and research centres of the Academy of Sciences and cooperating universities. The overall goal is to improve and support human resources in science and research. The project is co-financed from the

state budget of the CR and by the ESF. As the name of the project shows, it follows the previous project aimed at secondary school students from Prague; this time the project is directed to the students across the Czech Republic except Prague that gives the opportunity to students outside the capital city, which is a positive aspect.

Above, we have already mentioned project co-financed by the ESF and the Ministry of Education, *Support for Technical and Natural Sciences Subjects*, which is the popularization project with the aim to introduce the system of marketing support to science oriented subjects in universities. Expected outcomes of the project will contain methodology of science education support, materials, analysis and case studies presented via conferences, seminars, workshops, lectures and pilot activities in all regions. Project reacts to the lack of professionals educated in technical and natural sciences across Europe that can have inevitable and obvious economic subsequence. Therefore, in some aspects, it has similar goals as CIAAU project.

Partners from the Czech Republic have also participated in the international project *CITIES* oriented at secondary school teachers and students and namely on the preparation of training and teaching materials for secondary schools that will help teachers to make their chemistry lessons more appealing to students by placing the subject in the context of their daily lives.

#### **4) Identification of effective science education initiatives**

Effective tools to overcome the barriers identified in the section 2) of this material can be summarized as follows:

The method of teaching should be improved, as well as conditions and facilities for teachers (including the quality of their long life education, touch with current developments in research and science, improvement of teaching materials and equipment, etc.)

Prestige of research and researchers in the society should be enhanced; young people must see the perspective in the terms of prestige, prospect and income as well; they must know that there are interesting and prestigious jobs waiting for them after they complete their studies. The examples of rewarding career should be presented.

“Bad image” of chemistry should be abandoned – the way to this goal is to popularize chemistry and chemists; to show it in the context of our everyday life and researchers as modern people.

The curricula of chemistry at schools should be modernized to face the interest of the society (less memorizing of theory, more about up to date issues – pharmacy, drugs, food safety, modern materials, etc.).

#### **5) Identification of best practices**

We have identified many positive steps and initiatives in many documents and strategies analysed in WP2 of the CIAAU project. Some of the most notable are listed above, under the section 3) of this material. To abstract best practices out of these examples, we would like to stress following points. Obviously, it is often difficult to strictly decide whether project is oriented either to popularization or to another goal, as usually the goals are interconnected. Nevertheless, we point out that to change the attitude of society to natural science and chemistry in particular it is necessary to improve:

Popularization as a first step to awake interest of people that may lead to further education in the area;

Education of teachers (Summer School of Modern Chemistry);

Improvement of teaching materials (Lessons of Modern Chemistry, POPuch, ECHO, EURO, CITIES);

Attracting young people to study science (Open Science, Support for Technical and Natural Science Subjects);

Attitude of society (Czech Head);

Spread the information about the possibilities to study chemistry (Scientia Pragensis, Gaudeamus);

Improve the image of chemistry – to show it in its modern and positive form and in the context, to show its application in industry (ChemPoint).

## 6) Conclusions

Although there have been many successful projects and initiatives aimed at the development and support of LLL, its development in the Czech Republic remains rather slow. For example, general analysis and evaluation of the education projects financed from the resources of the EU and the state budget is missing.

Based on our findings, we would like to point out following conclusions:

Legal framework exists in compliance with the EU legal framework; the Czech Republic has an advantage as a recipient of the EU funds.

It would be desirable to improve the coordination not in the sense of central management, but in the sense of share of information and best practices.

The link between education sphere, research and industry should be strengthened.

The quality of teaching natural science, the quality of teachers as bearers of ideas and enthusiasm to the students should be improved and students should see the perspective of career and prestige in science and research oriented jobs.

Chemistry should be generally presented in the positive way in the context of all aspects of life (ecology, alternative sources of energy, nature, preservation of cultural heritage, safety of food, health care, etc.).

## 8) Bibliography and references

References:

[1] [Commission position paper Operational Programme Education for competitiveness](#)

[2] Support for Technology and Science Fields, <http://www.msmt.cz/european-union/ipn-in-the-field-of-tertiary-education-research-and-development/support-for-technology-and-science-fields?lang=2>

Bibliography:

Organisation of the education system in the Czech Republic 2008/2009, [http://eacea.ec.europa.eu/education/eurydice/documents/eurybase/eurybase\\_full\\_reports/CZ\\_EN.pdf](http://eacea.ec.europa.eu/education/eurydice/documents/eurybase/eurybase_full_reports/CZ_EN.pdf)

Strategy of Lifelong Learning in the Czech Republic, MEYS, <http://www.msmt.cz/areas-of-work/on-further-education-and-lifelong-learning>

Implementační plan Strategie celoživotního učení, <http://www.msmt.cz/vzdelavani>

Zpráva o plnění Implementačního plánu Strategie celoživotního učení za rok 2009, <http://www.msmt.cz/vzdelavani>

Support for Technology and Science Fields, <http://www.msmt.cz/european-union/ipn-in-the-field-of-tertiary-education-research-and-development/support-for-technology-and-science-fields?lang=2>

CITIES, <https://www.natur.cuni.cz/chemie/educhem/aktuality/projekt-cities>

Open Science, <http://www.otevrena-veda.cz>

ECHO, <http://vydavatelstvi.vscht.cz/echo/>

EURO, <http://euro.vsp.cz>

ChemPoint, [www.fch.vutbr.cz/cs/celozivotni-vzdelavani/esf/chempoint.html](http://www.fch.vutbr.cz/cs/celozivotni-vzdelavani/esf/chempoint.html)

POPuch, [http://www.vscht.cz/homepage/tisk/stredni\\_skoly/POPUCH](http://www.vscht.cz/homepage/tisk/stredni_skoly/POPUCH)

Czech Head, <http://www.ceskahlava.cz/>

Summer School of Modern Chemistry, [http://www.vscht.cz/homepage/tisk/stredni\\_skoly/ss](http://www.vscht.cz/homepage/tisk/stredni_skoly/ss)

Lessons of Modern Chemistry, [http://www.vscht.cz/homepage/tisk/stredni\\_skoly/hmch](http://www.vscht.cz/homepage/tisk/stredni_skoly/hmch)

Gaudeamus, <http://www.gaudeamus.cz/>

Scientia Pragensis, <http://www.sciprag.cz/>