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Chemistry Teachers' Training in Bulgaria



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CHEMISTRY TEACHERS' TRAINING IN BULGARIA

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Abstract

The paper presents results achieved by activities carried out under the Teacher Training thematic area of Chemistry is all around Network Project in Bulgaria. National policy in the field of Teacher Training, focusing on science teachers and particularly on Chemistry teachers' training is briefly described. Main forms of Teacher Training - initial teachers' training and in-service teachers' training are presented with emphasize on the in-service teachers' training. Based on results from examination of Bulgarian Chemistry teachers' competences and beliefs and the assessment of the national situation related to Chemistry teachers training some unsolved problems related to courses contents, didactic methodologies and benefits for the teachers participating in the in-service training are defined.

The Impact of the Project on Teacher Training was evaluated based on the results of activities carried out under the Teacher Training thematic area. Conclusions about possible future activities under the Project are drawn.

1. National Situation on Teacher Training

Actions related to teachers training are an integral part of the national policy and are regulated by few main documents:

- *Public Education Act* - it regulates the structure, functions and management of the public education system which provides education according to the state educational requirements - part 39(4) states that „teachers and school principals are provided with conditions to improve their qualification” [1].
- *State educational requirements for obtaining qualifications by occupation* – they regulate the conditions and educational requirements towards all occupations, including that for obtaining teacher's certificates and qualification [2];
- *Regulations on the conditions for improving the qualification of the teaching staff in the public education system and regulations on acquiring professional qualification degrees*– they also include rules on how to implement the procedures related to the acquisition of professional qualification degrees by teachers and school principals [3].

National programmes and strategies are developed as well. They plan those activities for a given period of time in compliance with the common European educational strategy and the specific nature of the Bulgarian educational system:

- *National Programme for Developing School Education and Pre-School Education and Training* (2006 – 2015 г.)[4]
- *National Programme „Qualification”* - the programme is in conformity with the objectives and priorities of the Programme for Developing Education, Culture and Youth Policies in Republic of Bulgaria 2009-2013 of the Ministry of Education and Science, as well as with the demand for teachers [5].
- *National Strategy for Introducing ICT in Bulgarian Schools* - the strategy is based on the programmes of the Bulgarian government in relation to the development of secondary education and the improvement of the competitiveness of Bulgarian economy. It has been developed on the grounds of a prior analysis which covers the Bulgarian and world experience related to the introduction of ICT [6].

The coordination of the state policy related to the planning, organization and conduction of education and improvement of teachers' qualification is performed by the Qualification and Career Development Directorate at the Ministry of Education and Science. It is responsible for the actions referring to the



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development and implementation of the state policy regarding the qualification and career development of the teaching staff. The educational and qualification activities are performed by institutions or specialized units accredited by the National Evaluation and Accreditation Agency.

1.1 Initial Teacher Training

Chemistry teachers in Bulgaria are trained in four universities: Sofia state university, Plovdiv University, Shumen state university and South-west university of Blagoevgrad which offer Bachelor and Master degree courses in chemistry.

Most Bachelor degree courses emphasize on pedagogical aspect of training and qualify graduates in teaching tandem subjects: chemistry and physics, chemistry and informatics, chemistry and biology. Universities of Sofia and Shumen offer degree courses which train only teachers of chemistry. Master's degree courses are intended for in-service teachers however training also is available for candidates who are not involved in active teaching.

Successful secondary education graduation is a prerequisite for joining bachelor degree courses. Training in college degree courses is subsidized by government however students are required to pay for their semester fees. Admission to university degree courses is through compulsory exam in chemistry, mathematics and biology (depending on the degree course to be followed) or the maturity exam grade provided it is not lower than 75% of the maximum grade point average. In both cases grade point average is added to the grades in chemistry, mathematics, biology or physics.

Bachelor degree courses are face to face and full-time. Some courses use blended learning, e-learning and face-to-face. Training ends up with state exams in both majors e.g. chemistry and physics; chemistry and informatics or chemistry and biology.

Two universities in Sofia and Plovdiv offer master degree courses in Teacher of chemistry. These course admit teachers with bachelor's degree in chemistry or other courses which include chemistry-based core subjects such as Chemistry, Chemical engineering, Agrarian science, Pharmacology, Dental medicine etc.

Master's degree courses are full-time and part-time and are subsidized under two schemes: state grant is awarded to candidates who are top performers in a selective exam in chemistry; tuition fee is paid by candidates who are willing to follow the course (in this case the amount of the fee is higher). Students graduate these courses with state practical exam or Master thesis on chemistry education. Successful graduates are awarded "Teacher of chemistry" qualification.

Bachelor degree courses for chemistry teachers include general subjects and core subjects through which prospective teachers acquire knowledge in contemporary chemistry education and skills to work in real school settings. The amount of credits received by the students should not be below 240 ECTS. Degree courses which train teachers of two school subjects include core and general studies for about 170 ECTS plus training in pedagogy, psychology, theory, methodology and application of both subjects that give another 70 ECTS.

Training of the future Chemistry teachers includes subjects such as General chemistry, Inorganic chemistry, Physical chemistry, Analytical Chemistry, Organic chemistry, Quantum and computational chemistry, Chemical technologies, Instrumental methods in chemistry, Chemistry of polymers. Syllabi include Calculus, physics, statistics plus at least four electives.

Specialized training of teachers in Bulgaria is regulated by law [2, 3] which provides the minimum amount of subjects required for the acquisition of "teacher" qualification. Chemistry teachers are to cover subjects of pedagogy, pedagogical psychology, chemistry training didactics, audio-visual and information technology in teaching chemistry plus internship. Training of chemistry teachers necessitates good knowledge in lab experimentation which is why subject Methods and techniques of chemical school experiments is included. Prospective chemistry teachers could opt on additional electives such as Didactic tests, School reaserch methods, Chemical tasks etc.

Master's degree courses aim at expanding knowledge and skills of in-service teachers and familiarizing them with the latest trends in chemistry teaching by including Chemistry for school, Chemistry and society, History and philosophy of chemistry, School documentation and standards for chemistry education, Rhetoric, Chemistry concepts and theory, School assessment etc.



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Chemistry is one of the fastest developing branches of science and student training inevitably builds up on its achievements. In studying fundamental chemical subjects, students get familiar with latest theoretical and methodological trends as well as acquiring skills in practicing novel methods and techniques in chemical experimentation which demand computer aided calculations and simulations and general knowledge in IT

Training pre-service teachers is focused on modern educational strategies and approaches; the accent being on research and problem-oriented interactive methods.

Students get familiar with the opportunities offered by the use of IT and communication technologies in chemistry education, they also learn how to develop personalized software and employ it in their practice.

During their studies some students are actively involved in research projects both in the field of chemistry science and education. Students in Master's degree courses for teachers must conduct their own research in teaching chemistry while preparing their thesis.

1.2 In-service Teacher Training

Vocational training upgrade is a follow-up of continuous learning which includes various forms of postgraduate training and aims at increasing professional efficiency of teachers, chemistry teachers included.

All methods, forms conditions and funding of in-service teacher training are regulated by law [3]. In-service training of teachers is effected primarily in institutions of higher learning or in their specialized departments. Three Bulgarian universities, Sofia state university "St. Clement of Okhrid", Plovdiv state university "St. Konstantine of Preslav", and "Tracian University" of Stara Zagora conduct in-service teacher training in various trends and on annual basis. For example the department of information technologies and upgraded teacher training at Tracian university of Stara Zagora offers long term postgraduate training in 12 or 18 months(part-time training) in the area of information technologies and their application in education, educational organization and management, school psychology, introduction of new teaching content aiming at effective implementation of educational strategy , etc. Short term forms of in-service training with emphasis on general pedagogy include specialized in-service courses, internships, language training, etc. [7].

In addition to specialized courses carried out in university departments, teachers may acquire professional qualification levels from one to five on the grounds of studied courses and held exams; levels one and two are acquired following a defense of thesis papers.

Access to in-service training depends on school head administrations. The delegated budgets of schools include allocations for funding teachers training, however, these amounts are very limited and therefore used to support part of teaching staff while they attend qualification courses. Acquisition of professional qualification levels is possible with the consent of school principal and the positive reference on behalf of regional inspectorates of education.

Training of in-service chemistry teachers is carried out following a decision of regional inspectorates of education in the trends determined by them and accorded with school principals and teachers (stake holders). During the last few years short-term courses of 8 to 16 hours were done for chemistry teachers in the following subjects: "Information technologies applied in teaching chemistry" , " Application of interactive methods in teaching chemistry" , "Education standards, curricula and targets in chemistry training" , ' Active training in natural sciences – physical, chemical and biological experiments in education", " Assessment of teaching quality in science training" , "Chemical experiments", " Compiling of high performance tests", " Strategies for and approaches to integrated training in the subject ' Man and Nature", „Reflection and natural science learning" etc

Training is conducted by academic lecturers in small groups and/or teams using IT and solving specific tasks and case studies. Teachers participate in them on voluntary basis while payment of tuition is made from the funds of delegated school budgets .Such training courses result in the active involvement of many teachers in subject matter that is of special interest to them. This in turn leads to participation in action research and later becomes prerequisite for acquisition of professional qualification levels.



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In addition to these forms of qualification there are various other sources such as special programs, projects, internet sites and private organizations which offer opportunities for enlarging teaching competence in natural sciences.

National projects. Since August 2013 Ministry of Education and Science through the Qualification and Career Development Directorate in partnership with the National Institute for Teaching and Qualification in the Educational System has launched the project „Qualification of Pedagogical Experts” [8], funded by the Operational Programme "Human Resources Development" and co-funded by the European Social Fund of the European Union.

The project objective is to train over 42000 teachers by the end of 2014, which is 80% of the total number of teachers, so as to improve their qualification. Several types of training are envisaged by the project:

- One year specialized training in institutes of higher learning for acquisition of further qualification on behalf of teachers of sciences, IT and foreign languages.
- Qualification and motivation of pedagogical experts who have proved their vocational aptitude - Encouragement and support of professional development of outstanding pedagogical experts according to related trends and specialized qualification in institutions which award internationally recognized certificates;
- Qualification upgrade of pedagogical experts for the purpose of assessing students' achievements in cross-cultural environment and work in groups for compulsory pre-school preparation. The focus is on pedagogical experts, who are appointed to positions that are novel for the educational system and also teachers who rejoin school staff after continual leave (over two years) or after termination of teaching experience in the related subject for more than two years.

Training sessions are of 32 hours and are held at nine training centers across the country Gabrovo, Kyustendil, Plevan, Plovdiv, Ruse, Sliven, Sofia, Stara Zagora and Shumen. Prominent academic lecturers are in charge of training as well as experts from regional education inspectorates and school principals who also participate as teacher trainers.

The project titled "ICT in Education" [9], funded by the Operational Programme "Human Resources Development", aims at developing a modern educational ICT environment in Bulgarian schools. One of the main project activities is certifying teachers in relation to their ICT skills - at the end of the project 30 000 teachers should be certified.

Internet-based approaches. A few web sites and portals provide opportunities for enhancing the teaching competence.

National Educational Portal is the first step to the development of electronic education in Bulgarian schools. The Portal has been designed and developed by LEKSis Consortium which consists of two companies that are leaders on the ICT market in Bulgaria. One of the main advantages of the Portal is its interactivity [10].

Teachers Innovators Network (Teacher.bg) - the Teacher.bg virtual school offers free on-line training in relation to the state-of-the-art technologies, methods and programmes referring to the introduction of electronic teaching content in the classroom to all teachers registered in the Network. The training is carried out according to topics set in advance. The lecturers are leading teachers from Bulgarian schools who have won recognition as leading experts in the area of electronic content, as well as experts in the field of various technologies. Such an innovative initiative will contribute to the motivation and qualification of Bulgarian teachers so as to actively use ICT in their daily work with the students, as well as for their personal professional growth [11].

Private organizations offering In-service Teacher Training. RAABE Ltd (member of Klett Publisher Group - one of the well-known publishers in Europe) offers programs for training and qualification of pedagogical specialists in the form of workshops and methodological training of teachers involved in pre-school and school teaching. These are organized by preliminary drafted schedule in the larger regional centers or by request made by specific schools, regional inspectorates, municipal authorities or professional associations. The qualification program " Methodological trainings" includes specialized and diversified training aiming at upgrading professional skills of teachers, integration of their key competences in the daily process of teaching, acquisition of innovative pedagogical approaches, improvement of methods for individual assessment of students. The program which is



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due in 2014 is intended for teachers in chemistry and includes subjects such as “Formation and assessment of basic competences in natural sciences through training in chemistry and environmental protection” and “Formation of key competences “Man and nature” taught in 5th and 6th grade [12].

2. Assessment of the National Training of Science Teachers

2.1. Teacher Training national policy

The issues and challenges of teacher training and qualification are a special point of discussion among Bulgarian institutions within the context of the continuous (over 20 years) reform of Bulgarian education. Part of these challenges are also characteristic for other European countries and they were discussed at the transnational meeting of project stake holders and at the international conference on challenges faced by chemistry teachers which was held in June 2013.

Concerning general educational policy of teacher training and qualification there are some aspects which are worth noting.

The problem with young teachers. A survey conducted by the European Commission reveals that only four European countries possess specialized programs for introduction of newly appointed teachers. Bulgaria is among those which do not have such program.

Young teachers need the continuous support of senior teachers for at least one year which will help them build up some practical skills in teaching classes and make effective connection with both students and parents. A hindering condition to the prospect of quick professional growth appears to be the clause which requires working experience of at least ten years as a prerequisite for acquiring the status of “senior teacher” [13].

Inadequate methodological support at the start of young teachers’ career was accounted for as one of the major problems at the National workshop of the project work group on training and qualification issues faced by chemistry teachers, which was held in May 2013. Irish experience of mentorship over young teachers was highly appraised [14]. All participants agreed on the feasibility of this experience in Bulgaria.

Continuous qualification of teachers. According to the results of the international survey TALIS conducted by the Organization of Economic Cooperation and Development /OECD/ Bulgaria, along with Slovakia, Poland Spain and Italy is among the countries that enjoy the highest percentage of teachers who are Master’s degree holders. Pedagogical training that is offered at university level is obviously insufficient for their successful professional realization. The widespread application of high technology demands adequate qualification of teachers to meet the ever expanding range of students’ needs in their formation as prospective highly qualified experts [13].

Another research conducted in March and April by the University of World and Home Economy among 228 school principals and 998 teachers indicate that half of the teachers do not have qualification level and every second teacher possesses only minimum required qualification and is not involved in a follow-up in-service training. The five qualification levels are not compulsory and are covered after a certain amount of work experience is reached [15].

Material incentives for professional upgrading are low and inadequate as the funds allocated for the purpose amount to barely 0,8% of the entire salary fund. According to this survey 71% of all teachers are dissatisfied with their pay. Most satisfied is the group of young teachers of age below 25 (their percentage being 55%), however, they are the least numerous group in the teachers’ guild. Those of age 56+ who constitute the largest segment of the guild are most dissatisfied. A major problem in the teachers’ qualification policy appears to be the lack of present day analysis on the specific types of in-service courses needed by teachers. The usual practice is to offer a list of courses which, as is often the case, are selected by the school principal [16].

2.2. National Training of Science (Chemistry) Teachers

In Bulgaria there has not been conducted complete research connected with the pre-service and in-service chemistry teachers, however there was an opinion poll conducted among them which covers several aspects:

- Philosophical and pedagogical views of the constructive learning environment in class [17-21] – results indicate the need of further qualification of in-service teachers which is to be targeted at the



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application of constructive approaches and methods such as problem-based approach, team work, work in small groups, collaborative and joint learning in a classroom. This in turn necessitates the updating of universities' training curricula intended for teacher training;

- Possibilities to enhance natural science literacy of students through learning chemistry [22] – it is noted that learning chemistry in Bulgarian schools is heavily theorized which prevents students from internalizing learning content and hence appreciate the importance of chemistry in life and practice. Teachers see good potential in redirecting learning content toward practical application knowledge and clearing the way to real experimentation at school and developing such competences in students that will enable them to solve real life situations, work with charts, diagrams, tables, etc. In this connection teachers agree that enlargement of their personal scientific awareness and that of students is of absolute necessity. They appreciate the need of acquiring further qualification and knowledge in the field of chemistry which are related to novel materials, nanotechnologies, forensic medicine, health and nutrition, foods quality, medicaments and drugs, etc.

- Application of IT and communication technologies in learning. The research indicates a serious need of competence upgrade in this particular area. Computer-based teaching skills are of vital importance to the enhancement of the quality of the process of learning [23,24]. Teachers of chemistry are motivated and determined to upgrade their qualification in this particular trend.

Research results allow to identify the major trends of qualification upgrade for in-service chemistry teachers:

- Present day aspects of developing chemistry knowledge and practice;
- Application of IT and communication technologies in learning chemistry
- Innovative approaches and methods for teaching and learning chemistry which are student centered, aiming at enhancing his motivation and scientific awareness.

2.3. Evaluation of teacher competences related to the application of e-learning

Due to the specific nature of chemistry as a science, it is very useful to apply ICT in schools for the following purposes: visualization of the teaching materials, mastering of the learning content and raising students' interest in the subject. There are a great number of web sites and forums, as well as interactive teaching materials in chemistry, thus imposing requirements on teachers in relation to their competences referring to the proper selection and work with them. Therefore it is very important to evaluate the current level of teachers' competence in ICT use so as to define the needs for improving their qualification. A system for evaluating Chemistry teachers' competence has been developed by the Research laboratory on chemistry education and history and philosophy of chemistry at the Sofia University. It is based on the methodical guidelines for ICT competence assessment standards of UNESCO [25] and reflects the current situation of the educational environment in chemistry - not more than one PC and one multimedia projector in the chemistry classroom. The structure of the system links the contemporary educational approaches related to the development of the individual such as technological literacy, knowledge depth and development of knowledge to the components of the educational system such as educational policies and approaches, content and assessment, pedagogy (didactic skills in a given area), ICT, organization and administration, training and professional development of teachers.

The system proposes some possibilities for assessing chemistry teachers' competences in the following areas:

- Selection of electronic teaching content
- Integration of ICT within the framework of the traditional educational environment
- Technological skills required to work with interactive materials.

It can also be successfully applied to the training of university students, future teachers in Chemistry [26]

3. The Impact of the Project on Teacher Training

Main thematic area during the second year of Chemistry Network Project is science teachers training and most of project activities have been focused on related issues.



To clarify the current situation in Bulgaria related to Teacher Training in general and Chemistry teachers training in particular, number of *Bulgarian papers and publications on Teacher Training issues* have been reviewed and the 5 most important of them have been uploaded on the Project Portal to be assessable by all project partners. That way it became possible to share within the Project Network specific features and problems related to Teacher Training, and some approaches to solve them also.

National workshop on Training issues of Chemistry teachers held in May 2013 in Gabrovo became a forum where secondary school teachers, university lecturers and experts involved in Chemistry teachers training shared professional opinion and discussed problems related to teachers' qualification in the context of ICT application in science teaching/learning at school. Presentation "Qualification of Bulgarian chemistry teachers – current situation, problems and solutions" (fig.1) and papers on Teachers Training uploaded on the project website by the project partners served as a thematic basis for the discussions.



Fig. 1 National Teacher Training workshop: "Qualification of Bulgarian chemistry teachers – current situation, problems and solutions" – Presentation of Prof. M. Kirova

Teachers' and experts' critical point of view was addressed to Bulgarian state educational policy concerning the qualification of chemistry and natural science teachers, namely, the lack of modern normative basis regulating the teachers' training, insufficient financial aid for teachers which has to provide for the qualification improvement etc. The role of the training climate and the scientific competences in the formation of contemporary teachers' pedagogical skills was also discussed. Teachers and experts commented also publications and articles available on the Teachers' training section of the project portal: The use of information and communication technologies by Portuguese teachers; Polish Education Reform and Resulting Changes in the Process of Chemical Education; Specifics of chemistry lessons at non-chemical secondary vocational schools; Information and communication technology and the problem of teacher training: myths, dreams and harsh reality; Improving pre-service elementary teachers' education via a laboratory course on air pollution: one university's experience; Evaluation of the impact of the training program in teaching experimental science: a nationwide study; Chemistry teachers' perceptions on laboratory applications: Izmir sample; Teachers' pedagogical competence as a prerequisite for entering the profession; Case study on mentoring in initial teacher training of science teachers in Ireland etc. The presented publications and the comments concerning them served as a basis for discussions "Chemistry teachers training: Bulgarian and European realities" and "Teachers' ICT competences - student oriented pedagogical approaches".



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The participants underlined the crucial role of the teachers in the modern process of chemistry education for increasing the interest and motivation of students towards the subject. In order to perform these tasks, however, teachers must constantly develop their pedagogic and communicative skills, to expand their competence, particularly those ones related to the use of modern technologies for educational purposes. The collaboration between teachers and experts allowed to elaborate a common opinion and to define some unsolved problems concerning chemistry teachers training in Bulgaria also. They agreed that the role of the teachers in the modern process of chemistry education for increasing the interest and motivation of students towards the subject is crucial. In order to perform it, however, teachers must constantly develop their pedagogic and communicative skills, to expand their competence, particularly those ones related to the use of modern technologies for educational purposes. This raises problems concerning qualification and expanding the competence of teachers, such as:

- Developing a modern conception and updating the normative basis regulating the activities for teachers' qualification by considering and using teachers' opinion
- Binding these activities with proper financial incentives, which will motivate teachers to improve their pedagogical skills.
- Developing effective qualification courses for distance or online training which will enhance and motivate teachers to expand their competence.

Both teachers and scientific experts underlined that chemical laboratory is a unique environment in which students may participate in various activities. Teachers have several main tasks in this process: to put the student at the centre of learning process using proper methodological tools and approach; to include interesting experiments related to the everyday life of people and the environment; to help students develop abilities to make sense of the terms, to collect and analyze data, to form research skills. Tools which support the teacher in these tasks are contemporary ICT as well as the rich base of interactive products; when combined cleverly with real laboratory experiments, they would significantly contribute to the students' motivation for studying the subject. This sets the requirement for teachers to develop skills to select and use proper computer applications during learning process or to create ones by themselves using certain products. That is why it is necessary to establish an overall system for teachers' training to apply ICT in teaching chemistry.

Transnational virtual meeting on Teacher Training, organized by Pixel (Italy) and held on 6 June 2013, was an online forum where national policies, opinions and different points of view considering the teacher qualification of all 11 countries were discussed and summarized. The meeting was attended by Bulgarian Chemistry teachers of Aprilov National High School, (Gabrovo), Vocational High School of Electronics (V. Tarnovo), an expert in Natural sciences and Ecology from Regional Inspectorate of Education (Gabrovo) and the Project contact person from Technical University of Gabrovo. During the meeting the main results of the National workshops on Teacher Training were also presented and discussed by the other project partners.

International Conference on Training Issues of Chemistry Teachers held on 26 June 2013 in Gabrovo was logical continue of the project activities on Teacher Training. The conference was organized by Technical University of Gabrovo in close collaboration with Research Laboratory on Chemistry Education and History and Philosophy of Chemistry – Faculty of chemistry and pharmacy, Sofia University, and Aprilov National High School – Gabrovo which are associated partners of the University in the Project. A primary goal of the conference was to turn it into a wide forum of discussing issues as: the methods of teaching the subject at school; the difficulties of chemistry teachers to keep update to the continuous progresses of the research; competences of chemistry teachers in using ICT as a mean to communicate with students and enhance their interest towards Chemistry lessons; opportunities and space within the institutional programmes for experimenting different approaches and methods for teaching and learning Chemistry; development of active partnership between university chemistry professors and researchers and secondary school science teachers so as to identify a common approach and a strategy to allow the better exploitation also at secondary school level of the most recent findings in the field of chemistry science and chemistry teaching. To reach this goal the main topics of the conference were defined to be “Policy for teacher professional development”, “Modern pedagogical approaches for student-centered teaching”,



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“Curriculum and assessment of advanced skills development”, “Teachers’ ICT competency”, Implementation of ICT in teacher training”, “Good practices in teacher training”.

More than 60 participants from 11 European countries attended the Conference, among them representatives of Universities, Schools, educational and public authorities. Chemistry teachers and experts, representatives of all Bulgarian schools and institutions involved in the Project activities as members of National Project Network associated partners of Technical University – Gabrovo attended the Conference and actively contributed to the sessions work.

Papers content dealt with 3 thematic areas. National policy, good experience and practical solutions in organization of chemistry teachers training in the 11 European countries were shared under the thematic area “Training of Chemistry Teachers – European Realities” by the foreign participants. Another 5 papers have been presented under the thematic area “Teachers competences: modern student oriented pedagogical approaches” by Bulgarian experts in Chemistry Teacher Training in close collaboration with young chemistry teachers. The 3th thematic area was dedicated to the methodology and modern approaches to teach specific Chemistry topics – young Bulgarian teachers demonstrated how to incorporate science in the Chemistry teaching/learning process using ICTs applications as video-lessons, simple and amusing experiments, “scientific toys” and different forms of collective work as school scientific projects, club activity etc.(fig.2).



Fig. 2. “On the edge of science and art” – scientific live show as a demonstration of innovative way to present the school science content

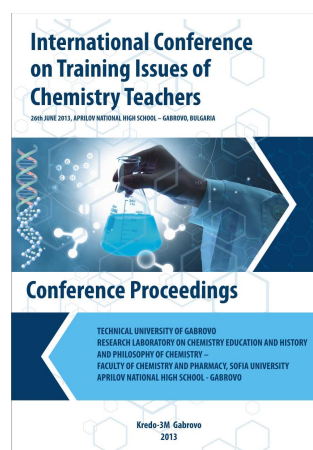


Fig. 3. Proceedings of the International Conference on Training Issues of Chemistry Teachers

In this aspect, the conference correlates with the project aim to develop collaboration between university professors and researchers and secondary school teachers so as to identify a common approach and a strategy to allow the better exploitation also at secondary school level of the most recent findings in the field of chemistry science and chemistry teaching. It also creates a bridge to the final Project’s thematic area dedicated to Successful experiences and Good Practices for teaching Chemistry. All conference papers were collected and full length published in Conference Proceedings (fig.3). They are also assessable as PDF on Conference website [26].

Summarizing the conference results and participants’ opinion it could be said that the conference became really a forum where the most important issues related to chemistry teachers competences and qualification as prerequisite to enhance the student’s interest in learning chemistry were discussed. Despite differences in educational systems the presentations of both foreign speakers and Bulgarian participants showed common problems also. The participants came to the common conclusions that although there is some practice in teachers training established in the different countries, there is a common need of clear policy and regular activity in science teachers’ training to

guarantee their permanent professional development and, thus, the high quality of the educational process

Considering the impact of the Conference, the foreign participants evaluate highly the positive attitude of the participants and possibility to have contacts with Bulgarian teachers and researchers. According to Bulgarian teachers and experts, the conference gave them possibility to meet specialists in the same field from other European countries, to learn new ideas and to share experience also.

Important role in coordination and dissemination of Project activities and results related to Teacher Training plays the Project Portal as a place to exchange opinion and good practices on Teacher Training issues. Both teachers and experts consider the portal an excellent virtual place for teachers' and experts' collaboration.

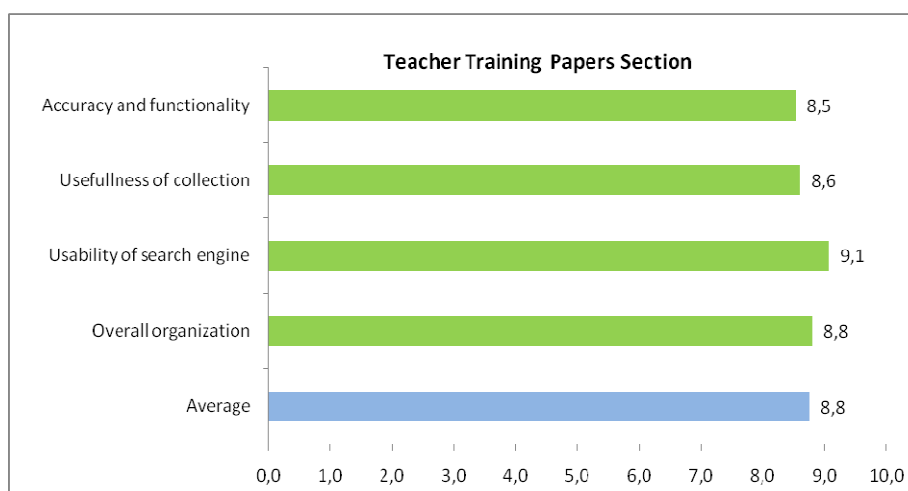


Fig.4. Chemistry teachers' and experts' evaluation of the Teacher Training Papers Section of the Portal

Papers and publications on Teacher Training have been highly evaluated by chemistry teachers and experts because of the content which combines scientific and pedagogical experience, and allows sharing it in international aspect (fig.4 and 5).

Both teachers and experts highly evaluate the usability of the Portal related to Teacher Training and find it useful and effective (fig.6).

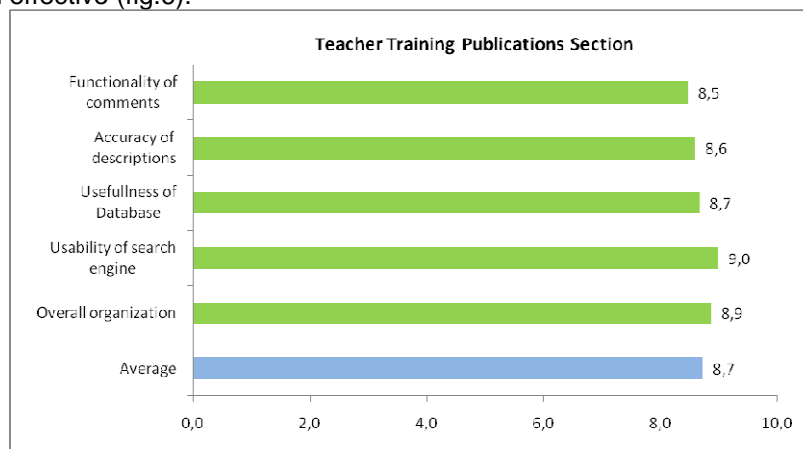


Fig.5. Chemistry teachers' and experts' evaluation of the Teacher Training Papers Section of the Portal

For some of Bulgarian experts Teacher Training section of the Portal is one of the most useful for their professional activities. They think that the Portal provides rich information and national viewpoint on issues related to chemistry teachers qualification and skills and bring together teachers and experts from partner countries giving a good snapshot on chemistry teaching advances and problems.

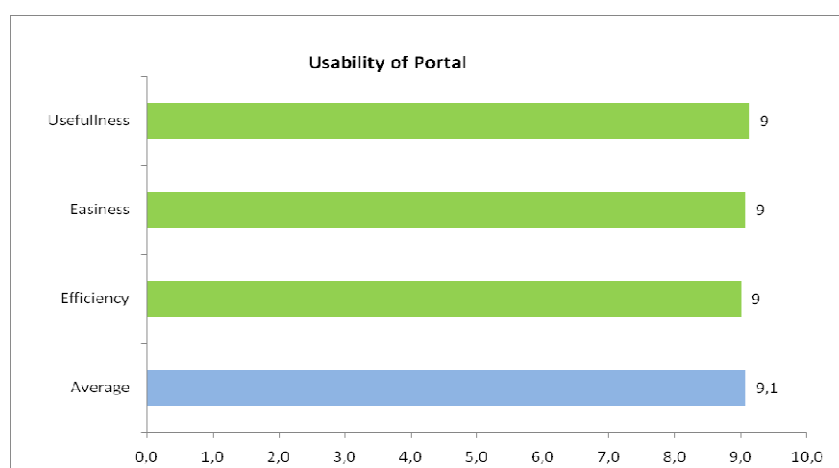


Fig.6. Evaluation of Portal usability in relation with Teacher Training

The common opinion is that the Portal brings up-to-date the knowledge of the teacher in the field of scientific teachers qualification and so answers to the present-time demands of education in the areas of natural science. It supplies information about the European tendencies which mean to ameliorate the quality of education, and to bring about a unification of teaching and learning.

It also allows for the communication of experience and the exchange of opinions which may lead to innovative ways of teaching chemistry in cooperation with teachers from other countries.

5. Conclusions

The introduction of new IT into schools and the unlimited access to information create better conditions for the use of interactive methods, as well as for the conduction of a learner-centred teaching process in chemistry. Therefore teachers play a key role in the building of skills that will help their students to get oriented in and select the required information, which will facilitate the acquisition of knowledge. The project outcomes and the results from the survey among the Bulgarian teachers in Natural Sciences (including Chemistry) indicate the following:

- There is need for additional training and qualification in relation to the application of interactive methods in teaching Natural Sciences, especially Chemistry [18].
- Teachers do not feel prepared enough to manage the teaching process along with their students, taking into consideration their opinions and desires referring to the way of delivering the teaching content.
- However, teachers are willing to participate in all possible forms for mastering and applying new teaching approaches and methods, as well as to work together in future projects.

To achieve that, the following is required:

- The state should invest in the Natural Sciences education, including Chemistry education, by providing qualified teachers, high quality materials and technologies.
- The curriculum, study programmes and state requirements should be reviewed and improved.
- The legislative framework defining the organization and conduction of training and the evaluation of the qualification and skills of the teachers should be updated [18].

Considering the national policy a possible solution to the problems of professional qualification of teachers in Bulgaria will be the endorsement of a new Secondary Education Act. The Bill foresees the

introduction of the so called “quick run” that will motivate young teachers for quick professional growth. The Bill also foresees statutory individual professional qualification of teachers since in the current provisions of the existing law this is not binding.

The Chemistry Network Project could effectively contribute to enhance the organization and efficiency of science teachers training not only in national but in European context also by following activities:

- Enlargement of the National Project Network and Involvement of new associated schools and institutions responsible for Teacher Training. The common viewpoint of teachers and experts could help policymakers to develop a clear national conception for science teachers’ qualification by considering and using teachers’ opinion, to update the normative basis regulating the activities in science teachers’ training which will guarantee teachers’ permanent professional development and, thus, the high quality of the educational process.
- Helping science (chemistry) teachers in all aspects of their work - methodology and didactic of science teaching, application of ICTs in educational process, use of student-centred approach in education etc.- by providing them with methodological materials, interactive teaching resources, information about good practices in science (Chemistry) teaching available not only at national level, but provided by the other Project partners also. These activities could be successfully performed using the Project Portal which has already proved its usefulness.
- Forcing the interaction between chemistry teachers and scientific experts and creation of fruitful cooperation in incorporation of science in the school education. This activity will allow enrichment of the knowledge both of teachers and learners, to improve the quality of education presenting the science content in a more attractive way and, thus, to motivate students to study Chemistry which is the final aim of the Project.

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