

THE IMPLEMENTATION OF “NETCHEM” PLATFORM AND OPEN EDUCATIONAL RESOURCES (OER) IN FOOD SCIENCES

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Abstract

An International cooperation, through well designed big projects in the framework of the European Programs, is today one of the most important ways to make together students and professors in different European Universities.

NETCHEM -ICT Networking for Overcoming Technical and Social Barriers in Instrumental Analytical Chemistry Education, including also analytical evaluation of food products, is an international project financed by ERASMUS + (2016 - 2019), having as target: - development and delivery of courses via NETCHEM platform; - using Open Educational Resources (OER) to increase the teaching quality and the professional skills of the students; - using of WARIAL system (Web Access Remote Instrumental Analytical Laboratories); - increasing the level of the laboratory practices and exercises, connecting the knowledge's of the staffs in the Universities part of the project; - using common computing systems in order to cooperate with each other, to solve scientific problems and to make present scientific issues, despite the distance and other barriers, for example different possibilities of the departments to use new instrumental methods of analysis and the respective new equipment. In this project several Universities from the region and EU take part like : Universities of Nish, Belgrade, Novi Sad, Kragujevac, Serbia; University of Tirana and Agricultural University of Tirana, University of Sorbonne, Paris, France, University of Greenwich, England, University of Brno, Check Republic, etc. and some other important international institutions and companies.

The Action Plan and results from the first year are: reports from partner countries, questionnaire outcomes from all partners related to their Universities, and establishing the online research structures.

Key words: NETCHEM, OER, Analytical evaluation, Education in distance.

1. Introduction

Open educational resources (OER), are high-quality teaching, learning, and research materials free for people everywhere to use and implement. Universities, foundations related with scientific research and many projects in the world, support today effective use of openly licensed educational resources that provide students around the world greater access to a world class education, also give them the power to significantly improve education and scientific research in the future. Related with the terminology OER, which is now familiar in student surroundings, it is originated by another important term-Open and Distance Learning-ODL, the education of students who may not always be physically present in auditors. So they need corresponding and/or online courses [6, 7].

For the first time OER was used in UNESCO's 2002 Forum on Open Courseware, having also the corresponding logo as follows:



Figure 1. The first UNESCO logo for OER

Hewlett Foundation, an old foundation related with high education, founded in 1966 and located in California, defines OER as: “teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others”. This definition was taken into account in NETCHEM design, at all stages of co-operation between partner countries and all the issues raised for the solution.

One of the main areas where the major changes in teaching and research are focused, is the successful promotion and use of OER, involving a large number of students and scientific researchers in a broader inter-university and international communication. The main purpose is to implement innovative forms of information transmission and benefit from the best experiences in terms of good teaching practices and also to know as well practical methods of analysis using the most modern equipment of the time, which are not yet used in all analogue departments.

“ICT Networking for Overcoming Technical and Social Barriers in Instrumental Analytical Chemistry Education” - NETCHEM is one of the winning projects of ERASMUS +, with a three year extension of time, 2016 - 2019 (approved by the end of 2016). Project coordinator is University of Niš, Serbia, and project Coordinator and contact person is Prof. Dr Tatjana Andjelković). NETCHEM has partnered with recognized European Universities [4, 7] and Higher Education Institutions (HEIs) of Serbia and Albania to benefit from the experience of EU countries and to implement effective forms of teaching and research in the framework of Open Education Resources, in order to realize a cooperation for innovation and the exchange of good practices.

In our countries there are many undergraduate programs, bachelor, master and postgraduate programs such as PhD programs, which can be structured depending on an open cooperation in theoretical and practical courses curricula and in direct scientific research. This international project creates the opportunity for an expanded institutional partnership as well as contributes modestly to the approach of contemporary scientific

thought and to the shortening of distances between professionals of the same field or similar.

Since the initial structuring of the project and later, on the work pages and the detailed agenda were defined those directions of scientific research where there was common interest and where close cooperation could be made to reach the ultimate goals. Selected research areas of the NETCHEM countries include instrumental analysis, food chemistry and microbiology and the environment, specifically in the application of instrumental methods of analysis in the environmental chemistry and food chemistry also.

There are now 14 months of experience in collaborating within the project, managing step by step the most important issues that here will be present. So Analysis of EU partners and partner countries (PC) Knowledge/Skills/Practice in using OER/WARIAL in EFSC (Environmental and Food Safety Control) & Training the university staff in using massive open on-line courses platform and WARIAL networking, were some of the issues included in the work pages of the realized activities of the project. Another key point was equipping PC institutions with technical support for forming NETCHEM platform and we are just in it [1, 3, 9, 10].

2. NETCHEM platform and open educational resources (OER) in food sciences

2.1 NETCHEM partnership

NETCHEM partnership comprises 14 institutions including 3 EU universities:

- University of Sorbonne in France.
- Greenwich University in United Kingdom.
- Brno University of Technology in Czech Republic.

PC partners are:

Four Universities of Serbia:

- University of Niš.
- University of Belgrade.
- University of Novi Sad.
- University of Kragujevac.

Two Universities of Albania:

- University of Tirana.
- Agricultural University of Tirana.

There are also important institutions, enterprises and analytical instruments producers as:

- Atomic Energy Commission, CEA-Paris, France.
- Enological station Vršac, Serbia.
- Thermo Fisher Scientific.
- Analysis d.o.o.
- Zlatiborac enterprise of meat products, Serbia, etc.

2.2 NETCHEM in food industries and two years results of the project

Programs and curricula of food chemistry in Balkan countries need to be renewed, considering the implementation of OER and WARIAL, because our countries require a large number of experts in food production and analytical evaluation. Having a good management from state institutions and private companies, these specialists can find important and useful jobs, especially in the quality and safety of food products and in food sciences also. In addition, specialists in microbiology of food products are required, considering microbiological analysis as important tests to control raw materials and products, to monitor environmental contaminations of food industries, and so on. For this reason on the NETCHEM platform, the above issues have been considered a priority and the final objectives have included the extension of this platform to the teaching and scientific research programs of countries, members of the project [3, 4, 8, 10].

The assessment of safety and quality in physical chemistry cannot be understood without applying the innovative techniques of instrumental analysis methods having as target:

- Improving knowledge's about structure and properties of raw materials and food products.
- Transmitting the new information through the implementation of open lectures, to use manipulations transmitted online, especially in laboratories where instrumental analysis methods are being used more and more frequently [7].
- Making students familiar with new equipment, which are not present in all laboratories.
- Using effective and periodic trainings for teachers and students, having the possibility to observe in special laboratories or auditors related together online, the function of new equipment and the use of new methods of analysis.
- Developing students skills using practical examples in laboratories of industrial microbiology and transmit them through online trainings, above all for specific microbiological analysis, such as tests of industrial yeasts morphology, isolation, purification and identification of bacterial strains, yeasts and molds, application of molecular biology techniques to differentiate similar species, application of techniques for obtaining biomolecules, etc.
- Understanding in details the techniques used by EU universities, partners in the project, having longer experience in the use of OER and WARIAL, which currently have more financial resources to implement the new information in science and teaching.
- Developing students' skills using statistical methods to elaborate experimental data of analytical or

microbiological character, using in the case of microbiological tests, specific statistical evaluations, taking into account the tolerance between parallel tests in microbiology.

- Having open lectures related with environmental pollution, possible pollutions of food products, the behavior between food and packaging systems used in food production and preservation.
- Including written reports, lectures, exercises, presentations in e-learning webs, so that a large number of students can use and benefit from them.

The target audience are HEI teachers with a prominent professional experience, young HEI teachers and researchers, students, and professionals in enterprises. The Project tends to promote learning opportunities for the above target groups, to minimize distances in the transmission of scientific and practical knowledge; to promote virtual mobility in universities, overcoming in this way the technical and social barriers between Partner and EU Countries [4, 6, 7] and also among partner countries themselves [3, 4, 10].

Important results are achieved during 2017 and 2018, based on a two year cooperation (collaborations, meetings and trainings, also a virtual mobility).

Some of the most important achievements are as follows:

1. A valuable experience from EU countries, UPMC-Paris, France, related to UPMC's Continuing Education Department, which is one of the most important University Continuing Education Center in France, since 1971 - development and promotion of online courses, short courses, inter enterprise courses, certificates of OER, Accreditation of Prior Experiential Learning-APEL, etc., contributing in the strengthening, extending and increasing effectiveness of relationships between EU and Partner HEIs.
2. A very good and detailed information to the benefit of specialists, was transmitted related with the current level of knowledge's and skills in food chemistry, new instrumental methods of analysis (new equipment also) and food physical-chemical and microbiological analysis. Their desired level in the future was also part of this information. This knowledge's were transmitted training the university staff for using massive open on-line courses platform and WARIAL networking. Example: E learning: mass spectrometry and sample analysis (ion preparation, ion cloud transfer, analysis in ion trap mass spectrometer, registration of the results, etc.).
3. Survey results, in UPMC related with "If you have participated in CPD courses and about your motivation"; "Barriers met during professional development"; "Which knowledge and skills you lack related to usage of GC/MS"; "Which knowledge and skills you lack related to usage of UV/Vis", etc.

4. The same survey in PC partners and survey results.
 5. A very good and detailed information was performed related with the design of SQL (Safety and Quality) system based on EFSC (Environmental & Food Safety Control) data. A NETCHEM SQL based system is considered as the principal component of the NETCHEM information academic oriented system [2]. The authors have described the database design phase divided into three steps: 1. Conceptual database design, independent of all physical considerations; 2. Logical database design - a specific model of the data to be used-e.g. relational data model and finally 3. Physical database design - a description of the implementation of the database is created using SQL language for monitoring of EFSC quality indicators [2].
 6. Training of university teachers for the creation of new designed courses for graduate, master and Ph.D. students, based on the principle of constructive alignment [2, 9].
 7. The efforts to create appropriate environments and auditors supporting by charged university ITs in order to apply and see the e-learning impact. A modified structure in the Faculty of Natural Sciences - Department of Chemistry (Group of Analytical Chemistry), will serve for OER implementation, also new equipment are taken using them for the improvement of learning in analysis of food products and food microbiology also [8], (a very simple example in Figure 2).
 8. Implementation of MOODLE system as a management system for online, virtual learning.
- Transmitting of all information taken by inter-training to the master level students and to new teachers is very important to improve all professional communication with the students. The inclusion of topics, which with their specifications, are suitable for MOODLE application, has been one of the tasks assumed, that started in 2018 and will be completed within the year.



Figure 2. A light microscope in microbiology for a simple learning and a new microscope for virtual learning

The selected topics are based on existing curricula. Appropriate changes are making and now is working to include them in the system. A detailed information will be given below, related with MOODLE and its adopting to the students. Trainers are specialists and researchers of the Department of Computer Sciences, members of the project.

2.3 MOODLE as a management system and its role in virtual learning

MOODLE is a content management system, server-side software that is designed to simplify the creation and maintenance of sites. He accomplishes this by managing online content, generate web pages and allowing users to upload and change content without requiring technical expertise [2]. Examples are: Wordpress, Drupal, or Joomla. Moodle as a management system for online learning (LMS) enables educators to create dynamic websites in private courses that enhance learning anywhere and everywhere (Figure 3).

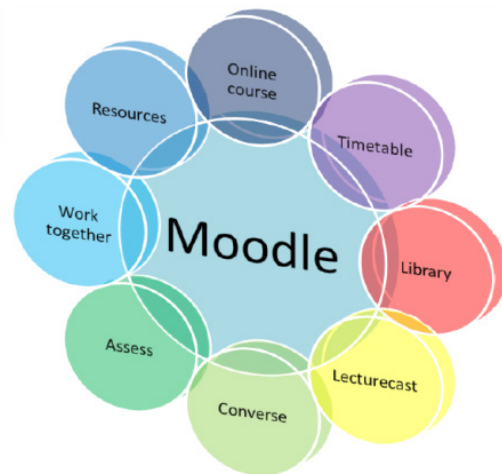


Figure 3. MOODLE System and MOODLE Community [10]

Possibilities for lecturers in Universities - three levels (bachelor, master and PhD), are as follows:

- Adding content.
- Facilitates learning.
- Differentiates progress.

Possibilities for students of three above levels in Universities are to:

- Access content.
- Follows path learning.
- Contacts teachers.

Some of the most important benefits of this system are:

- Management of student groups.
- Creating a rich learning environment.
- Interaction with content and other people.
- With different types of content.
- Integration of participation by the grades earned.
- Designed and management (changes also), of presentations.
- Accessing specific plugins.
- All learning tools are “under the same roof”.

3. Conclusions

Based on the results achieved regarding the implementation of e-learning, OER & ODL, concludes that they can be used very well in the laboratories of Food Chemistry, Food Microbiology and Food Analysis in the following directions:

- Microbiological aspects of food products (raw materials, bio products, co products, etc.).
- Study of the action of natural antimicrobials to reduce total load of microorganisms.
- Detailed experiments related with the shelf life of preserved vitaminized food products.
- In the application of modern techniques and equipment of food analysis (application of modern instrumental techniques of analysis).
- In biosensor uses, etc.
- First practical achievements will be useful for an advanced further implementation.

4. References

- [1] NETCHEM. (2017). *Assessment and proposal of procedures for using Open Education Resources and Web Accessed Remote Instrumental Analysis in Environmental and Food Safety Control*.
<URL: http://projects.tempus.ac.rs/attachments/project_resource/1548/3963_PREP_1.3_Assessment_and_proposal_of_procedures_for_using_OER_and_WARIAL_in_Environmental_and_Food_Safety_Control_v2.pdf. Accessed 20 June 2018.
- [2] Adamov J. (2017). *Creation of contemporarily designed courses based on the principle of constructive alignment*.
<URL: <http://www.netchem.ac.rs/news>. Accessed 20 June 2018.
- [3] Andjelkovic D., Stankovic I., Madic I., Mitić D., Andjelkovic T. (2017) *Conceptual design of SQL system based on EFSC data*.
<URL: <http://www.netchem.ac.rs/news/261-meeting-in-tirana>. Accessed 20 June 2018.
- [4] Andjelkovic T., Caslavsky J. (2017). *NETCHEM networking and sustainability*.
<URL: <http://www.netchem.ac.rs/news/261-meeting-in-tirana>. Accessed 20 June 2018.
- [5] Andjelkovic T., Andjelkovic D. (2017). *Survey of Laboratory Instrument availability at NETCHEM PC institutions and IT practice of NETCHEM staff*.
<URL: <http://www.netchem.ac.rs/news/261-meeting-in-tirana>. Accessed 22 June 2018.
- [6] Antonijevic M. (2017). *Current and Desired Level of Knowledge/Skills in Technology Enhanced Learning in EFSC*.
<URL: <http://www.netchem.ac.rs/news/233-kick-off>. Accessed 24 June 2018.
- [7] Friedenbergr R. (2017). *Continuing education in UPMC*.
<URL: <http://www.netchem.ac.rs/news/255-meeting-in-paris>. Accessed 24 June 2018.
- [8] Jovančićević B. (2017). *Establishing NETCHEM Platform*.
<URL: <http://www.netchem.ac.rs/news/233-kick-off>. Accessed 25 June 2018.
- [9] Tumbas I. (2017). *Development and delivery of courses via NETCHEM platform*.
<URL: <http://www.netchem.ac.rs/news/233-kick-off>. Accessed 25 June 2018.
- [10] Vasjari M. (2017). *Quality assurance and monitoring. Indicators of progress and their measurements*.
<URL: <http://www.netchem.ac.rs/news/233-kick-off>. Accessed 26 June 2018.
- [11] Moodle. *MOODLE System & MOODLE Community*.
<URL: <https://moodle.org/>. Accessed 27 June 2018.