

Project NMR-RU 78/08:

Distance Learning Course in Chemometrics for Technological and Natural-Science Mastership Education granted by the Nordic Council of Ministers, the Norwegian Centre for International Cooperation in Higher Education (SIU) and implemented in the frameworks of the Programme: “Nordic-Russian Cooperation in Education: Preparatory Actions 2008”.

Narrative Report

This project is aimed at developing outlines of a new chemometrics course with emphasis on distance and virtual learning to be suitable for Master’s Degree Programmes of technological universities and includible into them.

The project activities have been planned and arranged for achieving this goal and implemented in accordance with the project plan:

- 1. Preliminary stage (*self-financing of project partners*):** forming national teams of project participants involved in collection of information materials on distance and virtual learning in chemometrics as well as on chemometrics courses given at different Nordic and Russian (North-West Russia’) universities followed by this information exchange, analysis, evaluation and discussion at the first project event - the Workshop held at the Aalborg University Esbjerg, (Denmark) on September 29 – October 3, 2008.
- 2. Workshop at the Aalborg University Esbjerg (Denmark) on September 29 – October 3, 2008.**
Total number of participants – 10 persons: 5 – from Russia, 3 – from Finland, 2 - from Denmark including two well-known chemometricians, Prof. Kim Esbensen (Denmark) and Prof. Pentti Minkkinen (Finland), taken also part in discussions.

Detailed presentations of every project participant were incorporated into the Workshop Programme (in accordance with sharing of responsibilities at the preliminary stage):

- Nadezhda Khodyreva (SPb STUPP): project overview, main objectives and ways for their achievement;
- Jarno Kohonen (LUT): chemometric tutorials and courses currently available in the Internet;
- Alexey Pomerantsev and Oxana Rodionova (ICP RAS): their developments are supposed to form a basis of the distance learning course;
- Sergey Kucheryavskiy (AAUE): some preliminary ideas of technical implementation of a web-based distance learning center;
- Satu-Pia Reininkainen (LUT): features of chemometrics education in Finland and at the Lappeenranta University of Technology in particular;
- Oleg Yanush and Tatiana Markova (SPb STUPP): overview of chemometrics education at Saint Petersburg universities.

These presentations formed a basis of the data base project partners started to compile on the chemometrics education provided at Nordic universities, in Russia and in the Internet.

Participants attended also the lecture Prof. Esbensen has given to AAUE students in the frames of his basic chemometrics course.

In the course of this meeting, plans for organization of the next meeting in Saint Petersburg in February 2009 and some other questions have been discussed in more details, namely:

- to prepare, organize and hold the one-day Conference on “Methodological Aspects of Chemometrics Teaching in Europe Including Russia” for project participants, professors and lecturers of Saint

Petersburg universities as well as researchers and post-graduate students interested in chemometrics approach, its teaching and use;

- to announce call for abstracts and to publish the Conference proceedings;
- to prepare and hold the one-day Workshop for Master's Degree and post-graduate students as well as the lecturers and researchers interested in practical application of some chemometrics methods;
- the Agreement signed by SPb STUPP with CAMO Software AS, Nedre Vollgate 8, 0158 Oslo, Norway, and possibilities appeared from installation of this company' Unscrambler® software were also discussed.

3. Workshop in Saint Petersburg, Russia, at the Saint Petersburg State Technological University of Plant Polymers, on February 9 – 13, 2009.

Total number of participants – 35 persons: 2 – from Denmark; 2 – from Finland; 31 – from Russia.

During 5 days several major events were held which were being prepared by project participants during a period of time from the end of the first project meeting till February 9, 2009. Information letters together with a call for abstracts and Registration Forms have been preliminarily distributed among potential participants of the events. These events are:

- The International Conference on *Methodological Aspects of Chemometrics Teaching in Europe Including Russia* has been held on February 11, 2009. There were 13 presentations at the Conference made by well-known foreign and Russian scientists involved in development of theory of the method as well as its applications in different fields. The presentations have generated considerable interest among conference delegates assisting also in revealing more SPb STUPP lecturers interested in initiating the teaching of this subject at the university. The Conference Proceedings (in the Russian and English languages) have been published (in-kinds contribution of SPb STUPP).
- Workshop for Students and Postgraduates *Practice in the Use of Chemometrics Methods* has been held on February 12, 2009. Master's Degree and post-graduate students as well as teachers and researchers from different SPb universities and research institutions were invited to take part in the workshop. It was organized at university' computer class and held by project participants so that the audience could initially listen to several introductory lectures on chemometrics (4 hours) and then try to make exercises with the use of Excel Add-In software(4 hours). There were 25 students and researchers participated in the Workshop.

Both the Conference and the Workshop have evoked ready response of their participants and the organizers have got not only letters of thanks but also requests to organize and hold in Saint Petersburg one more workshop for Master's Degree and post-graduate students. Project coordinator has addressed the request to Dr Arne Haugen, Adviser, SIU, and after his positive reply, the workshop has been held at SPb STUPP premises on March 25-26, 2009. This workshop was devoted to Multivariate Curve Resolution with the use of Chemometrics.xla Add-In. The audience consisted of 10 Master's Degree and post-graduate students and Dr. Sc. Alexey Pomerantsev and Dr. Oxana Rodionova (ICP RAS, Moscow) conducted the classes. The workshop involved 8 hours of lectures and 8 hours of hand-on exercises.

In the rest days of this meeting at SPb STUPP project participants:

- have performed preparatory works for the Workshop for Students and Postgraduates at a university computer class (installation of necessary software and its testing);
- discussed and evaluated results of the events held as well as planned the programme of the next (final) meeting at the Lappeenranta University of Technology;

- discussed fund-raising issues, in particular, applying for any suitable Nordic or EU Programme in autumn and in this connection possible widening of the network integrating into it additional universities and institutions both Nordic, Russian and EU;
- discussed organizational issues of the Seventh Winter Symposium on Chemometrics (WSC 7) “Modern Methods of Data Analysis” and came to decision to hold it in February 2010 in Saint Petersburg. Project participants formed the Organizing Committee of the Symposium and launched these activities.

4. Final project meeting at the Lappeenranta University of Technology on May 11-14 2009. Total number of participants – 25 persons: 1 – from Denmark; 20 – from Finland; 4 – from Russia.

In the course of this meeting, **on May 13, 2009 the Chemometrics Workshop has been organized** by Dr. Satu-Pia Reinikainen, project contact person from LUT. Master’s Degree and post-graduate students as well as researchers from a number of Finnish universities (including LUT), research institutions and companies took part in the workshop. There were 7 presentations made at the workshop; among them, the presentations devoted to the project subject-matter and its implementation were made by project partners as well as those demonstrating results of the use of chemometrics methods in solving different applied tasks. Presentations have been copied and distributed among workshop participants. Some interesting scientific ideas were formulated in the course of discussion which development could lead to a new approach to for example automated control of pulp production, etc.

During breaks and in the end of the workshop, Dr Oxana Rodionova demonstrated simultaneously Chemometrics Excel Add-In operation and students practised using the software. As to the Finnish students, their participation in this Workshop as well as in software demonstration will be estimated by 1 ECT in case they submit a written report on the software application.

During this meeting, the following issues have been also discussed:

- results of the project for every participating institution;
- application for a future project in the frames of TEMPUS Programme while enlarging the network with some Nordic, West and East European universities; discussion of new prospective partners;
- prospects, sharing responsibilities and forms for further network collaboration in organizing WSC7;

After coming back to Saint Petersburg, Russian project partners have discussed in more details WSC 7 organizational issues and initiated preparation of this event:

- revising and enlarging the list of WSC 7 potential participants,
- compiling and printing the first circular,
- disseminating it among interested persons through e-mail and conveying the printed circular for its disseminating at a number of European chemometrics events to be held prior to the St. Petersburg one.

Project effect (results):

- established sustainable network of partner universities and research institutions involved in chemometrics training and R&D;
- enhanced collaboration inside the network trough planning further joint activities in organizing future training and scientific events, in disseminating educational and scientific developments of every partner inside and outside the network, in applying for different EU and Nordic programmes;

- collected and analyzed information on chemometrics training programmes available in the Internet, at Nordic and SPb universities;
- on the basis of this analysis, developed outlines of an e-learning chemometrics course, its possible contents and technical organization of a web-based distance learning center;
- developed recommendations for introducing elements of chemometrics training into SPb STUPP Master's Degree Programmes;
- software (CAMO and Excel Add-Inn) for chemometrics calculations installed at SPb STUPP and other network institutions to be used in students training and R&D.
- training workshops for MSc and PhD students (as well as teachers and researchers) organized and held at SPb STUPP (twice) and LUT on *Practice in the Use of Chemometrics Methods*.
- the conference on educational and scientific aspects of chemometrics approach organized and held for the first time in St. Petersburg for representatives of SPb universities and research institutions.
- the Chemometrics Workshop organized and held at the Lappeenranta University of Technology attracted general audience of interested persons among Finnish students and researchers.

Dissemination of project results was made through:

- web-site of the Russian Chemometrics society;
- Proceedings of the Conference *“Methodological Aspects of Chemometrics Teaching in Europe Including Russia”* published at SPb STUPP and distributed among project participants and their institutions, conference participants and their institutions, SPb STUPP staff;
- materials of the Chemometrics Workshop organized at LUT copied and distributed among project participants and their institutions, workshop participants and their institutions, LUT staff;
- software (Excel Add-In developed by O. Rodionova and A. Pomerantsev) installed at network institutions which may be used by these universities students and researchers.

Additional Value:

- In addition to the programme of events planned in application, the Chemometrics Workshop has been organized and held at LUT for Finnish Master's Degree, post-graduate students and researchers; its programme incorporated presentations on project subject-matter as well as on different practical applications of chemometrics made by project participants and Finnish scientists dealing with chemometrics.
- Three additional practical workshops for Master's Degree and post-graduate students and researchers have been arranged and held at SPb STUPP and LUT. Workshop participants not only have listened to introductory lectures on chemometrics but also performed calculations with software developed by Dr. Sc. A. Pomerantsev and Dr. O. Rodionova, project participants.
- The outlines of the distance learning course developed in the project will be presented at the International Conference Euroanalysis 2009 (September 6-10, 2009, Innsbruck, Austria).

Plans for continuing Nordic-Russian cooperation

Based on the collaboration between project partners enhanced in the project period, plans for continued joint activities have been formulated:

- to continue developing distance learning chemometrics course searching simultaneously for funds which financing would assist in implementing these plans;
- to exchange information about the best practices in chemometrics teaching at partners' universities;
- to invite project experts to give lectures or to hold practical classes at any partner universities;
- to exchange information on new chemometrics events to be held in any Nordic or EU countries or in Russia;
- to form the Organizing Committee of the Seventh International Winter Symposium on Chemometrics and to organize and hold the Symposium in St. Petersburg on February 14-19, 2010;
- to organize also a 2-days training course "Introduction into Chemometrics" prior to the symposium;
- to apply together (attracting also other Nordic, EU and Russian universities) for the project on Distance learning chemometrics course introducible into Master's Degree programmes of any technological university in the frameworks of the TEMPUS Programme.

Project Contribution to Nordic cooperation

- The Aalborg University Esbjerg (Denmark) and the Lappeenranta University of Technology (Finland) have old links in chemometrics R&D. Project allowed them to know better about chemometrics training programmes these universities have and the best teaching practice they are implementing, to exchange experience gained in this field in the last few years;
- Russian project partners distributed their experience in chemometrics calculations with the use of Excel Add-In software they have developed and demonstrated operation of these computer programs at meetings and workshops held at the Aalborg University, at LUT, at SPb STUPP. Both the Aalborg University and LUT may use this software in their students' exercises and in R&D.
- Additional Finnish universities, research institutions and companies were attracted to participation in the project activities through their attendance and participation in the Chemometrics Workshop organized at LUT on May 13, 2009.