

## Hands-on approach to analytical chemistry for vocational schools II

UL FKKT - LLP/LDV/TOI/2007/SI/15

<http://www.adam-europe.eu/adam/project/view.htm?prj=5582>

## Project Information

- Title: Hands-on approach to analytical chemistry for vocational schools II
- Project Number: UL FKKT - LLP/LDV/TOI/2007/SI/15
- Year: 2008
- Project Type: Transfer of Innovation
- Status: completed
- Country: SI-Slovenia
- Marketing Text: Innovative, small-scale, low-cost spectrometers and hands-on teaching units
- Summary: Rapid technological development requires professionals with excellent analytical chemistry skills to monitor technological processes and their impact on the environment, and to control food safety and people's health. Vocational education in Europe, especially in chemistry-based and chemistry-related disciplines, is undergoing a crisis, reflected in low enrolment rates, under funding causing a lack of adequate analytical instrumentation, changes in structure and the motivation of students.
- This project aims at contributing to the better quality and attractiveness of VET in chemistry-related and chemistry-based disciplines by implementing small-scale low-cost spectrometers that can be easily upgraded into other analytical instruments, e.g., gas and liquid chromatographs, into school practice in Poland, Slovenia and the UK, together with hands-on teaching units and several hands-on experiments that can increase the motivation in students and contribute to better learning outcomes.
- The partnership comprises the University of Ljubljana, the University of Gdansk and the University of Bristol, and five Slovenian vocational schools with VET programs in chemistry, laboratory medicine and food processing. The partnership has expertise in analytical chemistry, chemistry education and outreach programs to promote science.
- The outcomes of the project will be innovative, small-scale, low-cost spectrometers and teaching units "A hands-on approach to visible spectrometry" and "A hands-on approach to chromatography" and selected hands-on experiments implemented into VET practices in Poland and Slovenia, and integrated into the outreach activities of the UK partner. In addition to this there will be the trilingual web page with 20 newly developed hands-on experiments and a report on the evaluation of the responses of target groups on the implementation of hands-on approaches into school practice and outreach programmes in terms of the impact on the motivation of students and learning outcomes.
- The impact envisaged is a contribution to the higher quality and attractiveness of VET programmes in chemistry-based and chemistry-related disciplines and outreach activities, and the exploitation and valorisation of the hands-on approaches to analytical chemistry ensured through cascade effects.
- Description: The transfer of innovation is based on the small-scale, low-cost spectrometer for educational purposes, which was developed and patented by the applicant and coordinator of this project and can be considered as innovation on its own due to the fact that it can be easily upgraded into several different analytical instruments, e.g., a gas chromatograph, a liquid chromatograph, a microtitrator, and flow-injection analysis systems. All these instruments in the form of professional instruments are entirely different pieces of equipment; they are expensive and not easily affordable by schools and cannot be put into the function of one another. 25 small-scale low cost spectrometers were produced and allocated to partners' institutions. The small-scale spectrometers enable implementation of the teaching units "Hands-on approach to visible spectrometry" and "Hands-on approach to chromatography" into teaching practices. Therefore, the small-scale spectrometer with its upgrading potential opens up several new opportunities for teachers and their students and challenges them when carrying out their innovative ideas by, on the one hand, adopting the existing experiments from the project's website and adapting them to fulfil the requirements of their sector and, on the other hand, developing their own hands-on experiments relevant for their educational practice. The spectrometer is

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portable, easy to use, does not represent a black box to the students, allows for experiments with low volumes of chemicals, is a rapid and simplified experimental approach, and does not require a laboratory environment or any classical laboratory skills. This makes it very suitable also for use at the lower levels of vocational education or even for carrying out promotional activities at the pre-vocational educational level with the objective of attracting larger numbers of prospective students into vocational programs and to raise interest for natural sciences and natural-sciences-based or related disciplines. With hands-on activities based on the small-scale analytical instruments students become active experimenters, observers and creators of their own knowledge, who gain an understanding that natural sciences are not boringly and exhaustibly difficult, but challenging, interesting and logical.

Themes: \*\*\* Utilization and distribution of results  
 \*\*\* Quality  
 \*\*\* Continuous training

Sectors: \*\*\* Education  
 \*\* Professional, Scientific and Technical Activities

Product Types: teaching material  
 website  
 CD-ROM  
 open and distance learning

Product information: - 85 innovative small scale spectrometers were produced and implemented into VOC school practices and outreach activities. In accordance with the plan 25 spectrometers were produced from the project's funds. The Slovenian Ministry of Education financed additional 60 spectrometers which were distributed among the interested Slovenian vocational schools with different study programmes what enabled wider dissemination and contributes importantly to the sustainability of the project results.

- 30 CDs with the Polish translations of the Manual "Hands-on approach to analytical chemistry" comprising two teaching units with full support for direct implementation into classroom namely "Hands-on approach to visible spectrometry" and "Hands-on approach to chromatography" were produced and 20 of them distributed among the Polish teachers. During the previous project these teaching materials were already prepared in Slovene, Portugues and English

- 26 new hands-on experiments were developed in addition to 40 already developed through the previous project and are described on a trilingual web page of the project.  
<http://www.kii3.ntf.uni-lj.si/analchemvoc2/>

- A systematic evaluation study was accomplished in which 295 students enrolled into VOC programmes in Slovenia and Poland were involved in testing the selected modules of the teaching unit "Hands-on approach to visible spectrometry". The final report on the evaluation study is presented on the web site of the project in English; the shortened versions of the report are also available in Polish and Slovene.

Projecthomepage: <http://www.kii3.ntf.uni-lj.si/analchemvoc2/>

## Project Contractor

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## Project Tags

The project belongs to the following group(s):

Best Projects (<http://www.adam-europe.eu/adam/thematicgroup/MMVII>)