

## 5.1 Vocational and educational training

### Germany

The experiences gained from proving in the ComEd project confirmed that the model of integration of exploration tasks in measures of vocational training and further education is a feasible approach for skill development of educational staff in the field of micro- and nanotechnology.

In particular, the exchange between teachers in educational institutions and trainers in companies on relevant topics on education and training, fostered by exploration tasks, supports processes of informal learning. The method of exploration task has proved to be an important way to make the knowledge generated in companies more usable for learning and teaching processes.

With the help of the remaining web-based exchange platform (ComEd forum) it will be possible to make the achieved results from the project available for those interested in education and training and to enable broad-based further developments.

A continued development and integration of model and method is carried out in concepts for the qualification of educating specialists in SME of high technologies and photovoltaics (in the above mentioned pilot project BiMuna).

### Slovakia

Objective of VET in Slovakia represents facilitation of innovation and entrepreneurship of students/professors/SME employees and researchers through exploration tasks, bachelor program focused on innovation, access to new micro-systems technologies and innovation support actions for achieving the “critical mass” of people with innovative capabilities and increasing entrepreneurial skills.

Specific objective of VET in Slovakia is enlarging the cluster of people with innovative skills by increasing the number of students/professors/teaching staff/SME employees and researchers with strong technical and technological knowledge in the field of micro- and nanotechnologies and electronic micro-systems; exploration task method has impact on creating a solid offer and access to students/professors/SME employees and researchers to a proper environment (knowledge and logistic) for developing the innovation and entrepreneurial spirit.

The VET system supports:

- Participants in the acquisition and the use of knowledge, skills and qualifications to facilitate personal development, employability and participation in the labor market in the east part of Slovakia,
- University and enterprises in providing high quality, innovative learning courses

and practices through the exploration tasks,

- The enhancement of the attractiveness of vocational training and further education.

Project helps the participants to be integrated into the mainstream education and training in the technical field. The distant and multi-lingual learning features (Slovak and English) of the system help to eliminate all forms of discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation.

The transfer of the knowledge to a newly established exploration task system has made the most significant impact on the national, European and global VET systems. It is the communication channel between this training system and the users. The system works independently and automatically, within common solution of exploration tasks. The exploration task system is the learning tool for the most important topics of Electronics Technology as well as for the electronics Assembling Technology. The system can be beneficially used in all forms of vocational education, especially in technical secondary schools, in universities mainly in Bachelor study programs and colleges, and any kind of Life-Long-Learning means.

A large impact on the national VET system was made by the accreditation of Bachelor Study at Technical University of Košice in Slovakia (Bachelor study training program

“Progressive technologies and materials in technologies in electronics”). The accreditation provides the most important guarantee of the sustainability and further exploitation of the system. The accreditation of the program made easier to issue more valuable certificates and to ensure sustainability of the results beyond the project life. TUKE partner made a significant impact on the VET systems, in particular regarding the future.

### **Romania**

We disseminate exploration tasks to the companies, which will use the content and the method in further education of their workers. IMT will use this method for the implementation of new teaching modules for MS students and training of our employees and for short courses dedicated to other Romanian companies working in the field of micro- and nanotechnologies.

For practical implementation of exploration task method we use Power Point presentations and practical exercises (hands on training). A printed description of the exploration task (slides) was distributed in advance to the presentation, so that the apprentices had their own material and can be familiar with the subject and prepare questions discussed during the course.

This method of exploration tasks will be used and adapted by the companies and used in different technical fields.

In Romania the micro-technologist occupation is not defined: we consider technician working in microelectronic/ sensor domain. People (engineers, physicists, chemists) with MS degree (recognised by Ministry of Education and Research) in micro- and nanotechnology can work in research R&D institutes or companies actively in innovative products using micro- and nanotechnologies.

### Portugal

To disseminate exploration task methodology to AET courses, we suggest that its integration and appropriation could be done through the Reflexive Learning Portfolio,

and then applied to different modules and practice in the workplace, with the involvement net and participation of the entire pedagogic team and host companies. In this case, it will be important to adapt (simplify) the exploration task methodology and to extend to other technological areas.

### Switzerland (recommendations)

Based on the experienced implementation models of exploration tasks, two main approaches seem best applicable to the VET sector in order to meet the demands of teachers and trainers of vocational school and training centres in further education on nanotechnology:



- For (larger) groups of apprentices in electronic or micro-technologies: thematic visit of an R&D laboratory or SME prepared and accompanied by exploration tasks, demonstration and explanation of laboratory equipment, instrumentation and discussion about applications or products, ideally prepared in collaboration of the UAS with the vocational school.

At the institute MNT of the HEIG-VD, this measure can e.g. be implemented at the occasion of open days for future students and is therefore offered to interested teachers and trainers of the CPNV.

- For groups of up to three apprentices in electronics or microtechnologies: mini internships (duration: two afternoons) with an experimental exploration of a nanotechnology topic in an R&D laboratory, supervision by young engineers, preparation of a presentation by the apprentices coached by young engineers, possibly discussion with the professor, presentation to the class of apprentices. At the institute MNT of the HEIG-VD, this measure can occasionally be implemented (e.g. one or two groups per year). For a regular implementation of this model, funding for consumables and personal costs especially for the hosting UAS (or SME) would be necessary.

