

ComEd
“Development of competences of educational staff by integrating operational tasks into measures of vocational training and further education”

Best Practice-
Designing and implementation of activities to empower the education staff to implement the concept
-
Manual

(Status: 09/2010)

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1 Background, problems and objectives in the project ComEd

Vocational training and further education in areas of high-technology as micro- and nano-technologies require new methods in order of strengthening the part of teachers and trainers. Due to the dynamics of technical-technological developments and a high variety of products, materials and technologies in MNT enterprises the need of educational concepts and offers is different and changes quickly. Considering this situation there are special requirements in order of developing and designing educational processes and developing the competences of the educational staff. In addition to a continuous development of new knowledge from international research it has to be implicated know-how generated in companies in teaching and learning processes as well.

A suitable approach encouraging the development of competences of the educational staff is a stronger implication of exploration tasks aiming on working processes, carried out by apprentices or participants of further education. Explored information about working processes, problems, approaches of solutions and innovative development results are an important potential of learning for teachers and trainers.

Our project deals with a model of integrating exploration tasks in vocational training and further education, which was primarily developed and proved in other German industrial sectors. This model has been adapted in the context of qualifying the educational staff of MNT enterprises and educational service provider (ESP) and transferred to the European partner countries. As a result a model has been further developed on an European scale which includes products fostering European exchange (e. g. pool of operational tasks, handouts and a web based exchange platform for multipliers, teachers and trainers).

Furthermore it was the common effort of all partners to adjust the understanding of vocational training and further education in order to force the economical development in Europe. The partnership which realised the project ComEd, involves educational service provider for companies of MNT. These ESPs have a different institutional background and different focus on professional topics concerning vocational training and further education. ESPs will complement one another and assure a wide consideration of learning content.

Main objectives of ComEd were:

- **Strengthening the role of qualified employees** including educational staff within vocational training and further education in the field of MNT in terms of new functions and tasks in conjunction with high dynamic of technical-technological development
- **Increasing mobility of apprentices in MNT**
Actually, apprentices in industrial-technical occupations in mobility projects are comparatively low. For that reason, preconditions for future European mobility projects for apprentices in companies of MNT shall be created simultaneously within the project ComEd

Target groups of project were:

- **Education personnel** within vocational training and further education for MNT involved in transfer (teachers, trainers in educational institutions and in SME) and
- based on it, **learners** within vocational training and further education in MNT in all involved countries during proving of concepts and instruments

2 The teaching and learning method „exploration task“

Method

The Exploration in enterprises is a special work order to learners. It focuses on the independent recording, documenting, evaluating and presenting objects, phenomena or processes of a professional or occupational reality. Thereby the exploration is orientated at the business process (as opposed to factory tours and excursions). The elaboration of various learning situations based on the exploration of business processes (including production and training processes). For learners, teachers and trainers the explorations lead to a better understanding of professional actions. Especially teachers and trainers get an current insight into the operational practice.

Fields of applications of exploration in enterprises

The exploration in enterprises may relate to various aspects of the professional reality and services in the company. A wealth of variations are possible starting from the typical job descriptions in the professionalism to the (partial)description of the work and process design in the value chain up to the task description of parts of the company. Explorations can also fulfill different functions in the learning and training process. These include e.g. the preparation for new thematic contents as an independent project work as well as to "review" acquired theoretical knowledge in practice.

Use of explorations as an instrument of skills development

Educational institutions should strive for an systematic integration of exploration in enterprises (cf. Further developed conception for integrating the learning/teaching method „Exploration in enterprises“ into the configuration of measures concerning vocational training and further education in the field of Micro- and Nanotechnologies with recommendations for its institutionalization in the educational processes).

The exploration in enterprises is a conceptional demanding method. Therefore, it is necessary to make trainers and teachers become familiar with the tool and to train them for use (cf. „Hand-out/Manual for sensitisation and qualification of educational staff for being able to realize the concept).

3 Best practices



EMPOWERING TEACHERS TO APPLY EXPLORATION TASKS (BEST PRACTICES IN GERMANY)

Abstract

The method of operational exploration is seen as an approach to integrate knowledge from practice into the processes of education and training. This requires awareness raising and empowering of teachers involved in learning processes in enterprises resp. of

Background

Vocational training and further education in the field of high-technology like micro- and nanotechnologies (MNT) require new methods in order to strengthen the part of teachers and trainers. Due to the dynamics of technical-technological developments and a high variety of products, materials and technologies in MNT enterprises the need of educational concepts and offers is different and changes quickly. Considering this situation there are special requirements in order of developing and designing educational processes and developing the competences of the educational staff. Besides opening up continuously new knowledge from international research

panies has to be implicated in teaching and learning processes as well.

Objectives

There is an important requirement for the successful adoption of the method „operational exploration“ and its acceptance and intentional appliance as a tool for designing teach and learn processes: the benefit and the provided possibilities have to be clearly recognized. It is necessary to sensitize trainers and teachers to the method and to empower them for the adoption. Furthermore it should be made clear that the implementation of target-oriented exploration tasks into processes of vocational and further education can be useful quite well for optimizing education measures.

Results/Solutions

The teachers of BWAW Thüringen gGmbH and the trainers of the pilot companies involved in the project were familiarized with the topic of operational exploration by raising awareness dialogues. A compendium of processed information has been made available, including for example explanations to the concept of integrating operational exploration tasks and examples of operational tasks. This was taken as a basis to develop own exploration tasks by the educational personnel. The ComEd project staff assisted and advised them during developing and transposing the exploration tasks.

Benefits/Prospect

Both the trainers from the companies and the teachers of BWAW resumes that the provided material as well as the preparing and attending coaching talks and discussions were useful.

The advantages of the method (realistic, effective learning, improvement of soft skills such as creativity and self-study) were confirmed by the trainers and teachers in practice. The request was expressed to integrate the method of operational exploration in the long term education and training processes. After all exploration tasks are regarded as a possibility to improve the quality of vocational training and further education.

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Education and Culture DG

Lifelong Learning Programme

**BEFÄHIGUNG VON LEHRKRÄFTEN FÜR DEN
EINSATZ VON ERKUNDUNGS-AUFTRÄGEN
(BEST PRACTICES DEUTSCHLAND)****Abstract**

Die Methode der „betrieblichen Erkundung“ wird als ein Ansatz gesehen, Wissen aus der Praxis in Prozesse der Aus- und Weiterbildung zu integrieren. Dies bedarf einer Sensibilisierung und Befähigung der an Lehr- und Lernprozessen beteiligten Ausbilder in Unternehmen bzw. von Lehrkräften in Bildungseinrichtungen.

Background

Berufliche Aus- und Weiterbildung in Hochtechnologiebereichen, wie den Mikro- und Nanotechnologien (MNT), bedarf neuer Methoden zur Stärkung der Rolle der Lehrkräfte und Ausbilder. Infolge der zu verzeichnenden Dynamik technologischer Entwicklungen und einer hohen Vielfalt an Produkten, Werkstoffen und Technologien in Unternehmen der MNT variieren Aus- und Weiterbildungsbedarfe sehr stark und unterliegen schnellen Veränderungen. Das bringt besondere Anforderungen an die Entwicklung und Gestaltung von Bildungsprozessen und die Kompetenzentwicklung des Bildungspersonals mit sich. Neben einer kontinuierlichen Erschließung neuen Wissens aus internationaler Forschung und Entwicklung von Instituti-

onen gilt es, auch in Betrieben generiertes Wissen stärker in Lehr- und Lernprozesse einzubeziehen. Als ein Lösungsansatz wird gesehen, die Methode der Erkundung betrieblicher Prozesse durch in Aus- bzw. Weiterbildung befindliche Lernende für die Kompetenzentwicklung beim Bildungspersonal stärker zu erschließen. Erkundete Informationen zu betrieblichen Abläufen, Problemstellungen, Lösungsansätzen und innovativen Entwicklungsergebnissen werden dabei als wichtiges Lernpotenzial für Ausbilder und Lehrkräfte betrachtet.

Objectives

Wichtige Voraussetzungen für den erfolgreichen Einsatz der Methode „Betrieblicher Erkundungsauftrag“ und deren Akzeptanz und bewusste Anwendung als Hilfsmittel für die Gestaltung von Lehr- und Lernprozessen für Lehrende und Lernende gleichermaßen, ist das Erkennen deren Nutzen und sich bietender Möglichkeiten des Einsatzes. Notwendig ist, die Ausbilder und Lehrkräfte für die Methodik zu sensibilisieren und für eine eigene Anwendung zu befähigen. Zudem gilt es deutlich zu machen, dass die

Integration zielgerichteter betrieblicher Erkundungsaufgaben in Prozesse der Aus- und Weiterbildung recht gut zur Optimierung von Bildungsmaßnahmen genutzt werden kann.

Results/Solutions

Die Lehrkräfte der BWAW Thüringen gGmbH sowie die Ausbilder der am Projekt beteiligten Pilotunternehmen wurden mittels Sensibilisierungsgesprächen auf die Thematik „betriebliche Erkundung“ eingestimmt. Ein Kompendium mit aufbereiteten Informationen, z. B. Erläuterungen zum Konzept zur Integration von betrieblichen Erkundungsaufgaben, exemplarisch aufbereitete Erkundungsaufträge, wurden zur Verfügung gestellt, so dass darauf basierend eigene Erkundungsaufträge durch das Bildungspersonal erarbeitet werden konnten. Bei der Entwicklung und Umsetzung beratend und begleitend wirkten die ComEd-Projektmitarbeiter.

Benefits/Prospect

Die Ausbilder aus den Unternehmen als auch die Lehrkräfte des BWAW resümierten,

dass sowohl das Ihnen zur Verfügung gestellte Material als auch die vorbereitenden und begleitenden Beratungsgespräche und Diskussionen hilfreich waren. Die Vorteile der Methode (realistisches, effizientes Lernen, Verbesserung von soft skills, wie Kreativität und selbstständiges Lernen) konnten von den beteiligten Ausbildern und Lehrkräften in der Praxis bestätigt werden. Es wurde der Wunsch geäußert, die Methode der „betrieblichen Erkundung“ langfristig in Aus- und Weiterbildungsprozesse zu integrieren. Erkundungsaufträge werden als Möglichkeit zur Qualitätsverbesserung von Aus- und Weiterbildung gesehen.

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EMPOWERING TEACHERS & TRAINERS IN NANO & MICROTECHNOLOGY VIA THE APPLICATION OF EXPLORATION TASKS (BEST PRACTICES IN SWITZERLAND)

Abstract

The implementation of exploration task (ETs) in vocational training and further education has been tested in the field of micro & nanotechnology. It leads to an interactive knowledge transfer between Universities of Applied Sciences (UAS), small and medium size enterprises (SME) and/or vocational schools.

Background

Further education and continuous training in the fast developing field of nano- and micro-technology has been found to be a demand of engineers from Swiss SMEs, as well as of teachers and trainers of vocational schools. For engineers, a network of professors of the Swiss UAS has developed a federally recognized postgraduate study programme, the Swiss Master of Advanced Studies in Nano & Microtechnology (Swiss MAS NMT) www.nanofh.ch/nmt-master. This programme and its short training courses are regularly offered by the Swiss MAS NMT consortium since 2005. For interested trainers and teachers of vocational schools there is however a lack of adapted training offers in nanotechnology.

The method of ETs can be applied in order to fill this gap.

Objective

- Further stimulation and enhancement of the knowledge transfer in the field of nano- and microtechnology between SMEs, UAS and vocational schools via the development and pilot tests of ETs.

Methods

- Development and test of various models of ETs:
- Visit of an R&D laboratory based on ETs for course participants, visiting apprentices, teachers and trainers with demonstration of instrumentation and discussion of industrial applications.
 - Visit of a professional exhibition on micro-techniques with master students didactically prepared and accompanied by ETs.
 - Individual student project work on industrial application topics (master level) based on ETs.
 - Guest lectures from SME partners within courses for students (Swiss MAS NMT) prepared and accompanied by ETs.

- NMT training for trainers and R&D managers: explaining method of ETs.

Examples & Results

- ETs for apprentices with their teacher of the CPNV (Centre professionnel du Nord Vaudois) concerned "Scanning tunnelling microscopy & applications", "Nano- & micropositioning by piezoelectric actuators", and "Applications of integrated microelectronic circuits" during an open day visit of the institute MNT at the HEIG-VD. The ETs were announced to the apprentices under the title "Voir des atomes" ("Seeing atoms"). Here, the teacher was trained in advance by an individual laboratory visit, as well as during the ETs with the apprentices.
- ETs about NMT applications have been implemented in the MSE programme for training the skills for literature search, critical reading & writing of scientific & technical documents, and oral presentations for R&D. Some students worked with SMEs or R&D groups. The ETs clearly enhanced the knowledge transfer between the different partner UAS and SMEs.

Benefits/Prospect

In the field of nano- and microtechnology, the implementation of the ET method in vocational training and higher or further education of engineers can be considered as a benefit:

- active learning for the apprentices or students.
- recent information about nanotechnology R&D & applications for the teachers and trainers.
- interaction between UAS, SMEs and/or vocational schools. The method seems also promising for short term internships in the context of mobility projects.

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EMPOWERING TEACHERS TO APPLY EXPLORATION TASKS (BEST PRACTICES IN ROMANIA)

Abstract

The exploration tasks is a new method which use practical examples, in order to apply new knowledge and with the purpose to help the apprentices to put it quickly in their work. The teachers involved in the learning process in different SMEs has also to improve their abilities in using the exploration tasks method for a better understanding of the studied topics.

Background

Micro-nanotechnology (MNT) domain is an emerging field of sciences and we need a multidisciplinary approach. New technologies and equipments are used in the development of a new sensors/microsystem for a broad range of applications: biomedical, mechatronics, optics, wireless communications, environmental, energy or agriculture. Also a lot of different materials are utilized and advanced micro-physical characterisation techniques. The trainers (teachers) has to be familiar with these new topics, equipments and techniques and to be able to explain to the apprentices, based on an attractive method, as exploration tasks new

knowledge and also to present practical examples.

Objectives

The transfer of knowledge, coming from an interdisciplinary field is important to be based on an working method as exploration tasks, where the trainers have to adapt their learning method to a new approach. They have to adapt and make effective this interactive method, derived from experiments and practical work, discussions and analyses.

The implementation of exploration tasks has to be a permanent tool in further education and especially in the filed of micro-nanotechnologies. The trainers has to update their abilities for teaching new techniques, to use new equipments and to adapt to the requirements for further education in corporate training environment.

Results/Solutions

The trainers from IMT-Bucharest and from the pilot companies participating at ComEd project were introduced in the method of exploration tasks and its particularity in micro and nanotechnology field. There were considered different factors which could influence the teaching method and the knowledge transfer as past experience, personal skills and preference of the teachers. A fruitful dialogue about the concrete mode of working the concept of exploration tasks was realised, considering the best solutions for an attractive and quickly new knowledge transfer of know-how.

Benefits/Prospect

The trainers and the teachers found the Exploration Task as a very good method for learning, different from the traditional learning, considering the role in the learning process of each participant.

This method will be definitively taken in consideration in their modules for further education. They consider this tool as a flexible way for studding and come out as a significant trend for knowledge transfer in the field of micro-nanotechnology.

This creative method helped both the teachers and the apprentices to better organize and evaluate their work. The worked exploration tasks and the method will be used by teachers in the processes of further education.

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EMPOWERING TEACHERS TO APPLY EXPLORATION TASKS (BEST PRACTICES IN SLOVAKIA)

Abstract

When there is a demand for improvement of educational staff with regard to including knowledge based on practical experience and requirements of education for companies /enterprises, the concept of exploration tasks seen as a good approach. There is possibility to include the experience from this activity to permanent education process and continuously empowering educational process.

Background

The technology of assembling is one of the important areas in the electronic industry that have impact on quality and lifetime of final products. So, the quality of vocational training and further education in the Electronics Assembling Technology Exploration Task Program is very important. It is very good, when there is possibility to include theoretical background based on latest knowledge from research as well as on the practical experience (or know-how) acquired in the companies/enterprises into educational process. This process might be

improve both the teaching staff as well as students (classical student, potential employees or teachers on lower degree of education).

Objectives

There are two partial tasks when we want concept of the "exploration task program" put in place. One is concerned to educational staff and second to companies/enterprises. The knowledge from teaching/research institution (like TUKE) has more theoretical background whereas producing company's knowledge is often more practical. Conjunction of these two type of knowledge and including to the educational process should be produce more tailored students (potential employees) for practice (companies /enterprises). Both (teacher staff and companies) have to become sensitive for this idea. The whole process might be continuing as long term

Results/Solutions

The concept of exploration task program was applied on the young part of teaching staff on Department of Technologies in Electronics, TUKE. The assignment of exploration tasks were prepared based on communication between educational staff and companies. The requirements for accreditation were regarded in this step too. The acquired knowledge was transferred by training course (trial teaching) that consists from class lectures; laboratory exercises as well as discussion between teachers and participants. The quality of training was evaluated by feedback of participants. This allowed next improvement of exploration tasks. The prepared exploration tasks were subsequently applied into bachelor study training program "Progressive technologies and materials in technologies in electronics". Exploration task system training system has a short-term impact on both convergence education (retraining of already graduated engineers to a new area) and continuing education (training for field engineers according to their employer/industry needs).

Benefits/Prospect

Both the educational staff as well as companies had positive opinion on this concept of education. The exchange of knowledge between them is very useful for both, too. The companies acclaimed possibility improved the education process and by implication quality of their potential employees. The most important impact can be on the living standard and general happiness of the people, who are able to acquire a good knowledge and high skill and obtain good jobs for the benefit of their enterprises.

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