

Education and training of industrial sector employees

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Abstract

In the paper the authors present their experiences regarding to the design of the further professional education and training tailor made for some selected categories of employees from the industrial sector. Based on their experiences they propose a model of this training which consists of five modules, three of which – theoretical education, homework, continuous education - they recommend to carry out in a distance form and the other two – exercises, questions/exams - in the face to face form.

Keywords:

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1 Introduction

Functionality and prosperity of each company depend on flourishing common cross connection of financial, material, information and human resources. According Armstrong (2007), nature of human resource development consists in providing opportunities for learning and training to improve the job performance of both either the individuals and groups as well as the company at whole. Today companies of all sizes must do everything possible to stay competitive and maintain a highly skilled and motivated staff. And they are aware of the fact how important it is to offer professional education and training to their employees. One of the most important reasons to offer further training and education to employees is to ensure that work skills stay current. Keeping employees up-to-date with software applications, the latest thinking on logistical methods, and ways to improve efficiency are all necessary to keep businesses on a level playing field with competitors. Training is also an excellent way to retain the best employees. An unsuccessful company is one that does not keep up with trends in the area of its business, that is reluctant to change, and that has an unmotivated job staff with stagnant skills.

Faculties of education are perceived as providers of both pre-graduate teacher training programs as well as the further (postgraduate) education and training programs. A special feature of the Department of Technology and Information Technologies at the Faculty of Education, Constantine the Philosopher University in Nitra, is that this department has some contacts also with industrial practice and within this also with the professional training of employees from industry (Hašková, Hodál, Kuna, 2017). The contacts with the industrial practice are based on the cooperation of the department with the company. EATON, which is an outstanding producer and importer of automation systems.

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2 Education and training tailor made for industrial sector employees

The cooperation of the department with EATON has led into the participation of a few department members at several face to face trainings organized for employees of the EATON partner firms. Thematically the training was devoted to programming of the PLC facilities, HMI panels and frequency changers. During these trainings their face to face form has proved itself to be quite problematic and Eaton felt a necessity to change and improve the model of the employee education and training which was used. Consequently the common cooperation of EATON with the department resulted in the offer of the company to the department to take part at the development of the new model of the further professional education and training of their and their partners employees (Hodál, 2017).

The group of the further professional education and training participants, whom the training has been tailor made for, consists of:

- EATON employees, in particular business agents (sales representatives) and technical assistants,
- employees of EATON business partners (customers), i.e. companies producing technological processes in automation which are, at the same time, customers applying EATON systems into the practice.

These customers have in their command programmers, who apply these products into the manufacturing company, where the machines are put into the production process (this is the target production of the created training model). The lowest level of the production to which the training model is created, is the staff responsible for technical support and production line maintenance.

As it is clear from the above-mentioned the target group of the carried out training is very heterogeneous as it consists of employees of different companies and these employees are not of the same knowledge level (including not the same education background). In particular the training is tailor made for the specified employees of the following nine companies:

- EATON Slovakia,
- Kompozitum Topolčany,
- EON Malženice,
- FarmChoice Nitra,
- Tubex Žarnovica,
- MAL Mechatronik – Austria,
- Víno Levice,
- Engie Slovakia,
- EM Services Prievidza.

3 Model of the tailor made education and training

One of the very serious problems, the practice pointed out, was the problem of the organization of the trainings. To find out a date suitable for all participants – employees of different EATON partner companies has been almost impossible. The terms changed very often to increase the suitability of the training date for as many participants as possible, but despite that some of the expected participants were missing always. This was the reason why it was decided to use distant forms for the education.

From the methodological aspect it was pursued to embed the newest trends and knowledge from pedagogy and subject didactics (methodology of technical subject teaching) into the created model. At the same time there should be applied the state-of-the-art ICT technologies and reflected needs and requirements of both the society and industrial practice.

Although the chosen intention to put the model on the distant forms of education is in a good agreement with the above-mentioned proclamation regarding the methodological aspects of the created model, already the first steps of the implementation of the distance form into the use within the carried out training led to several problems. The most serious one was the finding that our initial prime idea to replace completely the face to face education and training by means of distant forms is not possible. In spite of our persistent effort, results of the carried out surveys point out a necessity to include also some parts of the face to face training into the compiled system. It was found out that participants of the training needs at the particular assignment programming not only the theoretical knowledge but also some skills which we are not able to ensure them in the distant way. The most serious problems have been motor skills development and imperative necessity to

connect together different components and apparatuses, to change and take away covers, to crimp connectors and so on.

For example, we have experiences that at pressing the reset button on the PLC systems very often the button has been damaged due to the use of beyond measure force. A separate chapter could be devoted to the issue of the distance education regarding the topic of the bus cabling production and connector crimping.

One of the very significant sociological aspects has been the personal meeting with the tutor (training lecturer/supervisor), who solved with the trainees (training participants) the subsequent problems through the electronic communication. The personal contact improved the quality of the communication. As the trainees expressed, this contact broke down barriers and asking a “stranger” various questions, they did not feel shame anymore to acknowledge in this way their study failures.

However, despite the presented problems, the distance forms have a wide spectrum of potential advantages, which could be not (or could be only very difficult and time-consuming) achieved through face to face training forms. To use of distance forms of education and training in the area of industrial practice offer the advantage of time and space asynchronism, low financial costs, it enables the trainees to go through the subject matter in their own pace etc.

So the final conclusion has been that the optimal model of the created further education and training for the target group of the employees has to be set on a distance form but it cannot be completely (100 %) distance form. It has to be done in a kind of a blended learning, with the use of some proportion of face to face carried out education and training added.

Final version of the proposed further education and training of the target group of the employees is presented in the scheme in figure 1.

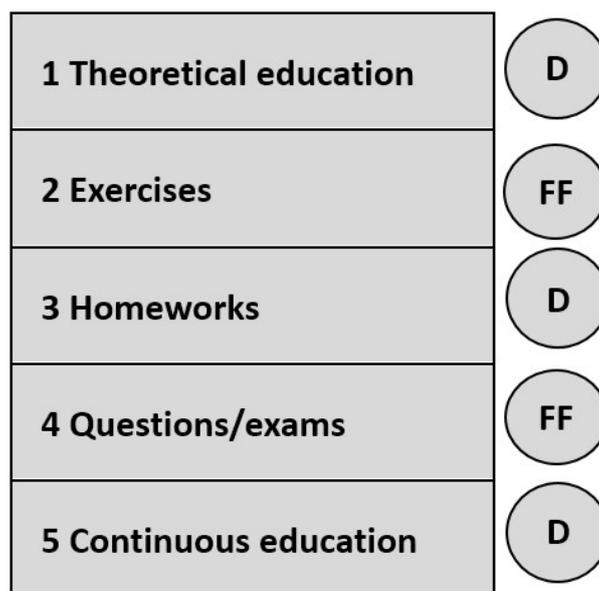


Figure 1 Model of the education and training tailor made for the selected group of the employees from industrial practice
 (D - distance form, FF – face to face form of education and training)

4 Model of the tailor made education and training

The final version of the proposed model of the further education and training of the employees (figure 1) consists of 5 modules.

The first module is a theoretical preparation of the participants (see the part *theoretical education* in figure 1). In this phase of the proposed model it is necessary the trainees become acquainted with the studied issue. The theoretical preparation can be done in both ways of education – either in the distance or face to face form. We decided to carry out this education through the distance form. This form was chosen because it is much easier, efficient and financially not so cost demanding to organize this form of education than the face to

face one. With the education portal support the trainees are to learn basic features, characteristics, specifications, principles and schemes of the particular components (equipment, apparatus, devices etc.). There are available for them various teaching materials (texts), video presentations, schemes, figures. Main goal of this phase is to make the trainees acquainted with the basic necessary knowledge, or to refresh the knowledge they already have had, or to refresh and broaden the previous knowledge, and in this way make them ready to deal with the subject issues. In this phase the advantages of the distance form of education are fully utilized – the education of the trainees is fully on them, they have it in their own hands. It is on them when and how long they will learn.

The second phase module are *exercises*. This phase is done completely in the face to face form. The exercises are carried out under the tutor personal supervision. The goal of the given (basic) exercises is to create a space for the trainees – the training participants to apply the acquired (basic) knowledge in particular selected schemes and connections, and at the same time to improve and develop their motor skills.

The basic exercises are the same for all trainees, regardless of their employee rating or job position in the company they work for. The exercises are focused on the basic connections of the PLC facilities and HMI panel programming. In this phase the trainees are to learn to connect low cost PLC units, to work with the Galileo software which is designated for HMI panels and to learn the standard commands and syntax of the Codesys program. The exercises are not specified and concretized to specific problems. They deal with basic schemes, connections and model situations which all participants are expected to be familiar with. They do not deal with particular problems which the trainees, in relation to their employee rating or job position, are facing to.

The third module consists of *homeworks* which are, altogether quite logically, carried out in the distance form. In the phase of this module the trainees are given assignments which they are expected to solve on their own at home. The assignments are focused (contrary to the basic exercises in the previous phase/module) on fully specified and concretized problems and tasks the trainees are in common facing in their work. This means that the trainees are given the assignments in dependence on their employee ratings and job positions. Another tasks are given to the programmers and another ones to line maintainers. The assignments are depending also on the company the trainee works for, i.e. they depend on the field of the company's activities – the branch the activities are aimed at. For example a programmer who is expected to program automated irrigation systems needs to solve different tasks than a programmer who works for electric power plants.

The issue of the assignments can be studied in the distance way due to the education portal support we had prepared. At the same time it is possible to consult the given assignments with the tutor in the electronic way, too, or the trainees can consult the arisen problems mutually. The chat forum is available at the portal, the trainees can contribute to the opened discussions there and the tutor can enter to these discussions with his advices, guidance, help or support.

The fourth module, *questions/exams*, represents a phase of the final training. The goal of the final training is to lead a common discussion of the trainees and the tutor focused on the problems which occurred during the previous phases, i.e. which the trainees had at learning the subject matter and solving either the basic tasks, or the homeworks or the assignments given to them. At the same time this is also a space to discuss different questions and specific problems derived from their work practice. This discussion is followed by a practical exam, during which the tutor watches how the particular trainees proceed and how they fulfil the given tasks.

The final, fifth, phase of the proposed model of the employee training is *continuous education*. This is carried out in the distance form with the aim to offer the particular trainees space and possibilities to learn missing knowledge and complete required knowledge/information, to communicate with the tutor on different professional topics, and to discuss and solve different specific tasks and problems derived from the everyday professional practice of the particular trainees.

5 Conclusion

In our case the first phase of the training done according the created model, the *theoretical education*, lasted two months, so that all participants had enough time and space to learn the subject matter in more detail. The phase started in March and finished in April 2018.

The second phase, *exercises*, lasted two months too. During these two months several common meetings of the trainees with the tutor were carried out – i.e. these were carried out from the beginning of May till the end of June 2018.

Duration of the third phase of the training, we carried out in accordance with the proposed model, was significantly longer, as it was necessary to ensure the participants to have enough time to complete themselves knowledge necessary to solve the given assignments and to deal repeatedly with different solutions so that they would come to the correct one. The given assignments of the *homeworks* represent complicated problems the employees are challenged in their everyday work performance, and they are time demanding in general – the solution of the given assignment is time demanding not only due to the possible need to look for the right solution repeatedly. The time offered the trainees to elaborated the given assignments, in our case, was from the beginning of July till the end of October (partially also with respect to the holiday period).

So currently we have finished the first four parts of the carried out professional education and training of the selected group of the EATON and its customers employees and there is waiting the next phase ahead of us, the final training – module *questions/exams*. Its realization is scheduled for December 2018.

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