TOWARD AN IMPROVED DUAL LEARNING AND LIFELONG LEARNING IN THE DEPARTMENT OF INDUSTRIAL ENGINEERING IN ZILINA

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Abstract

This paper deals with the improvement of the dual learning system in Department of industrial engineering at the University of Zilina (Slovakia). Dual learning brings individual support and guidance for young students and early preparation for a successful school-to-work transition. Also, on the other hand, this paper describes the lifelong learning for university teacher that leads to further education of university teachers of technical and economic focus and to share their skills and experiences (inspiration). The content of the modules of education is based on engineering pedagogy as defined by the European Association for Engineering Pedagogy (SEFI) and the International Society for Engineering Pedagogy (IGIP). The aim is to optimize the teaching methods of technical subjects, create curricula of technical programs in accordance with the requirements of practice, respect the rights and needs of students, use modern teaching resources etc.

Keywords: Dual learning, lifelong learning, Industrial engineering, improvement.

1 INTRODUCTION

Promoting lifelong learning focuses on the six key messages (Fig. 1) that make up a substantial part of the memorandum drawn up by the European Commission to create a coherent lifelong learning strategy in Europe. It is based on the idea of an inevitable need for lifelong learning, which is primarily aimed at promoting active citizenship (for example participation in all spheres of social and economic life) and promoting employment (for example the ability to secure and maintain employment).

Key messages of lifelong learning are:

**Key Message 1: New basic skills for all** - guarantee universal and continuing access to learning for gaining and renewing the skills needed for sustained participation in the knowledge society.

**Key Message 2: More investment in human resources** - Visibly raise levels of investment in human resources in order to place priority on Europe’s most important asset – its people.

![Taking Action on Lifelong Learning: Six Key Messages](image-url)
Key Message 3: Innovation in teaching and learning - Develop effective teaching and learning methods and contexts for the continuum of lifelong and lifewide learning

Key Message 4: Valuing learning - Significantly improve the ways in which learning participation and outcomes are understood and appreciated, particularly non-formal and informal learning.

Key Message 5: Rethinking guidance and counselling - ensure that everyone can easily access good quality information and advice about learning opportunities throughout Europe and throughout their lives.

Key Message 6: Bringing learning closer to home - provide lifelong learning opportunities as close to learners as possible, in their own communities and supported through ICT-based facilities wherever appropriate. [1]

This paper is structured in the form of five main sections, where demonstrated is the case study that focuses on the dual learning system in Department of industrial engineering at the University of Zilina (Slovakia). Introduction (section 1) establishes the scope, context and summarizes current understanding about the dual learning etc. In section 2 a detailed explanation of the methodology is given. The core is formed by case study (section 3) and results (section 4). Finally, a short summary and an outlook are given in the conclusion (section 5).

1.1 Dual learning

The current trend in Slovakia is to support dual learning, which enables students to complete the practical part of their teaching directly in the conditions of practice (in companies).

The dual learning system is unique in that it creates a partnership between the employer and the student, which is defined in the form of a learning agreement that regulates the rights and obligations of the parties in relation to the practical teaching of the students. [2], [3], [4]

Another important aspect of the dual learning system is the relationship between employer and university on a contractual basis, in the form of a dual learning contract, which governs, in particular, the scope, conditions and coordination of student’s training with the learning agreement, for example the coordination of theoretical and practical student’s teaching. The entire practical training is the responsibility of the employer, who simultaneously bears all the costs associated with its implementation. [5], [6], [7]

Practical training in the dual learning system is carried out at the workplace. The workplace of practical training is considered to be the organizational part of the employer or other area to which the employer has the right of ownership or the right of use and if it was also issued a certificate of the employer's ability to provide practical education in the dual learning system (referred to as the certificate). [8], [9], [10]

2 METHODOLOGY

Innovative approaches [11], [12] perceive traditional teaching methods as time-efficient but low effective from the point of view of sustainability, level of understanding. In contrast, problem situations simulate real life decision-making in them acquired skills can become part of the student's intuition. In practice with these adopted skills can work more effectively.

The lifelong learning [14] for university teacher leads to further education of university teachers of technical and economic focus and to share their skills and experiences (inspiration). They learnt use this process:

Introduction / Motivation:

- framing - naming the context of an activity, its linking e. g. with practice. Meaning is to motivate students to activity, to link activity to their own experience, creating a basis for the final discussion.
- through stories, examples, inducement, questions.

Instructions:

- In the instruction we clearly state the procedure and the time, the rules, what is forbidden, what we expect as the output.
In some activities, we sometimes use some time to organize the individual's thoughts (after the question we give time to individually write our own knowledge, summarize thoughts and then go into the subsequent discussion, work in the group.) The aim is to ensure the active participation of the individual and individual responsibility for work in group. Sometimes, on the contrary, working in a group can go into independent work. For each section, we report to the students an appropriate time. After entering the instruction, it is advisable to leave them room for their progress questions.

For each student, resp. for small groups, we can write instructions on special paper that they can have when completing a task before them. This will prevent them from interrupting their work in groups and asking the teacher constantly. At the same time, they have the ability to read instructions to assure themselves gradually and be more confident whether they are doing what is expected of them.

Output: we always tell students what output (product, answering questions, sketch, scheme, picture, project) we expect to have developed after the end of each activity phase.

Rules: we emphasize the respect of certain important conditions under which the activity takes place.

**Action:**

- The course of the activity itself.

**Reflection:**

- Every activity needs to be reflected [15], [16] because in many cases reflection is more important than the content of the activity itself.
- Teacher flexibly asks students, technique (process, feelings, knowledge, opportunities) can be helpful in helping them think about what they’re supposed to ask.

**Technique (process, feelings, knowledge, opportunities):**

- **Process** - questions simply serve to describe what really happened to describe the story. (Describe: How your situation was handled in your group?).
- **Feelings** - Questions focus on the feelings and impressions associated with the story. (What were your personal expectations / fears?).
- **Knowledge** - the questions reveal lessons learned from surviving situations. (What's new about this topic?)
- **Opportunities** - in the future - Questions will focus on the context of future behaviour, using knowledge in practice ("What do you think where you can apply this knowledge?").

The university teacher should think that the questions should be clear; enters them with ease; as far as possible, they formulate them neutrally, rather positive than negative (What do you think you have done? What could you improve? instead of: What do you think you made a mistake?). [17]

### 3 CASE STUDY – DUAL LEARNING IN SELECTED ORGANIZATION

Every year there is a university practice in industrial enterprises for students of the 1st year of engineering degree of the Department of Industrial Engineering of the University of Žilina. The main goal of the practice in the bearing manufacturing business was to scan production processes with a subsequent proposal to address the wastage that arises in the process. The partial objectives that were defined were the analysis of the workplace layout, the analysis of outages, the measurement of the cycle time, the calculation of the overall equipment efficiency. Dual training was attended by 21 students who were divided into teams.

On the first day it started with the presentation of the company, and the program continued with the introduction of a department that provided the organization with a practical and methodological approach. After the subsequent training, the students moved directly to the workplace where individual team leaders introduced the basic production line operation. Subsequently, the students began to process the steps by step.

In the following days, the program ran as follows:
• analysis of the production site and processing of the results on the flipchart, at the end of the
day of the evaluation of the results.

An important part of the day was the final feedback where the students presented what they had done
during the day and were further guided by what area to focus on the next day, how to search for
production improvement potentials.

On the last day, a meeting was held in the meeting room where the students presented the results of
their work.

4 RESULTS

The final presentation was also attended by management representatives from individual segments.
At the end of the whole dual education, the students received a certificate.

Top problems found by students, e.g. excessive grinding of the grinder, resulting in faulty parts, heavy
workload, inefficient use of repairers, obsolete equipment that reduces line productivity.

The anticipated contribution of high school practice in the company is reducing inefficiency, increasing
productivity, and increasing employee motivation. The next step is to cooperate with selected students
in the form of processing final works directly in the plant. This move is aimed at educating new young
professionals for the company. In the Fig. 2 are shown students within dual learning in selected
company.

Figure 2. Dual learning in company. [13]

The effectiveness of teaching can be assessed in terms of:
Time: needed to reach goals.

Energy: spent by the teacher or pupil to achieve the goals set.

Learning outcomes: Their adequacy in relation to energy and time.

However, research shows that in relation to the effectiveness of teaching, it is also possible to observe:

- the student's active activity in teaching,
- time: tells the teacher / tells the students.

In addition, other essential areas of student development need to be taken into account: not only intellectual but also personal development, thinking about the development of all students, their value system, tacit knowledge, but this cannot be immediately unambiguously measured.

5 CONCLUSIONS

Learning is an active process [18]; it cannot exist without the student's psychic activity being induced motivation. Motivation is a law but also a condition of proper learning. That is the exercise learning is given not only by the student's abilities but also by motivation. Especially internal motivation as a condition that forces an individual to do something, learn from their own beliefs. If they do not learn from their own beliefs but by the influence of external stimuli, we are talking about the outside motivation. It is less than internal but strong external motivation can through praise, reward, bias transform into inner. Strengths of dual learning are:

- Highly skilled workforce, a smooth transition from education to the labour market.
- Acquisition of qualifications and experience directly with the employer.
- Acquiring work habits directly in the manufacturing process with the employer.
- Teaching on new technologies directly with the employer.
- Employers' responsibility for the practical part of vocational training.
- The impact of employers on vocational training content.
- Up-to-date professional training programs and their content, flexibility in their editing.
- Verifying the graduate's knowledge and skills by the employer when completing their studies.
- Student chooses a profession and an employer to provide him with practical teaching.
- Choosing a student for dual education directly by the employer and taking a student to school with the consent of the employer.
- Supervision of employers' associations over the dual education system.
- Financial and material provision of the student by the employer.
- Close cooperation between company, school and student.
- Developing market-related professions.
- High probability of getting an employment contract with an employer.

Dual education opportunities are:

- Increasing employment of secondary school graduates.
- Opportunity for young people to get a good vocational training.
- Improving the level of professional competence and job morale of school leavers.
- Real work, social situations and the acquisition of "corporate culture".
- Choosing suitable graduates and employing them for your own business needs.
- Creating educational programs according to the needs and needs of employers.
- Strengthening the social status and attractiveness of technical professions - the status of "honest craft".
• Completion and strengthening of professional and professional organizations and centers of vocational education and training.
• Unification of content and difficulty of qualification exams, qualification levels.
• The interest of the state and the willingness of foreign chambers to support the development of dual education through their own experience.
• Increasing the competitiveness of enterprises and Slovakia.
• Through good examples, the gradual involvement of more employers in vocational education and training through the dual education system.
• Possibility of financing the transition to a dual system from EU structural funds.

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