

CASE STUDIES AND BEST PRACTICES IN GERMANY

Erasmus+ KA2 project: “REACT - Creation of a Collaborative Environment in e-classrooms”

Intellectual Output 2 “Creation of a set of innovative activities, tools and educational collaborative methods adapted to a virtual classroom curriculum”

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DIGITAL LEARNING SPACES IN INTER-COMPANY TRAINING - PROMOTING COLLABORATIVE LEARNING

INTRODUCTION

In the world of work, collaborative work and learning using digital media will play a central role in the future. How can young people be prepared for this as part of their training? At the Electro Technologies Centrum (etz), the concept »Inter-company Training 4.0« was developed, in which the principles of action orientation and self-control are supplemented by collaboration.

OVERVIEW

In the ETAEMA 4.0 project, the Electrical Technology Center identified how digitization affects the inter-company training of electronics technicians in the field of automation technology and electronics technicians in the field of machines and drive technology. The aim of the project was to integrate digitization-relevant learning content into inter-company training in order to promote collaborative learning and to develop a methodical and didactic approach.

The project is a special program of the BMBF and was supported by BIBB from 10-2016 to 06-2019. Responsible employees: Petra Gohlke (Head of Department at etz in Stuttgart) and Dr. Jürgen Jarosch (Managing Director at etz in Stuttgart.)

APPROACH

The digital transformation leads to a fundamental change in the technologies used in companies and intervenes deeply in the work of employees. The effects include activities, work equipment, place and time of work, work organization and, as a result, the qualification of employees (cf. Bauer/ Hofmann 2018, p. 3 ff.). The use of networked computers and mobile devices will become a matter of course, as will collaboration in virtual teams and the use of video and audio conferences, social networks and other applications that support collaborative work.

In addition to professional qualifications such as programming networked production and control systems, these are interdisciplinary thinking, recognizing and supporting innovations as well as enduring and promoting change (cf. Bauer/Hofmann 2018, p. 3 ff.), self-competence is becoming increasingly important, among other things for adapting to continuous changes in the world of work 4.0, and social skills for working in (virtual) teams.

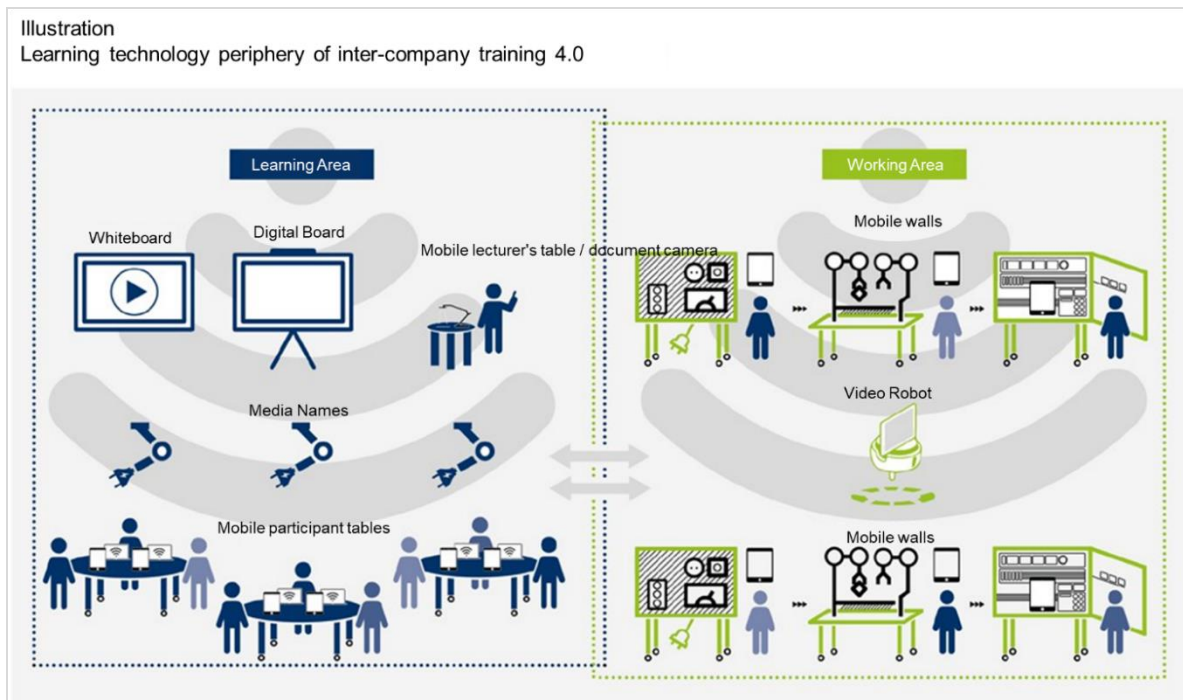
As part of a project funded by the BMBF, a concept was developed at the Electrical Technology Center (etz) that on the one hand integrates the digitization-relevant learning

content into the inter-company training and on the other hand offers the methodological-didactic foundations to promote these competences. This was implemented for the training occupations electronics technician specializing in automation technology and electronics technician for machines and drive technology for the courses of joint specialist education (focus 2nd year of training) and subject-specific specialist education (3rd/4th year of training). From a technical point of view, this means, for the two professions, among other things, that the trainees learn to set up and program networked production systems, to detect and eliminate faults and to be able to make remote access with mobile devices for this purpose. Due to these comprehensive requirements, the basic principles of action orientation and self-control are supplemented by collaboration in the design of the methodological-didactic concept »Inter-company Training 4.0«.

The »Inter-Company Training 4.0« is based on an interactive learning platform. This contains virtual customer orders for the inter-company courses within the framework of the training of the craft electrical and information technology professions, on the basis of which trainees learn in an action-oriented manner to analyze, plan, carry out and evaluate customer wishes. The concept of customer-order-oriented learning also focuses on the promotion of self-learning competence. When processing customer orders, trainees are enabled to identify their own need for learning/action, to set goals for action and to plan, implement and evaluate the procedures for working and learning. They design their learning processes successively and, depending on their learning progress and experience, self-directed by selecting learning and working methods as well as reflecting and controlling learning outcomes and processes.

Learning in the »Inter-Company Training 4.0« takes place very much with recourse to the learning community. Collaboration is therefore an essential principle in the learning process: This involves permanent, direct communication processes, the joint development of solutions, the sharing of knowledge and the use of collective competence within the framework of development and feedback processes. In the sense of »Collaborative Blended Learning« (Buchegger et al. 2007, p. 2), the trainees work in groups on learning tasks and solve predefined problems together. The learning scenario uses the virtual space by means of an online platform and simulation and the real space by means of a model structure and assembly wall. The joint development of learning outcomes, the associated promotion of collaboration skills and the methodological support of learners in the acquisition and transfer of experiential knowledge can be expected to add value – in the learning process itself, but also beyond, by preparing for real collaborative work processes in everyday business life. In order to support collaborative processes in the learning group, the concept created prerequisites on several levels: In addition to the use of collaborative methods of learning, the provision of suitable software tools for digital collaboration and the integration of digital media, the spatial conditions were also designed in such a way that collaboration is possible or promoted at any time.

The aim of the approach of »Inter-company Training 4.0« is to break up the classical concept of the training workshop as a more or less teacher-centered workshop with a frontal orientation (cf. Böhme 2009, p. 18). In order to locate the different learning activities in the »Inter-Company Training 4.0«, the space available in the workshops was divided into a »Learning Area« and a »Working Area« (see Fig., p. 32) in order to be able to better focus on the different interactions – from the moderation in the plenum on the topic of the week to the collaborative material calculation for a networked roller shutter system to short instructions on the real model – and to create adequate settings. It was avoided to separate the areas by barriers such as partition walls or furniture. For example, the learning area for learning phases such as the introduction of the learning week, the processing of online forms on behalf of the customer on the learning platform, Internet research or short theory units are always in connection with the working area in which assembly or programming work, system tests or measurements are carried out.



In order to be able to implement new settings at short notice, mobile, height-adjustable solutions were used to equip the learning area. This makes it possible to change the »architecture« of the space in just a few simple steps. Tables can be used while sitting and standing. The chairs can be used both at the tables, e.g. when working together on learning tasks, as well as in the working area during installation work in the control cabinet at the appropriate height. Trainers can thus conduct situational conversations with subgroups anywhere in the room. The change from teaching-centered work to collaborative learning sequences is possible and expressly desired at any time.

When designing the real models in the working area, model setups were developed in the form of control cabinets, which are pre-installed according to a standardized layout and can

be used flexibly for different customer orders. The installation walls are mobile, which allows a variable arrangement of the mounting structures. This means that different room configurations can be implemented in the working area for a learning module in electrical engineering than for a module in automation technology.

Laptops are used in the learning area, as the processing of online forms such as a material calculation or visit report on the learning platform requires a larger display and control via keyboard and mouse. For working in the working area, tablets are used, which make it possible to access content on the Internet or on the platform even in the practical phases. In addition, the camera function can be used to document the model systems that have been set up.

With the digital blackboard and the whiteboard in the learning area, it is possible to call up parallel views of different learning activities or learning outcomes using screen splitting. For digital collaborative learning sequences, the web conferencing function of the digital blackboard can be used. The results are visible to everyone on the presentation areas and can be supplemented at any time.

RESULTS

In the pilot phase, it became clear that in order to implement the new concept, the training staff must be intensively prepared for dealing with the media or learning technology so that the new methods bring the expected added value for the trainees in the learning process. The training courses for the training specialists also deal with the media-didactic dimension. Trainers must get to know new collaborative forms of learning, explore their potential and practice the new approaches. To this end, they must experience the new teaching media themselves in their didactic function and learn to combine individual elements in the learning scenario (spatial periphery, technology islands, learning technology, collaborative, real and virtual working methods) in a way that promotes learning.

For inter-company training in the above-mentioned training occupations, the learning content on the online training platform and the introductory training courses can be used. Ideally, additional internships should be carried out with trainers who have already gained experience with »Inter-Company Training 4.0«. In principle, it is conceivable that selected sequences will also be used by vocational schools and training companies in the course of learning location cooperation in order to support the integration of inter-company, subject-theoretical and in-company training in the digitization-relevant learning content.

Creates space for opportunity in which varied learning scenarios can be implemented.

CONCLUSIONS

1. Collaborative blended learning is the possibility for trainees/learners to solve learning tasks in groups and work together to develop predefined problems.
2. The joint development of learning outcomes, the associated promotion of collaboration skills and the methodological support of learners in the acquisition and transfer of experiential knowledge can be expected to add value – in the learning process itself, but also beyond, by preparing for real collaborative work processes in everyday business life.
3. Trainers must get to know new collaborative forms of learning, explore their potential and practice the new approaches. To this end, they must experience the new teaching media themselves in their didactic function and learn to combine individual elements in the learning scenario (spatial periphery, technology islands, learning technology, collaborative, real and virtual working methods) in a way that promotes learning.