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Work-based Learning in a Virtual Work Environment - the Future of Learning?

Abstract

Work-based Learning firmly stands for the idea that self-determined action and experiential learning are inseparably connected, if the learning here is understood in the sense of holistic competences development. The successful establishment of work-based forms of learning organisation remains somehow difficult at an organisational level, especially if the concept strives for an inclusion of learning at the place of work. From an international perspective, the vast number of TVET systems is for various reasons, school, college or university based and remains in traditional chalk-and-talk-mode addressing the input of knowledge, whether it may be relevant or not for the learner's future employment.

The article presents a didactical concept that integrates work-based learning, which is experiential and based on real work tasks comprising an input-based approach of E-learning, both combined fruitfully in a virtual work and learning environment. The final assessment of the participants is conducted by an independent and accredited certifying institution according to the regulations of the Advanced IT Training System (AITTS) and fully in compliance with ISO/IEC 17024 (personnel certification). This provides firm evidence there is no measurable difference in the degree of competence development compared to those, who underwent the program at their own in-company place of work. Although, this virtual concept at present only allows a few specific occupational profiles from the IT Sector to participate, in the light of continuously advancing information technology the concept itself may well point to a future path of work-based learning for those who have no direct access to real work.

Keywords*: work-based learning, work-integrated learning, web-based learning, virtual work and learning platform, experience-based learning, competence development,*

1 Introduction

Learning in work is the oldest and perhaps most natural form of learning for a profession. The place of work and the place of learning are inseparably connected. Action and learning form a unit that allows the individual to acquire competences in an objective-oriented manner. The serious character of real work enhances the validity of experiences, the degree of motivation, and the value of the learners´ performance in comparison to a social peer group, the Community of Practice (CoP), which gain an increasing importance for work-based learning in the context of progressing digitalization and through the learners´ participation in online communities (Henschel 2001; Müller 2002). Increasingly digitalized work environments, which are presently dynamically driven by the so-called Industry 4.0, represent a work environment with a subsequent change of work processes (Spöttl & Windelband 2017;

Gennrich 2017) that demands the use of virtual work environments and thus an enhanced exchange of knowledge within Communities of Practice. Knowledge, which is relevant to solving a problem occurring in the work process, needs to be shared and acquired horizontally between experts who don´t necessarily work for the same company, but who share the same interest.

As in the course of the past three decades several concepts had been developed and the term "work-related learning" became an umbrella term for different concepts of work-related learning organizations that are based on work-tasks and work-processes in vocational colleges and in-company place of work. The term work-based learning aims in most of its definitions at strengthening the aspect of including real work experience in formal vocational education, based on the fact that most technical and vocational training programs lack work experience and are too theoretical. Variants and models of work-based and work-related learning, such as work-integrated learning, work-connected learning, and work-oriented learning, can be distinguished from the criterion of the relationship between the place of learning and the place of work (Dehnbostel & Schröder 2017).

As through knowledge- and theory-based learning and training processes, only a part of professional action competence can be acquired, especially in further vocational education and training, informal and experience-based learning have increasingly gained importance in Germany (Dehnbostel 2007). Modern didactical concepts of work-based and work-integrated learning environments are based on action-theoretical approaches from work psychology (Hacker 1982; Volpert 1982; Frese & Zapf, 1994) and on experiential learning approaches (Dewey 1910, 1938). Donald Schön deepened Dewey's idea of learning from experience through reflexivity (Schön 1983). According to Schön, reflexivity is a dialogue between thought and action, which enables the practitioner to cope with his complex tasks and its inherent problems.

If the idea of learning through experience is being transferred into a comprehensive vocational learning organization, the sequence of planning - action - experience - reflection is essential. Based on work tasks and the planning of subsequent work processes in a participatory manner, learners act and learn self-determinedly. On the basis of self-activity and self-determination, competence is developed individually through experiential learning processes and its reflection (Schröder 2017). The learning facilitator has to consider in the design of the learning setting, what work task might be suitable according to the degree of competence, the learner already has acquired, and how to incorporate the world of work.

In the given case, Future Technologies for Expertise Development (FuTEx) is a virtual company in which information technology (IT) workers can obtain a qualification towards an IT specialist certificate. The qualification addresses jobseekers, who naturally do not have an in-company workplace as a precondition for work-based learning and therefore cannot participate in a regular qualification according to Advanced IT Training System (AITTS). FuTEx was conceptualized and implemented by the Federal Association for Information Technology, Telecommunications and New Media (BITKOM), in cooperation with training

providers. FuTEx is based on a virtual platform that provides a virtual work environment for the qualification of jobseekers according to the work-integrated method of AITTS. The German AITTS focuses on the development of professional competences through working experience. The individual working experience is enriched by a workplace which functions as a learning place and the real in-company job tasks which provide learning objectives. The main disadvantage of AITTS results from the exclusion of jobseekers, who are willing to undertake a qualification, but cannot earn a certificate, due to the lack of a workplace, which is a fundamental requirement of the certification. This article will address the theoretical basis of work process integrated learning environments, the regulative frame set by AITTS, the practical concept of FuTEx as a virtual work environment, and present final research results following completion of the qualifications. An earlier publication about FuTEx in the German language is based on interim results with respect to development and research.

Web-based learning environments are mostly based on classical behaviouristic concepts. The challenge and the main research question of the concept described in this article is how to establish an experience-based learning and work environment for action learning and competence development in a virtual work and learning environment.

2 The concept of Work-integrated Learning in a Virtual Place

Modern work-based and work-integrated education and training concepts are designed so that individual and corporate interests are both considered and workplaces are designed to be conducive to learning. Guiding dimensions for the improvement of a learning-conducive workplace design derive from industrial and organizational psychology. Work-based forms of learning, integrated directly into the operational workflow and combining formal learning with informal learning experience, are fundamental to the organization of work-integrated training programs. Through these learning forms, targeted competence development processes become achievable (Schröder 2009). The operational work infrastructure remains unaffected (Dehnbostel 2007) through the implementation of work-bound learning forms. Among the work-integrated learning forms introduced into in-company work, process-integrated learning in recent years, the learning bay, quality circle, adequate approaches of coaching, communities of practice, working and learning tasks, etc. are to be mentioned (Dehnbostel 2007). Working and learning tasks combine work and learning through the didactical expansion of real, operational tasks (Schröder 2009). The processing of the tasks is associated with a high degree of personal responsibility, self-determination, and self-monitoring on the part of the learner.

Work-based learning concepts include consulting and support. As part of the work-integrated training concept of the Advanced IT Training System (AITTS), the integral concept "facilitation of learning" was developed. In order to support this kind of processual learning, the help of a "learning facilitator" is essential in order to ensure effective and sustainable learning, reflection of practice, and, conversely, application of theory to practice. The facilitator advises learning towards the person of the learner and towards the actual

working/learning subjects. The facilitation of learning combines aspects of coaching and mentoring (Rohs & Käpplinger 2004). It aims at supporting individual targeted competence development, the careful combination of the operational work and learning infrastructure, and the reflection of informal and implicit learning outcomes (Dehnbostel 2010).

2.1 The German Advanced IT-Training System

The German AITTS was developed by various institutes of the Fraunhofer-Gesellschaft (which undertakes applied research of direct use to private and public enterprises and of wide benefit to society) under the auspices of the Ministry of Education and Research. Also, social partners in the German ICT industry were involved to monitor the process of development. The system is international by design – and not restricted to Germany with its own systems of education and training – as AITTS. Representatives of ministerial bodies and AITTS' stakeholder organizations have been involved with the consultation and establishment of a European Qualification Framework (EQF). AITTS represents Germany in e-skills policies on multi-stakeholder partnerships in Europe and is a reference point for the European e-Competence Framework.

AITTS takes into account the acquisition of skills through informal learning at work. The development of individuals' vocational competence is the focus of the final certification exam, which is carried out in accordance with DIN EN ISO/IEC 17024 (personnel certification).

At the specialist level, there are 14 information technology (IT) specialist profiles in five profile groups. Each profile defines requirements which consist of profile-typical work processes and competences (soft skills). Successful certification requires that the learner masters the work processes autonomously and has acquired the required competences (soft skills). As part of the FuTEx, IT specialist qualification requirements for the certification and the contents and processes of IT specialist profiles are to be considered conceptually (see Figure 1).

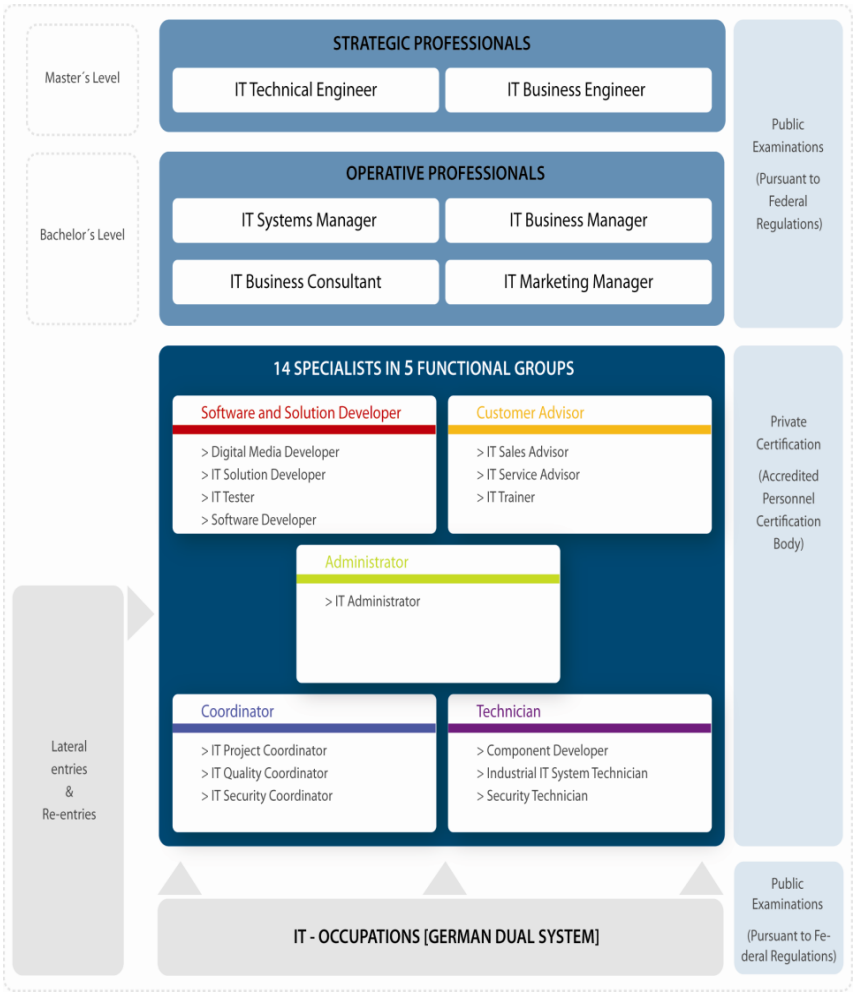

Figure 1: System of profiles and levels of AITTS

2.2 Future Technologies for Expertise Development (FuTEx)

FuTEx provides a virtual work environment for the further education of teams, consisting of several learners who learn through processing a real work task or project. This concept meets the requirements of AITTS, the certification authority and international standards. FuTEx links the participants of this concept for further education through digital media, who have to work and learn together but are located in different places. The virtual work environment becomes an "at distance" (remote) work and learning environment for linked learners. It is quite common for software developing projects to be realized by collaborators in geographically different locations. For example, the design of a software product and project management could be done in a company's headquarters in Europe, whilst the coding is done in a branch office in India.

FuTEx qualifications focus on job-seeking IT workers with professional experience. They have to meet the following requirements: (a) lack of up-to-date ICT qualifications, but experience in software development projects; (b) willingness and ability to learn new things, capacity for teamwork, willingness to work through networks, and interexchange of best

practice experiences; and (c) readiness to participate in remote learning with digital media in the home office.

The IT specialist profiles can be certified through learning by completing a software development project: Software Developer, IT-Tester, IT-Project Coordinator, and IT-Quality Coordinator.

2.3 Organisation of Work and Learning in a Work-integrated Virtual Learning

FuTEx qualifications follow a blended learning approach which combines classroom learning, remote learning, and learning in projects.

Therefore, there is a need of:

- Diverse studying techniques (e.g., classroom learning, informal or experience-based learning, individual learning, and learning in communities);
- Diverse teaching methods (e.g., a classroom setting and remote learning, different types of courses in virtual classrooms, such as seminars, exercises, oral presentations, exchange of experiences, etc.);
- Different learning media (traditional, e.g., textbooks, learned journals, etc.; digital, e.g., e-learning, computer- or Web- based business games, etc.);

Participants in FuTEx qualifications are assembled in learning and project groups. They are coequal in the working and learning processes; they are facing different learning objectives in their training and have different roles in an actual software developing project.

The participants are accompanied by a tutorial team which consists of a facilitator, a (technical) expert advisor, and a project director. The support of a facilitator includes individual coaching and support throughout the learning process of the participants and the cumulation of working and learning processes as well as the progress of training. The facilitator is the essential contact person for participants for issues concerning the learning process. He/she determines individual learning targets and learning methods, structures the training chronologically, and supports the participants in developing awareness of the learning outcomes through shared reflection.

The conceptual frame of FuTEx schedules communication between the facilitator and the participants on attendance days or through the various communication tools of the Learning Content Management System (LCMS) (e.g., chat, forum, virtual classroom, telephone, or video conference).

The (technical) expert advisor is chosen with regard to the content and the needs of the (qualification) project. He/she is the essential contact person for the participants on functional and technical issues and an expert in a certain discipline concerning project objectives. He/she assists the participants with problem solving during the work on the (qualification) project and supports them with the documentation of the project in order to prepare the certification process.

The project director has two roles in this context. He/she is an expert advisor for project management for participants who are working towards an "IT Project Coordinator" IT specialist profile. He/she also monitors and controls the progress of projects.

Participants work and learn in a home office, which should be designed in a manner conducive to learning. The educational institutions that provide a virtual learning and working infrastructure must meet the following requirements:

- Working and learning organization: ease of use, efficiency, usability, multivalent, and requirements-driven technical complementarity;
- Communication and cooperation by means of LCMS: Essential functions are telephone conference, chat, forums, e-mail function, who-is-online function, whiteboard, virtual meeting room with video conferencing, organizer function, "public documents" feature, and virtual classroom feature;
- Content/memory function: texts, curricula, learning modules, tools, with methodologically and didactically programmed content (e-learning tools), Web links, self-produced documents, and assessment materials.
- Database: administration, subscriber management, security, access permissions, storage and access of internally generated documents, reports, job results, photos, learning diary, etc..
- Software for the project work.

Central to the qualification are software development projects and real clients that need to be acquired by training providers. These should be "real" operational problems, which are invested with a real need. Projects must correspond in difficulty and complexity with the period of qualification and size of the learning team; meet qualification targets in their orientation, i.e., cover the work processes as described in IT specialist profiles; and be suitable with regard to data security, corporate security, and security classification.

The project owner should act during the project work as a customer, for example, during the order placement and the inspection of work results. Furthermore, the project owner should be available for consultation between the project manager of the project team and the expert advisor of the training provider.

2.4 The Process of the IT-Training in the Virtual Environment

The process of the FuTEx training consists of the following phases:

1. Educational institutions conduct the acquisition by addressing the Federal Employment Agency and companies;

2. Educational institutions use summative and formative tools for competence assessment to access the suitability of the participants;

3. The FuTEx training begins with a kick-off meeting at the learning agency, which is conducted by a learning facilitator (coach), to get to know one another and to establish a trust

relationship. As implementation continues, project teams and learning tandems are formed. Furthermore, participants are informed about the FuTEX training, the methods of the AITTS, the certification conditions, and the procedure and elements of work-based learning. Participants receive an introduction into the working and learning platform (LCMS) and define common rules of cooperation within the virtual room. Finally, individual learning agreements between the participants and the learning facilitator are developed and the suitable IT profiles for each participant are identified. The kick-off event lasts three days. Further meeting phases are established if required by the work process. Overall, the predominant share is remote learning (approximately 90-95%);

4. At the beginning of the training process, a formal training phase is required. In this phase, participants will receive the opportunity to engage intensively with the learning capabilities of the platform in the network and the software development tools. Other key content in this learning phase arises out of the nature of the project and, in the case of software development including IT fundamentals, project management, and marketing/sales. The duration of the learning phase can be between one and two months;

5. The structural basis of the project phase and the combination of work and informal learning in the virtual space are based on the sequence "planning-implementation-experience-reflection" as a result of the transfer of the working and learning task concept in the virtual space (Schröder 2009). The organization of the work process and the degree of informally acquired competences during the project phase derive from the nature and complexity of the project task. In practice, learning and project teams numbering five to six people have proven to be practical.

In the pilot, two different variants were developed and tested.

In Type 1, multiple project teams of five to six participants work at the same project task. The teams compete with each other. This version is suitable for project tasks of low complexity, so that a division of tasks is not possible (see Figure 2).

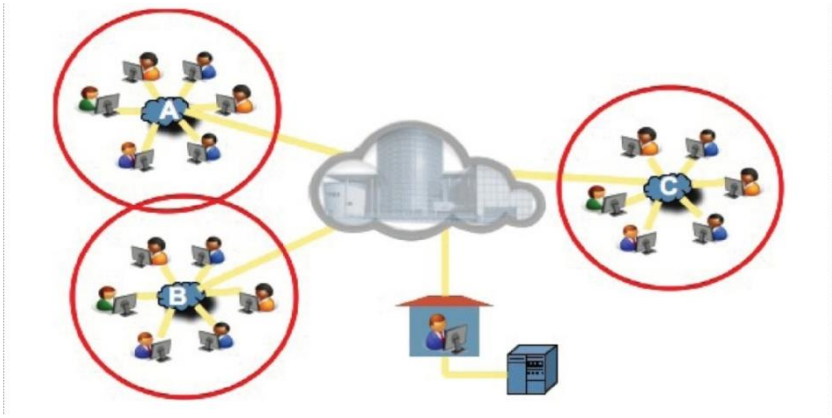

Figure 2: Model 1 - Small teams work on equal work tasks in competition or on different tasks with equal assistance structure (IT50PLUS 2008)

Type 2 is based on project assignments with a high degree of complexity that can be divided amongst several project teams (see Figure 3). This variant is characterized by an increased level of difficulty which requires extra effort in terms of coordination and consultation. The project teams handle the complex project task cooperatively. Each single team works on one part of the overall task. Their separate results are combined in a single overall result. This form of cooperation places higher demands on the IT project coordinators who have to cope with a higher degree of coordination and consultation. It transpires that this variant can serve to qualify two additional IT profiles: IT solutions developer and IT quality manager.

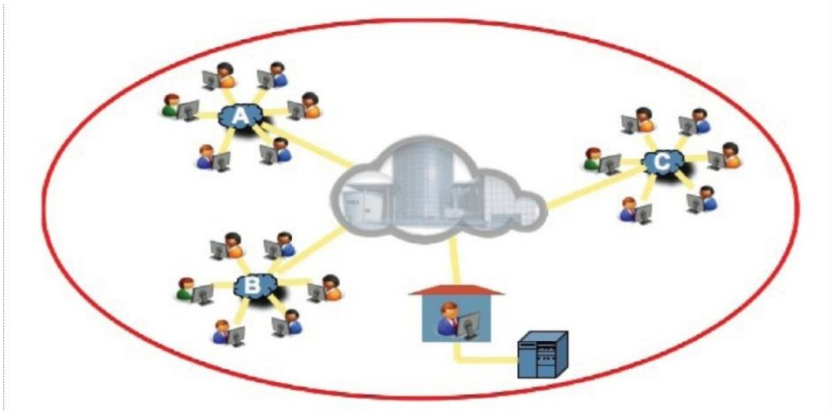

Figure 3: Model 2 - Work-sharing on a complex work task through three different teams (IT50PLUS 2008).

Training concludes with personnel certification under International Organization for Standardization (ISO) 17024. The certification exam is conducted by an independent and accredited certification body. The certification body evaluates the candidates, the fulfillment of their preconditions, and their individual work documentation. The test consists of a half-hour presentation and half-hour technical discussion, which has the function of verifying the plausibility of documentation. An important feature of this testing and certification is that theoretical knowledge is not queried, but the practical mastery of the defined work processes and process steps according to the IT specialist profile.

3 Conclusion and Outlook

The idea of conducting a work-based learning program based on experiential learning solely, aims in a direction that fundamentally breaks with the traditional understanding of learning. Moreover, the idea of aiming at competence development in terms of outcome-orientation as opposed to simply teaching knowledge, be it relevant or not, is still to the present day considered by the educational community not to be common sense.

The German IT sector, represented by the industry associations, the unions and government bodies, developed an AITTS, which is forward looking and incorporates work-based learning and the validation of informally acquired competences in one system. The IT sector, more than any other sector, has to cope with the dynamics of rapid technological development with

innovation cycles that increasingly become smaller. Most learning within the IT sector is informal per se and experience-based. Online communities replace the role of the experienced worker. The initiative to develop and operate FuTEx was based on a high demand for qualified IT specialists and the idea to offer a work-based program to the unemployed.

Additional efforts are necessary to develop concepts for those, who have no access to work-based learning, as there is no work place accessible. Particularly due to advancing IT technology it appears to be only a matter of time before it will be more than feasible to extend the concept of work-based learning in a virtual work environment to other sectors.

The above described FuTEx concept was evaluated by the Federal Association for Information Technology, Telecommunications and New Media (BITKOM) and the cooperating institutions. The main results of this evaluation are:

- In virtual work and learning spaces, a competency-oriented IT specialist qualification, which meets the requirements of AITTS, the certification authority and international standards, not only is possible, the results don´t differ from the outcome of classical work-based learning programs with a real in-company place of work;
- The processing of a real work task or project must be central to the qualification. The clients, who assign the project, are preferably to be involved in order to increase the relevance of the work;
- In addition to technical competence, social and personal competences, such as team skills, are developed;
- The qualification structure and its elements have proved feasible and practicable for the training provider and participants;
- Learning, project work, and communication in virtual networks can be achieved through the use of commercially available hardware and software, including freeware;
- The learning concept has been involved in all educational institutions as an economically viable product;
- Acceptance of the concept amongst participants was high. More restrained at the start of the measures, it increased significantly during the course of qualifications;
- Participation in the program with a recognized certificate significantly improved the chances of re-entry into the labor market.

The virtual work-based learning concept opens new avenues for job training and forms of lifelong learning in the workplace by means of digital media and blended learning. Through its work-based learning concept in a virtual work environment, the concept has pioneered a completely new approach for competence development in vocational training. It will be interesting to see, which route of development the educational sector will go under the impression of new technological and virtual opportunities.

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TVET@sia The Online Journal for Technical and Vocational Education and Training in Asia

CITATION:

Schröder. T. (2017). Work-Based Learning in a Virtual Work Environment – the Future of Learning? In: TVET@Asia, issue 9, 1-12. Online: http://www.tvet-online.asia/issue9/author_second_tvet9.pdf (retrieved 30.07.2017).

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