

Project studies integrated into the working processes of companies

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Abstract

In this paper, the concept of the project studies within the in-service master's programme "Professional IT-Business" is presented. The concept comprises several elements that enable and support learning in real working environments. Project and working-process-oriented teaching and learning formats that have been developed to strengthen the skills of the students are described. These teaching formats are applied in cooperation between third-level institutions and companies.

Keywords: project studies; in-service; reference process, didactic concept

1. Introduction

Project-oriented teaching and learning programmes (project studies) facilitate the development of the professional skills of the students. As a result, project studies are part of the curriculum in many different study programmes. Project studies are often executed within companies or in strong cooperation with companies (cf. Jung 2009, Kleuker & Thiesing 2011). The students experience real working environments and work in and control real projects. They have the opportunity to apply their knowledge and gain practical experience. The learning is thus shifted from an academic focus to real-world practical work and is more driven by professional demands. Learning within the work process places the emphasis on self-organisation and self-learning (Kruse 2009, Liebehenschel 2013).

Although several benefits motivate the use of project studies, the organisers of project studies meet different challenges that have to be overcome:

- How can project studies and learning be connected?
- How can it be proven that the learning targets have been met within the project?
- How can it be ensured that skills have been improved?
- How can the learning targets, tasks and skills that have to be achieved within the project be described, even though the individual projects might be totally different, e.g., with respect to the technology employed?
- How can the students be supported although they work in different projects with different companies?

In order to specifically support the occupational competence of students, an innovative concept for project studies courses was developed at the HTW Berlin within the framework of the in-service master's degree programme "Professional IT-Business". In the project study, students learn as part of the work process in real-world projects (practical projects) in (their own) companies. The students organise the learning-at-work themselves but receive extensive personal and technical support. A process-oriented curriculum, the so-called reference project, provides the structure of the project study. It serves as a model for the selection of the practical project, the planning of the working and learning processes, and also the proof of the successful completion of the project study. All processes of the reference project must be verifiably mastered by dealing with them, reflecting on them, and documenting them. In this article, the essential building blocks of this concept are presented.

This article is structured as follows: following a short introduction to the in-service master's programme "Professional IT-Business" and the "Project study" module, the didactic concept of this module is presented. This includes a) the reference project as a process-

oriented curriculum, b) the learning-at-work approach, and c) organisational and technical tools for supporting the students. A summary and outlook is given at the end of the article.

2. In-service master's programme "Professional IT-Business"

More than 13,000 students study at the University of Applied Sciences Berlin in 70 different degree programmes in the areas of technology, computing, business, culture, and design. Seven of the 70 degree programmes strongly focus on computer science.

2.1. The module "Project Studies" as part of the master's programme curriculum

The curriculum of the master's programme has been designed by professors of computer science in conjunction with members of several companies, e.g., IBM, SAP, and KPMG. In the master's programme, the students earn 90 credit points, 25 credit points each in the first and the fourth semester and 20 credit points each in the second and third semester.

The courses "Cloud computing", "Analytics", and "Requirements engineering and change management" are conducted in the first semester. The course "Analytics" presents the basics for the course "Project studies I". In this course, a project focused on analytics has to be completed in the students' companies. The courses "Mobile computing" and "Enterprise architecture management" are held in the second semester. The course "Project studies II" is focused on systems design. The third semester comprises courses in "IT security" and "IT controlling". The last is also main content of "Project studies III". The students write their master's thesis in the fourth semester, supported by a master's seminar. Besides the technical and professional focus of the project studies, the students also strengthen their social skills. Project studies I is focused on strengthening the ability to communicate, in the second semester the students practice their leadership abilities, and in the third semester the project studies are focused on strengthening the skills necessary for negotiating and sales.

For the "Project studies" course, the students need attend the university of applied science only for the introductory event, the interim presentation, and the final presentation. All the work for the project studies is done at the students' companies.

2.2. Learning in conjunction with employment

In order to enter the programme, applicants must have at least one year of professional experience following their bachelor's degree. The master's programme is conducted in conjunction with employment. That means that the students work in their companies from Monday to Thursday and take their courses at the university of applied science on Fridays and Saturdays. The students' work load is very high, with 1125 hours per year.

This work load cannot be carried out without the support of the companies. The companies not only pay the study fees (currently €16,500), but also enable the students to accomplish their studies by allowing enough time for studying and placing the students in suitable

projects. As the students would be unable to accomplish their studies without the support of the companies, the companies are committed to the programme by contract.

3. Didactic concept of the project studies course

The didactic concept of the project studies course includes learning and project work that are integrated into companies' real work processes and real projects; it is process and practice oriented. This course concept builds on the concept of work-process-oriented further education and is an example of process-oriented further education in conjunction with companies (cf. Fuchs-Kittowski et al. (2001)).

The following aspects were developed in order to systematise and support the learning process as part of the work process in real projects: a) process-oriented curricula (reference projects), b) a strategy for learning as part of the work process, and c) organisational and technical tools to support the students.

3.1. Work processes as learning content (reference project as a curriculum)

The central component of the didactic concept is the process-oriented curriculum. The learning content is not defined according to subject classification, but rather on the basis of work processes. This places the emphasis on competence instead of knowledge, makes the link with practical work, and ensures comparability.

Reference projects were developed as process-oriented curricula for each semester or profile of the project study (data analyst, EA manager, IT controller). The reference projects constitute typical projects at a relatively high level of abstraction for each profile based on the characteristic work processes (or reference processes) of that profile. These reference processes consist of all practically-relevant tasks typical for a given profile performed in a typical order. Each task in the reference process is further detailed as sub-processes. The required skills, knowledge, and tools are described on this most detailed level of the workflow.

3.2. Learning in real work processes

The students learn in real-life on-going projects (practical projects), i.e., in the day-to-day work context with appropriate practical requirements. The process-oriented curricula (reference projects) are used as concrete syllabi for the projects and define the mandatory learning outcomes for each profile. They serve as the model for a) the selection of the practical project, b) the planning, execution, and evaluation of the working and learning processes in the project, and c) the proof of the successful completion of the project study.

- a) The reference project is the *benchmark for the practical project* on which the participants base their project studies. The practical project must satisfy the reference project, i.e., be sufficiently similar to the reference project to be approved for the course.
- b) The reference project provides the *structure for all the learning and work* in the practical project. In the course of a practical project, students must prepare, execute, and evaluate every task, where a task can be, for example, a sub-process of the reference process.
 - *Preparation:* The students plan the task or sub-process, reflect on their relevant experience, and independently acquire any lacking knowledge insofar as possible in advance. The reference processes help with planning by making the work processes easier to anticipate, plan for, understand, and manage.
 - *Execution:* During the work process, the students independently acquire any other necessary knowledge that was not anticipated in advance.
 - *Evaluation:* After completing the task, the students reflect on and document what they have learned, thereby securing the knowledge. The documentation and the reflexive discussion are the central means of securing the work and learning experience as well as generalising the knowledge gained during the project.
- c) The reference project establishes mandatory learning outcomes for each profile, i.e., all sub-processes of the reference project must be verifiably mastered by dealing with them, reflecting on them, and documenting them. In this way, the ability to successfully carry out a real project and acquire the necessary knowledge and skills is assessed. The specific learning content is determined by the actual project (and the prior knowledge of the participant); however, the reference projects determine the level, complexity, and scope of the abilities and skills to be gained in the undertaking.

4. Organizational and technical support

The students are given support with regard to content (seminars), personnel (roles), and technical aspects (e-learning environment) in their self-regulated working and learning process.

In terms of *content*, the students are supported by a classic taught course (lectures and exercises) offered in parallel to the project study. In this course, specialised knowledge relevant to the profile of the upcoming project (data analyst, EA manager, IT controller) is presented (for data analyst cf. Chapman et.al. 2000).

Various *personnel* with different roles are available to the students both at the university of applied science and in the company:

- *Expert advisors* are available for special, subject-specific questions.
- *Learning process tutors* support the learning process and perform the reflexive discussions with the students.
- *Organisers* are responsible for the smooth running of the project. This includes the administration of technical support.
- Problems and experiences can be exchanged with *colleagues* and other students.
- *Superiors* provide working conditions that promote learning (especially by creating the time and space for learning processes) and an appropriate learning culture (by encouraging openness among the employees and a willingness to pass on knowledge) in the company.

Technical support for all participants is currently offered via a learning and communication platform (Moodle) to:

- support *individual learning* (self-study) by providing materials and learning content,
- support *communication* between participants with the aim of joining individual and collaborative learning (e.g., discussion forums),
- support the *exchange of information* through the mutual provision of activity records (project sketches, project plans, presentations, and documentation).

5. Procedure, regulations and evidence

The “Project studies” course runs for the entire semester, thus for 6 months, beginning with an introductory event. The students and their supervisors at the company are aware of the format of the course beforehand and, therefore, try to find an appropriate project before the course starts officially. In the introductory course, the learning process tutors inform the students about the content and aim of the project studies. In particular, the tutors present the didactic concept and the corresponding reference project and processes in detail.

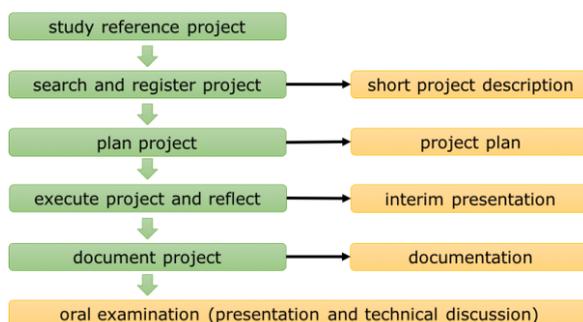


Figure 2. Procedure, regulations, and evidence

A month after the start of the course, the students deliver a short account of their projects including the project goal and a description of the organisational and professional environment in which the project will take place. Another month later, the students have to provide a project planning document containing the mile stones of the project. The students receive templates for the project description and the planning document from the tutors. The project plan must be based on the reference process for the project.

The students report on their experiences in an interim presentation and a reflexive discussion, which takes places about 2.5 months into the semester. In this way, problems in the learning and work process can be identified and solved at an early stage. However, above all, the students should be aware of their abilities as well as the gaps in their knowledge.

After this, the documentation is continuously expanded. When completed, the documentation is submitted as a basis for the examination (after approximately 5.5 months). The documentation is evaluated by the examiners with respect to the processes of the reference project and the expertise that should have been acquired (key situations also play a role here). If the documentation is evaluated positively (80% of the reference processes are completed successfully and evidence for 80% of the expertise is present), an oral examination is approved.

In the oral exam, students present their projects with regard to the most important processes and key situations, and the expertise they have gained as a result. In the second part of the exam, the documentation and presentation are orally reviewed and if necessary, the student can be questioned about expertise that is deemed to be missing.

6. Summary and outlook

In this article, the concept of the project study in an in-service master's IT programme has been presented. The aim of project study is the acquisition and promotion of occupational competence. Integrated working and learning takes place as part of real projects; these projects are process-oriented (learning as part of the work process), experience-guided (work itself is something to learn from and reflect on), self-regulated (the students regulate their own learning process with supervision), and participant-oriented (the workflow is different for each individual project, but the learning content is not random or arbitrary).

Students in the course learn as part of the work process in real projects (practical projects) in (their) companies. The students organise the learning-at-work themselves but receive extensive instructional, personal and technical support. A process-oriented curriculum, or reference project, provides the structure of the project study. It serves as a model for the selection of the practical project, the planning of the working and learning processes, and also the proof of the successful completion of the project study. All processes of the reference project must be verifiably mastered by dealing with them, reflecting on them, and documenting them.

Using reference projects as curricula is one of the fundamental ideas of the concept of the course. The process-oriented structure offers major advantages: as the processes are relatively fixed, they provide a common thread through dynamic technical and technological change. Due to the fact that the reference processes and sub-processes are modelled relatively abstractly and the skills and expertise are formulated on the meta level, many different forms of professional and entrepreneurial projects are possible. For the project study, real projects can be identified using the reference processes, which, despite having individual characteristics, contain general, comparable requirements.

The students are given a uniform approach to projects that can otherwise be very different, both technologically and organisationally. This allows students to more easily exchange information and ideas with each other. It also gives students the framework in which to reflect on their own activities, thereby supporting the development of diverse skills. Last but not least, the process-oriented structure allows an objective assessment of the projects up to certification by appropriate certification bodies.

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