

Facing the upcoming challenges in vocational training with mobile learning

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Introduction

Project MLS - Mobile Learning in Smart Factories

- 3 years, 2 partners:
 - VDW-Nachwuchsstiftung (Youth development in mechanical engineering)
 - University of Paderborn
- Research group: Computer Science in Education

Vocational education and training in Germany begins with an apprenticeship in the dual education system. It takes place in the



enterprise

and



vocational schools.

See BMBF (2014b).

Apprenticeship in mechanical engineering

- Apprentices are mainly satisfied. Only 8.5 percent of them abandon their apprenticeship (BMBF, 2014a).
- The demand on **apprentices** increased due to the pace of innovation. Apprentices have to gain competencies to apply their knowledge to new situations and to acquire the ability to self-study (VDW-Nachwuchsstiftung, 2012).
- The changes also affect **trainers** in the enterprise. They continuously have to verify the current apprenticeship concept. Trainers have to change their role of craftsmen to learning coaches. They have to realize a project- and process-oriented apprenticeship (VDW-Nachwuchsstiftung, 2012).

Project objectives

- "The development of a **context-sensitive mobile application for learning and working** [...] to initialize sustainable learning" (BMBF, n.d.).
- Apprentices** will be enabled to **obtain new competencies** in the working process and to **reflect** their state of learning.
- Trainers** will be enabled to enhance their **media competency** and to **integrate digital media** into the daily work routine

Project plan

- Figure 1 shows the project plan. The project is in the initial phase. We started first observations to identify use cases for possible learning scenarios and optimal applications of the software.

Application features

Figure 2 shows a draft of the GUI. Some features will be:

- Contextual learning modules** and training videos
- Didactically prepared **work-based learning tasks** with option to control the state of learning
- Didactically prepared protocol for each task
- Voice, image, and **video recording**
- Digital manuals** related to machine types & controllers
- Virtual workspaces
- Secure data exchange and storage in a private cloud
- Cloud search function
- Professional dictionary



Figure 2: Graphical user interface (draft)

Workshop development

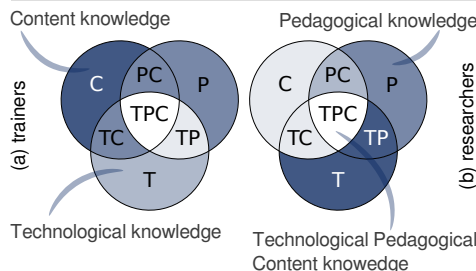


Figure 3: Application of the TPACK model: Suspected knowledge fields of trainers and researchers

- TPCK "is the basis of good teaching with technology" (Mishra & Koehler, 2006).
- Application of TPACK. T: Media literacy and technology
- P: Didactics, C: Mechanical engineering
- Figure 3 shows the suspected knowledge fields of trainers and the researchers.
- **Collaboration** is highly recommended

Context sensitivity



Figure 4: Milling machine with QR code

Image: [img-M, edited]

Apprentices

- Registration** (apprenticeship year, personal data)
- Optional placement test**
 - Learning recommendations
- Workplace**
 - QR codes** on machines (see Figure 4)
 - Topics for type of machine and machine control

Current state and results

- Initial meeting with participants from project partners, schools, and industry
- Comparison of software frameworks and hardware,
- Observations at 2 vocational schools and 1 company
 - Apprentices mostly do not use computers at their workspace. They had 3-5 sheets of paper
 - Idea: Use animations/videos to show wrong machine settings and breaking material
 - Idea: Use tablets for telephony and video recording, if machine is broken and support is needed
 - Privacy issues are important contents for workshops
 - Display remaining time for tasks
 - Possibility to examine, if tasks have been done

Future work

Requirements engineering

- Continue the **observations** at 1 new vocational school and 3 remaining apprenticeship companies
- Start interviews** with trainers to collect interests and knowledge gaps in computer science topics
- Conception and refinement of workshop contents

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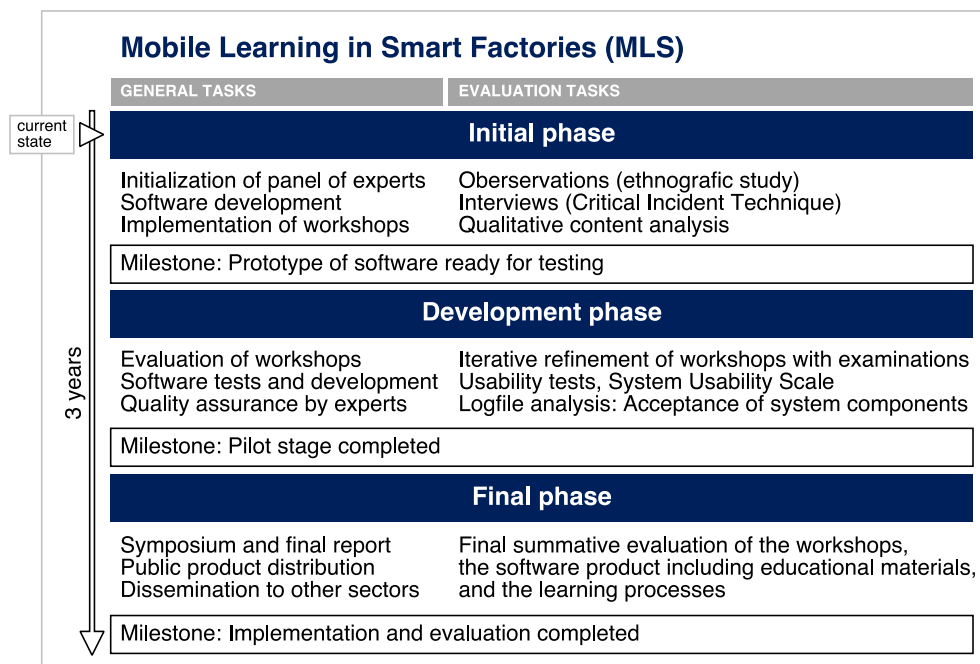


Figure 1: MLS project phases and task overview