Arguments for Contextual Teaching with Learning Fields in Vocational IT Schools – Results of an Interview Study among IT and CS Training Companies

Simone Opel and Torsten Brinda

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Students’ Ways after Graduation from School

- Vocational Education: 551,272 (56%)
- University: 426,206 (44%)
Germany’s Vocational School System

Full-time vocational schools

2 – 3 years,
Final examination approved by the state
E.g. technical assistant for IT/CS

“Duale Berufsausbildung” (dual vocational education and training):
Part-time vocational school and training at a company

• 2 – 3.5 years, final examination by the chamber of industry and commerce
• Different models of school attendance
• Apprentices are employees of their training companies
• Cooperation between training company and vocational school
  • Regular meetings between all partners of learning venue cooperation
  • Training companies get information about school grades of their apprentices
• Aim of apprenticeship:
  Connection between theoretical knowledge and individual working experience
Full-time vocational school

2 – 3 years
Final examination approved by the chamber of industry and commerce
E.g. technical assistant for metalworking

“Duale Berufsausbildung” (dual vocational education and training):
Part-time vocational school and training at a company

- 2 – 3.5 years, final examination by the chamber of industry and commerce
- Different models of school attendance
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Curricula of vocational IT and CS education demand:

- Open teaching methods
- Interdisciplinary collaborative teaching and learning
- Activity-oriented lessons
- Contextualised teaching
Consequence:

- Aims are described as competencies students should gain
- Curriculum consists of “learning fields” – “Lernfelder” instead of different subjects
“Learning fields are topical units, which contain didactically reduced business and working processes. They define several competencies the students should gain.” [KMK]
Business and Working Processes
Curriculum: Learning Fields
Learning field
Application development and programming

Aims:
The students are capable to analyse, design, implement and programme complex application systems. They design didactically reduced applications methodically and appropriately. They reflect on their approach and provide aspects of quality assurance. They apply methods of software development and implement applications based on known algorithms and data structures by using software development tools. They are enabled to reflect their strategies.

Content:

*Development of application systems*
- Model of project management
- Development strategies and action models for software engineering
- Methods and procedures of quality assurance
- Methods of actual analysis of business processes and IT systems
- Methods and tools for developing solution concepts and documentation

*Methods of programme development*
- Basic algorithms and data structures
- Structuring and documentation
Curriculum: Learning Fields

Implementation by Teachers

Learning Situation
Learning Situation
Learning Situation
Teachers do not put the Idea into Practice

- Lessons often follow the principle of traditional subjects
- Less usage of activity-oriented forms of teaching
Support for motivated teachers by …

- Development of a suitable competence model
- Development of
  - Examples and related teaching material
  - Guidelines for suitable learning situations
- Training the teachers how to develop learning situations on their own
Questions of the Latest Study

What are **typical working processes** in the field of IT and CS for an IT specialist?

How are the apprentices integrated into these processes?

Where are the **links** between **vocational schools** and **training companies**?
Semi-structured guideline interviews with certified trainers of training companies for IT specialists

Approximately 1 hour each
Voice recorded

Companies were recommended by:
Teachers,
the chamber of industry and commerce
or well-known for their excellent training
Participants:

- IT System House
- Local Internet Service Provider
- Manufacturer of Optical Devices
- Building Authority

Automotive Part Supplier
- Insurance Company (+ former apprentices)
- University Data Processing Centre
- Telecommunication Company

At least 10 Apprentices
Only 1 or 2 Apprentices
Degree of formalisation is not a quality feature!
Only 1 or 2 Apprentices
• IT System House
• Local Internet Service Provider
• Manufacturer of Optical Devices
• Building Authority

Only 1 or 2 Apprentices

• Basic instruction in important working methods
• After that: learning by training on the job
• No existing schedule to specify the competencies to be gained in which by training
• No training of personal, personal competencies
• Apprentices
• Basic instruction in important working methods

• After that: learning by training on the job

• No existing schedule to specify the competencies to be gained in which period of training

• No training of personal, methodical or social competencies

• Apprentices become specialists in the whole company’s IT and CS tasks
At least 10 Apprentices
• Automotive Part Supplier

• Insurance Company (+ former apprentices)

• University Data Processing Centre

• Telecommunication Company
• **First period of training:** apprentices were assigned to attend courses about different topics

• **Detailed schedule to specify the respective department the apprentice has to work**

• **Apprentices mostly work in pairs**

• **Tasks were assigned depending on previous knowledge and current period of training**

• **Assessments of apprentices and trainers after each period**

• **Third year of training:** Examination project, mostly at the department they will finally stay

• **Reproducible and formal training**
Degree of formalisation is not a quality feature!
Apprenticeship
Competencies which should be brought along
Competencies which should be brought along

- Previous internship and informatics at school recommended
- Motivation and interest to learn
- Ability to work independently
- No specific CS or IT skills
- Friendly attitude towards colleagues and customers
Competencies to be gained
Methodical competencies (information research, presentation skills, documentation)
Personal competencies and personal development
Problems in Apprenticeship
Increasing unpunctuality and discourtesy

General lack of perseverance in dealing with difficult problems
Cooperation between Vocational School and Training Company
Cooperation between Vocational School and Training Company

- Trainers are mostly satisfied
- Companies are interested in more detailed information about the schedule at school
- Vocational school should teach essential IT/CS concepts
- Companies as experts for their needs
Apprenticeship

Competencies to be gained

Problems in Apprenticeship

- Increasing unpredictability and discontinuity
- General lack of perseverance in dealing with difficult problems

Competencies which should be brought along

- Previous internship and experience at school recommended
- Motivation and interest to learn
- Ability to work independently
- Friendly attitude towards colleagues and customers
- No specific CS or IT skills

Cooperation between Vocational School and Training Company

- Vocational school should adapt to the needs of industry
- Companies as experts for their needs
- Trainers are mostly satisfied
- Cooperation is mostly positive and productive
Reported Working Processes
Planning, Documenting and Accounting an Application Development Project

Implementation of Project Plans into Functional Software

Application Development for Different Departments

Modelling Business Processes by Using IT Infrastructure
A new Working Place for an Employee

Maintenance of Telephone Systems

Installation and Configuration of Telephone and Broadband Connection

Installing new Software Versions

Installation and Support of Customer IT Solutions

Installation, Maintenance and Support of Servers

Customer Advisory Service

User Help Desk
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<tr>
<th><strong>Learning field - number</strong></th>
<th>1</th>
<th>2</th>
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<tr>
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<td>d</td>
<td>b</td>
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<td>Application development for collection department or accounting department</td>
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<td>Planning, documenting and accounting an application development project</td>
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<td>Implementation of project plans into functional software.</td>
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**Main topic of the respective working process**

**Alternate topic of the working process**

a: **Main learning objective:** Apprentice/student has to deal actively with the problem to learn the topics of the learning field
b: Apprentice/student uses mainly previous knowledge from the respective learning field to deal actively with the problem
c: Apprentice/student uses previous knowledge as background for decision making processes
d: Apprentice/student uses the knowledge from the learning field implicitly
Consequences for Prospective Learning Situations and Further Work
Consequences for Prospective Learning Situations and Further Work

- Learning situations should teach basic technical knowledge and selected topics to gain deeper understanding and skills.
- Each learning situation should be connected to a working process.
- Revision of the Curriculum / Learning Fields is recommended.
- Only less teacher-oriented instruction should be used.
- Each learning situation should contain documenting work and creating manuals.
- One working process can contain several learning situations.
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