Filling Skills Gaps in Blue Industry by Radical Competence Boost in Engineering VET

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RADICAL
Filling Skills Gaps in Blue Industry
by Radical Competence Boost in Engineering VET

Experiences with traditional and novel approaches in dual engineering studies

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UAS Hannover – a diverse university with strong technical focus

- Faculty I  Electrical Engineering and Information Technology
- Faculty II  Mechanical and Bio Process Engineering
- Faculty III  Media, Information and Design
- Faculty IV  Economics and Computer Science
- Faculty V  Diaconia, health, social affairs

UAS Hannover – about 10,000 students

Faculty II has almost 35 years "dual study" experience
- starting in 1985 with the dual study course "Production Engineering"
- up to now approx. 900 dual graduates
- currently 40 regional cooperation companies per semester
- approx. 70-80 freshmen per year (since winter semester 2005)
## Organisation of studies in cooperation with industry

<table>
<thead>
<tr>
<th>Form of Industrial training</th>
<th>Organisation of cooperation</th>
</tr>
</thead>
<tbody>
<tr>
<td>apprenticeship-integration</td>
<td>weekly interlinkage</td>
</tr>
<tr>
<td></td>
<td>block model</td>
</tr>
<tr>
<td></td>
<td>internship/apprenticeship semesters</td>
</tr>
<tr>
<td>practice-integration</td>
<td>no dual study (usually only practical phases without reference to curriculum)</td>
</tr>
</tbody>
</table>

- **University of Applied Science Hannover**
- **e.g. BachelorPlus Cooperative State University Baden-Württemberg Heidenheim**
- **e.g. „hochschule dual“ in Bavaria**
- **University of Applied Science Hannover**
- **e.g. University of Applied Science Bielefeld**
- **e.g. Hamburg University of Applied Science**
Synergies generated by different learning locations

→ Learning units and locations are closely linked

- theoretical knowledge
- methodological competence
- Bachelor degree (after 3.5 years)

- professional competence
- company-specific product and process know-how
- social competence (soft skills)

- craftsmanship
- Chamber of Commerce (IHK) diploma (after 2 years)

- matched content
- apprentice-ship

- reduced vocational school time (- 70 %!)
- additional theory (practice-oriented)

- projects, events

- joint curriculum

- common advisory board

- vocational school

source: Przywara (2014)
The Hannover model of cooperative studies

Available programmes: Machine design, Production engineering, Business Engineering (Technical Sales) (B.Eng., 210 CP); Value chain management in mechanical engineering (M.Eng., 90 CP)

1st part

<table>
<thead>
<tr>
<th>Sem.</th>
<th>Bachelor of Engineering 1st part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Studies: 3 days p/w (term time); vocational school (total of 100 hrs. on selected Fridays)</td>
</tr>
<tr>
<td>2</td>
<td>Apprenticeship: 3 days p/w (term time); fulltime (semester breaks), integrated projects; IHK (Chamber of Commerce) diploma</td>
</tr>
<tr>
<td>3</td>
<td>Studies: 5 days per week (term time)</td>
</tr>
<tr>
<td>4</td>
<td>Work: fulltime (semester breaks), integrated projects</td>
</tr>
<tr>
<td>5</td>
<td>Bachelor thesis in cooperating firm</td>
</tr>
<tr>
<td>6</td>
<td>Master thesis in cooperating firm</td>
</tr>
</tbody>
</table>

2nd part

<table>
<thead>
<tr>
<th>Sem.</th>
<th>Master of Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Studies: 3 days per week (term time)</td>
</tr>
<tr>
<td>8</td>
<td>Work: 3 days per week (term time), fulltime (semester breaks), projects</td>
</tr>
</tbody>
</table>

→ Sophisticated organisation, which places high demands on all partners

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Student workload in semesters 1-4

Total workload is at the upper feasible level

Source: Przywara (2014)
# Results – success indicators

<table>
<thead>
<tr>
<th>Indicator *</th>
<th>Study path</th>
<th>cooperative (dual)</th>
<th>traditional (non-dual)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average duration of studies (semesters)</td>
<td>7.4</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td>Graduation rate (total non-dropouts)</td>
<td>&gt; 85 %</td>
<td>~ 60 %</td>
<td></td>
</tr>
<tr>
<td>Immediate employability of graduates</td>
<td>100 %</td>
<td>80-90 %</td>
<td></td>
</tr>
</tbody>
</table>

* Mean values of all Bachelor courses in mechanical engineering at HsH since 2005

→ Cooperative study programs clearly outperform traditional study programs
Key success factors

- Close cooperation with industry
  - Students are constantly supervised by companies.
  - The organization of dual study assures stable learning conditions in fixed structures.
  - Industrial partners act as supportive and normative authorities.
  - Students are chosen by the companies (about 10% of the applicants).

- Improved learning conditions
  - Students are focused on their studies (no financial pressure)
  - Students form a cohesive and competitive work group.
  - Theory is easily absorbed in a practical content. Link of theory and practical experience forms qualified graduates.
  - Practice is answering theoretical topics.

→ Main Factor: Students are carefully chosen, guided and educated
Dual student numbers reflect the labour market demand

- freshmen
- participating companies

Slump of student numbers in mechatronics

Financial crisis

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Reasons for slump in mechatronics and actions taken

- **Reasons**
  - technical contents
    - digitalization implies more need on information technology contents
    - study program at that time with too strong focus on production
  - more competition by dual private universities
  - development-oriented companies have less interest in apprenticeship (IHK-diploma)
  - some companies are afraid of organizing the weekly interlinkage of university and company attendance

- **Actions**
  - significant increase in information technology share
  - change of university/company attendance model to semester by semester change
  - new study model with or without vocational training
# New mechatronics study model

<table>
<thead>
<tr>
<th>Sem.</th>
<th>Location</th>
<th>practice-integrated</th>
<th>apprenticeship-integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td></td>
<td></td>
<td>Firm: vocational training focussing on intermediate exam of Chamber of Industry and Commerce (IHK)</td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td><strong>Full-time studies:</strong> 5 days per week</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td><strong>Firm:</strong> Practical projects (lecture-free period)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td><strong>vocational school:</strong> special dates</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td><strong>Full-time in firm:</strong> practical phase + project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>vocational school &amp; IHK-diploma</strong></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td><strong>Full-time studies:</strong> 5 days per week</td>
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<td><strong>Firm:</strong> practical projects (lecture-free period)</td>
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<td>7</td>
<td></td>
<td></td>
<td><strong>Practical phase and Bachelor thesis</strong> in the cooperating firm</td>
</tr>
</tbody>
</table>

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[Project Logo]
Mechatronics - results

- **number of freshman** after introduction in 2017 increase to planned capacity (15) → **objectives achieved**

- students have more time for academic studies, but in case of apprenticeship study duration is 9 instead of 7 semesters

- students have not constantly contact with their companies, but extended continuous periods in the companies
Conclusions

- UAS Hannover has long experience in dual study programs and a well-established unique cooperative study model
- Very good success figures, which are proven by relevant indicators
- Technical trends, market situation and company wishes induced the development of a new mechatronics study necessary
  - Change from the weekly interlinkage model to a typical apprenticeship semester model
  - Main objective achieved (number of freshman raised back to target level)
  - no cannibalization of the other dual study models
Literature


  Drucksache 3479-13, Mainz.