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

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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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HOCHSCHULE HANNOVER
UNIVERSITY OF APPLIED SCIENCES AND ARTS
–
Fakultät II
Maschinenbau und Bioverfahrenstechnik

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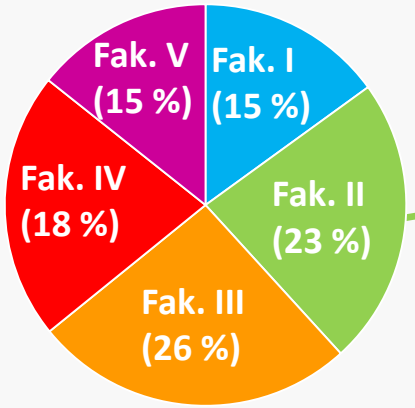
UAS Hannover – a diverse university with strong technical focus

UAS Hannover –
about 10.000 students



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

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)

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Organisation of studies in cooperation with industry

		Organisation of cooperation		
		weekly interlinkage	block model	internship/apprenticeship semesters
Form of industrial training	apprenticeship-integration	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
	practice-integration	no dual study (usually only practical phases without reference to curriculum)	e.g. University of Applied Science Bielefeld	e.g. Hamburg University of Applied Science

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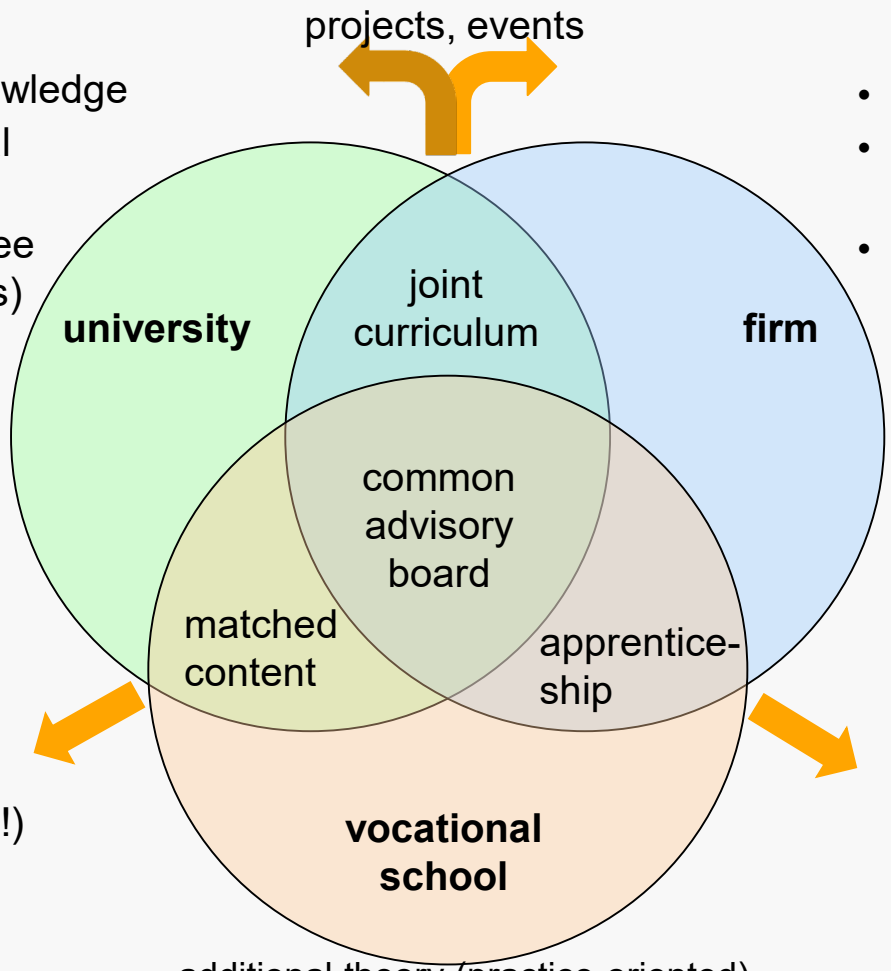
Synergies generated by different learning locations

- 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)

→ Learning units and locations are closely linked

source: Przywara (2014)

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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)

		Sem.		
Bachelor of Engineering	1st part	1 2 3 4	**Studies:** 3 days p/w (term time); **vocational school** (total of 100 hrs. on selected Fridays)	**Apprenticeship:** 3 days p/w (term time); fulltime (semester breaks), integrated projects; IHK (Chamber of Commerce) diploma
	2nd part	5 6	**Studies:** 5 days per week (term time)	**Work:** fulltime (semester breaks), integrated projects
		7	**Bachelor thesis** in cooperating firm	
Master of Engineer-ing		8 9	**Studies:** 3 days per week (term time)	**Work:** 3 days per week (term time), full-time (semester breaks), projects
		10	**Master thesis** in cooperating firm	

→ **Sophisticated *organisation, which places high demands on all partners***

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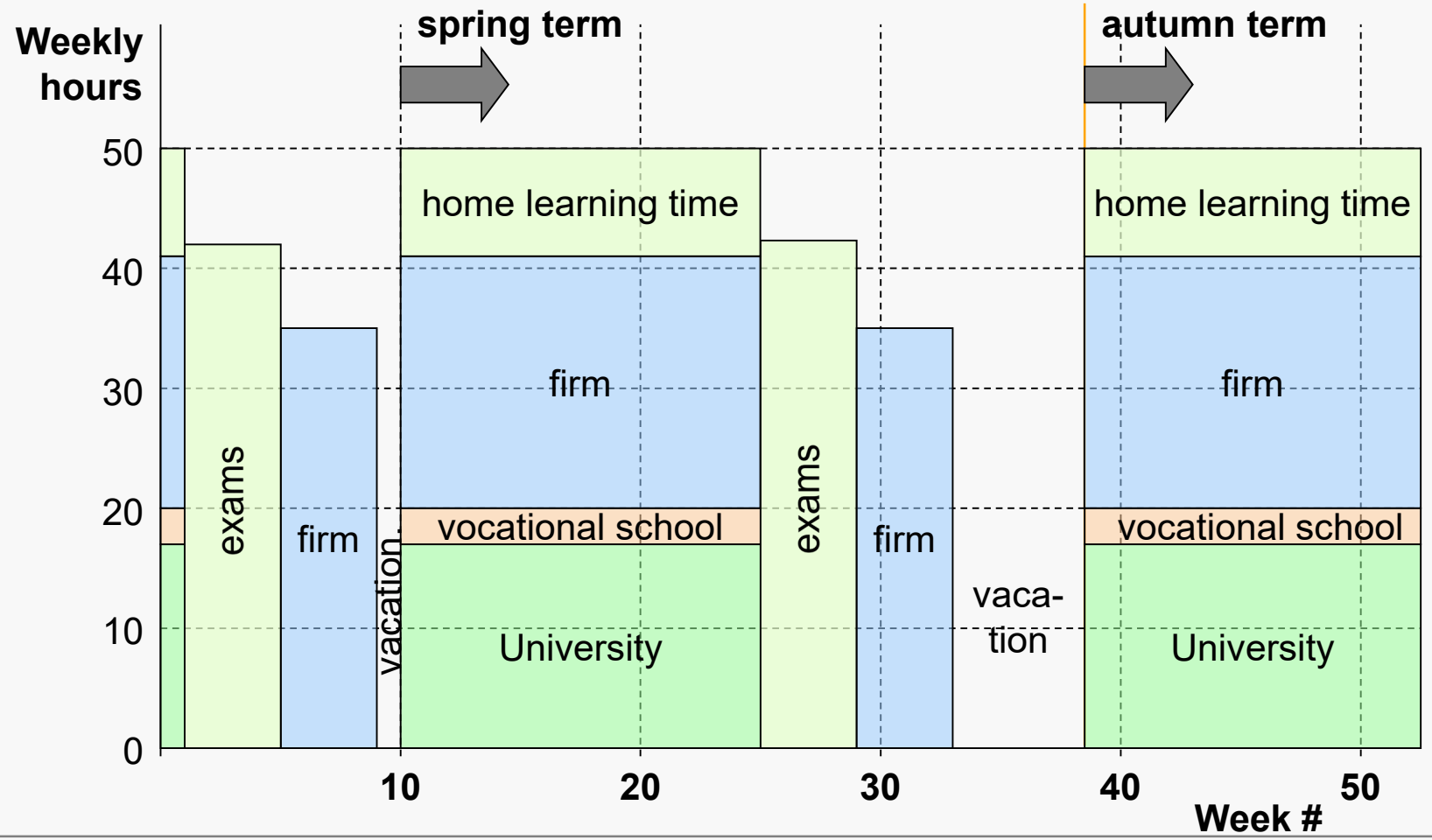
Student workload in semesters 1-4



→ ***Total workload is at the upper feasible level***

source: Przywara (2014)

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Results – success indicators

Indicator * \ Study path	cooperative (dual)	traditional (non-dual)
Average duration of studies (semesters)	7.4	9.0
Graduation rate (total non-dropouts)	> 85 %	~ 60 %
Immediate employability of graduates	100 %	80-90 %

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

→ ***Cooperative study programs clearly outperform traditional study programs***

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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 choosen 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***

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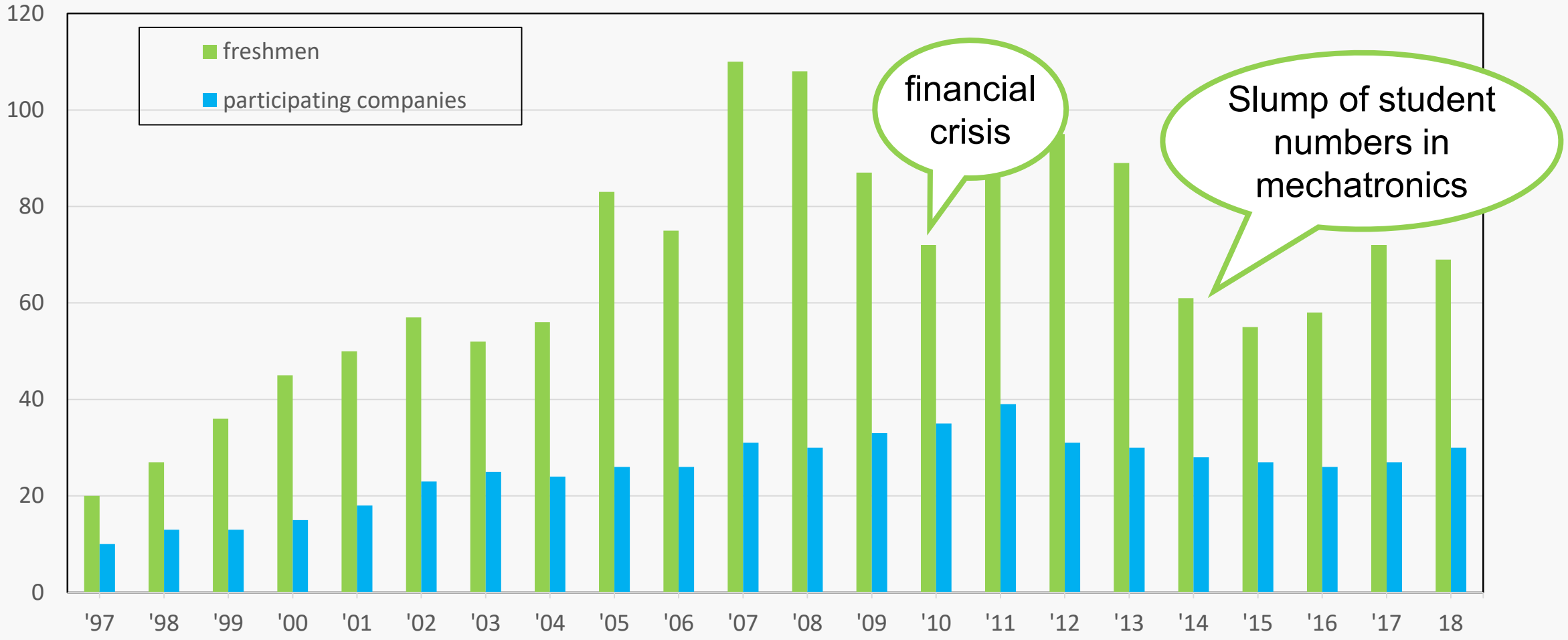
Dual student numbers reflect the labour market demand



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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**

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New mechatronics study model

Sem.	Location	practice-integrated	apprenticeship-integrated
-2 -1			**Firm:** vocational training focussing on intermediate exam of Chamber of Industry and Commerce (IHK)
1 2 3		**Full-time studies:** 5 days per week **Firm:** Practical projects (lecture-free period) **vocational school:** special dates	
4		**Full-time in firm**: practical phase + project **vocational school & IHK-diploma**	
5 6		**Full-time studies:** 5 days per week **Firm:** practical projects (lecture-free period)	
7		**Practical phase and Bachelor thesis** in the cooperating firm	

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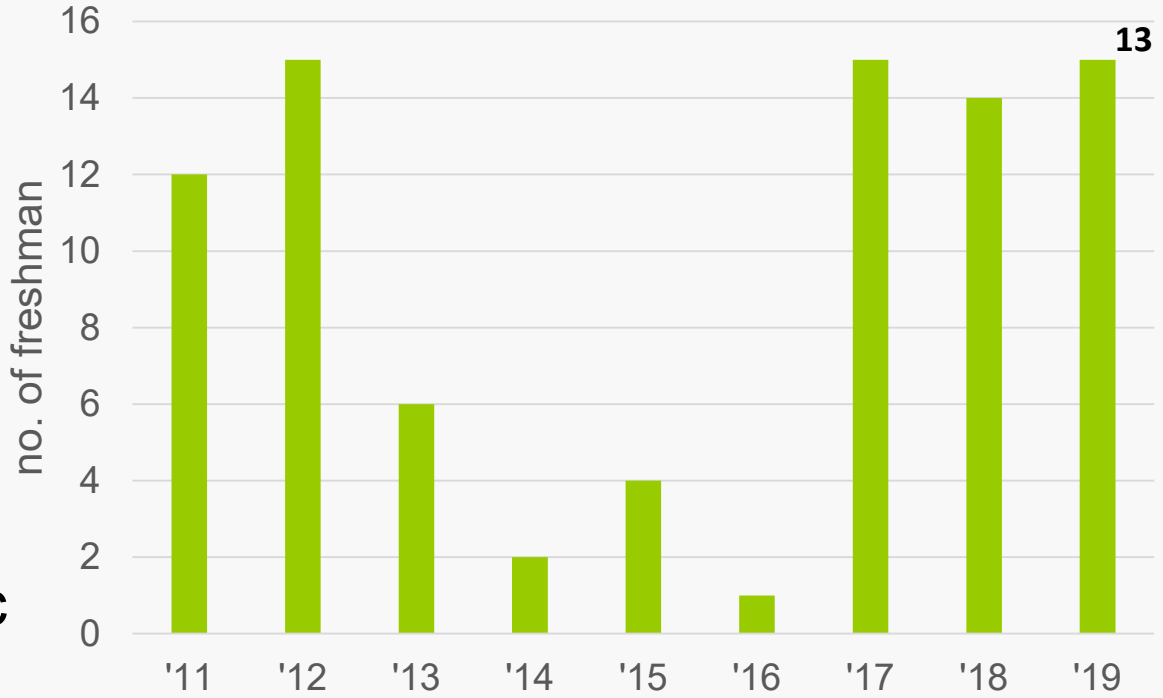
Mechatronics - results

- **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

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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

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Literature

- Przywara, Rainer (2014): *Dual Study Paths in Engineering Sciences - How to improve learning efficacy by integrating professional practice in academic education.* 2014 University-Industry Interaction Conference: Challenges and Solutions for Fostering Entrepreneurial Universities and Collaborative Innovation.
- Wissenschaftsrat (Ed.) (2013): *Empfehlungen zur Entwicklung des dualen Studiums – Positionspapier.* https://www.wissenschaftsrat.de/download/archiv/3479-13.pdf. Drucksache 3479-13, Mainz.

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