

## The Development of Technology Education in Lower Saxony (Germany)<sup>1</sup>

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It is a complex task to write the history of technology education in Germany: There are 16 federal states, all of them are relatively sovereign in their educational policy. Until 1989 there were even two German states with very different educational concepts, which further complicated the matter. In order not to reduce the history of technology education to a few general statements, but to meet scientific criteria, I will confine myself to Lower Saxony, with 47,600 sq km is the second largest state - but with only 8 million inhabitants rather in the midfield ranks. The period of my consideration extends from 1960 until today.

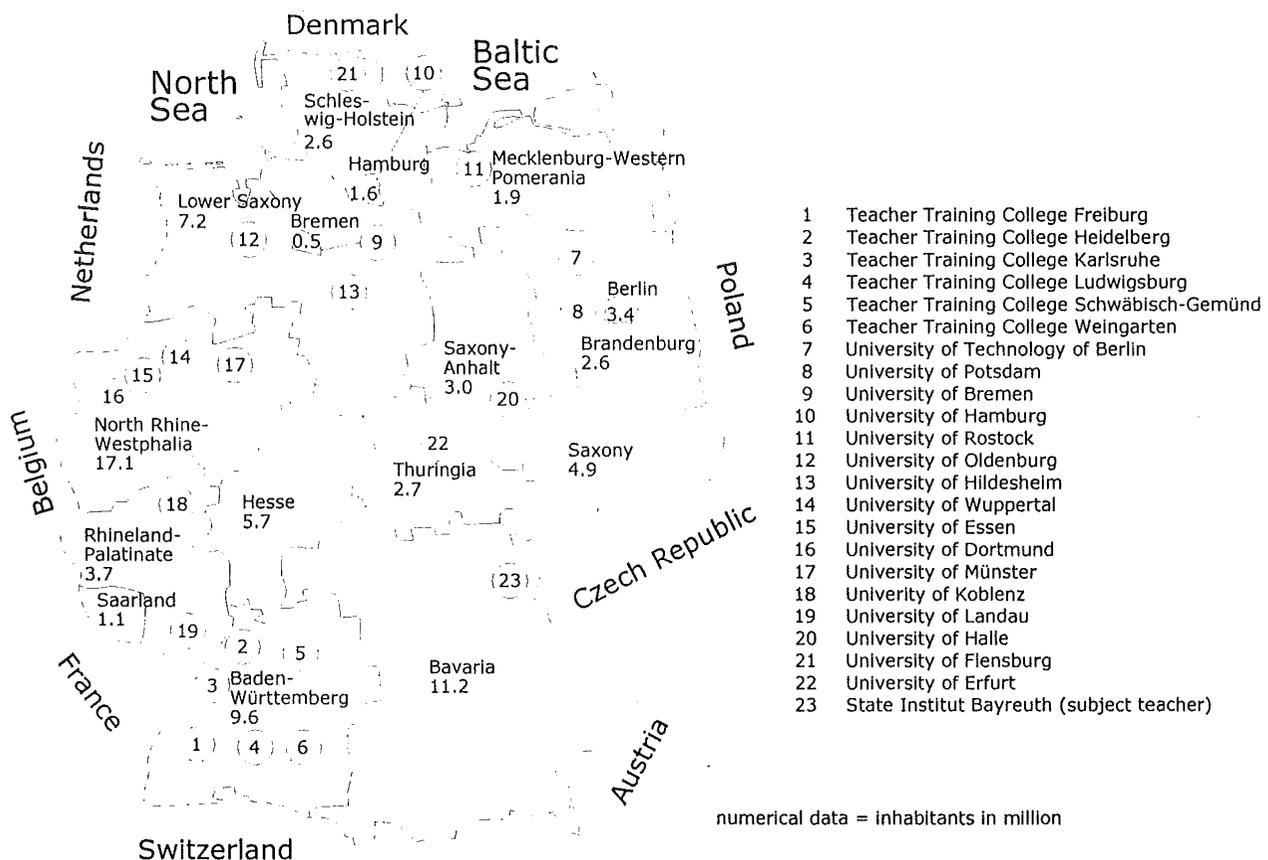


Figure 1: Federal States of the Germany and the location of Teacher Training Colleges in 2008<sup>2</sup>

For being able to draw the most objective view of technology education in Lower Saxony, the Schulverwaltungsblatt (SVBl, School Administration Journal) for Lower Saxony which is issued since 1949. In this monthly periodical the hours for all school boards and teaching subjects published by the value and importance of all subjects are accurately reflected. The time table is the ultimate instrument, whether and to what extent technology arrives in the classroom.<sup>3</sup>

Over the period, the education system in Lower Saxony was changed repeatedly, but the principle of tripartism was not touched. After the primary school (grades 1 to 4) the parents decide whether their children go to Hauptschule or Realschule. There are special schools<sup>4</sup> for children unable to cope the normal school. In my research I leave special schools and comprehensive schools largely ignored, because the existing student numbers are relatively small and the trends are similar.

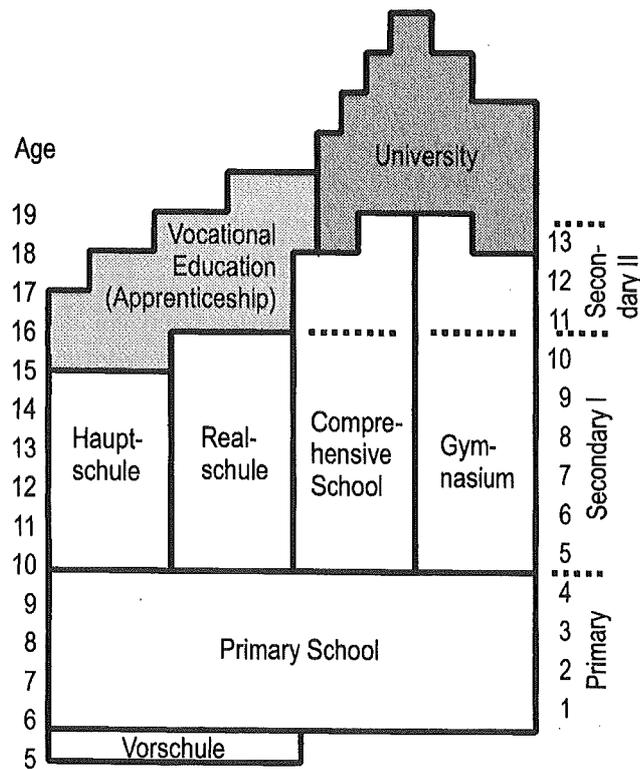


Figure 2: The German Educational System<sup>5</sup>

The term "Hauptschule" (main school) suggests that the vast majority of pupils is to be found here. However, the parents in the past years, "voted with their feet": For this school there are only few applications<sup>6</sup>. While the year 2007 252,000 students went to Gymnasium, 176,000 to Realschule, there remained only 92,500 students for Hauptschule. Inevitably, the discussion about the merger of primary and secondary schools to lower secondary begun - in the federal states of Saxony-Anhalt and Bremen this step has been completed already. This development reduces the importance of the subject technology, which has a special role in Hauptschule. In 1978 Christa Meins wrote in an essay in *Schulverwaltungsblatt*:

*"Without prejudice to all secondary schools in the same tasks, Hauptschule is focussed on pre-vocational education. It is primarily assigned to the new subject area 'labour-technology-economy'. Here the subjects of labour/economics (Arbeitslehre), technology, and home economics are comprehended."*<sup>7</sup> The dwindling number of pupils in Hauptschule is a qualifier for the demise of technology education.

The school subject Technology developed from arts and crafts. In 1960 the training of arts and crafts teachers was established not only in the pedagogical universities but also in teacher seminars. In Lower Saxony was the seminar in Dreibergen, where preferred men aged 20 to 45 years with a middle school degree and, if possible, with a craft training were accepted. In this time (1964), the recommendation of the German Committee for the educational system was published to establish the school subject *Arbeitslehre* (labour/economics).

The school administration in Lower Saxony responds early and in 1967 decides on the *"restructuring of the 3rd level of education in the elementary school."* *Arbeitslehre* is taught with a relatively high proportion of hours, while arts and crafts has a very minor role to play in the timetable. Amazing, that the decree is already adopting the concept of technological craft:

*"A special contribution to Arbeitslehre are to accomplish in the teaching areas socio-economic and vocational orientation,*

*science/technology lessons,  
 technological craft,  
 textile work and  
 home economics."* <sup>8</sup>

The conceptual confusion may result from the fact that the planning could not follow the academic discussion not fast enough.

	Grade 7	Grade 8	Grade 9
core lessons			
social studies economics Arbeitslehre	4	5	8
compulsory elective <sup>9</sup>			
music art craft	2	2	2

Tabel 1: Time table Volksschule in Lower Saxony 1967, SVBl 1967, p. 207, extract

A little later, the "Craft Congresses" <sup>10</sup> were launched on which the experts on Art and Craft and technology advocated for the move to technology education. Culmination was the IV Educational Congress<sup>11</sup> in the Hanover exhibition halls, where 1972 more than 1,500 participants arrived. It roused a passionate discussion, whether the entire Arbeitslehre area should serve rather the enforcement policy objectives, or whether the emphasis should be on imparting of knowledge and skills in the areas of economy and technology. <sup>12</sup> The educational power of the federal states made it then possible that both variants were implemented, depending on how conservative the state government was. In Lower Saxony finally succeeded a conception of a department comprehending the school subjects economy, technology and home economics.

Universities respond few years later. In Braunschweig, Goettingen, Hildesheim, Osnabrueck and Oldenburg teachers are trained for "technological craft", later, the subject is renamed to technology education. The universities Lüneburg and Vechta remain contrary to all attempts on the introduction of technology education and go on to educate teachers for arts and crafts. The consequences are fatal: still today craft and technology exist side by side in schools and do not only reduce the available lessons, but also interfere in the planning and installation of labs and shops.

In 1976, the time table for the Realschule is published. Apparently conservative forces could prevent influence of the Arbeitslehre discussion on the Realschule curriculum, despite the fact that this school should be vocation and practice orienting.

	Grade 5	Grade 6	Grade 7	Grade 8	Grade 9	Grade 10
craft / needlework	2	2	2	2	1	1

Table 2: Time table of the secondary school in Lower Saxony 1976, SVBl 1976, p. 191 f, extract

But two years later in Schulverwaltungsblatt 6-78 in two major decrees were published. The Hauptschule is transformed fundamentally. The Department of Labour-Economy-Technology is a significant part of the time table.

	Grade 7	Grade 8	Grade 9	Grade 10
Department Labour-Economy-Technology				
labour/economy (Arbeitslehre)	3	2	3	3
technology home economics		2*	3*	3*
Department Humanities				
music art	2	2*	2*	2*
arts and crafts needlework	2	2*	2*	
* = compulsory elective only				

Table 3: Time table of the Hauptschule in Lower Saxony 1978, SVBl 1978, p. 186 and p. 190, compilation and extract

An indication of the continuing uncertainty is running the following quotation:

"From grade 9 on, home economics and technology are offered as compulsory elective courses. Main component of technology is technological craft." <sup>13</sup>

However, in Hauptschule for the Department of Labour-Economy-Technology (Department of AWT) a conference head is appointed responsible for the coordination of subjects, for subject conferences, to cooperate with the vocational schools, vocational guidance and labour administration. This activity will discharge the teaching obligation by two hours per week. <sup>14</sup> In Realschule, the conference head was established in the years 1980/81. <sup>15</sup>

About 1980 the establishing of the department labour-economy-technology had its peak. At least in Hauptschule labour/economy and technology are in considerable extent in the time table. In 1982, the Lower Saxony Ministry of Culture published a report on the changes in this area. <sup>16</sup> Lattig and Masch claim Arbeitslehre an independent subject and economics as a school subject dispensable. <sup>17</sup> At the federal state level, advisers for the Department of AWT were appointed with 10 hours dispense, if they are in the upper school administration, in the lower school administration by 5 hours. <sup>18</sup>

In 1978, the Department of Labour-Economy- Technology is established in Realschule. Table 4 shows that the subject technology/economy can be found in the grades 9 and 10 with two hours in the compulsory area. Technology is offered only in grades 9 and 10 in compulsory-elective area and competes with 13 other subjects. Particularly serious is that technology is in competition with French, which is compulsory for all students who want to change to Gymnasium as a 2nd foreign language. This arrangement leaves it pure coincidence whether technology is ever taught in Realschule.

	Grade 7	Grade 8	Grade 9	Grade 10		
Department Historical-Social-Sciences				4*	4*	
history	2	2	2			2
social science	1	1	1			1
geography	2	2	1			1
Department Science						
physics	2	1	2			1
chemics	-	1	1			2
biology	2	2	1			1
Department Labour-Economy-Technology						
labour-economy (Arbeitslehre)	-	-	2			2
technology	-	-	-	-		
home economics	-	-	-	-		
Department Humanities						
music	2	1	1			
art	1	2	1			
design and craft needlework	1	1	-			
French language						
* = compulsory elective only						

Table 4: Time table of Realschule in Lower Saxony 1978, SVBl 1978, p. 193, extract

In connection with these significant changes in the time tables is a further decree of Lower Saxony minister of education regarding internships of students.<sup>19</sup> Johannes Graw commented this decree in the unofficial part SVBl.<sup>20</sup> This internship of 10 to 15 working days is an *"integral part of the Department Labour-Economy-Technology"*<sup>21</sup>. The conference head supports the teachers, thus allowing the organization. The internship underlines the importance of the Department.

In Gymnasium, the internship is also adopted. Since there is no department of labour-economy-technology, the implementation of the tasks assigned to the area of social sciences.

In 1979, the single-phase teacher education<sup>22</sup> is introduced at Oldenburg University. In the teacher examination areas for primary schools design and craft is stated, for Hauptschule and Realschule labour/economics, home economics and technology can combined with any other subject.<sup>23</sup> In special education arts and crafts and technology can be taught.

In the same year, internships are offered for teachers<sup>24</sup> so that teachers who had come from the school and coming back as teachers get some insight into the working world. One year later, the decree is commented: *"The guidelines stress that the internship is an integral part of teacher training for the Department of Labour-Technology-Economy"*<sup>25</sup>.

	1. Gr.	2. Gr.	3. Gr.	4. Gr.	5. Gr.	6. Gr.	7. Gr.	8. Gr.	9. Gr.
Department Science	-	-	-	-	3	3	3	3	3
Department Labour- technology -economy technology	-	-	-	-	- 2	- 2	5	5	6
Artistical Department incl. arts and crafts	-	-	5	5	5	5	3	3	3

Table 5: timetable of the school for mentally handicapped in Lower Saxony 1980, SVBl 1980, p. 315, extract

Even in the schools for mentally handicapped, the Department of labour-economy-technology is established. In grades 5 and 6, technology education has allocated their own portion of lessons. In the grades from 7 to 9, the school can dispose of more than 5 or 6 hours for the subjects labour/economy, technology and home economics.

Almost simultaneously for the primary school arts and crafts is settled:

	1. Gr.	2. Gr.	3. Gr.	4. Gr.
music	3	3	4	5
art				
arts and crafts	-	-		
needlework	-	-		

Table 6: Time table of the primary school in Lower Saxony 1981, SVBl 1981, p. 113, extract

Again, the school are free if and how much arts and crafts tuition is taught.

An annual special issue on is attached to the Schulverwaltungsblatt. This shows that the school administration offers in-service-training with increasing tendency for the subject technology education. While in 1983 only four courses for technology have been set up, the number rises to 15 in 1986.

In 1987, a comprehensive in-service-training programme<sup>26</sup> for future technology teacher at Hildesheim University<sup>27</sup> is offered a year later, Oldenburg University also is included in this training program<sup>28</sup>. The courses are offered in Schulverwaltungsblatt and there is a run on them. At the same time 1988 the number of training courses is decreasing to four and 1990 to two courses.<sup>29</sup>

In 1990, the time tables for Hauptschule and Realschule undergo a revision.

	7. Grade			8. Grade			9. Grade			10. Grade		
	compulsory	compulsory/ elective	elective									
labour/economy (Arbeitslehre)	3			2			3			2		
technology home economics				2				2			2	
arts and crafts textile craft		2			2			2			2	
art music												
study groups			2			2			2			2

Table 7: Time table of Hauptschule in Lower Saxony 1990, SVBl 1990, p. 26 ff, extract

The subject labour/economy loses one hour in grade 8, technology and home economics lose one hour each in grades 8 and 9, (see Table 3).

In 1990, there is also a new time table for Realschule. This brings no change for technology education - so it remains as unsatisfactory as 12 years ago (see table 4).

The in-service-training courses at the Universities of Hildesheim and Oldenburg are offered for the last time in 1995.

From 1972 on in Lower Saxony the Orientierungsstufe (orientation stage) of the grades 5 and 6 is introduced. Thus the transition to Realschule or to Gymnasium is postponed from the 5th grade to the 7th grade. These two years are used to monitor the students and to further and select talented students. Thus an educational institution emerged to expose the students to a two-year examination stress.

On the Web site of the Criminologist Research Institute of Lower Saxony Anna Maier Pfeiffer and Christian Pfeiffer publish an essay in which they establish the thesis that a consequence of the orientation stage is that the Hauptschule devalued to an unattractive rest school<sup>30</sup>. While student performance, especially in Class 6 promoted, there remains a rest of demotivated losers, finally deported to Hauptschule. The function of Hauptschule in grade 7 is "to bring the rather demotivated children back on track"<sup>31</sup> instead of being able to developing its own profile.

	5. Grade	6. Grade
music	3	3
art		
arts and crafts	1	1
textile craft		

Table 8: Time table of the Orientierungsstufe in Lower Saxony 1997, SVBl 1997, p. 99, extract

In this school, arts and crafts is offered with the smallest possible number of hours - technology education does not take place. So students who later go to Gymnasium, never came into contact with technology education. This plays a major role in the choice of study courses: technology is not in the horizon of entrants.

In 2004, numerous changes are made in the time table. In primary school now arts and crafts in classes 1 and 2 can be taught, instead one hour less is available of artistic and cultural education in Class 4.

	1. Gr.	2. Gr.	3. Gr.	4. Gr.
music	1	1	2	2
art	2	2	2	2
arts and crafts				
textile craft				

Table 9: Time table of the primary school in Lower Saxony 2004, SVBl 2004, p. 87, extract

The time table of Hauptschule, after the abolition of Orientierungsstufe, is expanded to grades 5 and 6. It is striking that, as in primary school, the subject music gets greater significance. Arbeitslehre is replaced by economy and loses one hour in the 9th.

	5. Kl.			6. Kl.			7. Kl.			8. Kl.			9. Kl.			10. Kl.		
	Compulsory	Compulsory/elective	elective															
economy							2			2			2			2		
technology	.	.	.	.	.	.	1											
home economics							1											
arts and crafts																		
textile craft	2			2						4			4			4		
art								2										
music	1			2														
electives			x			x			x			x			x			x

Table 10: Time table of Hauptschule in Lower Saxony 2004, SVBl 2004, p. 100, extract

Technology now is only compulsory with one hour in grade 7 and competes in grade 8 with home economics, textile craft, art and music with an hour total of 4. Only the subject economy remains firmly anchored in the compulsory field.

In the area of electives, schools have some leeway to set priorities or to provide support for the students.<sup>32</sup>

In Realschule, the Department of Labour-Economy-Technology is slightly changed: In comparison to the time table of the year 1990 (see Table 4), technology remains in an unsatisfactory situation, since in classes 9 and 10 it has to compete with many other subjects. What is new is that home economics in grades 7 and 8 comes into the compulsory/elective field. The subject economy in grade 8 gets an extra compulsory hour, but is reduced by one hour in grade 10.

Department Labour- Economy-Technology	5. Gr.	6. Gr.	7. Gr.	8. Gr.	9. Gr.	10. Gr.
economy	-	-	-	1	2	1
technology	-	-	-	-	compulsory/ elective	compulsory/ elective
home economics	-	-	compulsory/ elective	compulsory/ elective	compulsory/ elective	compulsory/ elective

Table 10: Time table of Realschule in Lower Saxony 2004, SVBl 2004, p. 107, an extract

In 2004 the Ministry of Culture decided a further measure, the Hauptschule I should benefit from: While the internship regulation in Realschule and Gymnasium is not altered, in Hauptschule "vocation orienting measures" with a duration from 60 to 80 days introduced<sup>33</sup> - to enhance the students' career choice maturity the and their chance for an apprenticeship.

The labour intensive supervising during the internship has to be done by the teachers of the department labour-technology-economy. While the teacher of the subject economy is bound by compulsory lessons, the teachers of home economics and technology have to look for the students in their internships up to 16. This will further weaken technology, as these "external service activities" will cost many hours teaching of teaching technology.

Against the background of a shrinking Hauptschule, a Realschule, where technology is taught probably only by coincidence and a Gymnasium<sup>34</sup>, which locks itself so far against any kind of technology education, the situation of technology education in Lower Saxony is poor.

Christian Hein<sup>35</sup> sees the reasons for this mess in the historic understanding of education in Germany, in the position of education politicians, in the turbulent forms of the German technology education and increasingly worse technology teacher training. Hein describes this as emergency teacher training.

In summer of 2007, the Lower Saxony Minister for Science and Culture, Lutz Stratmann, has advocated for a strong technology education.

*"Basically, I am convinced:*

*Economy, politics and technology issues determine the main challenges of our contemporary society. Against the background of a technologically progressive society, a fundamental understanding of technology and the promotion of responsible use of technology as part of general education is necessary. The technology education fulfils an important educational function. Solving technology problems enables pupils to understand mathematical relationships, natural laws and economic and ecological connections. Thus technology education delivers a fundamental contribution to a promising future. For the future of our society, it is particularly crucial, to fill children and early adolescents with enthusiasm for science and research, particularly for engineering and natural sciences, including engineering and computer science.*

*Above all, the economy laments the lack of scientists, engineers, technicians and skilled workers. In addition there are warnings of a lack of academics. A European study stated in Europe the lacking of*

*700,000 researchers, as gifted young people rarely decide for a research career. This provides for the Lower Saxony state government with concern and it is making a great effort in this field in. The problem, moreover, can not be resolved, if not particularly women are encouraged. Unmistakable is that we in Germany, in European comparison, spawn too few female scientists. It is therefore particularly rewarding to gain women for engineering and technical education. To say it in the words of an equality officer of a Lower Saxony University: "Who wants to win, does not leave half the team on the substitutes' bench."<sup>36</sup>*

With this contribution, Science Minister Stratmann stated clearly the problem of technical education. Unfortunately, the Science Ministry in Lower Saxony is not responsible for the general education and therefore has no direct access to the time tables.

In the here presented study was shown that after the initial positive assessment technology gradually loses importance in the time table – up to the fact that from 2004 on technology is represented in Hauptschule with only one compulsory hour - the rest is lost in the compulsory/elective field .

Strengthening of technology education is only possible if this trend can be reversed - ie: when technology is established again in the compulsory time tables of Hauptschule, Realschule, and Special Education. It is hoped that the Science Minister's appreciation of technology education is assumed by the Ministry of Culture.

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<sup>1</sup> With the friendly assistance of Reinhard Meiners and Gerd Höpken. The latter also produced the translation of the article in English.

<sup>2</sup> Höpken, G.: A New Curriculum for Technology Education in Schleswig-Holstein. In: Langer, K./Metzing, M./Wahl, D. (Hrsg.): Technology Education, Innovation, and Management. Berlin/Heidelberg/New York 1995. (Springer) S. 38.

<sup>3</sup> The time table does not necessarily reflect the school reality. If they are no labs, shops, or technology teachers available, the subject is cancelled. On the other hand, there are also schools, which focus on Arbeitslehre and technology - as a profile measure.

<sup>4</sup> Formerly the terms Sonderschule (special school) or school for metally handicapped were usual.

<sup>5</sup> Höpken, G.: A New Curriculum for Technology Education in Schleswig-Holstein. In: Langer, K./Metzing, M./Wahl, D. (Hrsg.): Technology Education, Innovation, and Management. Berlin/Heidelberg/New York 1995. (Springer) S. 39.

<sup>6</sup> [http://www.gew-ndp.de/meldungen/verlierer\\_hauptschule.php](http://www.gew-ndp.de/meldungen/verlierer_hauptschule.php) und <http://www.nlp.niedersachsen.de/Tabellen/Bildung/M3001515007.html>, Stand Juni 2008

<sup>7</sup> Meins, C.: Zum Erlaß „Die Arbeit in der Hauptschule“. SVBl 1978, p. 210, nichtamtlicher Teil  
<sup>8</sup> SVBl 1967, p.. 206

<sup>9</sup> One course of this group is compulsory.

<sup>10</sup> Mämpel, U. (Hrsg.): Technikunterricht, Arbeitslehre, Polytechnische Bildung. 4. Werkpädagogischer Kongreß, Hannover 1972. Stuttgart 1972, : Klett-Verlag

<sup>11</sup> Mende, M. / Reich, G. / Weber, E. (Hrsg.): Technische Bildung als Integration von allgemeiner und beruflicher Bildung. Berlin 1976. Rossa-Verlag. (Kongressbericht)

<sup>12</sup> Höpken, G.: Stages of 30 Years of Technology Education in Germany. In: Höpken, G.: Stages of 30 Years of Technology Education in Germany. In: Miyakawa, H. (ed.): Beyond Tomorrow: International Cooperation in Industrial Technology Education. Kariya 2004 (Aichi University of Education) ISBN 4-9901927-0-2, S. 55-66 and de Vries, M./Mottier, I. (ed.): International Handbook of Technology Education. Rotterdam/Taipei 2006 (Sense Publishers) ISBN 90-77874-12-7 (Hardback) or ISBN 90-77874-06-2 (Paperback), S. 417-428

<sup>13</sup> SVBl 1978, P. 187

<sup>14</sup> SVBl 1978, P. 273

<sup>15</sup> SVBl 1980, P. 213

- <sup>16</sup> Niedersächsisches Kultusministerium (Hrsg.): Schulversuche und Schulreform. Band 15. Arbeit-  
Wirtschaft-Technik. Schrödel Schulbuchverlag, Hannover 1982
- <sup>17</sup> ib., P. 111
- <sup>18</sup> ib., P. 118
- <sup>19</sup> SVBl 1978, P. 269
- <sup>20</sup> Graw, J.: Zu den Richtlinien zur Durchführung von Betriebspraktika für Schüler an  
allgemeinbildenden Schulen der Sekundarbereiche I und II. In: SVBl 1978, P. 363, nichtamtlicher  
Teil
- <sup>21</sup> ib.
- <sup>22</sup> In this model program, (closed down 1981), the University is responsible for the school practical  
part of the teacher education, which is normally a job of the school administration.
- <sup>23</sup> SVBl 1979, P. 384 ff
- <sup>24</sup> ib., P. 96 ff
- <sup>25</sup> SVBl 1980, P. 143 ff
- <sup>26</sup> In contrary to in-service-training within a subject, in-service-training to gain a new subject id  
provided with a certificate.
- <sup>27</sup> SVBl 1987, P. 341
- <sup>28</sup> SVBl 1988, P. 205
- <sup>29</sup> Sonderheft Lehrerfortbildung 1988 und 1990
- <sup>30</sup> <http://www.kfn.de/versions/kfn/assets/orientierungsstufe.pdf>, Stand Juni 2008
- <sup>31</sup> ib., P. 2
- <sup>32</sup> SVBl 2004, P. 100
- <sup>33</sup> SVBl 2004, P. 294 ff
- <sup>34</sup> An exception are Technischen Gymnasien at some vocational schools, which teach especially metal  
technology, electrical engineering, and informatics. But these are only appr. 3 % of all Gymnasium  
students. In a small study, we recently had to face the fact, that appr. 50 % of these students do not  
strive for a technological career.
- <sup>35</sup> Hein, C.: Zu den Hemmnissen und Perspektiven einer technischen Bildung in Deutschland. In:  
Hartmann, E. (Hrsg.): Technische Bildung in Unterrichtsforschung und Lehrerbildung. Frankfurt  
a.M., 2005. Peter Lang Verlag, P. 165 ff
- <sup>36</sup> Stratmann, L.: Grußwort des Niedersächsischen Ministers für Wissenschaft und Kultur anlässlich  
des Symposiums „Technische Bildung – Quo vadis?“ In: Henseler, K. / Hoffmann, K.-H. / Meiners, R.  
/ Reich, G. (Hrsg.): Technische Bildung - Quo vadis? Tagungsband vom Symposium vom 22. und 23.  
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P. 15 f

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