

# Computer science education in Germany

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## **Abstract**

In Germany there are 16 Province. In all Region the Educational System is different [1] and the Computer Science Education is different too. Computer Science is obligatory at the high school in Bavaria and in Saxony, in the other Regions just selectable.

Word processors, spreadsheets, and paint programs are taught not only like simple everyday tools, but as examples of object oriented programming too (in Bavaria). In other regions word processing is part of literature courses, spreadsheets in mathematics. Another disadvantage is most teacher was not graduated in Computer Science. However an advantage of the system is that there is more room to teach advanced topic in Computer Science lessons.

There is a big difference in the topics taught in various provinces. In Niedersachsen the curriculum is just the Office packet, in Mecklenburg–Vorpommern students learn the newest methods in Cryptography too.

Because of these big differences a project was initiated to standardize computer science curriculum in Germany in January 2006 at Königstein. This standard will be presented to Computer Science teachers at a Conference in Siegen. in October 2007. If accepted, then it will be widely used from the following year through all Germany.

*Keywords:* Computer science, Education, Germany

## **1. Introduction**

The German Educational System is more complicated, than the Hungarian. Figure 1 shows the outline of the German Educational System.

As you see, the grades of the secondary stages depend on the type of school. All provinces have their own Ministry of Education, so that from region to region the Educational System is different, and generally the teacher's education is different too (Table 1).

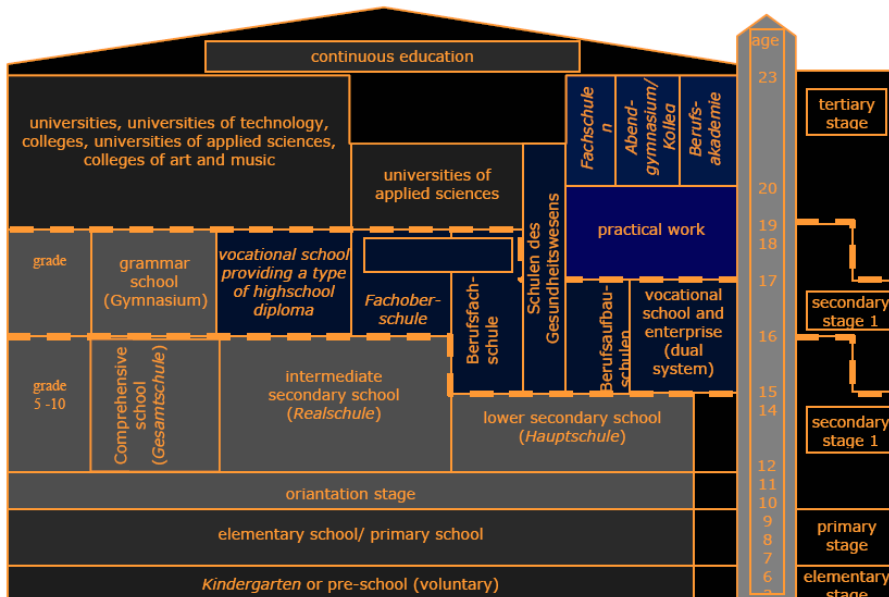


Figure 1: Outline of the German Educational System

Practical Training	2 <sup>nd</sup> State Examination			
	Traineeship (2 years) practical training at vocational schools and accompanying teacher seminars			
university level 2 <sup>nd</sup> stage (2½ years)	1 <sup>st</sup> State Examination			
	1 <sup>st</sup> subject (vocational field)	2 <sup>nd</sup> subject	3 <sup>rd</sup> subject (education)	Practical Training B (4 weeks)
university level 1 <sup>st</sup> stage (2 years)	Intermediate State Examination			
	1 <sup>st</sup> subject (vocational field)	2 <sup>nd</sup> subject	3 <sup>rd</sup> subject (education)	Practical Training A (4 weeks)

Table 1: Teacher Education in Germany

Table 1 shows what is common: the three State Examinations. The first follows the second year of studies, the third the practical training at vocational schools.

## 2. Subject

In the 16 provinces Computer Science Education is different. Computer Science is obligatory at the high school in Bavaria and in Saxony, in the other Regions just selectable.

Word processors, spreadsheets, and paint programs are taught not only like simple everyday tools, but as examples of object oriented programming too. In other regions word processing is part of literature courses, spreadsheets are taught in mathematics. Another disadvantage that most of the teachers did not graduate

in Computer Science. However an advantage of the system is that there is more room to teach advanced topic in Computer Science lessons.

There is a big difference in the topics taught in various provinces. In Lower Saxony the curriculum is just the Office packet, in Mecklenburg–Vorpommern students learn the newest methods in Cryptography too.

In the following I am going to show the Computer Science Education in all Provinces. In the primary stage (grade 1–4) is not Computer Science Education, like in Hungary

## 2.1. Computer science education in provinces

### 2.1.1. Baden-Württemberg

The Basic Informationstechnology (ITG, Informationstechnische Grundbildung) is taught in all schoolform in Baden-Württemberg in the secondary stage I. Later, Computer Science Education in secondary stage I and II corresponds with the two hours per week classes of Gymnasiums [2] (Table 2).

	lower secondary school	intermediate secondary school	Gymnasium
Secondary stage I (Grade 5 – 10)	ITG	ITG	ITG
Secondary stage I (Grade 10)			Computer Science 2 Hours per Week
Secondary stage II (Grade 11 – 12)			Computer Science 2 Hours per Week

Table 2: Computer Science Education in Baden-Württemberg

### 2.1.2. Bavaria

The Computer Science Education is on the highest level in Bavaria. Word processors, spreadsheets, and paint programs are taught not only like simple everyday tools, but as examples of object oriented programming too.

In the lower secondary school in Grade 8–10 ist Computer Science Education takes two hours per week in selectable form while in the intermediate secondary school it is obligatory. In Gymnasium Grade 6 and 7 Computer Science is part of the subject Nature and Technics in one hour per week. In secondary stage II. of the Gymnasium the subject gets two extra hours per week in the form of seminars [3] (Table 3).

	lower secondary school	intermediate secondary school	Gymnasium
Secondary stage I (Grade 5 – 7)	ITG	ITG	ITG
			Nature and Technic Gr. 6 + 7, 1 H/W
Secondary stage I (Grade 8-10)	Computer Science Gr. 8-10, 2 H/W (S)	Computer Science Gr. 8-10, 2 H/W (O)	Computer Science (NT) Gr. 9 + 10, 2 H/W
Secondary stage II (Grade 11 – 12)			Computer Science (NT) 3 H/W (+ 2 H/W Seminar)

Table 3: Computer Science Education in Bavaria

### 2.1.3. Berlin

The Informationstechnology (ITG, Informationstechnische Grundbildung) is selectable for students in Berlin Basic, who want to learn Computer Science in Gymnasium Grade 9–10. In secondary stage II students can learn Computer Science at advanced level in Gymnasium (5 hours per week) or 3 hours per week in normal level (Table 4). Basic Informationstechnology and Computer Science run parallel the in the intermediate secondary school and in grade 8 of the Gymnasium [4].

	lower secondary school	intermediate secondary school	Gymnasium
Secondary stage I (Grade 7 – 8)	ITG	ITG	ITG (S)
Secondary stage I (Grade 9-10)		Computer Science Gr. 8-10, 2 H/W	Computer Science Gr. 8 + 10, 2 H/W (S)
Secondary stage II (Grade 11 – 12)			Computer Science NL/AL 3/5 H/W

Table 4: Computer Science Education in Berlin

### 2.1.4. Brandenburg

The Computer Science is obligatory in secondary stage I, grade 9–10. In Secondary stage II students learn Computer Science at advanced level in Gymnasiums (5 hour per week) while at normal level just 3 hour per week [5] (Table 5).

	High school (Oberschule)	Gymnasium
Secondary stage I (Grade 7 – 10)	ITG 1 H/W	ITG 1 H/W
Secondary stage I (Grade 9-10)	Computer Science 2 H/W (O)	Computer Science 3 H/W (O)
Secondary stage II (Grade 11 – 12)		Computer Science NL/AL 3/5 H/W

Table 5: Computer Science Education in Brandenburg

### 2.1.5. Bremen

In all schoolforms students get the medien training (Medienbildung), but in Gymnasium Computer Science at advanced level get 5 hour per week, at normal level 3 hour per week [6] (Table 6).

	Comprehensive school	Secondary school	Gymnasium
Secondary stage I (Grade 5 – 10)	Medien training	Medien training	Medien training
Secondary stage II (Grade 10 – 12)			Computer Science NL/AL 3/5 H/W

Table 6: Computer Science Education in Bremen

### 2.1.6. Hamburg

The most popular school form is Comprehensive school in Hamburg. In secondary stage I Grade 5–6 the Computer Science is part of the Nature Science/Technics subject in all school forms. In all other secondary stage I schools Computer Science is obligatory and the students learn in 2–3 hour per week classes. In Gymnasium and in Comprehensive school the Computer Science is selectable both at advanced level or at normal level [7] (Table 7).

	Lower and intermediate secondary school	Comprehensive school	Gymnasium
Secondary stage I (Grade 5 – 6)	Nature Science/Technic	Nature Science/Technic	Nature Science/Technic
Secondary stage I (Grade 7)	Computer Science 2-3 H/W (O)	Computer Science 3 H/W (O)	
Secondary stage I (Grade 8 – 10)	Computer Science 2-3 H/W (O)	Computer Science 3 H/W (O)	Computer Science 2 H/W (O)
Secondary stage II (Grade 11 – 12)		Computer Science NL/AL Gr. 11 2 H/W, Gr. 12-13 3/5 H/W	Computer Science NL/AL 3/5 H/W

Table 7: Computer Science Education in Hamburg

### 2.1.7. Hessen

There is no big difference between the school forms of secondary stage I in Hessen, but in secondary stage II Computer Science is taught just in Gymnasium. Up from grade 11 students may choose between the normal and the advanced level [8] (Table 8).

	Lower secondary school	Intermediate secondary school	Gymnasium
Secondary stage I (Grade 5 – 9)	ITG	ITG	ITG
Secondary stage I (Grade 10)	ITG	ITG	
Secondary stage II (Grade 10 – 12)			Computer Science Gr. 10. 2 H/W. Gr. 11-12 NL/AL 3/5 H/W

Table 8: Computer Science Education in Hessen

### 2.1.8. Mecklenburg-Western Pomerania

Computer Science is integrated in the subject *Job-Economy-Technics* in Mecklenburg-Western Pomerania. This can take extra 3 hours per week as an obligatory selectable subject in the regional schools. In gymnasium there are two ways to learn Computer Science in grade 9–10. Either as a selectable subject in hour per week, or as an obligatory subject in 2 hours per week. In grade 10–12 students may choose between the normal and the advanced level, but one of them is obligatory [9] (Table 9).

	Regional school	Gymnasium	
Secondary stage I (Grade 5 – 9)	JET and Computer Science 1 H/W + 3 H/W (S)	JET and Computer Science 1 H/W	
Secondary stage I (Grade 7 – 10)	JET and Computer Science 0,5 H/W + 3 H/W (S)	JET and Computer Science 0,5 H/W (in Gr. 7: 1 H/W)	
Secondary stage I (Grade 9 – 10)		Computer Science 2 H/W (O)	Computer Science 1 H/W (S)
Secondary stage II (Gr 10 – 12)		Computer Science NL/AL 2/4 H/W (O)	

Table 9: Computer Science Education in Mecklenburg-Western Pomerania

### 2.1.9. Lower Saxony

Computer Science Education is very bare in Lower Saxony. In secondary stage I grade 5–8 the subject is n. In intermediate secondary school just two years with 2 hours per week (obligatory), in gymnasium just int hot part of the curricula. In secondary stage II it is taught in 3 hours per week [10] (Table 10).

	lower secondary school	intermediate secondary school	Gymnasium
Secondary stage I (Grade 5 – 8)			
Secondary stage I (Grade 9 – 10)		Computer Science 2 H/W (O)	
Secondary stage II (Grade 11 – 13)			Computer Science 3 H/W

Table 10: Computer Science Education in Lower Saxony

### 2.1.10. North Rhine Westphalen

The subject called “Basic knowledge of Information and Communication Technology” (Informations- und Kommunikationstechnologische Grundbildung (IKG)) in North Rhine Westphalen in grade 7–9. In lower secondary school students of grade 9–10 can choose between Computer Science (2H/W (TYP A)) and a subject integrated with CS (TYP B). In other schooltypes CS is an obligatory subject. In grade 12 of the Gymnasium students can learn CS in advanced or normal level [11] (Table 11).

	Lower secondary school		Intermediate secondary school	Comprehensive school	Gymnasium
<b>Secondary stage I</b> (Grade 7–9)	IKG 1 H/W		IKG 1 H/W	IKG 1 H/W	IKG 1 H/W
<b>Secondary stage I</b> (Grade 9–10)	Typ A Inf., 2 H/W (S)	Typ B Integr..	Computer Science 2 H/W (O)	Computer Science 2 H/W (O)	Computer Science 2 H/W (O)
<b>Secondary stage II</b> (Grade 11–13)					Computer Science Gr 11: 3 H/W, Gr. 12-13: 3/5 H/W (NL/AL)

Table 11: Computer Science Education in North Rhine Westphalen

### 2.1.11. Rhineland-Palatinate

In this province there is an interesting situation. In intermediate school and in gymnasium the subject of computer Science is different, but in the lower secondary school not. Later, in grades 9–10 of gymnasium it is selectable, while in secondary stage II students can choose between the normal and the advanced level [12] (Table 12).

	Lower secondary school	Intermediate secondary school	Gymnasium
<b>Secondary stage I</b> (Grade 7–9)	ITG	Different	Different
<b>Secondary stage I</b> (Grade 9–10)	ITG		Computer Science 2 H/W (S)
<b>Secondary stage II</b> (Grade 11–13)			Computer Science NL/AL: 3/5 H/W

Table 12: Computer Science Education in Rhineland-Palatinate

### 2.1.12. Saarland

The Informationtechnology (ITG, Informationstechnische Grundbildung) subject is obligatory in Saarland, in the higher secondary school, but selectable between Computer Science/Economy, or Typewriting/Communication Technics. In secondary stage II students can choose between the normal and advanced level in gymnasium [13] (Table 13).

	Higher secondary school (Erweiterte Realschule)	Gymnasium
Secondary stage I (Grade 5 – 6)	ITG ca. 0,5 H/W	ITG 1 H/W
Secondary stage I (Grade 9 – 10)	CS/Economy oder Typewriting/Communicationstechnik 2 H/W (O)	
Secondary stage II (Grade 10 – 12)		Computer Science NL/AL: Gr. 10: 2 H/W, Gr. 11-12: 3/5 H/W

Table 13: Computer Science Education in Saarland

### 2.1.13. Saxony

Computer Science Education is the same in all school forms of the secondary stage: obligatory in grade 7–10 with 1 hour per week. In gymnasium students can learn it in secondary stage II too [14] (Table 14).

	Secondary school	Gymnasium
Secondary stage I (Grade 5 – 6)	Technic/Computer Grade 5: 2 H/W, Grade 6: 1 H/W	Technic/Computer Grade 5: 2 H/W, Grade 6: 1 H/W
Secondary stage I (Grade 7 – 10)	Computer Science Obligatory, 1 H/W	Computer Science Obligatory, 1 H/W
Secondary stage II (Grade 10 – 12)		Computer Science 1 H/W

Table 14: Computer Science Education in Saxony

### 2.1.14. Saxony Anhalt

In the 7th Grade students learn a new subject: introduction in computerwork, while in grade 9–10 they learn about the modern medienworld, which is obligatory. Computer Science is taught in the secondary stage of gymnasium in two hours per week [15] (obligatory) (Table 15).

	Secondary school	Gymnasium
Secondary stage I (Grade 7 – 8)	Introduction in work with Computer Grade 7 1 H/W	Introduction in work with Computer 1 H/W (obligatory)
Secondary stage I (Grade 7 – 10)	Economy – Technic: integr. 28 hour.	
	Modern Medienworld 2 H/W (O)	Modern Medienworld Grade 9: 2 H/W (O)
Secondary stage II (Grade 10 – 12)		Computer Science 2 H/W (O)

Table 15: Computer Science Education in Saxony Anhalt

### 2.1.15. Schleswig-Holstein

The situation here is like in Rhineland-Palatinate. The secondary stage in all school forms is differing in having or not a subject like Computer Science or not.



You find it only in public schools, secondary stage II generally taught in 2–3 hours per week [16] (Table 16).

	Regional school	Gymnasium	Public school
Secondary stage I (Grade 7–9)	Different	Different	Different
Secondary stage II (Grade 11–13)			Computer Science 2-3 H/W

Table 16: Computer Science Education in Schleswig-Holstein

### 2.1.16. Thuringen

In the Grade 5–7 students can learn medienknowledge in one hour per week here. Later, in grade 8–9 (or grade 10 in highschool) you find Computer Science as selectable subject. In secondary stage II of gymnasium students can choose between the normal and the advanced level CS [17] (Table 17).

	Highschool	Gymnasium
Secondary stage I (Grade 5–7)	Medienknowledge 1 H/W	Medienknowledge 1 H/W
Secondary stage I (Grade 8–10)	Computer Science 1 H/W (S)	Computer Science Grade 8-9: 1 H/W (S)
Secondary stage II (Grade 10–12)		Computer Science NL/AL: Gr. 10: 2 H/W, Gr. 11-12 3/6 H/W

Table 17: Computer Science Education in Thuringen

## 3. Summary

We have shown the big differences in Computer Science Education of the various provinces in every school forms. To demonstrate this differences I have prepared an online test. This test will take place in June 2007 with students from all provinces taking part. The program will run on a server of Paderborn University [18] [platoon.upb.de/infotest](http://platoon.upb.de/infotest).

After having answered all questions we will see students of which provinces have a deeper knowledge of Computer Science.

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