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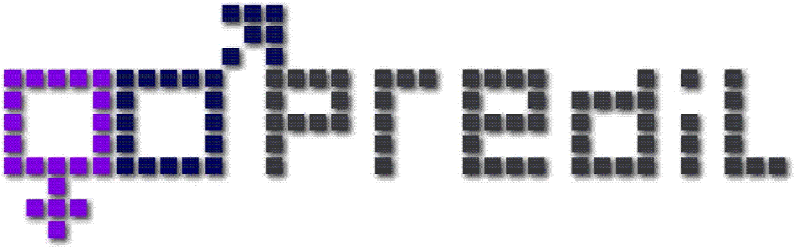

PREDIL

Promoting Equality in Digital Literacy

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THE NATIONAL CONTEXT OF GERMANY

Report

With the support of the Lifelong Learning Programme of the European Union

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Authors:	Kathrin Helling,Bernhard Ertl Universität der Bundeswehr München Kathrin.Helling@unibw.de Berhard.Ertl@unibw.de
Task Responsible:	UniBw
Contributors:	N/A
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Project coordinator:	Kathy Kikis-Papadakis, FORTH/IACM
Project coordinator emaill address:	katerina@iacm.forth.gr
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SUMMARY

Germany made progress with respect to the issue of gender and information and communication technologies (ICT). An increasing number of citizen is using ICT, and in the context of internet usage a recent study was able to show slightly more female users than male users in the age group of 14-19. However, for other age groups the study revealed that the number of male internet users steadily exceeds the number of female users and the difference increses with age. Besides, self-efficacy and competences follow the traditional western stereotype: at school level, boys show more confidence than girls in perfoming computer tasks; and in related subjects such as mathematics and natural sciences the competences of boys reach a higher level than that of girls.

In German schools, digital literacy and ICT competence is taught in the context of media literacy, which also includes traditional media, and the subject of informatics. However, because of Germany ś federal structure and the educational autonomy of each German state, there is no unified curriculum for media literacy or informatics across Germany. Informatics, for example, is part of the upper secondary curriculum in each state, but sometimes compulsory and sometimes complementary. Besides the differences of the respective state curricula, there is one common concept about what informatics competences pupils should have developed for obtaining an university admitting degree (Abitur).

German policies pay some attention to the gender aspects, but issues like migrants, the quality of the basic vocational education and the introduction of 8-year secondary education receive much more attention. Thus, at school level there are only specific projects dealing with research about and facilitation of gender and ICT, often in the context of technical subjects in general or math education. For university education, a little more attention is given to the gender issue in technical subjects.

Nevertheless, one can find the leaky pipeline phenomenon in Germany: Even if the balance of men and women in technical studies and ICT related careers improves, women are still significantly unterrepresented. Even the prospect of high employment rates in ICT related professions and superior salaries as compared to other professions are not able to change this situation: women choose a career in this field less often than men. Consequently, there are still less women in such professional careers and they usually earn less than their male collegues.

To sum up, the situation in Germany with respect to gender and ICT is still far away from gender balance. Statistics about ICT use of teenagers indicate that there may be a change. However, this has to be consequently supported to affect the uptake of ICT careers by women positively.

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1 Introduction

The following report was written in the context of the Comenius project PREDIL – Promoting Equality in Digital Literacy and provides an overview and information about the German structures and situation related to women ś uptake of a professional career in the information and communication technology (ICT) sector. Its main focus lies on the issue how the relation between gender and ICT develops during school, university and professional carreers anjd which initiatives aim at supporting gender balance in these areas. The following paragraphs will describe the structure of the report in detail.

The report starts with describing ICT use in German households and pupils ' digital literacy to illustrate the current situation. Therefore, section 2 presents data on the actual internet usage in German households. A focus is set in the description on differences between the internet usage behaviour of men and women.

Section 3 provides information about the structure of the German educational system and the educational pathways and transition options starting from pre-school institutions to continuing education. Differences between the German Länder and gender-related differences are described exemplarily.

In section 4, the focus is on media education and the use of ICT in the compulsory school system. Additionally, information about teacher education related to the interdisciplinary subject of media education is reported. The German educational system is characterised by its federal structure and the educational autonomy of the federal states. The different approaches on ICT teaching in the different German states are exemplified by the cases of Bavaria and North-Rhine-Westphalia.

Several jobs in the ICT sector require university graduation. Therefore, section 5 considers data on the uptake STEM (science, technology, engineering, and mathematics) at university. Information on the enrolment numbers, graduations and doctoral phases is provided in comparison for men and women.

The data on the income and labour market in the ICT sector, which is described in section 6, suggests that a career in this sector as generally attractive and profitable as compared to other economic sectors. However, differences for men and women related to the income of professions in the ICT sector show great inequalities.

Section 7 has a focus on national networks and projects which aim at supporting women in the context of taking up a career in ICT related professions.

The concluding section 8 summarises the report with a focus on the observed inequalities and the aims of the PREDIL project to improve the situation in a long-term perspective.

It has to be noted that the information and data provided in this report only provides a selective insight in the current situation in Germany. This is mainly due to the educational autonomy of the 16 German states and the resulting complexity of educational issues at the national level. Besides this, national data of the different sources in the field of ICT and gender often lack in coherence. Although several sources provided information on the related issues, they were often not up-to-date or considered the situation of men and women on a rather superficial level, not providing details that allow for a more comprehensive description of the situation.

2 Computer and Internet Usage Statistics in Germany

2.1 Internet usage in German Households

The following data from the (n)onliner-study of the Initiative D21 (2008) provides a statistically representative overview of the internet usage in German households with a focus on the digital divide between female and male users. The 2008 data is based on more than 50.000 computer-supported telephone interviews with German speaking inhabitants starting at the age of 14. The study differentiates between three types of internet users defined as follows:

- The **Onliner** – internet user, independent of the location and reason of usage
- The **Offliner** – person who does not use the internet and does not plan to do so
- The **Usage Planner** – person who does not use the internet but plans to use it within the next 12 months

In reverse to the tendency of the previous years, the digital divide between male and female Onliners was increasing in 2008. At the same time, more women plan to use the internet in future which allows hoping for a decrease of the digital divide in long term perspective. The following figure and tables (figures 2.1-2.4) present the detailed figures of the digital divide between women and men in Germany. The data refers to a differing basis in each year and between men (23.043-25.428 replies) and women (25.065-27.075 replies).

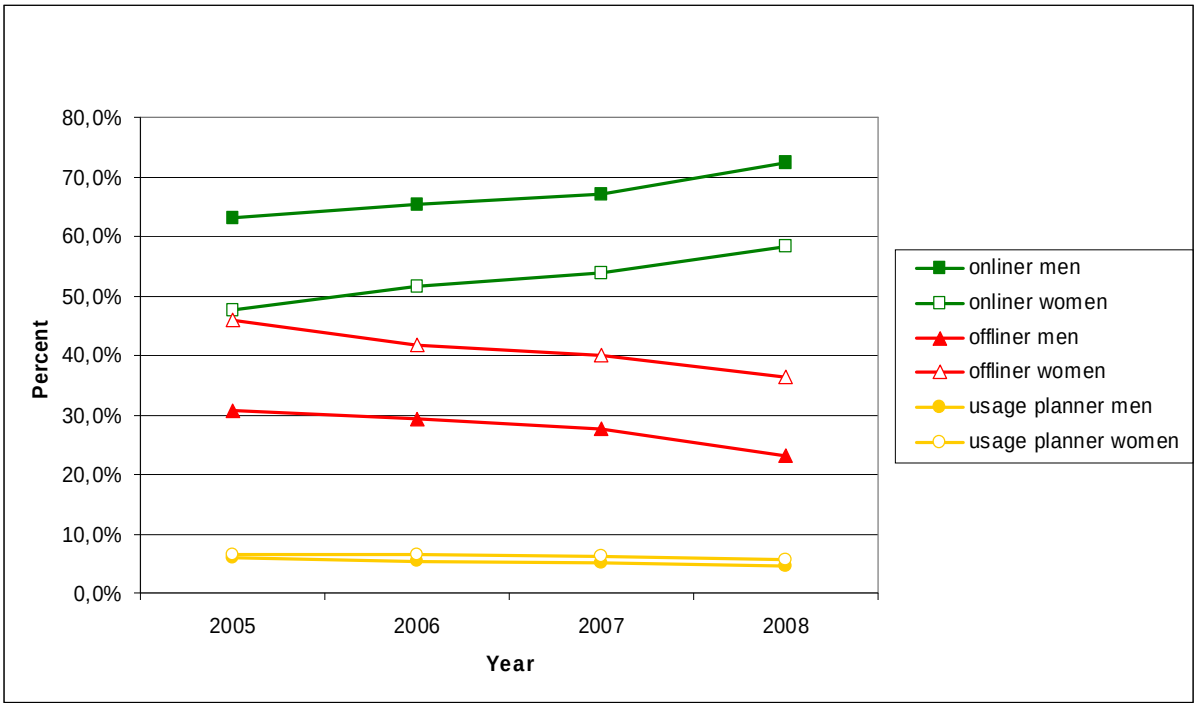


Figure 2.1. Percentage of male and female onliners, offliners and usage planners by year (Initiative D21, 2008).

Year	Male Onliner	Female Onliner	Difference
2005	63,2%	47,6%	15,6%-points
2006	65,4%	51,5%	13,9%-points
2007	67,1%	53,8%	13,3%-points
2008	72,4%	58,3%	14,1%-points

Figure 2.2. Male and female Onliners from 2005-2008 (Initiative D21, 2008).

Year	Male Offliner	Female Offliner	Difference
2005	30,8%	45,8%	15,0%-points
2006	29,2%	41,8%	12,2%-points
2007	27,7%	39,9%	12,2%-points
2008	23,2%	36,2%	13,0%-points

Figure 2.3. Male and female Offliners from 2005-2008 (Initiative D21, 2008).

Year	Male Usage Planner	Female Usage Planner	Difference
2005	6,0%	6,6%	0,6%-points
2006	5,4%	6,6%	1,2%-points
2007	5,2%	6,2%	1,0%-points
2008	4,4%	5,5%	1,1%-points

Figure 2.4. Male and female Usage Planners from 2005-2008 (Initiative D21, 2008).

The over proportional increase in male Onliners can be explained by their stronger increase in using broadband technology as compared to women (figure 2.5).

Year	Male broadband user	Female broadband user	Difference
2007	67,2%	50,9%	16,3%-points
2008	73,6%	55,9%	17,7%-points

Figure 2.5. Male and female broadband users from 2007-2008 (Initiative D21, 2008).

A differentiation by age shows that there are even more female teenagers than male teenagers in the group of Onliners. Nevertheless, in all older age groups the digital divide between men and women is increasing with the age and at the same time internet usage in general is decreasing with higher age for both men and women. The data refers to a differing basis for men (2.918-4.944 replies) and women (2.033-4.924 replies) in each age group (figure 2.6).

Age	Male Onliner	Female Onliner	Difference
14-19	93,2%	94,3%	- 1,1%-points
20-29	90,9%	88,6%	2,3%-points
30-39	88,2%	82,5%	5,7%-points
40-49	82,9%	73,5%	9,4%-points
50-59	69,6%	57,5%	12,2%-points
60-69	51,7%	32,4%	19,3%-points
70+	27,2%	9,2%	18,0%-points

Figure 2.6. Male and female Onliners by age groups (Initiative D21, 2008).

A high educational background has a positive influence on the internet usage of both men and women (figure 2.7). However, especially low educated women without vocational apprenticeship qualification use the internet to a much lower extend then men from the same educational background. The data refers to a differing basis for men (1.522-8.387 replies) and women (1.560-9.910 replies) for each educational background category.

Educational Background	Male Onliner	Female Onliner	Difference
Pupils	94,5%	95,5%	1,0%-points
Primary School, no apprenticeship	50,7%	25,0%	25,7%-points
Primary School and apprenticeship	59,8%	42,8%	17,0%-points
Secondary School, no leaving certification (Abitur)	76,7%	65,2%	11,5%-points
Higher education entrance certificate; Advanced technical certificate	89,3%	84,0%	5,0%-points
Completed university studies	85,8%	82,9%	2,9%-points

Figure 2.7. Male and female Onliners by educational background (Initiative D21, 2008).

2.2 Digital literacy of pupils in Germany

The following two graphics are based on PISA data published by the OECD (2005). They show the percentage of male and female pupils (age group ca. 15-16 years) who are confident in performing certain high-level tasks on computers (figure 2.8). The results are based on pupils 'self-reports. The comparison to OECD standards (figure 2.9) shows that pupils in Germany self-estimate their performance in all tasks better than pupils in other OECD countries, except for the creation of presentations. Within Germany (figure 2.10) boys feel clearly more confident than girls in performing all the high-level tasks.

a)	Use software to find and get rid of computer viruses	e)	Create a presentation (e.g. using <Microsoft PowerPoint>)
b)	Create a multimedia presentation (with sound, pictures, video)	f)	Use a spreadsheet to plot a graph
c)	Create a computer program (e.g. in <Logo, Pascal, Basic>)	g)	Use a database to produce a list of addresses
d)	Construct a Web page		

Figure 2.8. High-level computer tasks.

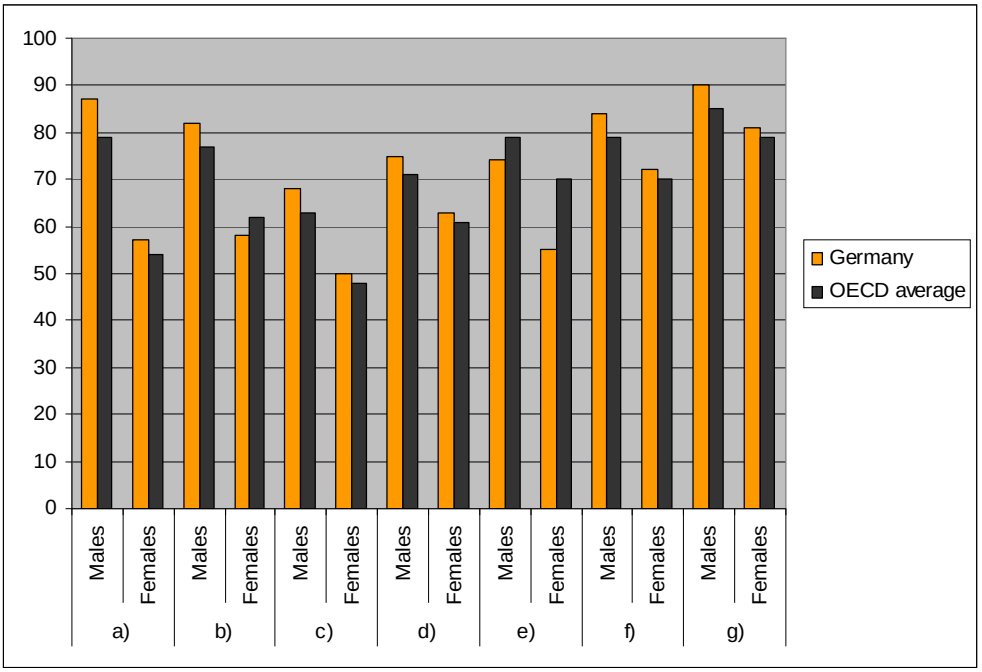


Figure 2.9. Percentage of pupils (males/females) who are confident performing high-level computer tasks in Germany and compared to the OECD average. (Source: PISA; OECD, 2005).

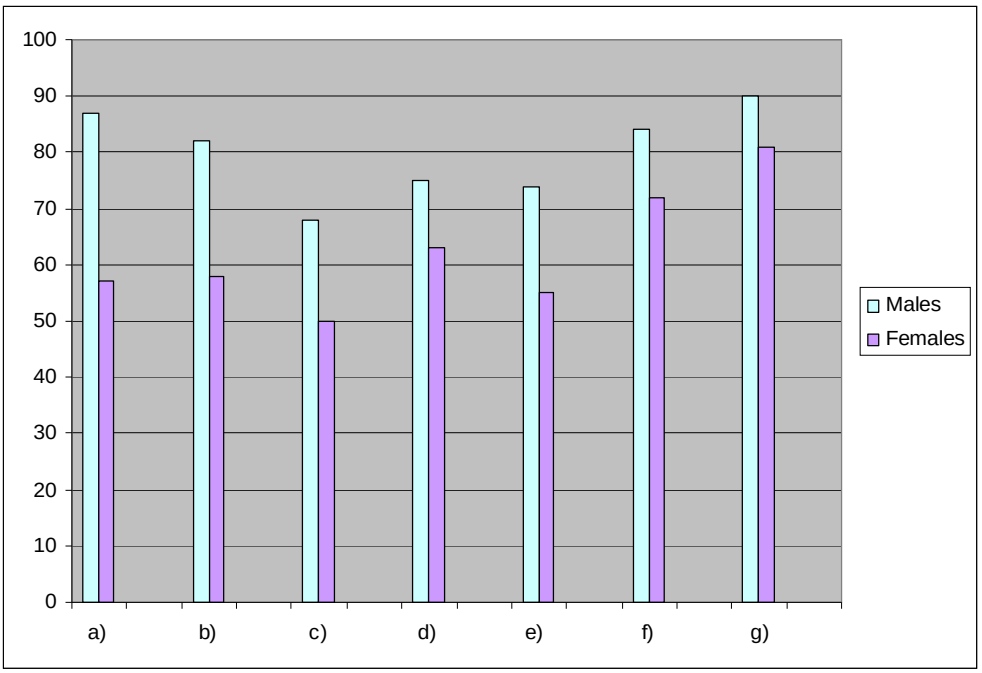


Figure 2.10. Percentage of male and female pupils in Germany who are confident performing high-level computer tasks. (Source: PISA; OECD, 2005).

3 Educational System Germany

Historically, education is primarily a responsibility of the federal states (Länder), and the educational system may vary from federal state to federal state. However, it is generally divided into five different main stages (German Eurydice Unit, 2008):

- pre-primary education
- primary education
- lower and upper secondary education
- post-secondary and tertiary education
- continuing education.

Figure 3.1 illustrates the characteristics of the German education system, starting from compulsory education at primary level up to continuing education after university or basic vocational training. Included in the figure are also the voluntary pre-school (Kindergarten) and further education years. Generally, compulsory education begins between the ages of six and seven and ends when the pupil reaches 18 years of age. The ages given on the right hand side display the earliest possible entry age and account for pupils with a continuous path through the education system (e.g. not interrupted by repeating a year due to low grades).

German children usually start primary school (Grundschule) in the month of September after their 6th birthday. After 4 classes of primary education (six classes in some Länder), pupils move on to one of three types of secondary schools (Hauptschule, Realschule, Gymnasium), depending on their grades and teachers 'recommendations. At the age of 15, pupils are allowed to leave school (with his parents 'permission), but they must take some form of vocational training until they reach the age of 18. According to BMBF (2004) about 30% of the pupils who go to Hauptschule complete a 10th year at this type of school instead of leaving school.

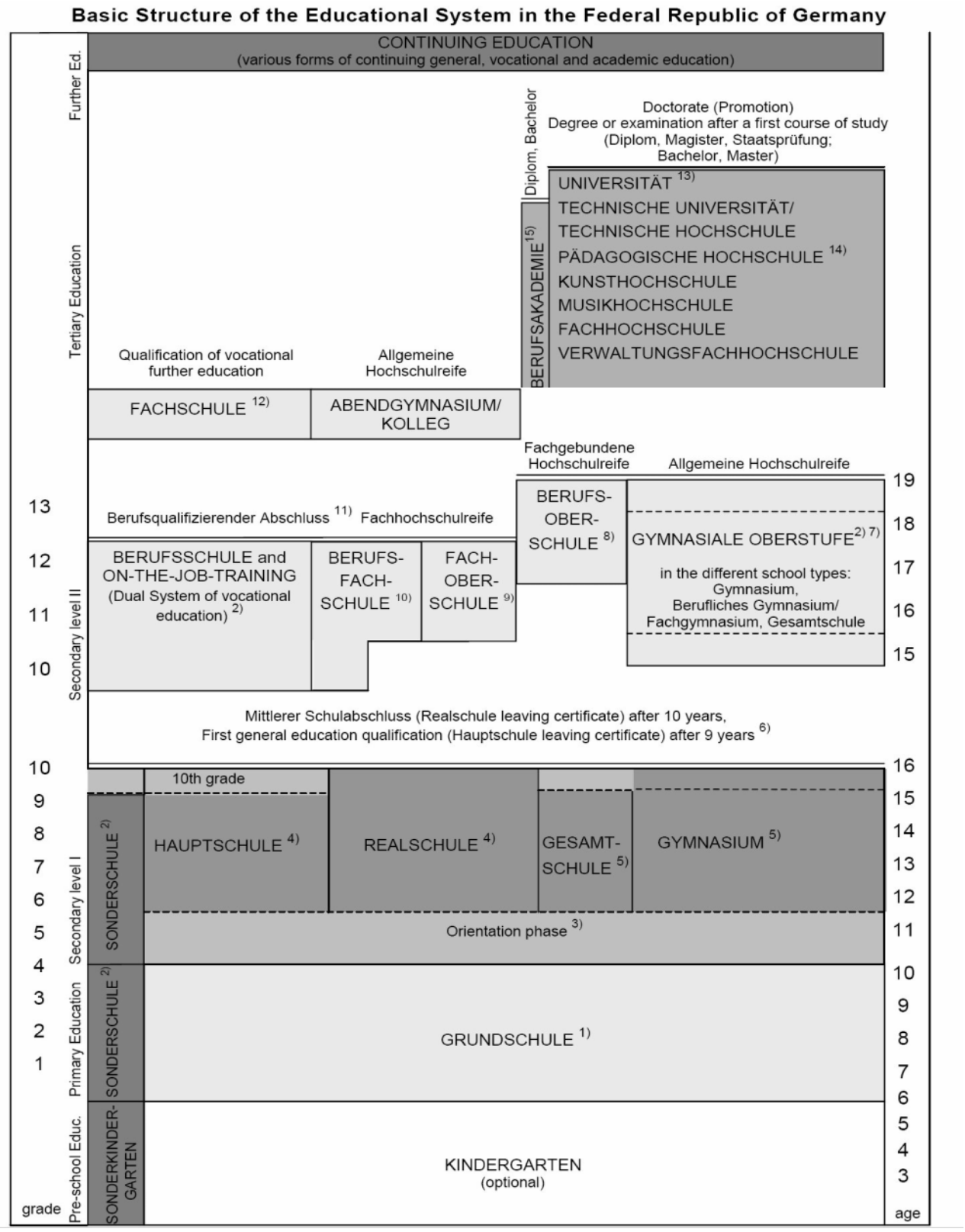


Figure 3.1. Basic structure of the Educational System in the Federal Republic of Germany (KMK; 2009, p. 2). For annotations see below.

These annotations for figure 3.1 are directly cited from KMK (2009, pp. 3-6).

At the end of this report a glossary provides additional information and explanations of the different terms.

The distribution of the school population in grade 8 as per 2007 taken as a national average is as follows: *Hauptschule* 20.6 per cent, *Realschule* 26.5 per cent, *Gymnasium* 33.4 per cent, *integrierte Gesamtschule* 8.5 per cent, types of school with several courses of education 6.4 per cent, special schools 3.8 per cent. The ability of pupils to transfer between school types and the recognition of school-leaving qualifications is basically guaranteed if the preconditions agreed between the Länder are fulfilled. The duration of full-time compulsory education (compulsory general education) is nine years (10 years in four of the Länder) and the subsequent period of part-time compulsory education (compulsory vocational education) is three years.

1. In some Länder special types of transition from pre-school to primary education (*Vorklassen, Schulkindergärten*) exist. In Berlin and Brandenburg the primary school comprises six grades.
2. The disabled attend special forms of general-education and vocational school types (partially integrated with non-handicapped pupils) depending on the type of disability in question. Designation of schools varies according to the law of each Land.
3. Irrespective of school type, grades 5 and 6 constitute a phase of particular promotion, supervision and orientation with regard to the pupil's future educational path and its particular direction (Orientierungsstufe or Förderstufe).
4. The Hauptschule and Realschule courses of education are also offered at schools with several courses of education, for which the names differ from one Land to another. The Mittelschule (Sachsen), Regelschule (Thüringen), Erweiterte Realschule (Saarland), Sekundarschule (Bremen, Sachsen- Anhalt), Integrierte Haupt- und Realschule (Hamburg), Verbundene oder Zusammengefasste Haupt und Realschule (Berlin, Hessen, Mecklenburg-Vorpommern, Niedersachsen) Regionale Schule (Mecklenburg-Vorpommern, Rheinland-Pfalz), Oberschule (Brandenburg), Duale Oberschule (Rheinland-Pfalz), Regionalschule (Schleswig-Holstein) and Gemeinschaftsschule (Schleswig-Holstein), as well as comprehensive schools (Gesamtschulen) fall under this category.
5. The Gymnasium course of education is also offered at comprehensive schools (Gesamtschule). In the cooperative comprehensive schools, the three courses of education (Hauptschule, Realschule and Gymnasium) are brought under one educational and organisational umbrella; these form an educational and organisational whole at the integrated Gesamtschule. The provision of comprehensive schools (Gesamtschulen) varies in accordance with the respective educational laws of the Länder.
6. The general education qualifications that may be obtained after grades 9 and 10 carry particular designations in some Länder. These certificates can also be obtained in evening classes and at vocational schools.
7. Admission to the Gymnasiale Oberstufe requires a formal entrance qualification which can be obtained after grade 9 or 10. At present, in the majority of Länder the Allgemeine Hochschulreife can be obtained after the successful completion of 13 consecutive school years (nine years at the Gymnasium). Yet in almost all Länder the gradual conversion to eight years at the Gymnasium is currently under way, where the Allgemeine Hochschulreife can be obtained after a 12-year course of education.
8. The Berufsoberschule has so far only existed in a few Länder and offers school-leavers with the Mittlerer Schulabschluss who have completed vocational training or five years ' working experience the opportunity to obtain the Fachgebundene Hochschulreife. Pupils can obtain the Allgemeine Hochschulreife by proving their proficiency in a second foreign language.
9. The Fachoberschule is a school type lasting for two years (grades 11 and 12) which admits pupils who have completed the Mittlerer Schulabschluss and qualifies them to study at a Fachhochschule. Pupils who have successfully completed the Mittlerer Schulabschluss and have been through initial vocational training can also enter the Fachoberschule directly in grade 12. The Länder may also establish a grade 13. After successful completion of grade 13, pupils can obtain the Fachgebundene Hochschulreife and under certain conditions the Allgemeine Hochschulreife.
10. Berufsfachschulen are full-time vocational schools differing in terms of entrance requirements, duration and leaving certificates. Basic vocational training can be obtained during one- or two-year courses at Berufsfachschulen and a vocational qualification is available at the end of two- or three-year courses. Under certain conditions the Fachhochschulreife can be acquired on completion of a course lasting a minimum of two years.
11. Extension courses are offered to enable pupils to acquire qualifications equivalent to the Hauptschule and Realschule leaving certificates.
12. Fachschulen cater for vocational continuing education (1-3 year duration) and as a rule require the completion of relevant vocational training in a recognised occupation and subsequent employment. In addition, the Fachhochschulreife can be acquired under certain conditions.
13. Including institutions of higher education offering courses in particular disciplines at university level (e.g. theology, philosophy, medicine, administrative sciences, sport).
14. Pädagogische Hochschulen (only in Baden-Württemberg) offer training courses for teachers at various types of schools. In specific cases, study courses leading to professions in the area of education and pedagogy outside the school sector are offered as well.
15. The Berufsakademie is a tertiary sector institution in some Länder offering academic training at a Studienakademie (study institution) combined with practical in-company professional training in keeping with the principle of the dual system. As at January 2009

3.1 Differences in the German school system

In the following, examples are presented to provide an insight into effects related to structural differences of the German educational system, looking at the Länder level (figure 3.2) as well as at different school levels and types.

Figure 3.2. Map of Germany (incl. names of the Länder; wwww.deutschland.de)

The structural differences of the German education system are reflected in differences of pupils' performance. Figure 3.3 visualizes PISA 2006 results (BPB, 2008; Prenzel et al., 2008). It displays differing mathematical and science literacy mean scores for the German Länder.

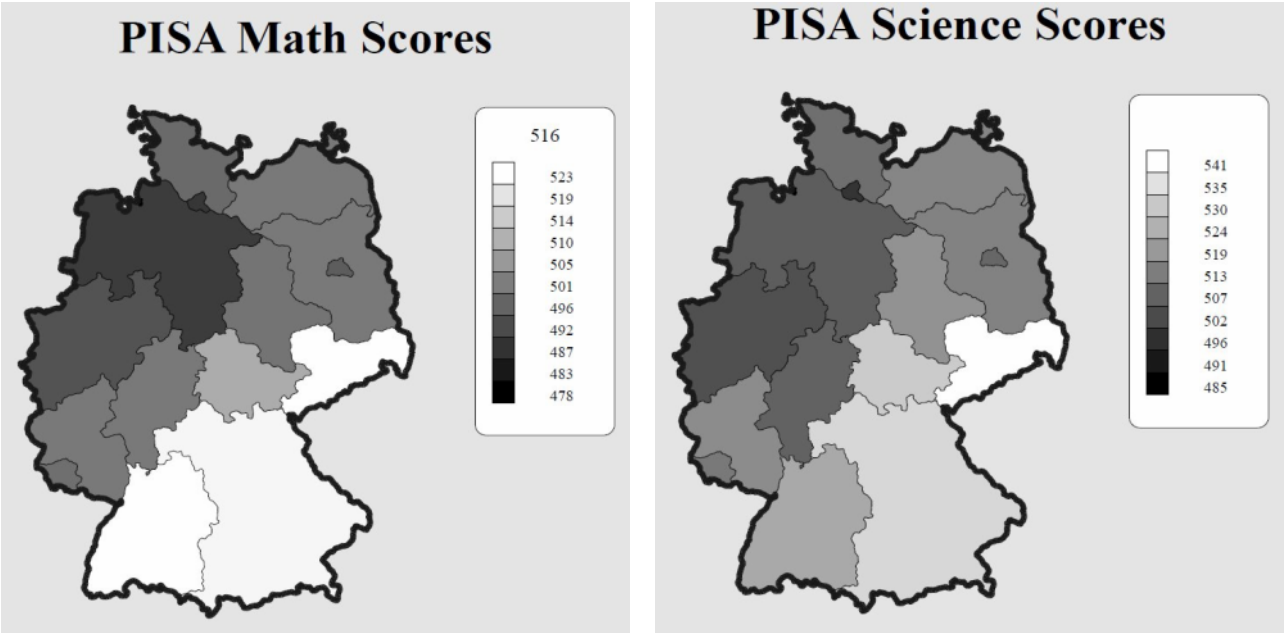


Figure 3.3. PISA 2006 mathematical and science literacy scores for the German Länder (Source: OECD PISA 2006).

Figure 3.3 shows clear differences between the Länder. For example, the math and science scores of the two largest Länder Bavaria (population: >12.519.300) and North Rhine-Westphalia (NRW, population: >17.968.100) differ about 30 points in both subjects. The competences of pupils in Bavaria in math (519 points) and science (535 points) are above OECD average (math 489; science 500) and above the average of Germany (maths 504; science 516). This is not the case in NRW where the pupils' maths score (487 points) is below OECD average and the average of Germany; and the

science score (507 points) is below the average score of Germany but above the OECD average.

The following link provides a video example of science learning in Germany produced in the context of the OECD PISA 2006 study (Duration: 4:17min):

www.viewontv.com/oecd/031207_pisa2006/index.php?lang=ge

PISA 2006 – Science Learning: Germany

Differences in the pupils' mean scores of mathematical, science and reading literacy are found in Germany also between school types and by sex. Figure 3.4 presents the performance differences of girls and boys for schools on secondary level.

The mean difference between girls and boys in their reading competence is reflected in their distribution to the PISA 2006 proficiency levels: at proficiency level V (expert level) two-thirds of the pupils are female, and on the contrary at competence level I (basic level) only one-third is female. This distribution is different for the mathematics and natural sciences competences: at the basic level the proportion of girls and boys is nearly equal whereas at competence level IV and V about 60% of the high achievers are boys (Frey, et al., Frenzel et al. as cited in Blossfeld et al., 2009).

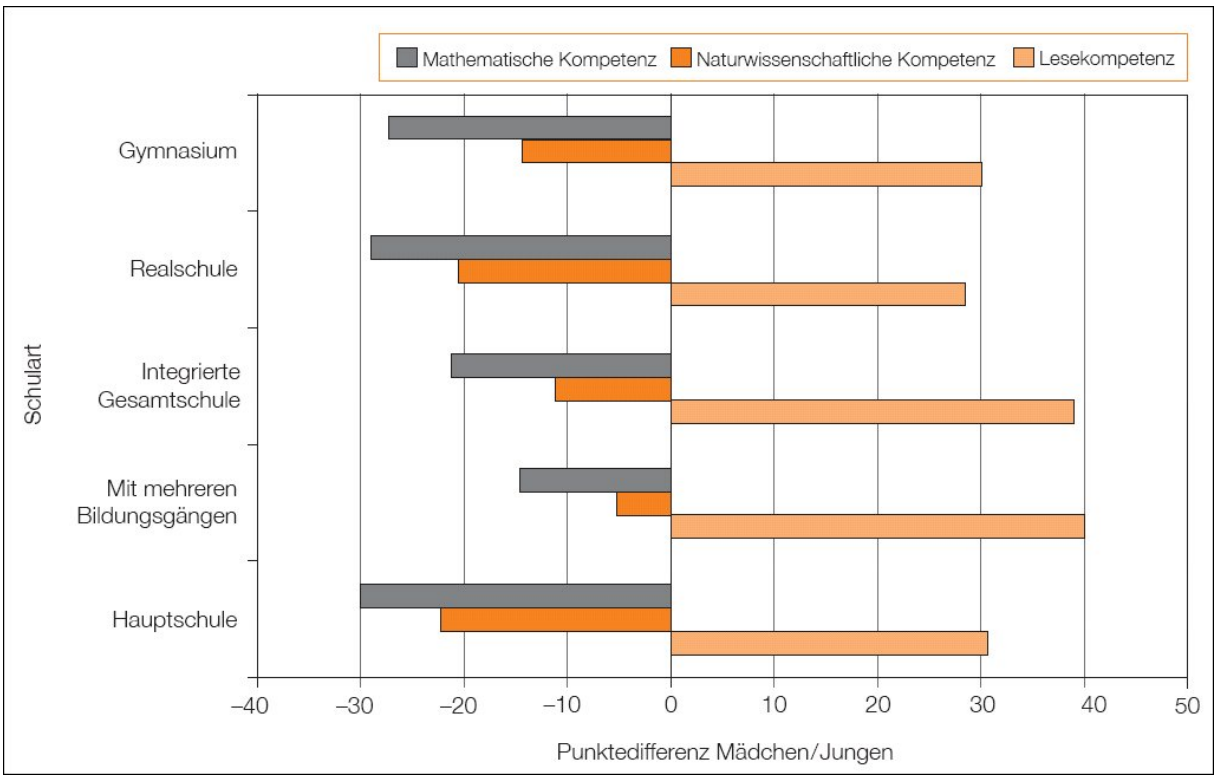


Figure 3.4. Differences in the mathematical, sciences and reading literacy PISA scores by school type and by sex. (Source: PISA 2006; Blossfeld et al., 2009).

Translation of figure 3.4 – Schulart: type of school; Gymnasium: grammar school; Realschule, Hauptschule: lower secondary schools; Integrierte Gesamtschule: integrated comprehensive school; mit mehreren Bildungsgängen: including serveral courses of education; Punktedifferenz Mädchen/Jungen: difference in the score of girls/boys; Mathematische Kompetenz: mathematical literacy; Naturwissenschaftliche Kompetenz: science literacy; Lesekompetenz: reading literacy.

4 ICT & Gender at School Level in Germany

4.1 Media education and media literacy

The terms media education and media literacy (Medienerziehung/Medienbildung and Medienkomptenz) are used complementary in the German curricula of compulsory schools. According to the Bund-Länder Commission for Educational Planning and Research Promotion (Bund-Länder-Kommission für Bildugsplanung und Forschungs-förderung, BLK, 1995) media education aims at teaching media literacy to pupils. Both – media education and media literacy – should focus on an integrative and interdisciplinary approach across all subject matters taking into account the stages of development of the pupils. Media education and media literacy should also be integrative with regard to the consideration of different media, e.g. print media, audiovisual offers and information technology.

The focus of media education in German schools should be on the following three main areas which can be seen as basis for the development of the Länder-specific curriculums:

- Use of media and non-media opportunities with the aim to select and assess media offers reflectively, e.g. in the areas of entertainment, information, communication, and problem-solving and learning.
- Insight into the production requirements and effects of media with the aim to develop a critical attitude towards media influence on perception, thinking and actions.
- Practical and creative media production with the aim to enhance personal ways for expression and creativity, and to develop a social responsibility in the use of media.

According to the BLK (1995), the conceptual implementation of a media didactic approach in the curriculum is related to two connected levels:

- The increasing use of media as teaching and learning resource for the design of lessons from a media didactic perspective.
- The education of pupils and facilitation of their competences to use media and the messages provided by media critically and productively.

Another view of a curricular approach to media education was provided by Hettinger (1999), head of the media department at the Ministerium für Kultus, Jugend und Sport Baden-Württemberg. He points out the following aspects as basis for increasing pupils ' individual media competences:

- Through a reflective approach of using media during lessons pupils experience the handling of media.
- By covering media issues on a content level pupils gain knowledge about media, e.g. about production and design processes, effects of media use, and the individual, legal, economic and social context of media.
- Furthermore, media use could be integrated in the daily school life, e.g. by using media for the documentation of school events; and pupils should be supported towards an active and design oriented handling of media.

The German educational system is characterised by the responsibility of the Länder for the definition and implementation of educational policies and strategies. In general the curriculum approaches of the Länder are based on the same policies, e.g. on decisions of the Ständige Konferenz der Kultusminister der Länder (KMK, a committee of ministers for education and cultural affairs of each of the Länder) or of the Bund-Länder-Kommission für Bildungsplanung und Forschungsförderung (BLK, a discussion committee of policy makers from the Federal Government and State Governments). Accordingly – although based on the three main areas of media education described above – the concept of media education and literacy differs for each of the Länder concerning content and focus related to the age of pupils and the interdisciplinary integration in the curriculum.

Due to the rapid development of new media and information technologies the efforts of educating pupils in this field need to be monitored and evaluated continuously according to the up-to-dateness and relevance of the content. The technical knowledge concerning the functionalities and handling of new media is only one aspect. However, a challenge in the context of the use of new media is the fact that due to the increasing availability of information and data a kind or orientation knowledge for a reflective use of this information needs to be developed by pupils. The responsible use and assessment of information needs to be discussed as well, e.g. in the context of possibilities for manipulating information (e.g. by digital image editing) or the availability of inappropriate contents on the Internet. Additionally, social and communication competences need to be further developed in the context of media education, especially as using new media can set a focus on individuality and individualism. Therefore, the current development and related effects and influences of new media need to be approached in a reflective and responsible way at school (KMK, 1997).

Media education and literacy need to take into account the use of current information- and communication technology (ICT) and new digital media for teaching and learning (see BLK, 1987; Gesellschaft für Informatik, 1999b). Between 1998 and 2003, the BLK supported the implementation of new media and information technology with the SEMIK project (Systematische Einbeziehung von Medien und Informations- und Kommunikationstechnolgie in Lehr- und Lernprozesse, www.fwu.de/semik) across all Länder. The SEMIK project aimed at the sustainable integration of new media in teaching at schools with a focus on teacher education, school development, development of didactical concepts and curriculums, and the provision of technical tools. The implementation of this project was based on an expert report by Mandl, Reinmann-Rothmeier and Gräsel (1998) which considered the current situation of new media in the context of society, school education and didactics and provided recommendations for teacher education, curriculum development, teaching concepts, and school development.

In the following, the focus is set on ICT, digital media and informatics from two perspectives: first as a subject of learning, and additionally the utilization of ICT and digital media for teaching and learning in various subjects is considered.

4.1.1 ICT and Informatics as subject of learning

The, basic education in information technology (Informationstechnische Grundbildung, ITG; see BLK, 1987) is to be implemented in all compulsory schools in Germany at lower secondary level by integrating it into existing subjects and/or offering the subject informatics (Informatik). The extent and processes of implementation differ between the Länder (see Institut für Schulforschung, 2007a; 2007b).

The Gesellschaft für Informatik (GI) issued several recommendations concerning the integration of the subject of informatics in school curriculums at lower and upper secondary level (see www.gi-ev.de/service/publikationen/empfehlungen; e.g. GI, 1999b; 2000). Due to the self-government of the Länder in education policy these recommendations are implemented to a different extent and the Länder and schools can decide to include informatics either as a compulsory or elective subject in the school curriculum. The different implementation approaches are reflected in the number of curriculum frameworks available in the Länder. A list available in the ZUM wiki – a teacher wiki for the collection of teaching materials and related resources – provides a collection of standards and curriculum frameworks for informatics teaching (http://wiki.zum.de/Richtlinien_und_Lehrpläne_für_Informatik). However, the list is not exhaustive and information on the missing Länder could be retrieved from the web pages of the ministries of education and cultural affairs, and the educational servers of the Länder.

The KMK is concerned with the development of educational standards for mathematics, natural sciences and technical education at school. However, the current standards do not include the subject informatics (see www.kmk.org/bildung-schule/qualitaetssicherung-in-schulen/bildungsstandards/ueberblick.html). However, the KMK (2004) published a resolution on common standards for informatics Abitur examination (Einheitliche Prüfungsanforderungen Informatik, EPA) which specify methodological competences (e.g. application, evaluation, and reflexion of informatics methods and issues, communication and cooperation related to informatics tasks) and subject contents (e.g. modelling techniques, interaction with and of informatics systems, opportunities and barriers of informatics processes) to be examined.

The development of specific educational standards for informatics is set on by the GI (2008). The GI recommends principles and standards to be fulfilled at the end of lower secondary level (Sekundarstufe I). The focus is on specific contents (e.g. algorithms; informatics systems, informatics, humans and society) and related processes (e.g. modelling, communication, assessment, networking). Additionally, the website www.informatikstandards.de offers support for informatics teachers for implementing these standards, e.g. by suggesting different (non-)commercial tools and tasks (planned). Again, the implementation of these standards is followed by the Länder to a different extent and own standards are formulated as well, e.g. in the context of the Bildungsplan 2004 (educational plan) issued in Baden-Wuerttemberg (see http://lbsneu.schule-bw.de/entwicklung/bistand). Considerations for the development of educational standards for informatics on upper secondary level were published by Fothe (2008). These standards refer to both the EPA Informatik issued by the KMK and the GI recommendations as outlined above. Fothe concludes, that it is essential to support teachers in the implementation of these educational standards as basis for their teaching.

4.1.2 ICT for teaching and learning

New media enable didactical approaches, focusing on cross-linked, example based and interdisciplinary knowledge. At the same time, the supportive arrangement and provision of learning methods and strategies through programs and learning environments can facilitate competences for self-regulated learning as basis for lifelong learning. Knowledge sharing, networking and collaboration are supported even across long distances. Teachers need creativity and experience for the successful implementation of new media in teaching and learning and sometimes rather high

expectations cannot be met to the satisfaction of everybody. A clear need and potential for the use of ICT in schools was identified in this context (KMK, 1997).

The current situation of the use of ICT for teaching and learning (e.g. eLearning) is monitored by the German Ministry for Education and Research (BMBF). An analysis of the usage of information technology in the German education system (BMBF, 2006) indicates for 99% of all schools equipment with desktop and mobile computers for teaching and learning. All in all over 11.5 Mio pupils at more than 30.600 schools, including primary, secondary and vocational schools have access to a computer for learning. In the following, the focus is on primary and secondary education.

In primary education, there are on average 12 pupils per computer and in secondary education 11 pupils share one computer. Several schools (36% of primary schools, 66% of secondary schools) offer their pupils to use the computers also outside classes, e.g. by using the computer room after lessons. Internet connection is available in 52% of the primary schools and 75% of the secondary schools.

With respect to frequent or occasional computer usage in different subjects of learning differences between primary and secondary education were identified. In primary education, computers are mainly applied in German language teaching, followed by the subjects of mathematics. Furthermore, computers are used in project working groups. In secondary education, mathematics lectures get the first rank in computer usage, followed by German language teaching and natural sciences, project working groups, social sciences, and computer science (figure 4.1).

Type of school	**Primary schools**		**Secondary schools**	
Subject	Computer usage	Internet usage	Computer usage	Internet usage
German language	93%	66%	87%	76%
Mathematics	92%	40%	92%	57%
Social sciences	-	-	79%	79%
Natural sciences	25%	28%	87%	81%
Computer science	-	-	77%	77%
Project working groups	58%	54%	80%	77%

Figure 4.1. Percentage of schools which use the computer and the internet by school type and subject (BMBF, 2006).

Learning applications is the kind of software mainly used during lessons in primary education (96%) and in secondary education (91%). Furthermore, multimedia reference books and dictionaries are used often (primary schools: 54%; secondary schools: 75%). Programs for the design of multimedia applications are on third place in both school types (primary schools: 33%; secondary schools: 71%). Software tools are used by 18% of the primary schools and 54% of secondary schools. Additionally, programming languages (40%) and sector-specific software related to vocational education (18%) are used in secondary schools.

4.2 Teacher education and training

The structure of initial teacher education (at university) and in-service teacher training (provided by teacher training institutions) in Germany is quite complex. An exhaustive description cannot be provided in the scope of this report. In the following, basic information on the teacher education and training in Germany is provided and furthermore the focus is set on the context of media education and literacy.

4.2.1 Basic information on teacher education and training

Education is in the responsibility of the federal states (Kulturhoheit der Länder), and this applies also in the case of teacher education at universities.

Initial teacher education in Germany follows two consecutive phases: 1) teacher education at university and 2) practical training at school. On secondary level, teachers have to study at least two school subjects, including subject specific didactics. The studies on lower secondary level have duration of 7-9 semesters; on upper secondary level the duration is 9 semesters and 12 for certain arts subjects (Deutscher Bildungsserver, n.d.b). Currently, teacher education in Germany is subject to a reform, focusing on the extended integration of practical experience in the educational processes, improving the connection between the theoretical and practical education phases, emphasizing the importance of the job entry phase, implementing examination which accompany the studies at university (not afterwards), developing the diagnostic and methodological competence of teachers. This reform process should also consider the implementation of bachelor and master studies for teacher (Deutscher Bildungsserver, n.d.a). Since 2007, the number of centres for teacher education (Zentren für Lehrerbildung) at universities increased steadily. These centres work on the restructuring of teacher education; they are founded based on Länder specific laws and regulations (Plattform Lehrerbildung, 2007). The current status of the reform in Germany is reported by the Lehrerbildungszentrum der Ludwig-Maximilians-Universität München (2009) and can be downloaded from its homepage (www.lehrerbildungs zentrum.uni-muenchen.de).

In-service teacher training is compulsory for teachers who have completed initial education. Again, Länder specific regulations apply with regard to the extent and content of these trainings (Lehrerbildungsgesetze; teacher education laws). To support cooperation across the Länder, an association fort he facilitation of continuing education of teachers – the Deutsche Verein zur Förderung der Lehrerinnen- und Lehrerfortbildung (www.dvlfb.de) – was founded.

4.2.2 Teacher education, teacher training and media education

The BLK (1995) points out that the competences of pupils often exceed those of teachers in the use of ICT and other media. Qualifying teachers for media education therefore should aim at increasing the teachers ' media literacy and at the same time prepare them for teaching the sensible use of media. Teachers ' should acquire the following competences; either as integral part of the initial teacher education and during in-service training for teachers:

- understanding the media experiences/context of media usage (Medienwelt) of children and adolescents
- reflecting on what they have heard, read, seen, and on their own usage of media
- analyse the quality, terms of production and effects of media
- developing craft and technical competences for the development of media products with pupils
- following the scientific and public discussion on media usage and effect

In 1998 the BLK published a complementary report on the role of media education in teacher education, focusing on new media and telecommunication technologies. Schools have two functionalities in this context: they support pupils in the acquisition of media literacy and the responsible usage of media, and they focus on the utilization

of multimedia and telecommunication technologies for teaching and learning. It is essential that teachers are qualified accordingly and have the following competences:

- Application: technical application of media; knowledge about current media offers; didactical implementation of edutainment offers
- Analysis: critical analysis of media effects (e.g. concerning socialisation, interaction)
- Communication: communicating with pupils, critical reflection of media experiences, consideration of cultural backgrounds in media-transmitted communication
- Design: media design and production with pupils, considering stylistic elements and technical requirements
- Management: managing and planning the pedagogical usage of media in education, e.g. for project work, interdisciplinary projects

Kerres and Kalz (2003) point out that teacher education and training should not only focus on aspects of media education and the technical usage of media. Additionally, media didactics need to be taken into account, considering opportunities of media usage during lessons and the didactic reflection of the relevance of media for teaching and learning processes. This view is in line with the current EU principles for teacher education: Teachers ' "education and professional development should equip them to access, analyse, validate, reflect on and transmit knowledge, making effective use of technology where this is appropriate. Their pedagogic skills should allow them to build and manage learning environments and retain the intellectual freedom to make choices over the delivery of education. Their confidence in the use of ICT should allow them to integrate it effectively into learning and teaching "(European Commission, 2005, p. 3).

According to the teacher education standards published by the Sekretariat der KMK (2004), all teachers have to acquire certain key competences during initial teacher education at university. Media education is among these competences, e.g. the implementation of media taking into account conceptual, didactical and practical aspects. From a theoretical perspective teachers have to gain knowledge about media education concepts and related psychological issues, as well as about the opportunities and barriers of demand- and situation-oriented implementation of media during lessons. Additionally, during practical training teachers should acquire the competences to integrate modern information- and communication technology in a sensible and reflective way. These standards apply also for in-service teacher training. In this context, several in-service training offers aim at qualifying teachers for teaching with ICT at school, and are therefore ICT-based itself. Detailed information for teachers on the usage of ICT in school (e.g. for certain subjects; on the availability of specific trainings and course; school development) is provided on Länder level by the education servers of the Länder (Landesbildungsserver).

4.2.3 Teaching the subject of Informatics

People interested in becoming an informatics teacher have the possibility to study Lehramt Informatik at several universities in Germany. According to an overview provided by the Gesellschaft für Informatik (GI; www.gi-ev.de/service/informatik-studiengaenge.html) more than 40 universities, universities of applied science, and pedagogical universities offer informatics teacher education as a specific subject (e.g. for primary schools, lower and upper secondary schools, vocational schools, special needs schools). The GI set up an working group teacher education for informatics '

(Arbeitskreis "Lehrerbildung für Informatik"). In 1999, it published recommendations for all phases of informatics teacher education and training (GI, 1999a), aiming at closing the prevailing gap of compulsory offers of informatics in secondary schools in several Länder and the lack of accordingly educated teachers at this time. These recommendations focused on subject-specific skills as well as on didactical competences of teachers, e.g. theory of informatics, implementation of information and communication technology for teaching.

Currently, the implementation of Bachelor/Master in teacher education aims at ensuring that teachers studying at different universities acquire comparable qualifications. Central competences to be achieved during Bachelor/Master studies of informatics and computer science are described in the following as published by the Sekretariat der KMK (2008, pp. 20-21; translated):

"Competence profile for informatics teachers: Graduates gain technical and didactic knowledge in informatics. It enables them to design teaching, learning and education processes in informatics. They are able to integrate new subject specific and interdisciplinary developments in teaching and for school development. They

- can capture, explain and assess informatics related facts in different contexts concerning social effects
- know about the durability and transferability of central informatics concepts
- know the different perspectives of informatics and its specific approaches to gain insights by methods of construction, proving and empirical research
- can develop relation between their technical knowledge and informatics at school; design didactical concepts and media for heterogeneous groups of learners and evaluate them from a content perspective; follow current developments informatics research and integrate new issues target-group specific in their teaching practice
- can apply didactical concepts and empirical results from subject-specific research on teaching and learning to analyse thinking and expectations of pupils, to raise pupils' interest in informatics, to facilitate and assess individual learning progress
- command about first reflected experiences in the authority oriented planning and accomplishment of informatics lessons and know basics of the achievement diagnostic and -appraisal in the subject
- have gained first reflective experiences in planning and implementing informatics lessons in a competence-oriented way, know the basics subject-specific of assessment diagnostics"

Additionally, figure 4.2 (KMK, 2008; translated) provides an overview about the contents of informatics teacher education at university.

Teacher education (lower secondary level)	Extended for teacher education at secondary level / grammar school
formal languages and automats	
• grammars as generators of languages • automats as acceptors of languages • finite automats • calculability and their constraints	• *consolidation for the content mentioned on lower secondary level; besides:* • push-down automaton and turing-machines • Chomsky-hierarchy • calculability- and complexity-classes
algorithm and data formats	
• time- and area-complexity of algorithm • asymptotical growth of complexity • search- and sorting procedure • algorithm principle: divide and conquer, systematic search • development of easy algorithm • abstract data type and their realisation with data format (lists, trees)	• *consolidation for the content mentioned on lower secondary level; besides:* • graph-algorithm • distributed algorithm, concurrent procedures • advanced data structures (balanced trees, hash-tables) • NP-completeness and reductions
data modelling and database systems	
• data modelling and data base structure • relational model • inquiry language: relational algebra, SQL • structural and domain specific integrity • relational blueprint-theory: functional addiction, normal forms	• *consolidation for the content mentioned on lower secondary level; besides:* • transaction-management • formal semantics of inquiry language
programming and software technology	
• programming paradigm and languages • procedure-model for the development of extensive software systems • methods and languages for asset-related development • software testing methods	• *consolidation for the content mentioned on lower secondary level; besides:* • syntax and semantics of programming languages • specification and verification of programmes • architecture schemes, design patterns

computer architecture and system software	
• presentation of information, codification • build-up and functionality calculators and networks • basics of system software • security	• *consolidation for the content mentioned on lower secondary level; besides:* • basics of circuits • network structure and basic technologies • protocol architecture • basics of cryptography
informatics, human and society	
• basis of human-computer-interaction • data security • copyright of digital media • informational self-determination • pupils and virtual worlds	
didactics of informatics	
• basics and standards for the informatics teaching • planning, organizing and implementation of informatics teaching • didactic (re-)construction of technical knowledge, particularly didactic reduction (examples) • knowledge, analysis and didactic preparation of appropriate practice areas • methods, techniques and media for teaching of informatics contents • historical and current teaching approaches and typical teaching methods of informatics • analysis and appraisal of teaching- and learning procedures in informatics	

Figure 4.2. Contents of informatics teacher education at university (KMK, 2008).

4.3 Gender aspects in media education and ICT in schools

Gender aspects are considered for the German school system in discussions about co-education and equality of women and men in education, and are embedded in the education acts and curriculum frameworks of the Länder.

Reflexive co-education aims at the change of gender ratios for realising equality in living together (Nyssen, 2004). According to learn:line NRW (n.d.) the concrete objectives of reflexive co-education are:

- Reducing gender hierarchies in school education to promote living and learning in equality
- Dissolving ascribed gender stereotypes to support the development of competences and knowledge of both, girls and boys
- Recognising individual differences without the experience of discrimination. The aim is not to equal both sexes

- Teaching contents should focus on cultural achievement of women an men equally and by this work against the prevailing men-dominated understanding of history
- Girls and boys alike aspire vocational qualification and employment without giving up having children and family. The ability of girls and boys for realising this life perspective should be supported.

Recommendations for the implementation of the educational principle "reflexive co-education" are available on Länder level only, published by a variety of ministries, institutes and associations. For example, the Landesinstitut für Schule und Weiterbildung in Nordrhein-Westfalen (2002) and the Ministerium für Bildung, Wissenschaft und Weiterbildung Rheinland-Pfalz (1999), published handouts to support teachers in implementing reflective co-education at school. In Hessen, the association FrauenUndSchule Hessen e.V. provides Hessian teachers with information on co-education, e.g. based on the above mentioned publications from NRW and Rheinland-Pfalz (Frauen & Schule Hessen e.V., n.d) and in a position paper on gender equity in school by Peschel (2003). And GISA – Gender-Institut Sachsen-Anhalt (n.d) is an association which worked out a concept for gender-sensitive curriculum development for primary schools.

In the bordering country Austria the Federal Ministry for Education, Arts and Culture (Bundesministerium for Bildung, Kunst und Kultur, BMUKK) issued in 1995 a principle decree as basis for the educational principle "education to equality of between women and men" (Unterrichtsprinzip: Erziehung zur Gleichstellung von Männern und Frauen, BMUKK, 2003) and additional recommendations for its implementation in different school types are provided. The Austrian educational principle is considered relevant for Germany, which can be seen from references made on German websites (see for example: Bildungsserver Hessen, 2008; GenderKompetenzZentrum, 2009). Paseka (2003) points to the little awareness of the educational principle "education to equality of women and men" as compared to then high awareness of the educational principle "media education" among Austrian students. Her aim is to raise awareness by showing possibilities for connecting both educational principles. During educational practice, this would mean the critical reflection and deconstruction of medial gender representations.

Concerning media education and ICT in schools in Germany, the aim of equality of girls and boys was formulated by the BLK (1987, p.8): "Ziel aller Bemühungen muss es sein, durch die Vermittlung einer informationstechnischen Bildung allen Jugendlichen - Mädchen und Jungen gleichermaßen - die Chancen der neuen Techniken zu eröffnen und sie zugleich vor den Risiken zu bewahren, die durch unangemessenen Gebrauch entstehen können." (Translation: The aim of all efforts is to enable all adolescents – girls and boys equally – by information technology education to benefit from new technologies, and at the same time prevent them from risks of inappropriate usage).

Nossek (2009) points out in a short overview article on reflexive co-education and the usage of new media by girls that the opportunities and limits of co-education should be considered especially in the context of STEM teaching. This view is supported by Wurm (2004) who describes in her article experiences from mono-education in Informatics lessons in Austrian schools. She refers to the importance of reflective co-education (see Faulstich-Wieland, Weber & Willems, 2004) in the context of informatics lessons and provides exemplary statements from boys and girls who were educated in gender-homogenous groups. The girls saw advantages in not being disturbed or irritated by boys, and had the feeling to receive more attention from the teacher; they did not see any disadvantages. The boys had the feeling not to be impeded by girls, e.g. by their

"moaning" and the time-consuming questions the girls would ask; however, a disadvantage was seen in the lacking possibility to copy from the well structured notes took by girls during lessons.

4.4 The cases of Bavaria and North Rhine-Westphalia

The German educational system is characterised by the responsibility of the Länder for education. Accordingly, clear difference can be seen in the educational performance of the Länder. In the following, the cases of *Bavaria* and *North Rhine-Westphalia* (NRW) are described to provide exemplary insight in aspects of ICT, Gender and school on the Länder level. Although structural differences between small and large countries can be found as well, Bavaria and NRW were chosen because they are the two largest Länder and cover nearly one third of the German population. Additionally, the pupils' performances in the PISA math and science scores differ strongly between these two Länder, with Bavaria clearly outperforming NRW (see section 3.1).

A comparison of the concepts, curricular and implementation of media education and information technology education between the two countries is hardly possible with respect to the complexity of both educational systems. Media education is implemented across all subjects in both Länder, and informatics teaching is offered in all school types as well. However, the related curricula differ for both countries and in Bavaria informatics is compulsory for grammar schools, in NRW it is not. In both Länder the implementation of ICT & Gender at schools is mainly based on model projects. Therefore, we provide both cases as examples for different implementations.

4.4.1 Bavaria

Area: 70.551 sq km

Population: >12.519.300, including > 6.383.900 women (June, 2008)

Compulsory schools: >4000 with >1.868.200 pupils (school year 07/08)

In Bavaria media education (Medienkunde) in schools aims at providing knowledge about the technical, procedural, economic, legal, artistic, and organisational use of media. This comprises the following aspects (Bay. Staatsministerium für Unterricht und Kultus, 2003):

- Information technology education: handling of information and communication technologies, including the relevance of effects and influences of the computer, computer usage, algorithms, data processing, and the computer as media.
- Media didactics: theoretical and practical implications of the use of media for the provision of learning content and as means to support the educational design of lessons.
- Media education: motivation and guiding of learning processes which support pupils to use media in a self-dependent and competent way. This includes for example the discussion of media-related experiences, the reflection on the relevance of media for pupils in relation to current events and in their free time, discussion of personal perception and the reality communicated by media, and the critical assessment of media content and design elements. Furthermore, issues of socialisation and development of identities in relation to media, media ethics, effects of media on social change, youth protection and data privacy are covered.

Media education is implemented at all school types and for all school grades. The critical interdisciplinary discussion of media is integral to all subjects. A report form the Staatsinstitut for Schulqualität und Bildungsforschung München (Mörig, 2006) exemplarily describes the curricular integration of media education. Figure 4.3 provides an overview of this curriculum for primary and secondary level schools. Further information on the usage of computers in different schools subjects is available from the Bavarian school server (Bayerischer Schulserver; www.schule.bayern.de/ unterricht/schulfaecher). The website provides information for teachers on suitable computer programs and the didactic integration during lessons.

Additionally, the subject informatics is offered at Bavarian schools either as elective or compulsory subject. Bavaria was among the first Länder to integrate Informatics as a compulsory subject at grammar schools (Gymnasien): Informatics is compulsory for all pupils at lower secondary level since the school year 2004/05. At Realschulen Informatics is part of the compulsory subject Information Technology (Informationstechnologie). The contents of the Informatics lessons differ according to the type of school, general Informatics education is offered as well as competences training for the usage of Informatics in the context of work and university (Friedrich-Alexander-Universität Erlangen-Nürnberg, 2009).

According to the teacher examination regulation (Lehramtsprüfungsordnung I, LPO I) media education with a focus on new media and knowledge of methods for the facilitating pupils 'digital literacy is compulsory part or the initial education of teachers. Furthermore, it is relevant for the second teacher examination, after completion of the practical training phase at school. Seminars which accompany the practical training phase therefore focus on the use of media in education among other issues. In the context of in-service training, teachers are asked to enlarge their knowledge and competences in this respect, taking into account the specific requirements of media education and teaching with media that arise from their daily practice at school. Additionally, media education counsellors (Medienpädagogisch-informationstechnische BeraterInnen, MIB; www.mib-bayern.de) work in teacher education and training and support teachers in the implementation of media in teaching and learning (Bay. Staatsministerium für Unterricht und Kultus, 2003).

The implementation of new media in schools is not limited to the level of learning and teaching with ICT. A project initiated at several schools in Bavaria (1998-2003) for knowledge management at schools and school development (Wissensmanagement an Schulen und Schulentwicklung; http://projekte.isb.bayern.de/semikcd/home.html; http://dbbm.fwu.de/semik/projekte/by1.htm) aimed at school development processes through the use of new media. The focus was on knowledge management by pupils during classes, in the context of teacher collaboration, and across hierarchical levels at school through the use of new media. This Bavarian school development project was one of 25 single projects initiated in the Länder in the scope of the overarching SEMIK project described in section 4.1. The implementation of the Bavarian knowledge management project resulted in new communication and collaboration structures at the participating schools (e.g. online communication platforms), and the initiation of steering committees for the school-specific implementation of the project. The project was mainly pushed by individual engagement of teachers; a feeling of responsibility for the project and related knowledge management activities was not visible at the level of the complete staff of the schools. Accordingly, only in some classes pupils were actively engaged in the project. However, the overall evaluation of all SEMIK projects in Bavaria showed a high interest and motivation of pupils in the use of new media for learning (Frey-Flügge & Huber, 2003).

Grundschule (primary school)				
School year	*German and Other Languages*	*Mathematics*	*Natural science*	*Ethics*
1/2	• Possibilities of using the computer (e.g. for recognition of words and sounds) • Word processing	• e.g. insert numbers on a calculator or computer keyboard	• Testing and comparing electronic games • Using additional pictures and film learning material	
3			• Comparing and using media • Information research (e.g. Internet, dictionaries) • Comparing design and effects of information (e.g. truth content)	
4	• Sending eMails to partner schools in other countries			• Reflecting on excessive television and playing on the computer • Reflecting on advertisements

Hauptschule (lower secondary school)				
School year	**German**	**Art**	**Catholic religious education**	**Ethics**
6	• Information research (e.g. Internet, dictionaries)		• Media in everyday life • Reflected selection of media offers	
8				• Impressions of models in media • Reception of media influences
9		• Reflection on picture editing		

Realschule (lower secondary school)		
School year	**Media education** (preparation of interdisciplinary teaching projects)	**Music**
5	• Computer equipment and technical requirements • Self-reliant computer usage • Computer programmes and applications (contents will be provided in the context of other subjects)	
6	• Responsible internet usage (e.g. browser, search engine, bookmarks) • Researching and assessing information • Homepage design, web editing	
8		• Information research and multi-media presentation of results • Digital sound and production of music • Music and file formats, relation of music and multi-media
9	• Sensible use and design of media • Manipulation by media and the role of advertising • Social, economic and legal conditions	

Gymnasium (grammar school)		
School year	**German**	**Nature and Technology (NT)**
6		• Computer science education • Usage of programmes and documents in relation to other subject content of NT • Presentation of information using standard software (e.g. texts, graphs, multi-media)
7	• Usage of media for the acquisition of knowledge and presentation of results • Reflective use and development of assessment competences • e.g. differences between reality and media design	

Figure 4.3. Examples of the curricular integration of media education in schools of primary and secondary level in Bavaria (based on information from Mörig, 2006).

In the context of gender and ICT, a programme is offered for schools in Bavaria (and also other Länder of Germany) called "Mädchen machen Informatik" (MMI; girls doing informatics; http://portal.mytum.de/am/aufgaben/mmi/document_view?). This informatics project is initiated by an agency for girls in science and technology of the Technical University Munich (Agentur Mädchen in Wissenschaft und Technik). It is a two days project for girls of 6th-8th grade at Realschulen and Gymnasien. With a computer-based instruction, they learn to build a LEGO robot and afterwards teach 'it to move around and complete minor tasks, e.g. starting its engines, turning in circles, following a course, avoiding obstacles, learning to dance and even drawing and writing, etc. Feedback provided by the participating girls in a questionnaire and qualitative questions about their experience in the project shows that girls considers informatics and technology as something boring and difficult which has to do with computers only. However, during the project the girls make the experience that informatics can be interesting and that even children can programme robots. They are motivated by the direct results and sense of achievement, combined with the experience of understanding the relation of cause and consequence (Brüggemann-Klein & Krischer, n.d.).

4.4.2 North Rhine-Westphalia

Area: 34.085 sq km

Population: >17.968.100, including >9.229.300 women (June, 2008)

Compulsory schools: >6100 with >2.205.700 pupils (school year 08/09)

In North Rhine-Westphalia (NRW) a specific curriculum for media education is recommended on the online educational server www.learn-line.nrw.de (see also Tulodziecki, 2002). The curriculum can be seen as suggestion for the implementation of media education at schools. It takes into account experiences from teachers and model tests at schools and includes suggestions for the implementation of media education as integral part of all school subjects (figure 4.4).

school year	Selecting and using media services	Designing and disseminating media inputs	Understanding and evaluating media design	Detecting and reviewing media influences	Understanding and assessing conditions
1/2	Entertainment, Information	Pictures/Photos, Audio inputs	Forms of representation, Design techniques	Emotions	
3/4	Learning, Playing	Printing, Video inputs	Design intentions	Perceptions, Behavioural orientation	
5/6	Entertainment, Information, Playing	Pictures/Photos, Printing	Forms of representation	Perceptions	Economic conditions
7/8	Learning, Simultions	Audio input, Video input	Design techniques	Emotions, Behavioural orientation	Legal conditions
9/10	Telecommu-nications and telecooperation	Compuer-based contributions	Types of design, Design intentions	Orientation by values, Social context	Personal/institutional conditions, Political/social conditions

Figure 4.4. Curriculum for media education in NRW in secondary schools (Tulodziecki, 2002; www.learn-line.nrw.de/angebote/medienbildung/Konzept/matrix.htm).

The implementation of basic education in information technology in NRW is supported through a professional group set up by the Gesellschaft für Informatik e.V. (GI; Fachgruppe Informatische Bildung in NRW, www.nw.schule.de/gi). In this group Informatics teachers from all school types in NRW cooperate with the aim is to improve the requirements for implementing and developing Informatics teaching in NRW; e.g by contributing to the development of education standards for Informatics teaching (see GI, 2008) and by organising Informatics days for educating teachers in the current development of Informatics teaching in NRW. In 1990 guidelines for basic education in information technology on lower secondary level (Rahmenrichtlinien zur Informations- und Kommunikationstechnischen Grundbildung in der Sekundarstufe 1) were published by the Ministerium für Schule und Weiterbildung des Landes NRW. The implementation of these guidelines is in the responsibility of each single school (FA IBS, 2009).

In 1993 guidelines for the elective subject Informatics on lower secondary level (Richtlinien im Fach Informatik für die sekundarstufe 1) were published (see FA IBS, 2009) and approved core curriculums are available from the Ritterbach Verlag (see www.standardsicherung.schulministerium.nrw.de/lehrplaene/kernlehrplaene-sek-i). For example, the core curriculum for the Gymnasium includes information on the subject-specific contents, on context-related teaching and methods to support self-guided learning of pupils in Informatics. Furthermore, it includes a section about the problem of equity of girls and boys in MINT subjects. Reflective co-education and the methods of context-related teaching and self-guided learning are pointed out as importand approaches towards a promotion of gender equity (Ministerium für Schule und Weiterbildung, Wissenschaft und Forschung des Landes Nordrhein-Westfalen, 1999). However, according to FA IBS (2009) the percentage of pupils participating in the elective subject Informatics at upper secondary level was 12%; and only 25% of these pupils were female.

Teacher education and in-service training in NRW is regulated by the ministry for school and continuing education (Ministerium für Schule und Weiterbildung des Landes Nordrhein-Westfalen; www.schulministerium.nrw.de). During the practical phase of the initial teacher education the teacher trainees participate in seminars (Studienseminaren), including the concepts of gender mainstreaming and media integration (Ministerium für Schule und Weiterbildung des Landes Nordrhein-Westfalen, n.d.). Nevertheless, many teachers are currently not educated sufficiently to implement basic information technology education at school. Additionally, structural problems such as an inadequate technical infrastructure and time shortening of schooling impedes a successful implementation (FA IBS, 2009).

Demand-oriented in-service training is provided by competence teams (www.kompetenzteams.schulministerium.nrw.de) which offer different courses for each district of NRW (e.g. about diagnostic tools, self-regulated learning, school development). Specific courses about the usage of media in education are offered by some of these competence teams (e.g. teaching with media, usage of learning management systems). All teachers/schools in NRW can make use of media counselling (Medienberatung; www.medienberatung.nrw.de). The media counsellors develop concepts for the didactical and technical implementation of new media in school education and are responsible for the qualification and competence development of teachers in this respect. Additionally, they cooperate with publishers concerning the development of related learning materials and are engaged in school projects of the usage of media in education.

In the following, an example of the implementation of media education in schools in NRW is described. The above mentioned SEMIK project was implemented in NRW as well, and one of the single projects self-guided learning in mathematics at grammar school (Selbstlernen in der gymnasialen Oberstufe – Mathematik, SelMa; www.learn-line.nrw.de/angebote/selma). The focus was on testing computer-supported self-guided learning methods with pupils of grammar schools in the subject of mathematics. This included the use of offline media and telecommunication applications. The evaluation results of the SelMa project (Büchtner, Preussler & Schulz-Zander, n.d.) show in general positive effects with regard to the successful project implementation; however preparing the pupils for the use of new media and self-guided learning strategies in lower classes is seen as essential for an even more effective implementation of this approach at secondary level. The use of media allowed for the implementation of problem based mathematic exercises which facilitated the pupils ' reflection on multiple perspectives and solutions. However, significantly more boys than girls think of new media as supportive of learning processes. Additionally, the boys in the SelMa project self-assessed their mathematical literacy and computer literacy significantly better than girls. Girls prefer group work instead of individual work (it is the contrary for boys) and especially with regard to mathematics girls are taking more delight in this subject through collaborative learning approaches and appreciate peer-learning more than boys.

5 ICT & Gender at University Level in Germany

A university degree can be seen as entrance ticket to a career in the IT sector. The qualification level is quite high and the majority of employees in the IT sector graduated either at university or university of applied science (Holzapfel, 2006).

According to data from the German Federal Statistics Office in the winter semester 07/08 1.941.405 students were enrolled at German universities (including universities of applied science and "Verwaltungsfachhochschulen"); 926.644 of them were female. The number of enrolments of male students exceeds the number of females. Nevertheless, since 2006 this proportion changed to the reverse for the total number of passed examinations. Examinations in the year 2007 were passed by 286.391 students, including 145.377 women. However, this development refers to teacher training and diploma graduation only; other examinations such as PhD, University of applied science of Bachelor and Master degrees are still passed by a majority of men. The following table (figure 5.1) shows the kind of graduation completed by men and women.

	Passed examinations 2006 and 2007					
Gender	Total	Diploma (University) and alike	PhD	Teacher training	Universities of Applied Sciences	Bachelor and Master
	Number of passed examinations 2006					
Men	131.635	51.180	14.360	6.215	46.303	13.577
Women	134.069	55.229	9.927	20.236	35.936	12.741
	Number of passed examinations 2007					
Men	141.008	53.827	13.775	6.959	47.247	19.200
Women	145.377	58.774	10.068	36.258	21.900	18.377

Figure 5.1. Number of passed higher education examination in the year 2007 (Source: destatis).

Eurostat data provides information on the percentage of women enrolled at university, and in Mathematics, Information Technology and Science in specific (figure 5.2).

	Amount of women enrolled at university (in %)						
Year	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
All subjects	48.1	48.7	49.0	49.5	49.4	49.6	49.7
Mathematics, Information Technology, Science	32.3	32.6	33.0	33.4	33.8	34.4	34.8

Figure 5.2. Percentage of women enrolled at university (Source: Eurostat).

The number of men and women who started their first year at university in the winter semester 07/08 was nearly 50% each. Nevertheless, women decided for subjects

according to traditional stereotypes. They rather choose linguistic and cultural sciences, social science, or teacher training. Women are clearly underrepresented in engineering sciences and choose only selected subjects such as architecture, interior design, or health sciences. Therefore, in Germany several initiatives and project aim at attracting women to study STEM subjects, e.g. information days for pupils, information services for women at university, and special studies for women only (Studien- & Berufswahl, n. d.).

A report by the BMBF (2008) presents similar results about the spreading of men and women over different subjects at higher education level. Some subjects are clearly dominated by men, others by women (meaning that less then 30% men or women study the subject). Currently, more subjects are dominated by women than by men. Subjects dominated by women are mainly offered by universities, subjects dominated by men are mainly offered by universities of applied science (figure 5.3).

	Dominated by men	
Subjects	*University*	*FH*
Traffic engineering	90%	92%
Mechanical engineering	86%	82%
Information technology	88%	87%
Physics	83%	-
Industrial engineering	83%	81%
Constructional engineering	71%	81%
	Dominated by women	
Subjects	*University*	*FH*
Veterinary medicine	86%	-
Art sciences	82%	-
Romance studies	83%	-
Anglistics	71%	-
Psychology	77%	-
Educational sciences	77%	77%
Social services, social work	76%	76%
German studies	76%	-
Pharmaceutics	75%	-
Ethnology	72%	-

Figure 5.3. Subjects dominated by men and women, resp. at university and university of applied science in winter semester 2006/07 (Fachhochschule, FH; BMBF, 2008).

The above table does not provide information on the subject of Biology; however, among the natural science subjects it is clearly dominated by women. The following figure (table 5.4) displays the percentage of women beginning at university in STEM subjects for the year 2001 and 2002.

	Female beginners (in%)			
Subjects	*University*		*FH*	
	2001	*2002*	*2001*	*2002*
Biology	62,0	64,2	-	
Architecture	53,9	54,4	48,0	48,6
Chemistry	47,5	46,7	-	
Mathematics	41,7	41,6	-	
Constructional engineering	33,5	35,6	22,1	22,4
Physics	22,9	22,8	-	
Industrial engineering	21,5	24,5	21,5	21,9
Computer sciences	17,7	17,2	14,3	14,7
Mechanical engineering	12,0	14,1	7,6	7,2
Electrical engineering	10,2	10,0	7,0	7,7

Figure 5.4. Percentage of female beginners at university and Fachhochschule (FH) in STEM subjects in the years 2001 and 2002. Source: Federal Statistical Office (Frauen geben Technik neue Impulse e.V., 2004).

The Hochschul Informations System (HIS) provides a study related to the whereabouts of Mathematics graduates, including mathematics teacher training, and compared to information technologies and electrical engineering studies (Briedis et al., 2008). The focus of the results presented in the following is on differences regarding women and men as could be retrieved from the available data of the HIS study. The graphs are screenshots from the report and were chosen to visualize the results at first glance. The data is based on analysis of official statistics from the Federal Statistical Office and on HIS surveys of enrolled students (from the years 1990, 2994, 1999, 2004, 2006), elementary students (from the years 1990/91, 1995/96, 2000/01, 2006/07, winter terms), graduates (of the years 1993, 1997, 2001, 2005), and the 18th Sozialerhebung of the Deutsche Studenten Werke (DSW).

Figure 5.5 shows the number of beginners at university by year and for the four subjects mathematics (Mathematik), information technology (Informatik), electrical engineering (Elektrotechnik), and mathematics teacher training (Lehramt Mathematik). Looking at the percentage of female students for these subjects (figure 5.6) and compared to humanities (Geisteswissenschaften) a clear underrepresentation of women can be seen for information technologies and electrical engineering. In mathematics (including teacher training), the number of women is close to the number of men as well as to the total percentage of women enrolled at University (Universität insg.).

Figure 5.7 shows the number of graduates for the subjects mathematics, information technology, electrical engineering, and mathematics teacher training. Compared to the other subjects, the number of information technology graduates currently clearly exceeds the other subjects. Again, in figure 5.8 the percentage of women graduating in information technology and electrical engineering reflects the already described underrepresentation of female students in these subjects and their overrepresentation in humanities.

Finally, the number of doctorates in the subjects mathematics (not including teacher training), information technology and electrical engineering is presented in Figure 5.9; and again a underrepresentation of women can be seen in the postgraduate field (figure 5.10). Furthermore, the previous graphs showed a clear overrepresentation of women in the enrolment and graduation numbers for humanities; however, looking at doctorates in this subject women and men nearly equal in the number of completed doctorates.

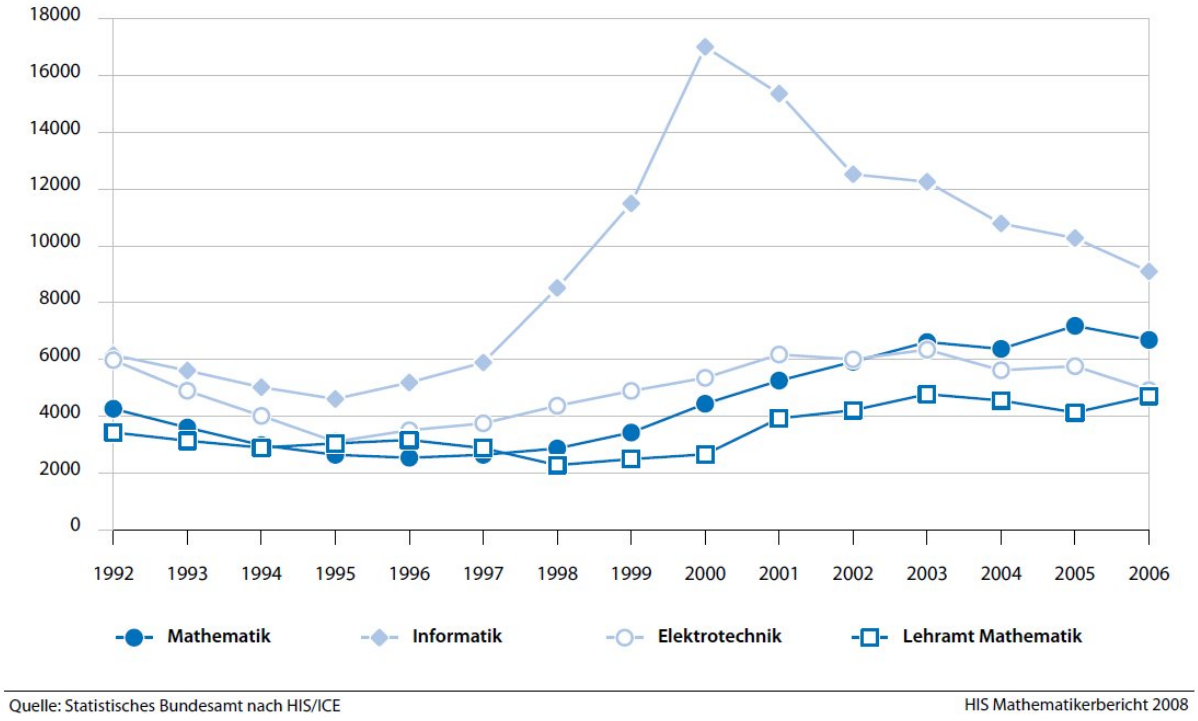
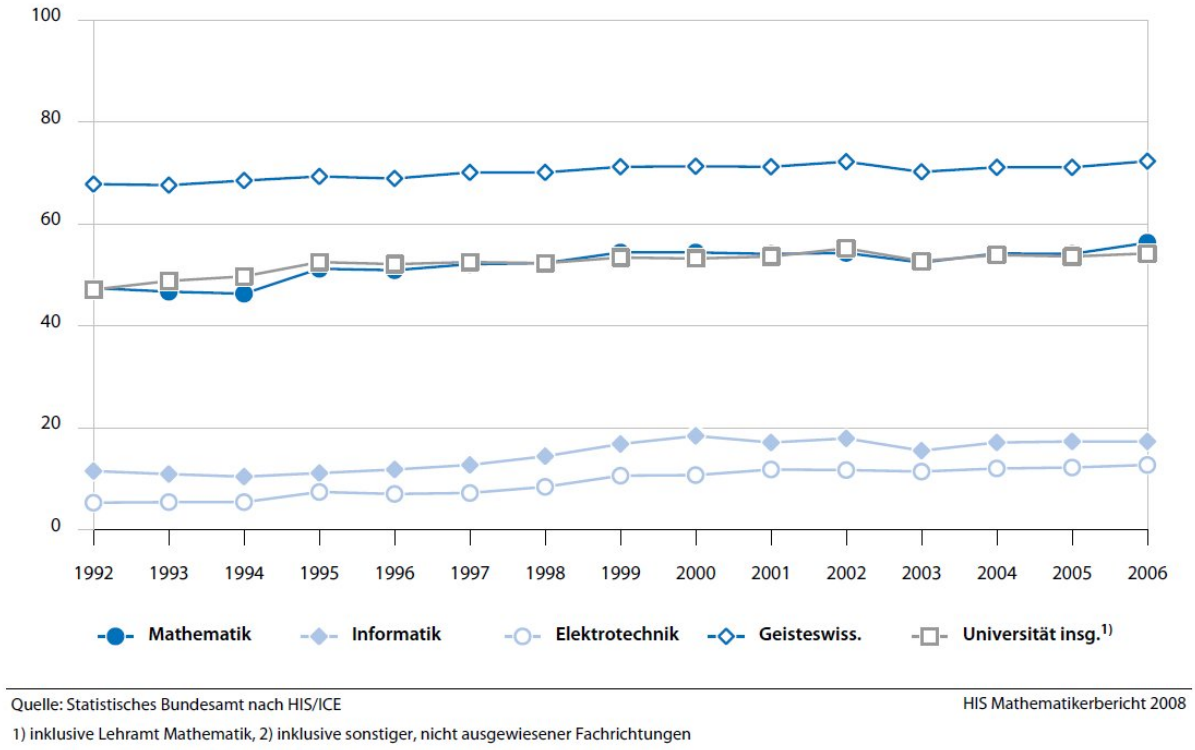


Figure 5.5. Number of beginners at university by year and subject (absolute numbers).

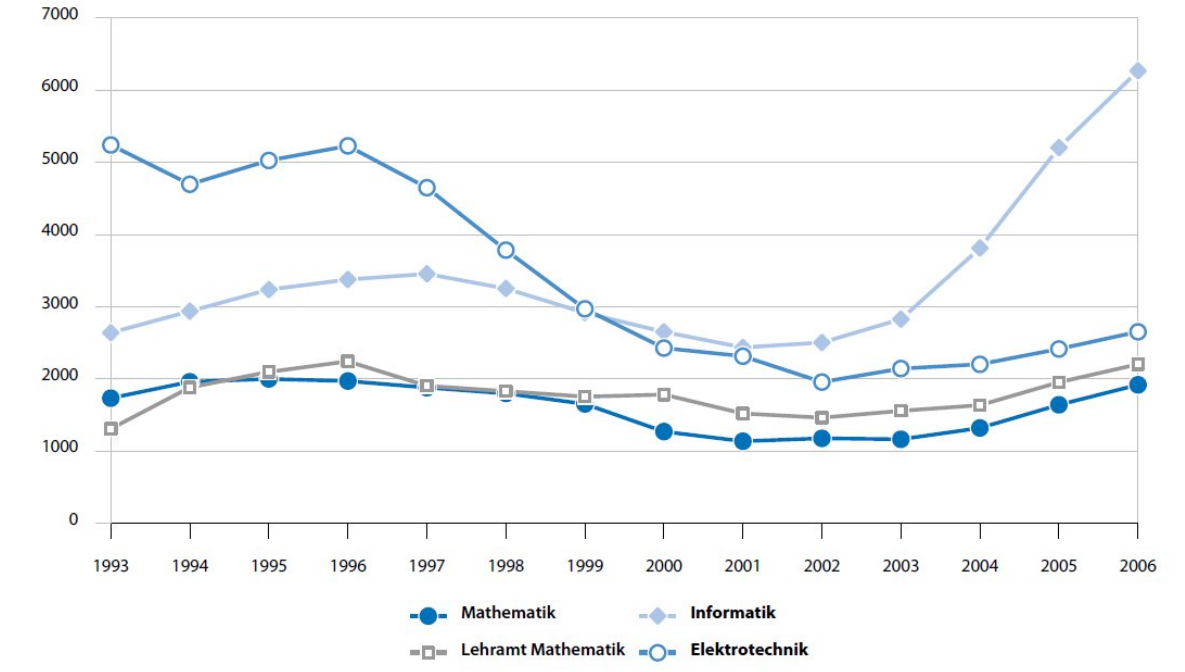


Quelle: Statistisches Bundesamt nach HIS/ICE

HIS Mathematikerbericht 2008

1) inklusive Lehramt Mathematik, 2) inklusive sonstiger, nicht ausgewiesener Fachrichtungen

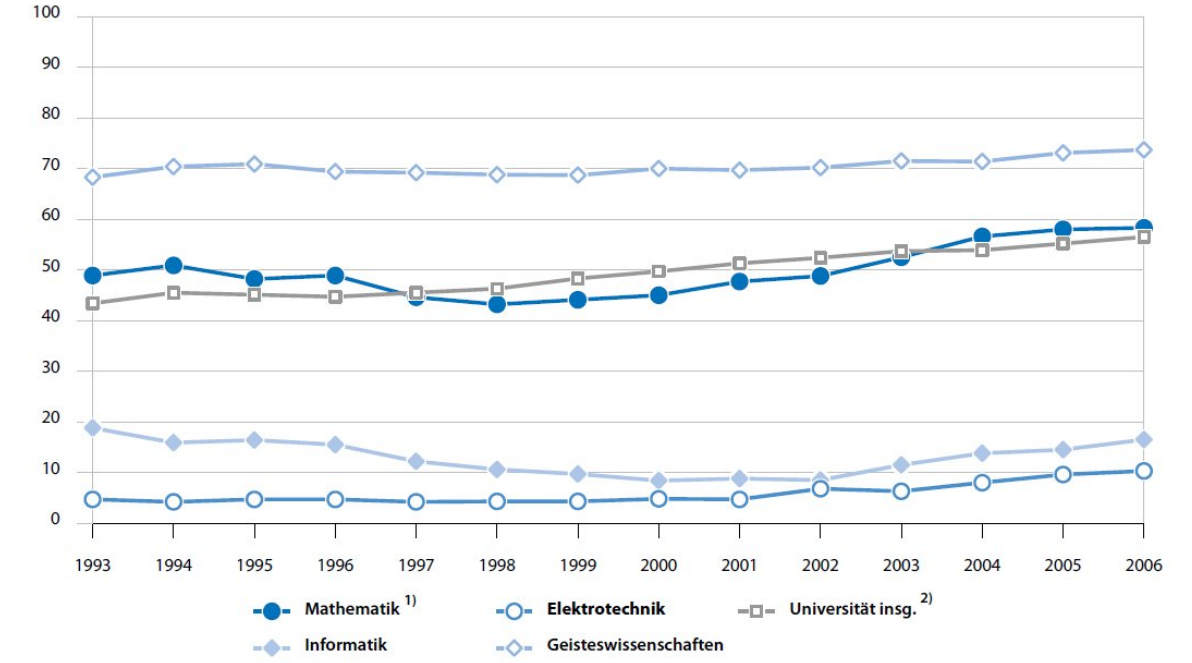
Figure 5.6. Percentage of female beginners at university by year and subject (in %).



HIS Mathematikerbericht 2008

Quelle: Statistisches Bundesamt nach HIS/ICE

Figure 5.7. Number of graduates by year and by subject (absolute numbers).

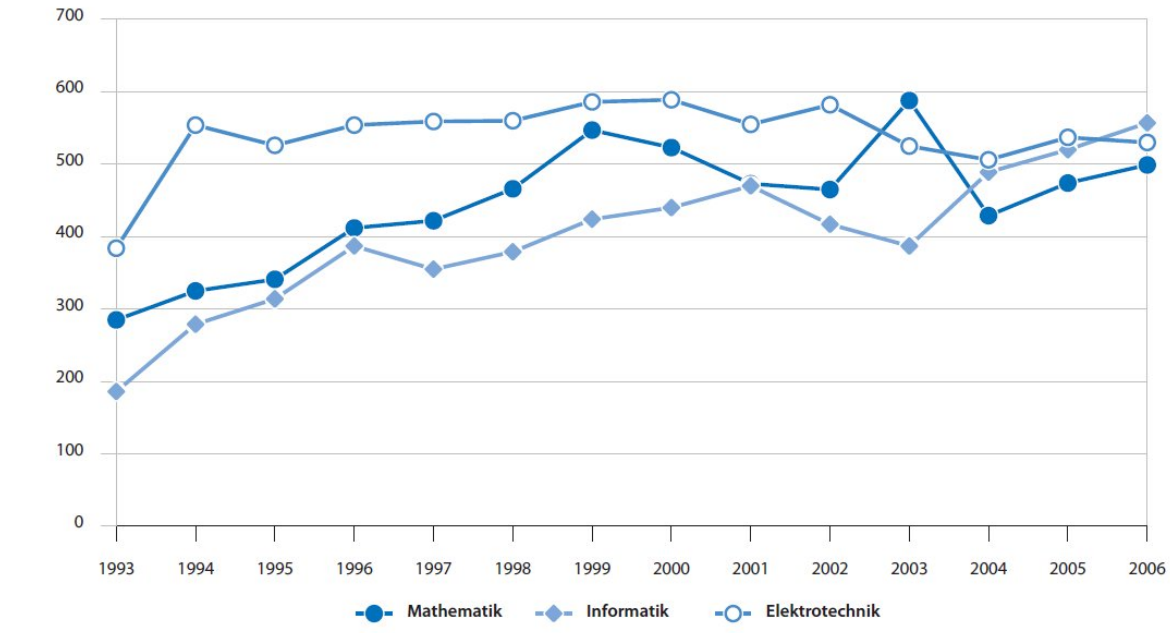


HIS Mathematikerbericht 2008

1) inklusive Lehramt Mathematik, 2) inklusive sonstiger, nicht ausgewiesener Fachrichtungen

Quelle: Statistisches Bundesamt nach HIS/ICE

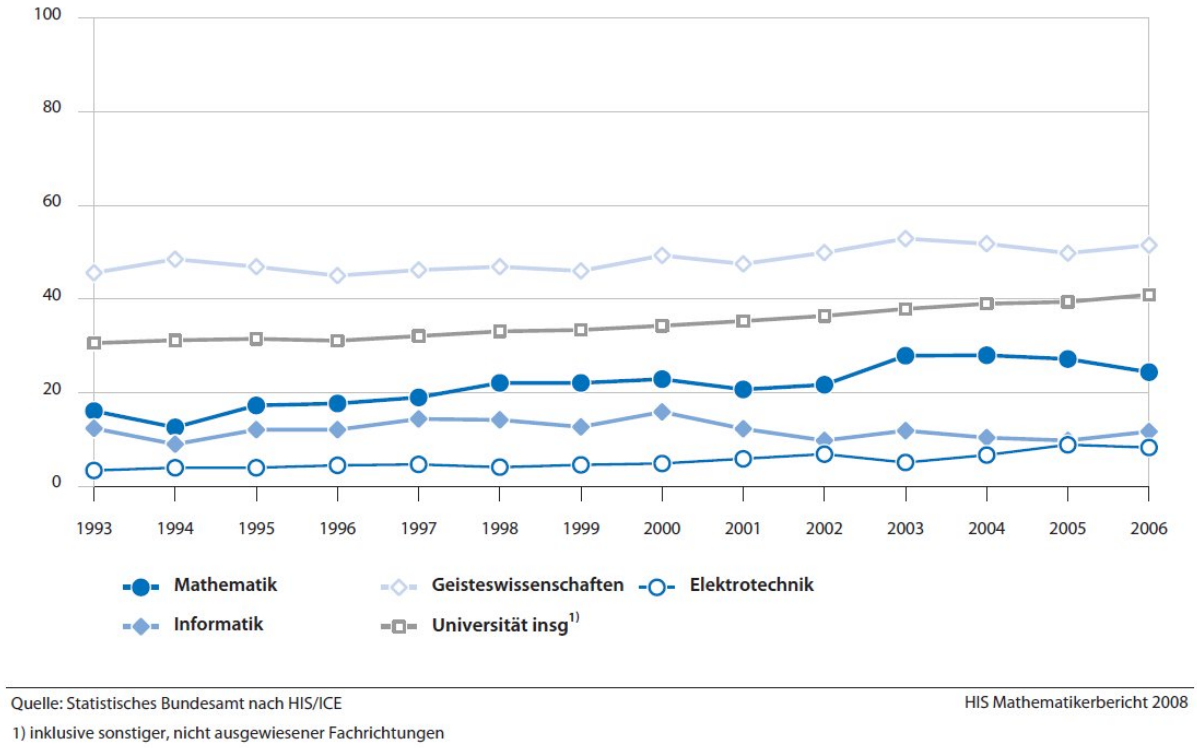
Figure 5.8. Percentage of female graduates by year and by subject (in %).



Quelle: Statistisches Bundesamt nach HIS/ICE

HIS Mathematikerbericht 2008

Figure 5.9. Number of doctorates by year and by subject (absolute numbers).



Quelle: Statistisches Bundesamt nach HIS/ICE — HIS Mathematikerbericht 2008

1) inklusive sonstiger, nicht ausgewiesener Fachrichtungen

Figure 5.10. Percentage of women ṡ doctorates by year and by subject (in %).

6 ICT & Gender at Careers Level in Germany

6.1 Data on employment in the IT sector

The following table (figure 6.1) represents the general increase and decrease in employment in IT related professions, namely in the sectors of Information Technologies and Communication Technologies (ITC) and Consumer Electronic (CE) for the period of 2003 to 2008.

Employees and self-employed persons in the German ITC sector											
	In thousand						Growth rate (in %)				
End of year	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2004*	*2005*	*2006*	*2007*	*2008*
Total (ITC+CE)	809,8	806,0	809,4	812,9	825,7	828,7	-0,5	0,4	0,4	1,6	0,4
CE	30,1	28,2	25,8	22,1	23,2	22,5	-6,3	-8,4	-14,6	4,9	-3,1
ITC	779,7	777,8	783,6	790,9	802,6	806,3	-0,2	0,7	0,9	1,5	0,5
Information Technology (IT)	477,8	483,3	494,3	515,2	539,7	556,2	1,14	2,3	4,2	4,8	3,1
IT hardware	46,8	42,8	42,9	37,2	38,9	37,9	-8,7	0,4	-13,3	4,5	-2,5
IT software, services	431,0	440,5	451,4	477,9	500,7	518,3	2,2	2,5	5,9	4,8	3,5
Telecommunications (TC)	301,8	294,5	289,3	275,7	262,9	250,1	-2,4	-1,8	-4,7	-4,6	-4,9
TC hardware	71,3	69,4	65,7	61,0	58,0	55,4	-2,6	-5,4	-7,1	-4,9	-4,5
TC services	230,6	225,1	223,6	214,7	204,9	194,7	-2,4	-0,7	-4,0	-4,5	-5,0

Figure 6.1. Employees and self-employed persons in the sector of information and communication technologies (ITC) and consumer electronics (CE). Estimated data for 2008, status: September 2008. Source: BITKOM, Bundesagentur für Arbeit, Bundesnetzagentur, Federal Statistical Office.

The German Institute for Employment Research (IAB) provides the following data for women and men employed as data processing professional, and computer scientists (classification 7741; occupation: research, development, construction, design of products, concepts and programs). The data exemplarily show an underrepresentation of women in IT core professions in Germany. Although in general an increase in the total number of 774 employees can be seen for each year the percentage of women is decreasing (figure 6.2).

[1] The German terms for professions classified as 774 is *Datenverarbeitungsfachleute and InformatikerInnen (ohne nähere Angaben*). The German description of the related occupation is *Forschen, entwerfen, konstruieren, gestalten von Produkten, Plänen, Programmen* (Tiemann, et al., 2008).

Employees (Classification 774: data professionals and computer scientists)				
Year	**Total**	**Men**	**Women**	**Women (in %)**
1999	363.248	287.329	75.919	20,9 %
2000	395.985	314.808	81.177	20,5 %
2001	425.430	338.642	86.788	20,4 %
2002	440.284	350.906	89.378	20,3 %
2003	440.456	350.603	89.853	20,4 %
2004	443.000	353.514	89.486	20,2 %
2005	448.383	359.630	88.780	19,8 %
2006	-	-	-	-
2007	469.880	376.844	93.036	19,1 %

Figure 6.2. Percentage of women employed in professions of the classification 774. (Source: IAB; data for 2006 not available)

Looking at the unemployment rates for 774 professionals an increase over the years can be observed in total and for men and women. However, the percentage of unemployed women is decreasing over the years (figure 6.3).

Unemployed (Classification 774: data professionals and computer scientists)				
Year	**Total**	**Men**	**Women**	**Women (in %)**
1999	21.061	14.995	6.066	28,8 %
2000	21.227	15.772	5.455	25,7 %
2001	26.163	19.779	6.384	24,4 %
2002	44.415	35.177	9.238	20,8 %
2003	61.701	50.255	11.476	18,6 %
2004	63.142	51.524	11.618	18,4 %
2005	59.615	49.063	10.552	17,7 %

Figure 6.3. Percentage of unemployed women in professions of the classification 774. (Source: IAB; data or 2006 and 2007 not available).

The issue of women in ICT professions, especially in leading positions, was discussed on the CeBIT 2009 in Hannover. An initiative was started to attract more women to this sector, especially by improving the working conditions, exceeding the concept of just combining family and work but taking into account a comprehensive career planning approach. A related charta was designed and signed by more than 100 women and men from several enterprises, including women in ICT leading positions (Kompetenzzentrum, 2009a; 2009b). The results of a short research with 125 male and female visitors of the CeBIT point out the need for action in this area. More than

half of the women (59,1%) can imagine working in a STEM profession and even more (63,6%) see the STEM sector as innovative field of work. However, only one fifth of the questioned visitors see women in management or leading positions in the ICT sector (BMBF, 2009).

The above mentioned HIS survey (Briedis et al., 2008) provided additional data about the progress of employment of students in the first 12 months following graduation at university. Figure 6.4 displays this progress for the subjects mathematics (Mathematik), teacher education for the subject mathematics (Lehramt Mathematik), information technologies (Informatik), electrical engineering (Elektrotechnik), humanities (Geisteswissenschaften), and in comparison to the average progress of employment for all graduates in the related period (Uni insgesamt). It can be concluded from the data, that in general graduating in mathematics, and even more in information technologies and electrical engineering, is associated with clearly better chances for a swift job entry after university than graduating in mathematics teacher training or humanities. However, after completing teacher education (for mathematics) at university the students have to continue their education during practical phases in schools. This accounts for the relatively low number of employed mathematics teachers during the first 12 month after graduation at university.

It has to be noted that according to Blossfeld et al. (2009) the number of women who work as teacher clearly exceeds the number of men who work in the same profession (in total 65,3% teachers are female: 88% on primary school and 40% for grammar schools. In other professions which university degree or a degree of a university of applied sciences the percentage of women is 39,6%.

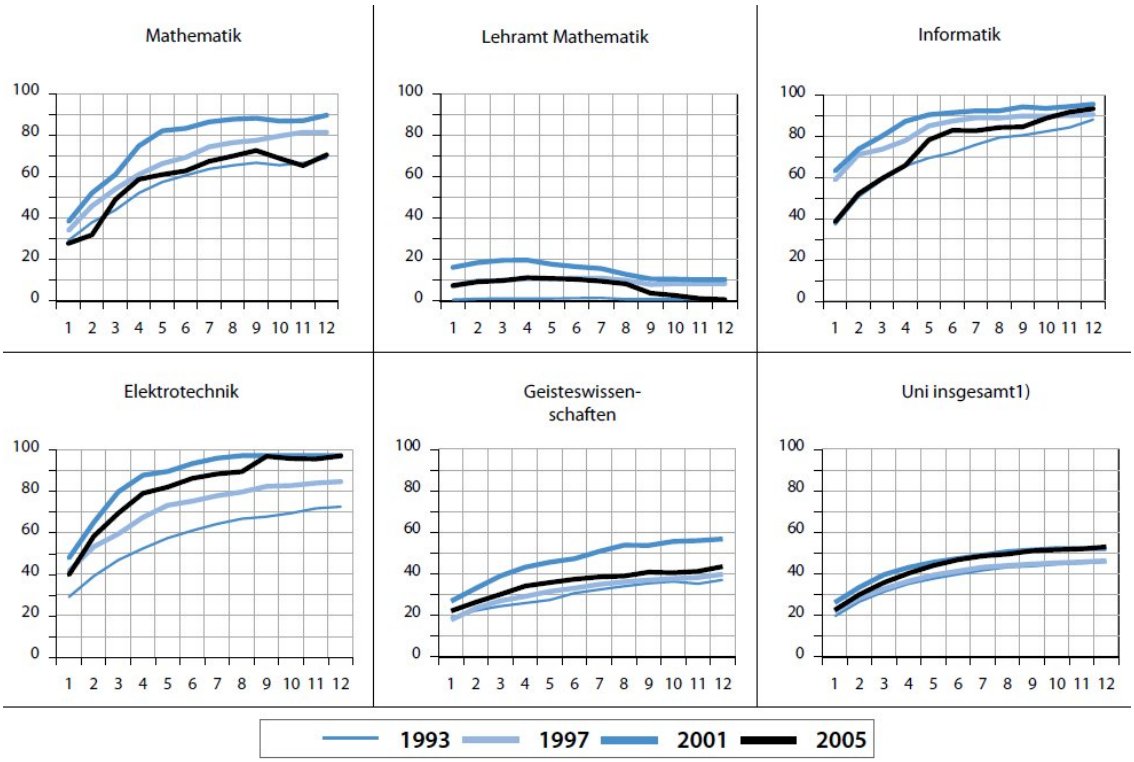


Figure 6.4. Progress of employment in the first 12 months following graduation at university by subject (in %).

Another HIS survey with a focus on the whereabouts of university graduates (Kerst & Schramm, 2008) provides information on the working hours compared for men and women. The results show that in general more men than women work in full time employment whereas the percentage of women in part time employments exceeds the number of part time employed men (figure 6.5). The data is based on the second survey of graduates from the year 2000/01. The survey was done in winter 2006/07, and the 5.426 respondents represent 23.3% of the 165.000 graduates from the year 2000/01.

Working form	**Full time employment**						**Part time employment**						**No agreed working hours**					
Sex	Men			Women			Men			Women			Men			Women		
Year	93	97	01	93	97	01	93	97	01	93	97	01	93	97	01	93	97	01
Subject area	University of Applied Sciences (University of AS) degree																	
Engineering, Computer Science	96	96	96	81	87	85	2	2	2	14	11	13	3	2	2	5	3	3
Economics	96	98	94	83	77	82	0	0	3	14	18	18	4	2	2	3	5	1
Social Care	81	-	75	66	57	47	19	-	22	32	40	46	0	-	4	2	3	7
University of AS degree total	94	96	93	74	69	67	3	2	4	21	26	27	3	2	3	6	5	7
	University degree																	
Engineering, Computer Science	95	96	96	85	81	85	3	2	3	12	15	13	2	1	1	4	4	2
Mathematics, Science	85	86	89	72	76	66	9	10	7	24	18	27	6	4	4	5	6	7
Medicine, Pharmacy	93	94	98	78	72	77	5	5	1	20	26	22	2	1	1	2	2	2
Education, Psychology	78	75	79	54	63	57	16	18	15	37	33	36	6	7	7	10	4	8
Law	89	92	88	76	84	78	3	3	6	11	12	17	8	5	7	13	5	5
Economics	96	95	95	83	85	84	1	3	2	12	14	15	3	2	3	5	1	1
Teacher Training	77	84	90	60	67	80	20	14	10	38	30	18	3	2	0	2	3	2
Magister	68	74	70	57	57	57	13	16	20	28	28	28	19	10	9	15	15	15
University degree total	88	89	89	68	70	72	6	7	7	25	25	23	6	4	4	8	6	6

Figure 6.5. Working hours by subject and kind of graduation for graduates from the years 1993, 1997 and 2001 (second survey, 5 years after graduation). Source: HIS-Absolventenbefragung 2008.

6.2 Income of IT-related professions

The high-tech association BITKOM (2008) reports on the basis of a current study about 45.000 job offers in the IT sector in September 2008. Negative effects from the financial crisis seem not yet to influence the job market for IT experts. On the contrary, the study reveals still a slight increase in the number of available IT job compared to the previous year, and a decrease would be rather temporary as the shortage of IT experts is a structural problem. Therefore, young people can opt for a career in the IT sector without worries.

However, Apfelbaum (2009) reports a decreasing demand for IT experts in 2009 and he prognoses a related reduction of the average income. Data from the 2008 c t-study (n = 4485) on income in the IT sector still suggest by tendency a distinct increase in the average income compared to the previous year for mainly all IT profession, sectors and qualifications (figure 6.6). It has to be noted, that the sample of he c t-study consists mainly of IT experts which regularly read the c t computer magazine. The data cannot be seen as representative but rather suggests a tendency of the current situation.

In the c t-study, the term IT expert refers to the following professional orientations: management, software and database development, system and network administration, consulting, service and support, web development, programming, web design, quality assurance, security specialists, research, training, marketing and sales, hardware development, editorial work and content management. According to the 2008 c t-study the average IT expert in Germany is characterized as follows:

- Male,
- 33,9 years old
- Avarage gross income per year: 51.200 €

Regarding the income in the IT sector differences between all German federal states (Länder) and between western and eastern parts of Germany can be found: the income is higher in the financially strong Länder and in the western Länder. Additionally, older IT experts have a higher income than their younger colleagues.

The **income of female IT** experts is with an average of 44.800 € clearly below the average income of their male colleagues. Additionally, the data suggest a general underrepresentation of women in IT professions in Germany. Only 1,9% of the participants of the 2008 c t-study were female.

Gender	**Male IT experts**			**Female IT experts**		
Year	*2006*	*2007*	*2008*	*2006*	*2007*	*2008*
Gross income in €	48.600	49.000	51.200	42.600	41.300	44.800
Growth rate in %	1,9	0,8	4,3	3,1	-3,1	7,8

Figure 6.6. Annual gross income (including special payments) of male and female IT experts (Apfelbaum, 2007; 2008; 2009).

A difference in the income of men and women was also reported as a result of an analysis of the continuing online survey of the website www.frauenlohnspiegel.de (WSI, 2007). In average, women earn 22% less than men. This percentage is related

to all 130 professions which were taken into account in the survey (n = 68.000). Looking at the two IT professions – computer scientist and computer programmer – considered in the study the situation is only slightly better (figure 6.7).

	Monthly gross income (in €)		Difference
Profession	Men	Women	(in %)
Computer scientist	3971	3590	9,6
Computer programmer	3204	2948	8,0

Figure 6.7. Monthly gross income (excluding special payments) of male and female computer scientists and programmers.

As described above, the IT expert profession can be defined by several different professions. Accordingly, the annual gross income differs by profession. The following table (figure 6.8) provides exemplarily an overview about differences for some IT professions, taking into account fixed and variable income. The data is based on results from two IGM-studies on income in the ICT sector (IGM, 2007; 2008). The average income refers to 35 hours work per week and includes vacation allowance and special payments. The 2006 data (IGM, 2007) was collected from 52 enterprises (more than 26.000 replies); the 2007 data (IGM, 2008) is based on replies from 26 enterprises (more than 19.000 replies). In general, the data from the IGM-studies suggest a decrease in the average income of IT expert professions from 2006 to 2007.

	2006			**2007**			
	Annual gross income (in €)						Women (in %)
Profession	*Total*	*Fix*	*Variable*	*Total*	*Fix*	*Variable*	
Project manager (entry position)	53.429	48.903	4.803	49.616	44.800	4.816	42,1
Project manager (leading position)	85.853	68.989	11.865	80.182	72.727	7.455	7,9
Junior consultant (entry position)	42.881	40.297	3.058	44.325	39.672	4.653	51,4
Consultant (leading position)	98.640	79.393	16.859	83.384	72.141	11.243	12,2
Software engineering (entry position)	45.183	43.445	2.728	37.033	35.467	3.703	25,2
Software engineering (leading position)	100.752	79.441	13.742	92.270	89.091	15.909	10,0

Figure 6.8. Gross income (fix and variable amount) of IT professionals in 2006 and 2007; and the percentage of women working in the different profession in 2007 (IGM, 2007; 2008).

7 Promoting ICT & Gender Issues

The following section introduces networks, initiatives, projects and associations related to the issue of PREDIL – Promoting Equality in Digital Literacy. The examples consider the promotion of equality in STEM and ICT at school and university level and are furthermore related to career decisions of women in relation to STEM and ICT. Governmental activities from the Länder and from the Federal Government as well as from public, private and non-profit organizations are taken into account. The information is provided in German language. A description of these resources in English is available in the PREDIL Resource Library (see http://predil.iacm.forth.gr; www.unibw.de/paed/personen/ertl/predil). Furthermore, the PREDIL Resource Library includes additional information, e.g. on teaching and learning materials for teachers and pupils.

Name	Description	Link
Agentur Mädchen in Wissenschaft und Technik - Technische Universität München	„Die Agentur Mädchen in Wissenschaft und Technik hat die Aufgabe, für technisch-naturwissenschaftlich interessierte und begabte Schülerinnen aller Altersstufen an Hochschulen, Forschungseinrichtungen sowie Schulen und Einrichtungen der Kinder- Jugend- und Mädchenarbeit ein anregendes Umfeld zu schaffen. Die Agentur baut auf dem Ferienprogramm *Mädchen machen Technik* auf. “ Die Universität der Bundeswehr München beteiligt sich regelmäßig an dem Projekt.	https://portal.mytum.de/am/index_html_alternativ http://www.unibw.de/praes/universitaet/aktuelles/biosignale
ARD/ZDF Förderpreis 2009 Frauen + Medientechnologie	„ARD und ZDF verleihen den Förderpreis für exzellente Abschlussarbeiten von Frauen in den Ingenieurwissenschaften. “	http://www.ard-zdf-foerderpreis.de
be.it be.ing	„Informatik ist ein Beruf für junge Frauen. Mit diesem Studium bekommen sie Zugang zu interessanten Tätigkeitsfeldern in Medizin, Medien und vielen mehr. Die Initiative be.it berichtet über diese Möglichkeiten und stellt junge, erfolgreiche Informatikerinnen vor. “ „Die Berufsbilder im Ingenieurbereich verändern sich und werden attraktiver für junge Frauen. Die Initiative be.ing stellt Tätigkeitsfelder und interessante Frauen aus der so genannten "Männderdomaine Technik" vor. “	http://www.werde-informatikerin.de/
Center of Excellence – Women and Science (CEWS)	„Das Kompetenzzentrum Frauen in Wissenschaft und Forschung CEWS ist der nationale Knotenpunkt zur Verwirklichung der Chancengleichheit von Frauen und Männern in Wissenschaft und Forschung in Deutschland. Für dieses Politikfeld gibt das CEWS Denkanstöße, initiiert Veränderungsprozesse, die es wissenschaftlich begleitet, und gestaltet die	http://www.cews.org

	erforderlichen Transferprozesse zwischen Wissenschaft und Politik aktiv mit. “	
Deutscher Akademikerinnen Bund e.V. • Arbeitskreis Frauen in Naturwissenschaft und Technik im Deutschen	Ziele: „Akademikerinnen zu befähigen, ihr Fachwissen wirkungsvoll zu nutzen, den Status von Frauen und Mädchen durch Gendermainstreaming zu verbessern, lebenslanges Lernen zu fördern, dem Lebensmodell Karriere mit Kindern zum Erfolg zu verhelfen “	http://www.dab-ev.org/ http://www.dab-ev.org/index.php?id=33
Deutscher Frauenrat: Lobby der Frauen - Bundesvereinigung von Frauenverbänden und gemischter Verbände in Deutschland e.V.	„Der Deutsche Frauenrat hat sich in seiner über fünfzigjährigen Geschichte zur wichtigsten Lobby von Frauen in diesem Land entwickelt. [...] Der Deutsche Frauenrat ist die Vereinigung von aktuell 56 bundesweit aktiven Frauenverbänden und -organisationen. Zu unseren Mitgliedern zählen konfessionelle Verbände und Berufsverbände, die Frauengruppen der Parteien, der Gewerkschaften und des Deutschen Olympischen Sportbundes, außerdem überkonfessionell und überparteilich arbeitende Organisationen mit vielfältigen sozialen und politischen Aufgaben. “	http://www.frauenrat.de
Deutscher Ingenieurinnen Bund e.V.	„Seit über 20 Jahren setzt sich der deutsche Ingenieurinnenbund für Frauen in technischen Berufen ein. Das bundesweit aktive Netzwerk besteht aus derzeit 18 Regionalgruppen. Neben gegenseitiger persönlicher Unterstützung in beruflichen und fachlichen Fragen, liegt der Schwerpunkt in der nationalen und internationalen Lobby- und Gremienarbeit. “	http://www.dibev.de/
CyberMentor	„Anliegen von CyberMentor ist es, das Interesse und die Beteiligung von Mädchen am MINT-Bereich (Mathematik, Informatik, Naturwissenschaften und Technik) zu steigern. Durch die Teilnahme am E-Mentoring-Programm profitieren Schülerinnen und Mentorinnen von verschiedenen Angeboten. “	https://www.cybermentor.de
diemedia – frauen info online	„Frauen - Info – Service mit aktuellen Informationen und gut kommentierten Linksammlungen zu frauen-spezifischen Internet-Seiten mit Informationswert “.	http://www.diemedia.de
do-Ing	„Die Ziele von do-Ing in Aachen sind: Mädchen und Frauen für Technik faszinieren! Für ein spannendes und interessantes Ingenieurstudium begeistern!Über Studieninhalte und die guten Berufsaussichten informieren! “(Projektzeitraum: 1999-2004)	http://www.do-ing.rwth-aachen.de

Einstieg Informatik	„Einstieg Informatik ist das zentrale Projekt zur Vermittlung von Informatik an Kinder und Jugendliche im Informatikjahr - Wissenschaftsjahr 2006. Mit Workshops und Aktionen auf Messen und überall dort wo viele Jugendliche erreicht werden, wollen wir Informatik allgemein verständlich und spannend darstellen. Darüber hinaus sollen Jugendliche begeistert werden sich auch näher mit der Informatik zu beschäftigen. “	http://www.einstieg-informatik.de
Erster Deutscher Frauenstudiengang Informatik und Wirtschaft (FIW)	„Obwohl Frauen gute Voraussetzungen für ein Informatik-Studium mitbringen, sind sie mit nur 20 % unter den Studierenden zu finden. Damit nutzen sie ihr Potenzial für chancenreiche Zukunftsberufe nicht aus. Frauen wählen zumeist Studienrichtungen wie Sprach- und Kulturwissenschaften, in denen sie später leider weder gute Berufsaussichten haben noch ein hohes Einkommen erzielen. Wir wollen mehr Frauen als bisher für ein Informatik-Studium motivieren und ihnen den selbstverständlichen Umgang mit Technik ermöglichen. Damit folgen wir dem Vorbild vieler amerikanischer Women Colleges und deutscher Frauenstudiengänge. “	http://fiw.f4.fhtw-berlin.de
FiT e.V. – Frauen in der Technik	„Flexibel und mit gebündeltem Know-how Projekte zu Frauen und Technik / Naturwissenschaften durchzuführen - dazu haben wir uns in dem als gemeinnützig anerkannten Verein Frauen in der Technik - FiT- e.V. zusammengeschlossen. “	http://www.fitev.de
Frauen ans Netz	„Ziele: Den Frauenanteil im Netz auf mindestens 50 Prozent steigern. Frauen ohne Zugangsmöglichkeiten zur Technik die Internetnutzung kostengünstig ermöglichen. Die Kompetenz im Umgang mit dem Medium Internet verständlich und in angenehmer Atmosphäre vermitteln. Frauen zeigen, wie viel Spaß das weltweite Netz macht und wie sie es optimal für Kontakte, Unterhaltung und Information als auch Weiterbildung nutzen können. Frauen motivieren, die Alltagstauglichkeit des Mediums Internet zu erproben und sich an der Gestaltung der Informationsgesells-chaft zu beteiligen. “(Projektzeitraum: 1998-2005)	http://www.frauen-ans-netz.de/
Frauen in der Geschichte der Informationstechnik	Dieses Werk entstand im Rahmen des Projekts „Frauen in der Geschichte der Informationstechnik “.	http://www.frauen-informatik-geschichte.de
Frauen in Naturwissenschaft und Technik e. V. (NUT)	„Der Verein *Frauen in Naturwissenschaft und Technik* NUT e.V. ist ein Zusammenschluß von Frauen, die in naturwissenschaftlichen und technischen Bereichen arbeiten oder studieren. “	http://www.nut.de

Frauen machen Karriere • Dossier Mathematikerinnen	„Mathematik war lange Zeit ein männerdominiertes Fach. Heute gibt es fast genauso viele Mathematik-Studentinnen wie -Studenten und sie haben attraktive Berufsaussichten. Eine Karriere in der Forschung, eine erfolgreiche Laufbahn in der Wirtschaft oder ein Berufsweg in der Lehre - die Möglichkeiten mit Mathematik sind vielfältig. Das zeigt das neue Dossier „Zahlenkünstlerinnen "auf frauenmachenkarriere.de. "	http://www.frauenmachenkarriere.de/Brancheninformationen/Bildung_und_Forschung/dossier_mathematikerinnen/
G@ME Gender awareness in Media Education - Genderaspekte in der Medienbildung	„Projektgesamtziel: Zukünftige und praktizierende Lehrerinnen und Lehrer werden sensibilisiert für die Wahrnehmung geschlechtsspezifischer Unterschiede im mediendidaktischen Bereich und berücksichtigen diese in der Unterrichtsgestaltung. "	http://game.bildung.hessen.de
Genderaktivitäten im Wissenschaftsjahr 2006	„Die Verankerung des Gendergedanken in den Wissenschaftsjahren und die ausdrückliche Ansprache des weiblichen Nachwuchses war Ziel des vom Bundesministerium für Bildung und Forschung (BMBF) geförderten und inzwischen abgeschlossenen Projektes *Genderaktivitäten im Wissenschaftsjahr 2006*. "	http://www.kompetenzz.de/Genderaktivitaeten
Gender Networking	„Um besonders Frauen zu einer Qualifizierung im Bereich Netzwerktechnik zu ermutigen, und ihnen damit eine deutlich verbesserte Positionierung in ihrem späteren Beruf zu ermöglichen, startete der Verein Frauen geben Technik neue Impulse e.V. gemeinsam mit der Cisco Systems GmbH und der Fachhochschule Bielefeld das Projekt Gender Networking. Das Qualifizierungsprogramm schließt mit einem international anerkannten Weiterbildungszertifikat ab. Im Rahmen des Projekts wurden zusammen mit den Partnerinnen und Partnern Qualitätskriterien und neue curriculare Elemente unter Genderaspekten entwickelt, die das Bewusstsein von Dozentinnen und Dozenten und Lehrenden für neue Zielgruppen in der Netzwerktechnik schärfen und mehr Frauen für dieses Feld gewinnen. "	http://www.gender-networking.de/ http://www.kompetenzz.de/Projekte/Alle-Projekte-A-Z/GenderNetworking
Gesellschaft für Informatik e.V. • AG Frauen und Informatik • Girls go Informatik	„Die Fachgruppe *Frauenarbeit in der Informatik* (FRAUINFORM) der Gesellschaft für Informatik e.V. (GI) setzt sich für eine Gestaltung und Anwendung von Informationstechnik, die sich an den Interessen von Frauen orientiert, ein. " Girls go Informatik – Informationstage (2001-2006) zum Informatikstudium für Frauen.	http://www.gi-ev.de/themen/frauen-in-der-informatik/ http://www1.gi-ev.de/fachbereiche/fa_81/ www.girls-go-informatik.de

Girls 'Day – Mädchen-Zukunftstag Neue Wege für Jungs	„Am Girls'Day - Mädchen-Zukunftstag haben Schülerinnen Einblick in Berufsfelder, die Mädchen im Prozess der Berufsorientierung nur selten in Betracht ziehen. In erster Linie bieten technische Unternehmen und Abteilungen, sowie Hochschulen, Forschungs-zentren und ähnliche Einrichtungen am Girls'Day Veranstaltungen für Mädchen an. “	http://www.girls-day.de http://www.neue-wege-fuer-jungs.de/Neue-Wege-fuer-Jungs/Jungenangebote-nicht-nur-am-Girls-Day
Girls-inform.de – Christian-Albrechts-Universität zu Kiel	„girls-inform.de ist eine Initiative des Instituts für Informatik der Christian-Albrechts-Universität zu Kiel, um Mädchen und junge Frauen an das Studium der Informatik heranzuführen. Sie besteht aus einem Spektrum an Veranstaltungen, von Schnupper-studiumswochen über Vorträge zur Berufsorientierung bis zu Veranstaltungen im Rahmen des Girls' Day (Mädchenzukunftstag). “	http://www.girls-inform.de
Idea - Mentoring für Schülerinnen und Studentinnen in Naturwissenschaft und Technik	„idea - das ist ein neues Service- und Beratungsangebot der Freiburger Universität für Studentinnen der naturwissenschaftlich-technischen Fächer und interessierte Schülerinnen. idea bietet Studentinnen und Schülerinnen: die Teilnahme an unserem Mentoringprogramm, ein interaktives Portal mit Informationen zu Studiengängen und Berufen aus Naturwissenschaft und Technik und anderen aktuellen Themen, die Möglichkeit eines gegenseitigen Austausches und der Vernetzung. “	http://www.idea.uni-freiburg.de
idee_it	„Das idee_it -Netzwerk möchte Mädchen und junge Frauen unterstützen, sich für die neuen und spannenden IT-Berufe zu entscheiden. “	http://www.idee-it.de
Informatica Feminale	„Deutschlandweites Sommerstudium für Frauen in der Informatik. Die Informatica Feminale bietet jährlich kompakte Lehre zur Informatik für Studentinnen aller Hochschularten und für an Weiterbildung interessierte Frauen. Studieneinstieg, Verbleib im Studium, Berufsübergang und lebenslanges Lernen auf universitärem Niveau stehen dabei gleichermaßen im Blickfeld. Dozentinnen und Teilnehmerinnen kommen aus dem In- und Ausland. Das Sommerstudium in der Universität Bremen ist ein Ort des Experimentierens, um neue Konzepte für das Informatikstudium zu finden. “	http://www.informatica-feminale.de

Ingenieurinnennetzwerk – IngNet e.V.	Ziele: „Professionelle Zusammenarbeit von Frauen aus technischen Berufen, Fachspezifische und bedarfsorientierte Weiterbildung, Gegenseitige Unterstützung im beruflichen Alltag, Verbesserung der rechtlichen Situation von angestellten und selbstständigen Ingenieurinnen im Beruf “	http://www.ingnet-online.de
Joblab & Diversity	„JOBLAB & DIVERSITY ist in der Sozial- und Bildungsforschung sowie in der Medienentwicklung tätig. Die Mitarbeiter von JOBLAB & DIVERSITY haben zahlreiche Studien und wissenschaftliche Begleitungen in unterschiedlichen Kontexten und für unterschiedliche Auftraggeber durchgeführt. Dazu sind Leitfäden und viele weitere Veröffentlichungen erschienen. “ „Wir haben 2001 ein Multimedia-Planspiel zur Berufsorientierung und Berufswahlentscheidung von Mädchen entwickelt. Ab 2005 ist JOBLAB dann für Mädchen und Jungs erweitert worden … “	http://www.joblab.de/wer_sind_wir_.html http://www.joblab.de/das_planspiel_joblab.html
Jump in MINT	„Auf diesem Portal findest du viele Informationen, Tipps und Angebote, mit denen wir dich unterstützen möchten, den für dich passenden Beruf zu finden: Berufsbeschreibungen, Ausbildungsplatzbörsen, Bewerbungstipps, Veranstaltungen, Informationsangebote für Deine Kommunikations- und Präsentationsfähigkeit, Links über Links zu weiterführenden Informationen und vieles mehr. Dabei werfen wir immer wieder einen ganz besonderen Blick auf die Welt der MINT-Berufe. “	http://www.jump-in-mint.de
Komm mach MINT	„Internetseite des Nationalen Pakts für Frauen in MINT-Berufen. Der nationale Pakt zwischen Politik, Wirtschaft, Wissenschaft und Medien soll das Bild der MINT-Berufe in der Gesellschaft verändern, junge Frauen für naturwissenschaftliche und technische Studiengänge begeistern sowie Hochschulabsolventinnen für Karrieren in der Wirtschaft zu gewinnen. “	http://www.komm-mach-mint.de
Kompetenzforum Genderforschung in Informatik und Naturwissenschaften	„In unserem Forum lehren und forschen kompetente Wissenschaftlerinnen zur Gender-Thematik in ihren Fachgebieten. Besonderes Augenmerk liegt auf der Schnittstelle zwischen Informatik und Naturwissenschaft, die sich in ihren Modellbildungen gegenseitig durchdringen. “	http://gin.iig.uni-freiburg.de/h_seite.php?h_men=1

Kompetenzzentrum Technik, Diversity, Chancengleichheit Bielefeld	„Vorrangiges **Ziel** des gemeinnützigen Vereins Kompetenzzentrum Technik-Diversity-Chancengleichheit ist es, den Weg Deutschlands in die **Informations- und Wissensgesellschaft** aktiv mitzugestalten. Dazu werden vielfältige Initiativen und Projekte entwickelt und durchgeführt, die die **Potenziale von Frauen und Männern** nutzen, um Chancengleichheit in allen gesellschaftlichen und beruflichen Bereichen zu verwirklichen. “	http://www.kompetenzz.de/
Lizzynet	„Die Informations-, Kommunikations- und Lernplattform stellt für Mädchen einen eigenen virtuellen Raum zur Verfügung, in dem sie sich selbstbestimmt unter ihresgleichen bewegen, kommunizieren und kreativ sein können. Die Umsetzung von innovativen Ideen und die Bündelung bereits bestehender Online-Angebote für Mädchen gehört ebenso dazu, wie die Entwicklung von zielgruppengerechten E-Learning-Angebote auf unterschiedlichen Bildungsniveaus. “	http://www.lizzynet.de http://www.lizzynet.de/dyn/136960.php?sid=337655887263710181 23678437845750
Mädchen und Technik – Universität Bamberg	„Das Projekt »MUT - Mädchen und Technik« geht auf eine Initiative der Fachhochschule Coburg zurück. Die Initiative hat das Ziel, Mädchen und junge Frauen für technische und naturwissenschaftliche Berufe zu begeistern. “	http://www.mut-bamberg.de/
Medi@girls	Stärkung der Medienkompetenz von Mädchen und jungen Frauen, ein Projekt des Wissenschaftlichen Instituts des Jugendhilfswerkes Freiburg e.V. (WI-JHW.) Projektziele: Mit Medienkursen für Mädchen und junge Frauen verfolgen wir das Anliegen: * Projekte zu entwickeln, die Spaß am Umgang mit neuen Medien wecken; * Mädchen an neue Medien heranzuführen; * Mädchen aus Familien in sozial benachteiligten Lebenssituationen zu gewinnen; * Medien- und Technikkompetenz zu vermitteln; * durch teilnehmerinnenorientierte Kurse die Auseinandersetzung mit Medien anzustoßen den selbstbewussten Umgang mit der Computertechnologie zu fördern Teilnehmerinnen bei der Veröffentlichung ihrer medialen Produkte zu unterstützen; * kritische Reflexion und Einflussnahme auf gesellschaftliche Entwicklungen zu fördern; *das Berufswahlspektrum in Medienberufen zu erweitern Projektzeitraum 2001 - 2003	http://www.mediagirls.de/

MeMPhys - Mentoring in Mathematik und Physik	„Der Vergleich mit anderen Ländern zeigt, dass der Frauenanteil in Mathematik und Physik lange nicht so gering sein muss, wie dies in Deutschland der Fall ist. Deswegen ist es uns ein besonderes Anliegen, gerade Frauen in diesen anspruchsvollen Studiengängen zu unterstützen. Herzstück des Mentoring-Programms sind die "Tandems": Jede Teilnehmerin im Grundstudium wird als "Mentee" einer Studentin im Hauptstudium, ihrer "Mentorin" zugeordnet. In regelmäßigen Treffen erhält die Mentee die Gelegenheit, Fragen bezüglich des Studiums und allem, was dazugehört zu stellen und den Rat ihrer Mentorin einzuholen. “	http://www.memphys.uni-freiburg.de
Netzwerk "Gender Studies + TechnoMedSciences"	„Das Netzwerk *Gender Studies + TechnoMedSciences* [...] ist in Zusammenschluss von Geschlechter-forscherinnen aus den Bereichen Naturwissenschaft, Mathematik, Medizin und Technikwissenschaften sowie aus den Gesellschafts-, Kultur- und Sozialwissen-schaften. Die Entwicklung von Forschungs-kooperationen, die Akquirierung von Finanzierungs-möglichkeiten, gemeinsame Publikationen und Konzeptionen für Lehre und Curricularentwicklungen im Bereich TechnoMedSciences sind Inhalte der Vernetzungsarbeit. “	http://www.gleichstellungsbuero.tu-bs.de/gender/tms
Netzwerk Frauen.Innovation.Technik Baden-Württemberg	Ziele: „Das Berufswahlspektrum für Mädchen und junge Frauen in Richtung Informatik- und Technikberufe erweitern. Schülerinnen für Informatik- und Technikstudiengänge bzw. Naturwissenschaften interessieren und motivieren. Informatikstudentinnen sowie Studentinnen in technischen Studiengängen durch Zusatzangebote unterstützen. Die Karriere von Naturwissenschaftlerinnen, Informatikerinnen und Ingenieurinnen fördern. Informationsangebote für Multiplikatorinnen, Studentinnen und Schülerinnen schaffen. Die Vernetzung der verschiedenen Zielgruppen fördern. Module, die in Hochschulen, Schulen und Jugendarbeit eingesetzt werden, unterstützen.	http://www.netzwerk-fit.de
Roberta – Mädchen erobern Roboter	Roberta nutzt die Faszination von Robotern, um Schülerinnen Naturwissenschaften, Technik und Informatik spannend und praxisnah zu vermitteln. Lehr- und Lernmaterialien, mit dem geschulte Roberta-KursleiterInnen Roboterkurse durchführen können, wurden entwickelt und erprobt.	http://www.iais.fraunhofer.de/roberta.html
Smart Girls	„Smart Girls sind Mädchen in ganz Deutschland, die begeistert sind von Robotertechnik. Manche haben Smart Girls-Teams gegründet und nehmen am RoboCupJunior teil. “	http://www.smart-girls.info
Verein Deutscher Ingenieure (VDI)	„Konkrete Hilfestellung und Erfahrungsaustausch bietet Ihnen unser fib-Netzwerk. Frauen soll es möglich sein,	http://www.vdi.de/ http://microsites.vdi-

• Bereich Frauen im Ingenieurberuf (fib)	in allen Lebensphasen als Ingenieurin die technische Entwicklung mit zu steuern, ohne ihre Karriere vernachlässigen zu müssen. Wichtig ist es, Vorurteile weiter abzubauen, veraltete Lebensmodelle zu ersetzen und mehr Vorbilder zu schaffen. Wir suchen den Dialog mit anderen Verbänden und zu unseren Partnern aus Wirtschaft, Wissenschaft und Politik. “	online.de/index.php?id=1572
webgrrls.de e.V. – Business Networking für Frauen in den Neuen Medien	„webgrrls.de ist das Netzwerk für weibliche Fach- und Führungskräfte, die in oder für Neue Medien arbeiten. Ziel ist die berufliche Weiterentwicklung sowie die Präsenz und den Einfluss dieser Frauen innerhalb der Branche zu fördern. Webgrrls.de bietet zu diesem Zweck ein Forum für Wissenstransfer, Erfahrungs-austausch, Job- und Auftragsvermittlung, strategische Allianzen, Mentoring sowie Förderung der Networking-Kultur. Grundgedanke des Business-Netzwerks ist das "Geben und Nehmen" der Mitglieder zur gegenseitigen Förderung. “	http://www.webgrrls.de

8 Conlusion

This report focused on the issue of gender equity in ICT at school, university and on the career level in Germany. Nowadays, internet usage statistics of teenagers show promising results: girls are catching up. Yet, there is still a long way to go. Using ICT goes beyond the pure internet usage, and in this respect there are still differences in the competencies and self-concepts in favour of boys. Additionally, educational trajectories from school to universities and the uptake of careers in ICT related professions increase gender imbalance in a way that they meet the comparison with a leaky pipeline (European Commission, 2006): Particularly in the context of ICT, the share of women shrinks with continuing professional development. Even if women are employed in ICT professions, they still earn less money for their work than their male colleagues.

A basic approach to promote equality is the implementation of media education, basic education in information technology, and informatics lessons at school. These subjects and related frameworks are nowadays indispensible part of the curricula of each of the German Länder. However, the implementation is inconsistent across the Länder and among schools. Additionally, there is no general gender support foreseen in the curricula, and specific gender support in relation to ICT is implemented on project level only. Therefore, future development of education policy at school level has to take into account both, the consistent implementation of information technology education and at the same time the specific facilitation of girls and boys towards an increase and equal development of their digital literacy.

A major problem in this context is the inadequate education of teachers. Although teacher education and training include aspects of media education and information technology education, only a low number of teachers have the competences to adequately implement ICT in education and facilitate pupil's digital literacy. Future education policy development needs to deal with this challenge by ensuring the

competence development of all teachers in this respect. Furthermore, the availability of teaching and learning materials for the facilitation of digital literacy of girls and boys from a gender perspective needs to be advanced and supported.

The report provided insight into the current inconsistent situation and challenges of implementing media and information technology education and informatics at school level, the underrepresentation of women in ICT related subjects at university and consequently in ICT related professions. A great number of initiatives and projects focuses on the promotion of ICT and gender issues, however, the described statistics and studies show that the issue of promoting equality with respect to gender and ICT will remain a critical topic in future for Germany and needs to be advanced from a project-based approach to a more strategic level.

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Media and education; http://www.eduserver.de/zeigen_e.html?seite=2675

State concepts for media education; http://www.bildungsserver.de/zeigen_e.html?seite=2884

State institutes (school development, quality assurance, school research, teacher education);
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http://www.oecd.org/topicdocumentlist/0,3448,en_33873108_33873402_1_1_1_1_37455,00.html.

10 Data Sources

Bayerisches Landesamt für Statistik und Datenverwaltung	http://www.statistik.bayern.de
Population	http://www.statistik.bayern.de/daten/intermaptiv/archiv/home.asp?UT=bevoelkerung.csv&SP=1
BITKOM – Bundesverband Informations-wirtschaft Telekommunikation und neue Medien e. V.	www.bitkom.org
Surveys and policy papers	http://www.bitkom.org/de/publikationen/38338.aspx
Data on the ITC sector in Germany	http://www.bitkom.org/de/markt_statistik/804.aspx
Employees in the German ITC sector	http://bitkom.org/files/documents/Erwerbstaetige_ITK_CE_2003_bis_2008.pdf
Destatis	www.destatis.de
Amount of students enrolled at German universities	http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/BildungForschungKultur/Hochschulen/Tabellen/Content50/StudierendeInsgesamtBundeslaender,templateId=renderPrint.psml
Passed higher education examinations Men	http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/Zeitreihen/LangeReihen/Bildung/Content100/lrbil14a,templateId=renderPrint.psml
Passed higher education examinations Women	http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/Zeitreihen/LangeReihen/Bildung/Content100/lrbil15a,templateId=renderPrint.psml
Eurostat	http://epp.eurostat.ec.europa.eu
Amount of women enrolled at universities in Europe	http://epp.eurostat.ec.europa.eu/portal/page?_pageid=1996,39140985&_dad=portal&_schema=PORTAL&screen=detailref&language=de&product=REF_TB_education_training&root=REF_TB_education_training/t_edtr/t_educ_indic/tps00063

IAB – Institut für Arbeitsmarkt und Berufsforschung	http://www.iab.de
Percentage of employed and unemployed women in 774 professions	http://www.pallas.iab.de/bisds/Data/seite_774_BO_a.htm
IT.NRW – Information und Technik Nordrhein-Westfalen	www.it.nrw.de
Population	http://www.it.nrw.de/statistik/a/daten/amtlichebevoelkerungszahlen/index.html
Compulsory schools	http://www.it.nrw.de/statistik/d/daten/eckdaten/r313schul1.html
Over-representation of girls in secondary school leaving certifications	http://www.it.nrw.de/presse/pressemitteilungen/2009/pres_045_09.html
Kultusminister Konferenz (KMK) – Statistik	http://www.kmk.org/statistik.html
Sozialerhebung der Deutschen Studentenwerke (DSW)	http://www.sozialerhebung.de

11 Glossary

The following glossary about with terms of the German education system is directly cited from KMK (2009, pp. 3-6).

- **Abendgymnasium** Establishment of the so-called Zweiter Bildungsweg at which adults can attend evening classes to obtain the general higher education entrance qualification.
- **Allgemeine Hochschulreife** General higher education entrance qualification. Entitles holder to admission to all subjects at all higher education institutions and is usually obtained at upper Gymnasium level (Gymnasiale Oberstufe) by passing the Abitur examination. The certificate of Allgemeine Hochschulreife incorporates examination marks as well as continuous assessment of pupil's performance in the last two years of upper Gymnasium level (*Qualifikationsphase*).
- **Bachelor** The Bachelor's degree as a first higher education degree provides basic qualification for a profession. It can be obtained after a standard period of study (*Regelstudienzeit*) of at least three and at most four years at universities and equivalent institutions of higher education, at colleges of art and music, and at Fachhochschulen. Together with the Master's degree, the Bachelor's degree is part of a graduation system of consecutive degrees (two-cycle degree system) which is to replace the traditional system of higher education qualifications (Diplom and Magister). The Bachelor's degree provides the same rights as Diplom qualifications obtained at a Fachhochschule. The Bachelor's degree may also be obtained as a tertiary education qualification providing qualification for a profession at Berufsakademien.
- **Berufliches Gymnasium** Type of school at upper secondary level offering a three-year course of education which includes both the general education subjects taught at upper Gymnasium level (Gymnasiale Oberstufe) and career-oriented subjects, such as business and technology, but which also leads to the general higher education entrance qualification.
- **Berufsschule** Vocational school at upper secondary level generally providing part-time instruction in general and vocational subjects to trainees receiving vocational education and training within the dual system.
- **Diplom** The Diplom degree as a higher education qualification provides qualification for a profession. It may be obtained either at universities and equivalent institutions of higher education (particularly in social or economic sciences and in natural and engineering sciences), at colleges of art and music, and at Fachhochschulen (in all subjects, with the specification Fachhochschule or FH added to the degree title).
- **Fachgebundene Hochschulreife** Qualification entitling holder to study particular subjects at a higher education institution. May be obtained through certain courses of vocational education at upper secondary level.
- **Fachhochschule** University of applied sciences. Type of higher education institution established in the 1970s, which has the particular function of providing application-oriented teaching and research, particularly in engineering, business, administration, social services and design.
- **Fachhochschulreife** Qualification entitling holder to study at a Fachhochschule. May usually be obtained after 12 years of schooling at a Fachoberschule or - under certain conditions - at other vocational schools.
- **Grundschule** Compulsory school for all children of the age of six onwards. It comprises four grades, except in Berlin and Brandenburg where it covers six grades.
- **Gymnasiale Oberstufe** The upper level of the Gymnasium, which can however be established at other types of school such as the Gesamtschule. It comprises grades 11-13 (or 10-12, 11-12, depending on the Land). Course of general education concluded by the Abitur examination, which leads to the general higher education entrance qualification (Allgemeine Hochschulreife).
- **Gymnasium** Type of school covering both lower and upper secondary level (grades 5-13 or 5-12) and providing an in-depth general education aimed at the general higher education entrance qualification. At present, in almost all Länder, there is a change from the nine-year to the eight-year Gymnasium in which the Allgemeine Hochschulreife is acquired after grade 12.
- **Hauptschule** Type of school at lower secondary level providing a basic general education. Compulsory school, unless pupil is attending a different type of secondary school, usually comprising grades 5-9.

- **Kindergarten** Pre-school establishment for children aged between three and six as part of child and youth welfare services – may be either publicly or privately maintained (not part of the school system).
- **Kolleg** Establishment of the so-called Zweiter Bildungsweg where adults attend full-time classes to obtain the general higher education entrance qualification.
- **Kunsthochschule / Musikhochschule** The colleges of art / colleges of music teach the entire gamut of artistic subjects or only certain branches of study, in some cases also the pertaining theoretical disciplines.
- **Magister** The Magister degree as a higher education qualification providing qualification for a profession may be obtained at universities and equivalent institutions of higher education (particularly in arts subjects).
- **Master** The Master's degree as a further higher education degree provides an advanced qualification for a profession and can be obtained after a standard period of study of one to two years at a university or equivalent institution of higher education, at colleges of art and music, as well as at Fachhochschulen. Master's study courses are differentiated by the profile types "more practiceoriented" and "more research-oriented." They require a first degree qualifying for entry into a profession. Consecutive Master's study courses build on a preceding Bachelor's study course in terms of content and are part of a graduation system of consecutive degrees (two-cycle degree system) that is to replace the traditional system of higher education qualifications (Diplom, Magister). Nonconsecutive Master's study courses and Master's courses providing further education correspond to the requirements of consecutive Master's study courses and lead to the same level of qualifications and the same rights as consecutive Master's study courses.
- **Mittlerer Schulabschluss** General education school leaving certificate obtained on completion of grade 10 at Realschulen or, under certain circumstances, at other lower secondary level school types. It can also be obtained at a later stage during vocational training at upper secondary level. In some Länder called Realschulabschluss.
- **Promotion** Award of a doctoral degree on the basis of a doctoral thesis and either an oral examination or a defence of the student's thesis. As a rule, the doctorate is embarked on after completing a first course of study culminating in the Magister, Diplom or Staatsprüfung, as well as after obtaining a Master's qualification, and the promotion serves as proof of ability to undertake in-depth academic work.
- **Realschule** Type of school at lower secondary level, usually comprising grades 5-10. Provides pupils with a more extensive general education and the opportunity to go on to courses of education at upper secondary level that lead to vocational or higher education entrance qualifications.
- **Sonderkindergarten** Pre-school establishment for children with disabilities – also known as a *Förderkindergarten*.
- **Sonderschule** Special school – school establishment for pupils whose development cannot be adequately assisted at mainstream schools on account of disability. Also known as *Förderschule*, *Schule für Behinderte* or *Förderzentrum*.
- **Staatsprüfung** State examination concluding a course of study in certain subjects (e.g. medical subjects, teaching, law). Also refers to examination taken by law students and teaching students at the end of their preparatory service (known as the Second State Examination). The examinations are administered by examination committees staffed not only by professors from the institutions of higher education but also by representatives of the state examination offices of the Länder.
- **Technische Hochschule / Technische Universität** Type of higher education institution equivalent in status to university. Focus traditionally lies in natural science and engineering.
- **Verwaltungsfachhochschule** Fachhochschule maintained by the Federation or a Land which trains civil servants in a particular sector of public administration for careers in the so-called higher level of the civil service.