**Lifelong Learning Programme**

**Sub-Programme COMENIUS**

# PREDIL
# Promoting Equality in Digital Literacy

***Project Number: 141967-LLP-1-2008-GR-COMENIUS-CMP***

# EMPRIRICAL RESEARCH REPORT
# GERMANY

**Deliverable / Report**

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

| | |
|---|---|
| Work Package: | WP3 |
| Authors: | Helling, Kathrin; Ertl, Bernhard; Mok, Sog-Yee |
| Task Responsible: | UniBW |
| Contributors: | N/A |
| Status, Version No. | Final, Version 15/11/2010 |
| Due date of deliverable: | 30/11/2010 |
| | |
| Start Date of Project: | 01 December 2008 |
| Duration: | 24 Months |
| Dissemination Level: | Public |
| Project coordinator: | Kathy Kikis-Papadakis, FORTH/IACM |
| Project coordinator email address | katerina@iacm.forth.gr |
| Financing: | Project funded by the European Commission, Lifelong Learning Programme (2008 - 2010) |

This project has been funded with support from the European Commission.

This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

# SUMMARY

This report summarises the methodological approach and results of the qualitative and quantitative research activities performed in the context of the PREDIL project in Germany by the Universität der Bundeswehr München.

The research activities include the analysis of interviews on interests, perceptions and career decisions of pupils, university students, teachers and professionals in the field of information and communication technology (ICT) from a gender perspective. Further, the results of a quantitative questionnaire survey on the issue of gender and ICT at secondary school level is reported. The annex includes the instruments that have been applied during the research activities.

The interviews with teachers, student and ICT professionals revealed several influence patterns in the field of gender and ICT in education and career; these focus on cognitive and socio-cultural aspects, interest and motivation, gender interaction, support structures and the education pathway. The results show tendencies of gender and ICT issues, however, they cannot be generalised.

> The teachers said that girls look for reasons to use a computer, while boys approach computers in a trial-and-error way. It is the teacher who is responsible for supporting the girls' usage of ICT, especially as boys generally show more interest in computer issues and a career in this field, and girls self-assess their performance below their actual performance. There might also be a domination of boys in the active participation in ICT classes, and gender-homogenous teaching needs to be considered in this respect. Also, teachers need to be educated to use ICT properly.

> The student interviews show that the decision for a subject at university is influenced by prior knowledge and interest in the respective field, e.g. informatics. The decision is influenced by parents and teachers (e.g. the professional background or the provision facilitating tasks) but self-initiative to study the subject is essential. The interviewees did not perceive gender-related difficulties at university or in a work context; however, thinking about career pathways that allow combining work and family might be relevant for some students.

> The ICT professionals reported about a general interest in ICT, which was developed either at school (and should be developed there), university or at home and influenced the career decision. The decision was also influenced by friends and family to a certain extent, but not for all interviewees. Being a women did not result in gender-related problems at university; however in working life, the female ICT professionals experienced barriers from not being expected to work in this filed or from the wish to have a family.

The quantitative questionnaire surveyed 75 German pupils (36 males, 39 females) from upper secondary public schools. The questionnaire focused on different areas of ICT usage and attitudes towards gender and ICT. The results show that there are hardly any differences between boys and girls in the overall usage frequencies of standard software, although girls use more word processing and presentation software, and boys more spread sheet applications. With regard to internet applications, the use of chat and downloading data are important activities, performed by boys and girls at home. Specific computer activities (e.g. creating web-pages, gaming, educational software, and programming) are only used by a minority of pupils at all, at home. The use of computers in school differs between subjects; especially languages and

mathematics provided boys and girls alike with a chance to develop their digital literacy by using computers. The use of social networks (especially chat functionality) at home is comparable for boys and girls; however boys rather use gaming functionalities of social networks and girls share contents more often.

The majority of pupils who participated in the questionnaire survey intends to continue education at university level; with stereotypical differences in the subjects preferred by boys (e.g. business, technology; but also social sciences) and girls (e.g. teacher training, languages).

Asked about the attitude towards specific gender issues, the results of the survey show that boys are expected to be better at using computers, because of their interest in technology and experience in using computers. However, the family is seen as important factor by about half of the survey participants, too. Further, most respondents are of the opinion that girls are generally treated better than boys in technical classes, although, this seems to depend on the teacher and differs from case to case.

The survey participants also provided advice to informatics teachers to improve their teaching. The advice refers to explanations and information provided by teachers, the learning content, curriculum and practical relevance of lessons, the needs of pupils, the teaching and feedback methods, and teacher education. Further, asked about the characteristics of good informatics pupils, girls and boys pointed out that interest in technology is among the most important factors that influences achievement in informatics. Further, boys rather than girls used external stereotypical aspects (e.g. wearing glasses, high bodyweight).

The survey participants seem to have a general idea of the future relevance of computing and ICT and therefore consider university studies and a career in ICT as important. Nevertheless, the professional profile of a computer scientist is vague, and many respondents see the main advantage in the ability to solve computer problems.

Further, this report describes central networking and dissemination activities performed by the University of the Bundeswehr. These include three teacher workshops conducted at the PREDIL networking conference "Synergy Development between Policy and Praxis on Technology Enhanced Learning from a Gender Perspective" in Slovakia.

Additionally, a summary of the analysis of learning resources for teaching (with) ICT is reported; the complete analysis report can be downloaded from the PREDIL project website. The results show a clear gender bias in the materials: in general, the representation of men and women in texts and pictures is biased to the advantage of men. Publishers of school books and online learning materials, as well as teachers, need to take these results into account and either adopt the materials accordingly or follow a gender-reflective teaching approach when using these materials.

Finally, the report includes a list of papers (including abstracts) and presentations published by the PREDIL project team of the University of the Bundeswehr. These list shows the main activities performed in order to disseminate the project and its research results among teachers and researchers in Germany and Europe.

In conclusion, it can be said that gender-differences in the field of ICT manifest in the context of school education, but also at home. Support structures for girls (and boys) need to be advanced at different levels, aiming at rising motivation and interest in ICT.

# TABLE OF CONTENTS

# 1 Introduction & Research Approach

"PREDIL is built on the premise that evidence based pedagogical strategies can prove catalytic in increasing both the quality of educational provisions and the educational outcomes as well as foster pupils' motivation to STEM and related choices for careers. In light of that the project goal is to articulate a gender sensitive pedagogical strategy for technology enhanced teaching/learning for the upper secondary level of education. Such a pedagogical strategy is to be founded on the process that underpins the great imbalance in take up of ICT by boys and girls at school and university levels"(PREDIL Application form, 2008, p. 23).

The project introduces "a coherent and comprehensive self-directed diagnostic and reflective pedagogical strategy. PREDIL produces outputs of innovative non-interventive character that are in the form of tools and frameworks. These emerge from empirical research results presented from a comparative and equity perspective. The findings from the empirical research actions define good practices from a gender perspective not only for teachers but also for instructional and software designers"(PREDIL Application form, 2008, p. 24).

The research activities of the PREDIL project were centred on four main research questions which were developed during the project runtime. The focus was on teachers and pupils, taking into account their perception of ICT use, the interest in ICT, its relevance for future careers, and related influence factors from a gender perspective. According to the PREDIL Operational Plan (2009, May; internal project document) these questions are:

- How do teachers perceive gender in relationship to ICT use?
- How do pupils (of different grades) perceive ICT now and from a future perspective?
- How do female and male pupils perceive ICT with respect to their future careers?
- How do contextual factors influence engagement in ICT (facilitating or hindering)?

It was decided to collect the information on these issues by interviewing and questioning pupils and teachers, and by taking into account the experiences and perceptions of computer science university students and professionals of the ICT sector.

# 2 Qualitative Research

## 2.1 Teacher Focus Groups & Interviews

In Germany, one focus group discussion and three interviews with informatics teachers were held. The results are presented below according to eight aspects which relate to the interviewee and her/his experience, opinion and perceived situation of gender and ICT in school context.

### 2.1.1 Focus Group

**Participants:** 3 Teachers (1 female, 2 male)

#### a. Information about focus group participants

All three participants teach at an upper secondary school (focus on economics). First, the female teacher told about her experiences with mono- and co-educative ICT lessons; afterwards, the two male teachers discussed their experiences of gender and ICT related teaching aspects.

#### b. ICT and gender – Opinion and experiences

N/A

#### c. Classroom interaction

In mono-educative ICT lessons girls were more goal-oriented and the working climate can be described as calm, civilised, pleasant and cooperative. The girls posed more questions because they did not fear ridiculous remarks by boys. The girls favoured this kind of teaching and wanted to keep to it for the remaining school term. Also, boys appeared to be more purposeful in mono-education ICT classes. They were not as distracted as in co-educative settings. However, they channelled their protective instinct ("Beschützerinstinkt") and their need to look over girls' shoulders to other boys within their group. It seemed that they missed the possibility to make "stupid remarks" of girls.

In mixed classes, especially in grade 11 (pupils do not know each yet[1]) a strict separation of boys and girls was observed, especially in ICT lessons, e.g. during group work or with regard to the self-chosen seating arrangements. Only, if a pupil is known to be good in a specific ICT subject matter s/he is asked for support by all pupils, boys and girls alike. The gender separation is reduced after the first school excursion. Further, it is reduced in grade 12 because pupils then have developed a kind of community.

#### d. Performance and attribution differences

[1] The school is a non-compulsory school at upper secondary level. Pupils start studying at this school in grade 11; they have completed grade 1-10 in other school at primary and secondary level. For this reason, the class structure in grade 11 is very heterogeneous regarding the educational background of the pupils (they come from different school types, e.g. from Gymnasium [grammar school] and Realschule [middle school]). Many pupils do not know each other yet.

Part of the ICT curriculum is the development of PowerPoint presentations. The female teacher observed in one of her mixed classes (with a higher number of girls) that gender-heterogeneous groups were formed for these tasks and that work was divided among members: boys were responsible for the subject content, they did the internet research and decided what was important; the girls actually designed the PowerPoint presentation, including animations. The two male teachers observed in their classes, that girls took the presentation and related talk in front of the class much more serious than boys and considered it as a chance to receive positive marks; boys approached the tasks rather chaotic and did not care for the assessment.

The pre-knowledge of pupils influences their performance in working with spread sheet applications. Often, girls are already very good and skilful, as well as boys. Boys do not have any advantage due to their general interest in informatics, although if asked about the perceived capability to perform certain tasks, boys would consider themselves capable more often than girls. It seems that boys feel to have good computer knowledge in general but over-estimate their performance in basic software applications. Girls often show much better performance in this respect. They have a different approach towards technology and consider it as "a means to an end".

The teachers observed that girls are hard-working all the time whereas boys work hard only in the probationary period ("Probezeit") and at the end when they feel pressure from the need to acquire the school leaving certificate. In general, the girls' performance is higher, however, girls' seem more astonished if they receive positive marks, and boys take each result – positive and negative – calmly.

### *e. Interest and motivation*

Sometimes, pupils are specialists for certain ICT related issues, e.g. the use of image processing software, if they have already used it for spare time activities.

There are only few pupils who can really programme computers; though the boys always ask if they will learn how to programme; girls never ask for it.

There are girls who think that they do not understand the subject matter and then pose questions: girls ask more questions than boys, they want to understand the subject matter right during lessons. Boys only ask, if they have a special interest in any subject matter and often over estimate their knowledge of certain ICT aspects.

Girls show more willingness to solve a task at the blackboard; boys show more engagement in ICT lessons activities, although this is dependent on the topic. Often boys want to proof their knowledge in a certain area and they need to be restrained; this cannot be observed for girls: they often have an attitude of "I will not understand it anyway".

### *f. School and curriculum*

The teachers think that in their economics school there are fewer "computer freaks" in ICT lesson than would be in a technical school.

### *g. Educational pathway and career decision*

N/A

#### *h. Other issues*

During ICT lessons pupils often work on their own or in small groups in front of a computer which catches their attention. For this reason, informal and private talks between pupils and teachers can be held easily, because there is not a complete class eavesdropping on what is discussed.

### *2.1.2 Interviews*

**Teacher A (female)**

#### *a. Information about interviewee*

Teacher for the subjects informatics, mathematics, physics at lower secondary level of a grammar school with orientation towards science ("Unter- und Mittelstufe an einem naturwissenschaftlichen Gymnasium") in Bavaria.

#### *b. ICT and gender – Opinion and experiences*

Girls are reluctant in using computers and afraid of making mistakes and breaking the computer. They are often reserved because they fear to disgrace themselves. However, if they come to trust in how to use computers, girls are equally successful as boys. Boys use the computer in a playful and rather inexperienced/naïve ("unbedarft") way. They rather use a trial-and-error approach.

#### *c. Classroom interaction*

N/A

#### *d. Performance and attribution differences*

The pupil's self-assessment of performance is often appropriate (e.g. in $10^{th}$ grade about 90% of the pupils self-assess their selves correctly).

At the beginning (first 3 weeks) girls tend to self-assess their performance below the actual performance level. However, this is also dependent on the teacher who needs to support the girls and who can influence the development of pupils, especially of girls.

#### *e. Interest and motivation*

A basic interest in informatics can be reported for all pupils – boys and girls – because the school has a scientific orientation, and pupils chose that school on purpose. However, the interests differ.

#### *f. School and curriculum*

Informatics is a compulsory subject at this school (in this state).

#### *g. Educational pathway and career decision*

Girls tend to choose careers in technology less often in boys. Although some of them perform generally well they do not show interest in this professional field.

### *h. Other issues*

At this school an e-learning platform is used more and more for teaching and learning; however, the use of computers in other subjects than informatics is dependent on the teacher.

## Teacher B (female)

### *a. Information about interviewee*

The interviewee is teacher for the subjects informatics, mathematics and social science at a grammar school in North Rhine-Westphalia. At this school (in this state) informatics is not compulsory but can be chosen by pupils.

### *b. ICT and gender – Opinion and experiences*

There are hardly any girls who chose informatics courses.

She experienced – 10 years ago – a better situation with informatics courses targeted at girls only.

It is the responsibility of the teacher – especially female informatics teachers – to support girls, e.g. following the slogan "Gemeinsam sind wir stark" ("together strong").

### *c. Classroom interaction*

Girls approach the computer by asking for reasons; e.g. why they should use the computer for performing a specific task. They are often excited about using computers. Further, they work in a rather tidy way. Boys ask less often for reasons and just try out using the computer; their work approach is less tidy.

During group work, boys often take a leading role; this kind of dominance often intimidates girls.

Girls need to develop awareness: they are a minority but have the ability to assert their selves.

### *d. Performance and attribution differences*

Girls are more self-critical than boys. They assess their performance – although if it is at the same levels as the boys' performance – worse than boys do.

Boys tend to present and express their knowledge in an extroverted way; it seems that girls are intimidated by this behaviour.

### *e. Interest and motivation*

At home, boys and girls have the chance to use computers; however studies show that boys rather play games while girls use the computer for chatting with friends.

It is important that the teacher supports and backs up girls and also functions as a role model. This would help girls to feel comfortable in lessons dominated by boys.

### *f. School and curriculum*

Informatics can be chosen at grade 8 and following; however, teacher B is of the opinion that computer usage at school should start earlier.

### *g. Educational pathway and career decision*

Boys are engaged with using computers more intensely than girls, e.g. they run a server at home or repair broken computers on their own. Often, they already know for which (local) company they would like to work and what subject they want to study at university.

### *h. Other issues*

Teacher B reported about a project at her previous school: Laptops were used in the classroom instead of using the computers in special rooms. The problem was the inadequate education of teachers in using the laptops during lessons.

## Teacher C (female)

### *a. Information about interviewee*

Teacher for the subjects informatics, domestic economy ("Hauswirtschaft"), business and employment studies ("Arbeitslehre"), and economy ("Wirtschaft"); she is also qualified in social pedagogy and media education. She works at a comprehensive school in North Rhine-Westphalia at which informatics is not compulsory but can be chosen by pupils.

### *b. ICT and gender – Opinion and experiences*

Boys are more experienced in using computers, especially when it comes to tasks like "saving a word document". In grade 9 and 10, boys generally know how to do it; girls don't, however girls are rather experienced in the use of instant messaging programs.

The number of boys in informatics lessons is much higher than that of girls, and often the understanding of informatics are inadequate, e.g. they expect to be surfing in the internet all the time.

### *c. Classroom interaction*

Boys and girls do not prefer working in heterogeneous groups, and girls tend to take the role of bystanders rather than being active in these groups.

Example: Pupils were asked to dismantle a computer. In a gender-heterogeneous group the boys actively took the computer apart, the girls watched them; in a group with female pupils only, the girls were reluctant in dismantling the computer at the beginning but realised that is not difficult and then took the computer apart in a more detailed way than the boys did.

Girls ask more questions than boys and are not afraid of expressing a lack of knowledge in certain areas. Boys prefer to find out things by trial-and-error. However, the general number of contributions in lessons does not differ between boys and girls.

Girls show much more patience than boys in explaining things to other pupils.

There are also girls which take high-performing boys as a model and try to learn from their experience.

#### d. Performance and attribution differences

The performance of pupils who have an inadequate understanding of informatics in advance of the courses (see above) is often below that of other pupils.

Girls self-assess their performance below the actual performance and it is the other way around for boys. They consider themselves better than they are and also try to justify these judgements.

#### e. Interest and motivation

N/A

#### f. School and curriculum

Pupils should start using computers at an earlier stage at school and develop basic knowledge in order to overcome inhibitions. This might facilitate girls' choice of informatics courses.

#### g. Educational pathway and career decision

In a short internship/work experience in a company pupils' experience the importance of computers in working life.

#### h. Other issues

It would be important to train teachers in using the computer already during initial teacher training. Many teachers feel insecure about using a computer during lessons and therefore decide not to use it at all.

The use of computers in other subjects depends on the teacher.

### 2.1.3 Summary of Influence Patterns

#### Main issues on gender, ICT and education in Germany?

In the following, a summary of the teacher focus groups and interviews is provided according to six dimensions: cognitive dimension, socio-cultural influences, interest and motivation, perceived gender interaction, support structures, education pathway. This summary is based on the statements of the teachers which cannot be generalised but give an impression of how the issues of gender and ICT are perceived in school contexts in Germany.

## Cognitive dimension

Girls demand reasons for using computers to perform specific tasks. They are reluctant and afraid of breaking the computer. They use computers as “a means to an end”.

Boys have a trial-and-error approach towards using computers. They do not show lack of knowledge; and they present existing knowledge in an extrovert way and want to proof their knowledge.

## Socio-cultural influence

The teacher is in the responsibility of supporting girls in using computers, in their choice of informatics lessons and in backing them up in case they feel dominated by boys.

## Interest and motivation

Boys seem to be more interested in informatics; their number exceeds that of girls in optional informatics lessons.

In general, there seem not to be substantial performance differences between boys and girls. Girls often perform better than boys, e.g. in the use of software applications. However, girls self-assess their performance below and boys self-asses it above the actual performance level.

Often, boys already have experience in using computers, e.g. in using software applications or with regard to administrator tasks. Girls often are experienced in using instant messaging software. The pre-knowledge influences the pupils’ performance.

Girls are described as hard working in general; boys work hard if they are interested in a topic or if they feel certain pressure (e.g. probation period, school leaving examination).

## Perceived Gender-Interaction

In gender-heterogeneous groups boys take the active part and seem to dominate girls. For example, in joint preparation of a presentation boys decide on the importance of contents and girls take over the activity of designing the actual presentation in PowerPoint.

The working atmosphere in mono-educative ICT lessons is pleasant and favoured by girls. They can pose questions without receiving ridiculous remarks by boys.

A separation of boys and girls, e.g. in group work or seating arrangement is more prevailing at the beginning when pupils do not yet know each other. The separation is less existent after the first school excursion or in following grades when a community is formed.

## Support structures

Computer use should be started at an early age in school in order to overcome inhibitions.

Gender-homogenous groups encourage girls in using computers on a software and hardware level.

Teachers of other subjects than informatics are often insecure in using computers during lessons; therefore, teacher training needs to focus on using computers in teaching and learning.

### Education pathway ("Bildungsbiographie")

Boys consider the information technology sector as a career option; girls do show less interest in a career in this field.

The type of school has an influence on the number of pupils interested in ICT, e.g. the interest is considered higher in schools with scientific or technological orientation.

## *2.2 Student Itineraries*

The main goal of these qualitative studies was to obtain narrations about choices being made by university students having chosen ICT as their career. We have conducted 3 interviews with female informatics and mathematics students at different stages of university studies and with differing future career plans.

### *2.2.1 Description of Interviews*

### Student A (female)

#### *a. Information about interviewee*

The interviewee is a female university student, 23 years old. Currently, she is studying to become a Mathematics teacher (Master of Education) and in parallel doing her Bachelor of Science Informatics. She is planning to teach at school in future, but would like to work as research associate at university first, for about 2-3 years.

#### *b. Interest in and use of technology and related competences*

At school, she was the best pupil in class in Mathematics, also better than boys. Also, she was among the best pupils in Informatics which was acknowledged by the teacher.

She was characterised by her Mathematics competencies (*„es hat mich als Person in der Klasse ausgezeichnet"*). Other pupils (boys and girls, appreciated her knowledge and asked for support (e.g. learning in groups). This can be considered as a kind of socially motivating factor. It also supported her development of interest in Mathematics especially in grade 10 and following.

Her interest in Mathematics was the main motivating factor in her choice of university courses (*„Interesse war für mich sehr wichtig. Ich hab sehr stark gemerkt, man kann sich nicht für etwas motivieren, das einen nicht interessiert"*). Additionally, she is very interested in technical issues and if faced with technology-related problems she makes an internet research on how to solve a problem, or at university she asked her fellow students for advice, and she appreciates cooperative learning activities in this respect.

She is aware that girls tend to attribute failure in class to internal causes, e.g. a lack of competences, and that boys rather explain failure by external factors, e.g. a bad teacher. At school, she often noticed girls who said "I am not able to do this". The interviewee herself did not think like this and always tried to solve problems on her own. She did not doubt her own competencies *(„Ich persönlich hab nie so gedacht, ich war immer sehr hartnäckig und hab versucht Probleme zu lösen. Ich hab an meinen Leistungen nicht gezweifelt"*). Also, at university, she attributed failure on external factors, e.g. the difficulty of a test (about 70% of the other students also failed) and on "bad luck". She often reflected with her mother and best friend (female) on reasons for success and failure.

### *c. Educational pathway – supporting factors and people*

At grammar school ("Gymnasium") the interviewee decided to set a focus on Mathematics and Biology ("Leistungskurse"). She also had the chance to study Informatics at school but did not decide to do so. Asked about her reasons, the interviewee said that she did not like the teacher and her best friend (female) chose Chemistry and as she was also good in Chemistry she decided to do it instead. Another reason might be that the majority of pupils who decided for the informatics course were boys (although, about 10 girls choose Informatics, too).

The interviewee started in grade 12 (one year before leaving school) to collect information about studying at university. Her parents advised her to become a teacher, and she always liked to give private tuition lessons for pupils. Due to her interest in Mathematics it was clear to her to become a Mathematics teacher. However, teachers in Germany have to study two subjects and she had to decide between Biology, Chemistry and Informatics. She decided for Informatics because the chances to be admitted to Biology courses were rather bad (many teacher trainees choose this subject); Informatics is chosen by fewer students. Furthermore, she considered her chances to get a job after university better, if she studied Informatics.

Apart from her interest in Mathematics and Informatics she described other support factors that influenced her educational pathway, especially the parents, teachers and friends.

Family background: The interviewee has three sisters who have high competence levels in mathematics. Her mother has acquired university entrance qualification ("Abitur") in Turkey and wanted to become a Mathematics teacher, but could not realize this goal. For this reason, the mother strongly supports her daughter. The students' father is a worker. He considers it important that his daughters receive good education and are financially independent. He motivated the interviewee in this respect. In general, the interviewee considered the support of her parents as important for becoming a university student, but she also had to show self-initiative behaviour.

School and teacher: The student was successful at school and often supported other pupils. She focused on mathematics at grammar school ("Gymnasium, Mathematik-Leistungskurs"), and the teacher of her mathematics course was at the same time her Informatics teacher. He supported her, e.g. by giving her challenging tasks and motivating her to study Mathematics at University. Also, her female chemistry teacher supported her and focused on subject content which would be needed at university. The student expressed that it was good to be backed up by teachers; it motivated her to go to university.

Peers: The student reported about a friend who already studied economic informatics ("Wirtschaftsinformatik") at university. He encouraged her and pointed out that she can manage to study at university, given that she is generally motivated.

### *d. University studies*

Mathematics at university was difficult in the beginning; the student failed during her first Mathematics test at university. She did not expect it to be difficult, and the failure was shocking, because at school she was always best in class. However, after the first year at university she got used to the longer and complex teaching and learning phases and tests. From then on, she liked to study at university and did not regret her decision. She even liked Informatics better than Mathematics; but Mathematics was important for Informatics and she could benefit from synergy effects.

### *e. Career choice and planning*

The student considers writing her master thesis in the field of didactics for informatics and she can imagine doing scientific research in this field after finishing her university studies. She also might focus her PhD studies in this direction. However, in a long term perspective, the student wants to become a teacher. She has already worked at school during internships and has experienced that she likes teaching children. She considers herself rather as a "social person"; she wants to work in a field where she is in direct contact with people. She is less interested in working as a computer scientist in private enterprises. She is also of the opinion that becoming a teacher would give her the chance to combine work and family life, rather than a career in another occupational field, which would be challenging in this respect.

### *f. Gender aspects*

Family background: The interviewee's family members considered it not unusual, if girls showed interest in Mathematics. Also, in Turkey (the student has a Turkish migration background) gender issues are less important in the field of technology, for example the number of males and females in engineering is quite balanced.

School: The interviewee did not have any problems with gender-heterogeneous teaching, e.g. in Mathematics. She did not feel distracted by boys, although she experienced depreciating comments by boys. The interviewee – who was best in class in Mathematics – supported her classmates equally, independent if they were boys or girls. Her best female best friend attended the same courses.

The student considers it important to give girls the opportunity to show that they are equally competent than boys, e.g. the teacher should pose questions equally to boys and girls and girls' working results should be presented to the class. Also, she experienced during her internship in informatics teaching at school, that teachers need to stop boys from making inappropriate behaviour (depreciate girls, talking without being asked), because otherwise girls would not get a chance to speak.

University: At the university the interviewee noticed the imbalance in the number of men and women attending the courses for the first time and wondered why girls do not study Mathematics or Informatics. She did not have any problems with the boys at university and found friends among them.

### *g. Other issues*

N/A

## Student B (female)

### *a. Information about interviewee*

The interviewee is a 25 years old master student of mathematics at an elite university in Munich, Germany. Before studying in Germany, she began with computer engineering courses at university in Romania, and was at a university in Sweden for one year. She completed her Bachelor studies in Hannover, Germany. She also gained some work experience during an internship at a research institute in Germany. At school (Gymnasium in Romania) she had already focused on mathematics and informatics.

### *b. Interest in and use of technology and related competences*

The interviewee participated in a Math competition during 5th grade at school. Since then, she put a focus on math and natural science at school. She also was motivated by the experience of meeting interesting people at these competitions; it gave her the chance to go to larger cities (she lived in a small town) several times a year.

She was a bit concerned of selecting computer science/ informatics at university; she was “afraid” that it would not be the right choice for her. That was also the reason for her to study a year in another country (Sweden) and to do an internship in the research institute. It helped her to develop new knowledge and also find out about her ability to study informatics. Also, she was not among the best in Mathematics at university and therefore was concerned that she did not make the right choice. However, her doubts resolved during the internship, because she experienced that she was able to work practically in this area. She has a kind of playful approach towards mathematics, resulting from the support that was given to her by her father (see below).

She also accepted that she has multiple interests and likes to do languages as well as sports, additionally. Although, that means that she would not achieve as good in informatics as men who focus on it only and dedicate 20 hours a day to working at their laptop.

### *c. Educational pathway – supporting factors and people*

Family: The student’s parents have studied at university – they are both physicians – and it was not questioned that she would not go to university, too. Her parents expected her to work hard at university. They provided her with emotional and financial support and stood behind her decision to focus on informatics. When the student was still at school, especially, her father had supporting influence, e.g. they worked together on mathematics problems for pupils published in mathematics journals. Also, the father developed own tasks for the facilitation of his daughter until she has completed 8th grade at school. Most important was that he encouraged her and expressed trust into her mathematical competences.

Teachers at school and university: Several of the interviewee’s teachers supported her to participate in Mathematics competitions for pupils, from school level up to national level. She received extra tuition by the teacher in preparation for these competitions. She also had to be self-initiative in this respect and looked for teachers who would facilitate her, e.g. by giving her Mathematics tasks. At university, she was motivated by the teachers as well, e.g. when she came to Germany, the dean supported the accreditation of her achievements made at university in Romania and Sweden, and he provided a recommendation letter for her to continue at master level.

Peers: At school, the student had a female role model. She was two years older and achieved exceptionally good in Mathematics. At university, she feels socially integrated in the small group of elite student at university of Munich; this was not the case during her Bachelor studies in Hannover, where the number of students was higher. She sometimes felt lonely.

### *d. University studies*

The interviewee’s current subject at university at Master level is Mathematics. She also considered bio-informatics; although, the professional prospects are worse, and one could mainly find jobs in research. The subject matter is quite difficult, but it is fun, and the student considers the difficulty also as a motivating aspect.

### *e. Career choice and planning*

The decision to continue with mathematics in Germany was related to the good funding opportunities she received (possibility to get scholarships at all universities in Germany) and the career possibilities it offers. She felt that her achievements were much more appreciated in Germany than in Romania. She also thinks about writing a doctoral thesis, but the actual decision depends on her experiences she will make with writing the master thesis. She also plans to get further work experience by working at IBM for 10 weeks during next summer.

### *f. Gender aspects*

The student was used to the gender imbalance right from the beginning, e.g. at the mathematics competitions. She experienced this quantitative gender imbalance also at university. In her current master studies, 3 women and 14 men are enrolled. However, there was less imbalance at university in Romania, were there were about 40% women enrolled for computer engineering studies. The student experienced that it was sometimes difficult because of being female, but it did not matter to her and she did not really think about it, because she was used to it and considers it as normal. At work, she often was the only women, however, she was treated according to her qualification and achievement, and no problems occurred.

### *g. Other issues*

N/A

## Student C (female)

### *a. Information about interviewee*

The interviewee is a doctoral student and research associate in projects of technical informatics at the Universität der Bundeswehr München, Germany. She is now working on her doctoral thesis for about three years. She studied informatics in Oldenburg, minor subjects were geography and art.

### *b. Interest in and use of technology and related competences*

In general, the interviewee has multiple interests, also within the area of informatics itself; she needs change. She really enjoys solving technical problems, which she has done in a playful way since childhood, and she has some kind of ambition and self-motivation to work on difficult tasks and find solutions. During her free time, she spends time at the computer, e.g. to play games or to study the use of specific computer applications (e.g. Typo3, content management for designing websites). She would describe herself as persistent.

Family: The student's father is electrical engineer at a large telephone provider in Germany. The family got the first personal computer when the student was six years old. She appreciated having a computer at home and did minor programming already as a child. She also liked the application of programs, e.g. she learnt PowerPoint all by her self, because she enjoyed finding out about all functionalities. Her father supported a playful approach towards computers.

School: School in general was "awful". The student was good in natural sciences, especially in Mathematics and Physics. Although at the beginning of grammar school ("Gymnasium") she had some difficulties in Mathematics. Her school mate was equally bad achieving in Mathematics – the teachers took the decision that her friend had to repeat a year at school, but that she could proceed to the next grade. This was a kind of key experience for the interviewee and she managed to get better results from then on in Mathematics. However, she did not have to work hard for these good results; it was sufficient for her to work on Mathematics at all (which she had not done at all while she and her friend were in the same class). She experienced the subject informatics as something new and interesting. In upper secondary school, she soon realised that she needed 10 minutes for the same tasks other pupils worked on for two weeks. Further, she has often used free lessons to work with class mates and they mutually coached each other.

### *c. Educational pathway – supporting factors and people*

Especially, the interviewee's father was an important person who facilitated her to engage in technical matters.

At school, she felt supported by teachers who encouraged her. She also reported about an indulgent and nice informatics teacher at school who gave her the chance to speak in class and show her knowledge although she was rather restrained and did not show much engagement on her own. She thinks that many girls, who are good at school but shy, are often not noticed and therefore are assessed negatively by teachers. Other pupils in class did not show much interest in technology, especially not the girls. Other pupils considered her as freaked out ("durchgeknallt").

At university, she was again supported by a nice informatics teacher who became her mentor in the context of a university mentoring project. He supported her, especially during one important oral examination, and helped her to cope with pressure and fear of examination. Most of the time at university, she was engaged in self-studies and did not participate in student learning groups. On the one hand, this supported her self-esteem: she was aware that she could manage difficult content on her own; on the other hand, she would have appreciated cooperative learning groups, but thinks that her shyness prevented this.

Her aim is to follow a career at university and therefore she started working on her PhD although colleagues advised her against this.

Another supporting factor is her husband, who is informatics teacher. This allows her to discuss professional issues also at home.

### *d. University studies*

Her decision to study informatics at university was based on her knowledge about existing competences and less on what she would have liked to study. Nevertheless, she had to learn how to learn. At school, it was sufficient to be present during lessons but at university merely listening to a lecture was not enough.

### *e. Career choice and planning*

During her time at university she was additionally engaged in several projects. Therefore, she knew soon that she would like to work in science and write a doctoral thesis.

Her current plans for the future focus on finalising her doctoral thesis and publishing it. Afterwards she would like to engage in project management and university teaching in a scientific field. She prefers to focus on technical matters, e.g. she is engaged in a project for hardware simulation and she certainly considers herself not as programmer.

### *f. Gender aspects.*

Family: The family can be described as do-it-yourself-family; they perform household-related craftsmanship activities on their own (for example her sister is equally technical competent). In this context, the sex of people was never considered important, especially the interviewees’ father had the opinion that you can achieve what you want, no matter, if you are a boy or a girl.

University: During the first lecture she visited at university she experienced a gender-related attitude of the professor. The professor expected the students to develop profound programming knowledge during the first weeks at university. A women – at school she was in a class for highly-talented pupils and finished school one year before usual schooling duration – remarked that these requirements are extreme, and the professor replied that „most often, women have problems with his requirements‟. The interviewee did not want this professor to be the examiner in her examinations, because she suspected him to test women harder than men. Among the students gender aspects were not mentioned.

At work: With regard to her doctoral position, the interviewee reported about a pleasant working climate and good relationship to her professor and team. However, she also reported about a colleague from Macedonia who often makes questionable statements about women and technology; and older colleagues often are of the opinion that women are not interested in technology. Men working in the informatics sector, but also men she meets during private activities, often show surprise when they find out about her professional expertise. The interviewee thinks that in commerce, she would not experience competitive behaviour by men; she rather expects to be supported instead of being considered as competitor.

#### *g. Other issues*

The interviewee is of the opinion that specific support of girls would be necessary to increase girls' interest in technology. Still, girls are used to play with dolls and boys play with technical toys. However, individual facilitation measures can hardly be implemented at school, where classes often include up to 30 pupils.

The interviewee supports the concept of full-time schools, because time for homework is well structured.

In general, the curricula at school lack media studies. The opportunities and dangers of using the internet have expanded rapidly and young people often use it without knowing about it.

### *2.2.2 Summary of Influence Patterns*

In the following, a summary of the student interviewees is provided according to six dimensions: cognitive dimension, socio-cultural influences, interest and motivation, perceived gender interaction, support structures, education pathway. This summary is based on the statements of the students which cannot be generalised but give an impression which role the issue of gender and ICT plays in the process of deciding for informatics studies at university.

#### Cognitive dimension

Prior knowledge and (trust in) existing competencies in the area of informatics – e.g. gained through working with computers at school or during free time – seems to be an important factor in the process of deciding for a subject to be studied at university.

Two interviewees reported also about the importance of experiences made at work, (e.g. during an internship or project work) because it helps to realise one's competencies.

The three interviewees were quite good at school, however, two of them reported about difficulties at university, which they experienced in the beginning. They needed to study much harder than at school. For one interviewee, this challenge was a motivating factor.

#### Socio-cultural influences

The parents and teachers at school are the most important influence factors with regard to the decision to study informatics at university.

The interviewees reported about teachers that acknowledged their attainment, gave them facilitating tasks, and prepared them for university studies. Also, dislike of a teacher was for one interviewee the reason to decide against informatics at school. Further, encouragement of teachers at university was considered supportive.

The parents of the interviewees also had a technical or scientific background, e.g. physicians, math teachers, electrical engineer. Two interviewees pointed out the support received by their parents for the decision to study at university and informatics in specific. In the interviewees' families, it was not considered unusual that girls show interest in technology and work in this field, and the parents facilitated their daughters in this respect.

Also, the interviewees' peers influenced choices taken, especially with regard to courses at school, e.g. informatics was not chosen, because the best friend did not. Two interviewees reported about other friends or older pupils acting as role models. Further, in one case, the other pupils appreciated the interviewee's knowledge and wanted her to help them at school; another interviewee was rather looked at as crazed because of her interest in technology.

Although teachers, parents and peers influence the decisions, the interviewees reported about the necessity to show self-initiative, e.g. with regard to participation in a mathematics competition, learning the application of computer programs or with regard to the decision to study at university.

### Interest and motivation

A general interest in technology and informatics can be considered important for the decisions to study informatics at school and university.

It seems to be self-evident that informatics and mathematics cannot be considered separated, e.g. being good at school in mathematics is related to being good in informatics; at university, two interviewees study mathematics and informatics.

One interviewee also reported about increase job chances for informatics teachers (as compared to teachers for biology or chemistry) which influenced her decision.

### Perceived Gender-Interaction

At university, the interviewees did not experience any difficulties related to gender aspects among the students. However, one interviewee reported about a professor who made a comment, stating that in general women cannot cope with his requirements.

The interviewees' did not report about gender-related difficulties in a work context. One interviewee reported that older colleagues tend to consider it unusual, if women are interested in technology.

### Support structures

Two interviewees expressed their opinions: girls need opportunities to show that they are equally competent as boys, e.g. teachers should facilitate this by realising speaking times for girls during lessons; girls need support to develop interest in technology, however, this is difficult to be realised in classes with too many pupils.

### Education pathway (Bildungsbiographie)

All three interviewees can imagine to follow a scientific career and write a doctoral thesis in the field of informatics (one of them has already started her PhD). However, one student pointed out that this would be an option for some years only, because she wants to become a teacher and work at school. Further, becoming a teacher was considered by her appropriate for combining work and family life, which would not be that easy if she worked in commerce.

## 2.3 IT-Professional Interviews

The main goal of this qualitative study was to obtain *narrations* about choices being made by practitioners having chosen careers in the field of computer science and information technology (IT) and about their reasons for that.

The UniBW has conducted three interviews with two female and one male IT professionals. The results of these interviews are described in the form of cases below and influence factors for the uptake of a career in ICT are derived.

### 2.3.1 Description of Cases

#### Professional A (female)

#### a. Educational pathway

The interviewee is female, married and has two children. She studied mathematics and informatics and graduated from the technical university in Munich in 1972. During the study she worked at Siemens as student assistant. In 2009 she retired. After graduation at university she got a contract at the university. Following, she worked as free-lancer and changed her job a few times. It was noticeable that since she has children it was difficult for her to plan and maintain her career plans. In contrast, her husband had an excellent career who studied the same subject. She also took part in further education and gained a software qualification which was a requirement for one of her professional positions. Finally, she collaborated in a multimedia-based project at the university in Munich at the department of educational science.

#### b. Self-perception

With regard to her self-perception the interviewee remarked that many men did not take women seriously in the field of informatics. She always observed the behaviour of male colleagues in order to reveal aspects why women are not accepted by men. As a consequence, for example she changed her clothes to a more masculine style and had a short hair cut, and she experienced that she was then more accepted and taken seriously in this male dominated professions

#### c. Influence of family and friends

The interviewees' social environment indirectly influenced her career values: Her husband studied the same subject at university. After his graduation he was really successful in his professional career. A lot of her friends also studied mathematics and operated in the same line of business and she is still in touch with most of them. She admitted that she was a little jealous of their careers because at university they were all at the same educational level and had the same opportunities, but the opportunities decreased for her because of her decision to have children. Still, she also got support from her children, e.g. they acknowledged her further education qualification in IT-related courses.

### d. Measures which enhance girls' interest in IT and in IT-studies

The interviewee thinks that computer science classes at school could be improved by following a more descriptive approach. Further, the curriculum should include more computer science related content, e.g. the functionalities of a computer. Additionally, teacher education needs to focus on aspect gender aspects in relation to technology use and facilitation methods.

## Professional B (female)

### a. Educational pathway

The interviewee is female and was successful in information and communication technology-related subjects at school and university. She chose English and mathematics as main subjects at secondary school (grammar school, Gymnasium). She chose to study computer science and mathematics at university. She was also good enough to study medicine. However, she was not interested in this field. After university she worked in the field of software development and consulting field.

### b. Self-perception

At university, the interviewee did not particularly realize the low proportion of women during the computer science courses, but women were under-represented in this field with less than 20% females at the beginning of the study. However, the interviewee appreciated to have a female friend at university, so that she did not feel alone. With regard to the lecturers, she did not experience differences in the treatment men and women received by the teachers.
She perceived gender differences in the vocational environment. Women are still underrepresented in software engineering companies or in particular leading positions. The support for women by colleagues was limited, and in general it was assumed that only men work in computer science (e.g. the form of salutation in letters often addressed males only). In addition, she thinks that women have to make an effort to be taken seriously in the computer science domain.
The interviewee also described the typical computer scientist as a little "weird" and agrees that the profession itself is difficult to describe. Computer science is obtained as a hard subject and people cannot imagine what computer scientists exactly do. A good computer scientist should be able to arouse interest in a topic, have good basic knowledge, and can actively participate in discussion.

### c. Influence of family and friends

The interviewee's family members (father, mother and sister) had all science-related jobs but it did not influence her study and career choice directly.

### d. Measures which enhance girls' interest in IT and in IT-studies

According to the interviewee, measures that enhance girls' interest in computer science should support the development of important computer science characteristics (e.g. basic knowledge, arouse interest in a topic, participate in discussions). Girls would need opportunities for exchanging related information with other girls (e.g. cyber platforms). Further, computer science classes at school should be more application-orientated. Furthermore, the term "STEM" (science, technology, engineering and mathematics) in school or in general is not well-established and should be promoted by public relation activities on school level.

### Professional C (male)

#### *a. Educational pathway*

The male interviewee studied at university in Munich and gained a degree in computer science. He studied mathematics and physics already at school. He was always interested in computer science; therefore his study choice was clear to him. By now, he has got 15 years of experience as a free-lancer in computer science.

#### *b. Self-perception*

The interviewee enjoys his current work and considers it interesting. He described some positive aspects: the job is diversified and corresponding to a modern craft. He assumes the image of a good computer scientist is about being able to find faults in a programs and developing problem solutions.
Asked about his perception of women during his time at university, he reported about a small percentage of female students (about 30 %).

#### *c. Influence of family and friends*

The family had impact on the interviewee's interest in computer science. His parents were very interested in science and worked in science-related domains. The father got a home computer at which the interviewee learned programming by self-study. For example, he started to programming in the age of 13. In addition, he has three older brothers who are also computer scientists.

#### *d. Measures which enhance girls' interest in IT and in IT-related studies*

As measure to promote girls' interest in IT-related subjects the interviewee suggest that a good computer scientist class should be more application-orientated for example the curriculum could include the programming of a simple game.

## *2.3.2 Summary of Influence Patterns*

The next section includes a summary of the interviews with IT professionals. The summary is structured according to six dimensions: cognitive dimension, socio-cultural influences, interest and motivation, perceived gender interaction, support structures, education pathway. The summary is based on the statements of the IT professionals who participated in the interviews; the statements cannot be generalised, however, they give an impression about factors that influence the career decision.

### Cognitive dimension

One female interviewee reported about success in information and communication technology-related subjects at school and university, and the male interviewee pointed out that since he was young he had the chance to learn about computers on a personal PC at home.

One female interviewee describes a typical computer scientist as weird. The computer scientist should be able to show interest in a topic, have good basic knowledge, and can actively participate in discussion. This image was completed by the male interviewees' perspective: he said that a good computer scientist is able to find faults in a program and develop problem solutions.

### Socio-cultural influences

For one of the female interviewees, social contacts played an indirect role with regard to her career decisions. Her female friends and husband also studied computer science; however, she has to admit that her friends, who decided not to have children, as well as her husband, had better careers. The other female interviewee said that she was not influenced by family and friends in her decisions. For the male interviewee, the parents, who also were interested in computer science and worked in related domains, can be considered as influencing factors.

### Interest and motivation

The male interviewee explicitly reported about a general interest in computer science, which was the reason for choosing computer science at university and as a profession. Also one female interviewee points out, that she could also have chosen other subjects at university but was not interested to do so.

### Perceived Gender-Interaction

The interviewees reported about underrepresentation of women in computer science at university, but they did not perceive any related problems. However, in a professional context, the perceived underrepresentation of women was accompanied by some gender-related experiences made by the female interviewees: women are not expected to work in computer science and men do not take women seriously in this field. Therefore, women need to make an effort and adopt masculine behaviour in order to be respected. Further, one female interviewee made the experience, that having children is a barrier in following a career in the IT sector.

### Support structures

All three interviewees think that girl's interest in IT could be raised at school. Therefore, computer science classes should be more descriptive and application-oriented, focusing on functionalities of a computer or including the programming of simple games. One interviewee also pointed out the importance of focusing on gender-aspects in teacher education. Also, people at school and in public are not aware of the term "STEM" and this should be changed by targeted public relation activities.

### Education pathway (Bildungsbiographie)

Two of the interviewees (female and male) reported about having focused on subjects related to information and communication technology already at school (e.g. mathematics). The male interviewee also reported that due to his interest in computer science, his educational and career decisions were always clear to him.

# 3 Quantitative Research

## 3.1 PREDIL Online Survey

Based on a series of qualitative investigations, the PREDIL project has launched a large quantitative study, in order to better understand the representations that secondary level pupils have about information and communication technologies (ICT). The following text explains the approach used by the partnership and adopted in Germany, and it presents the main results obtained during the survey.

### 3.1.1 Developing and, testing the questionnaire

A task force was set up for overlooking the questionnaire development, testing and processing. The first task force meeting aiming at building a questionnaire was held in April 2009 in Paris. At that time, several possibilities for developing the PREDIL survey instrument were discussed, one of the ideas being to rely on previous questionnaires elaborated in other European projects, like G@me[2]. A first version of the instrument was designed, circulated and discussed at a project meeting in Paris in September 2009. This meeting was followed by another phase of elaboration. It resulted in an adapted version of the instrument, taking into account the various characteristics of the different partnership countries.

The instrument – a questionnaire consisting of a mixture of closed and open questions – was then piloted in the partner countries in the beginning of 2010. The aim was to test the comprehension of the criteria and vocabulary used in the questionnaire with pupils from the target group and to check the feasibility of the survey. In Germany, a translated paper version of the questionnaire was tested with 20 pupils (9 boys, 11 girls) from grade 7, 8 and 11.

As people in Germany might not know general software expressions, but only specific programmes, the German version of the pilot was enhanced with examples (e.g. „word processing" was combined with the expressions „MS Word"; „OO Writer"; social network was combined with „Facebook", „StudiVZ"). Thus, pupils in Germany did not have problems in answering these questions, as was for example the case in the French pilot test. Based on these results the final version of the questionnaire used in all PREDIL partner countries was enhanced with such examples. Other results from the pilot testing were also considered and the partnership then agreed on final questionnaire which was validated across different countries and schooling systems.

### 3.1.2 Collecting and analysing data by the questionnaire

The validated online questionnaire was implemented by using Lime survey3. It was launched in Germany in spring 2010. The link to the online questionnaire was disseminated to several informatics teachers in different states in Germany and to other people who participated in the qualitative PREDIL survey. It was also processed as paper version in one secondary school (focus on economics) in Munich. The data from the paper questionnaires was fed into the Lime survey system by a member of

[2] http://www.project-game.eu

[3] http://www.limesurvey.org

the University of the Bundeswehr München. The data collection process in Germany was stopped in June 2010. Also, in June 2010 the task force met again in Paris to elaborate a common framework for analysing results, also taking into account the comparability of data across countries.

### 3.1.3 Sample

The sample of pupils who participated in the PREDIL online survey is characterised by giving an overview about the respondents' sex, place of residence and type of school.

*Number and sex of respondents*: 75 pupils participated in the German PREDIL online survey. The number of males and females is nearly the same (male respondents n = 36, female respondents n = 39).

*Place of residence*: 59 of the respondents live in a city (over 30000 inhabitants) and 16 in a town (up to 30000 inhabitants).

*Type of school*: All respondents attend public schools at upper secondary level. 67 pupils attended the same secondary school (with a focus on economics). The remaining 11 pupils attend grammar schools (Gymnasium"); 1 respondent did not provide any information about the type of school.

## 3.2 Results for Germany

### 3.2.1 ICT Use at School and at Home

A major part of the PREDIL online questionnaire was concerned with the use of ICT in school and at home, with a focus on standard software, internet use, social software, ICT supported communication, games and educational software, programming, social networks and internet research. The pupils were asked about the usage frequencies of certain applications with a three-point likert scale with the following options: "often", "sometimes", "never". Further, they could choose the option "would like to learn" instead. The results are described below and also presented in four figures (see figures 3.1-3.4).

**Standard Software Applications (see figure 3.1)**

*Word processing*: Pupils use word processing software more often at home than at school. With a percentage of more than three-quarters usage frequency in both context this application is best known to the pupils and there is hardly any interest in learning more about it. The total percentage of boys and girls who use it at home often or sometimes is the same, although boys chose the category "often" and girls chose the category "sometimes" more frequently (boys: 61% often, 33% sometimes; girls: 56% often, 38% sometimes). In a school context, the total percentage of girls who use it often or sometimes is 10 per cent points above that of boys (boys: often 33%, sometimes 44%; girls: often 23%, sometimes 64%).

*Spread sheets*: Spread sheets are more often used at school than at home. Slightly more boys than girls use it in both settings (boys: often 53%, sometimes 33%; girls: often 44%; sometimes 41%). Also, more girls than boys would like to learn spread sheet use.

*Presentations*: Designing presentations with a software application (e.g. PowerPoint) is used sometimes at school and at home by the majority of the pupils. Girls use it more often than boys, especially at home (boys: 19% often, 44% sometimes; girls: 28% often, 51% sometimes). There are also more girls who show interest in learning about presentation software. Concerning pupil's use of PowerPoint presentations at home a significant difference between male and female participants exists. More boys than girls answered "never" ($p < 0.05$; $\chi^2 = 24.68$).

*Databases*: Databases are used by the pupils who participated in this survey often at school (by 67% boys and girls) and hardly at home (only 8% boys and girls use it often at home). Again, at school girls use it slightly more frequently than boys (boys: 67% often, 11% sometimes; girls: 67%often, 18% sometimes). At home, boys use it more frequently (boys: 8% often 28% sometimes; girls: 8% often, 22% sometimes).

*Graphic Arts*: Graphic arts software is used seldom at school, and if such software is used at all, boys (6% often, 11% sometimes) used it rather than girls (0% often, 10% sometimes). This result differs for the context at home: it is clearly used more often than at school and in that case the number of girls who use it exceeds the number of boys (boys: 28% often, 36% sometimes; girls: 46% often, 36% sometimes).

<u>In summary (figure 3.1)</u>: There are hardly any salient differences between boys and girls in the overall usage frequencies of standard software, although there are differences in the type of software used by the pupils. Girls use word processing and presentations more often. Spread sheet is clearly used more often by boys. Databases are more often used by boys at home and by girls at school; graphic arts are rather used by boys at school and by girls at home. In general, the differences in the usage frequencies at school and at home are higher than that between boys and girls. Learning how to apply standard software hardly plays any role.

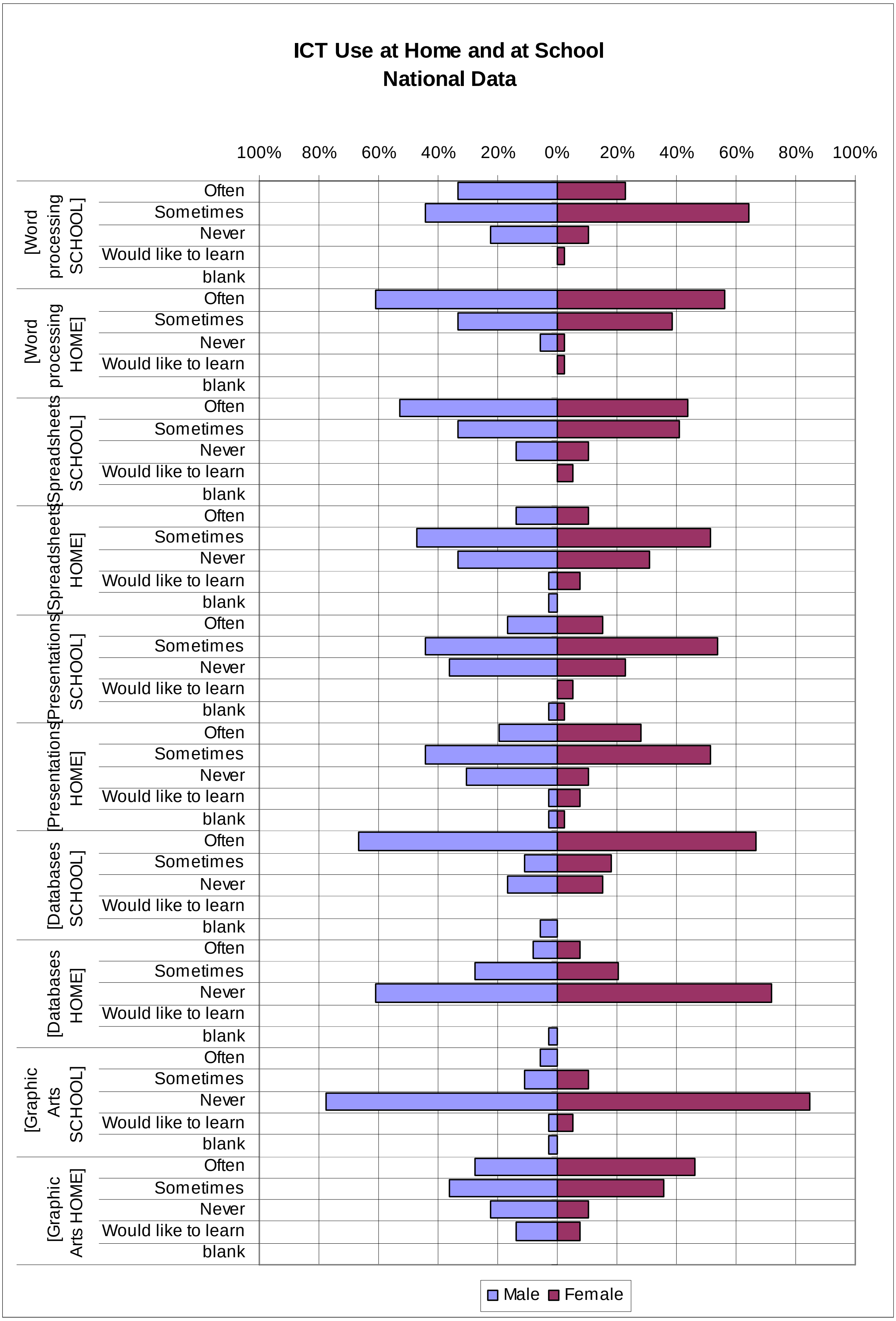


*Figure 3.1*: Use of standard software at school and at home, by sex, in percent.

## Internet, Social Software (see figure 3.2)

*Surf the web*: At school, boys surf the web more often than girls, and there are more girls who never surf it at all (boys: 25% often, 58% sometimes, 11% never; girls: 10% often, 59% sometimes, 28% never). At home, surfing the web appears to be a central ICT activity: 89% of the boys and even 95% of the girls do it often; another 5% of the girls surf the web sometimes at home. Also, 6% of the boys would also like to learn it at home.

*Download data*: Downloading data at school is never done by 75% of the boys and 92% of the girls. However, 22% of the boys do it often or sometimes, and 5% of the girls download data sometimes at school. At home, 83% boys and 95% girls download data often or sometimes; although boys rather chose the option "often" and half of the girls replied to the options "often" and "sometimes" each. Regarding pupils download activities at home a significant difference was found, because more girls than boys answered "sometimes" ($p < 0.01$; $\chi^2 = 232.68$).

*Chat*: Using chat applications is an activity done at home mainly, by both boys and girls alike (boys: 56% often, 36% sometimes; girls: 59% often, 33% sometimes). At school, 14% of the boys use chat often or sometimes and 8% of the girls use chat sometimes.

*Forums*: Again, the usage of forums is more important at home than in a school context and the majority of the pupils do not use it at all. If used at school, 15% of the girls use it sometimes and 9% of the boys use it often or sometimes. If used at home, it is used more often by boys (boys: 25% often, 28% sometimes; girls: 5% often, 44% sometimes).

*Blogging*: In both contexts blogging is never used by most of the pupils (school: 89% boys and 90% girls; home: 83% boys and 85% girls). If used at all, boys rather use it often or sometimes than girls in both contexts (school: 8% boys; 5% girls; home: 14% boys, 10% girls).

<u>Summary figure 3.2</u>: Internet use in general and specific web-based activities (e.g. downloading data, using social software) do hardly play any role at school and are mainly used at home, if used at all. It is remarkable, that 100% of the girls, and also about 90% of the boys, surf the internet at home. At home, downloading data and using chat applications play a role for boys and girls alike, with downloading data being more important for boys. Using forums and blogging is less important at home; only a few pupils – slightly more boys – use these applications. The wish to learn more about using the internet and social software was hardly expressed by any pupils at all.

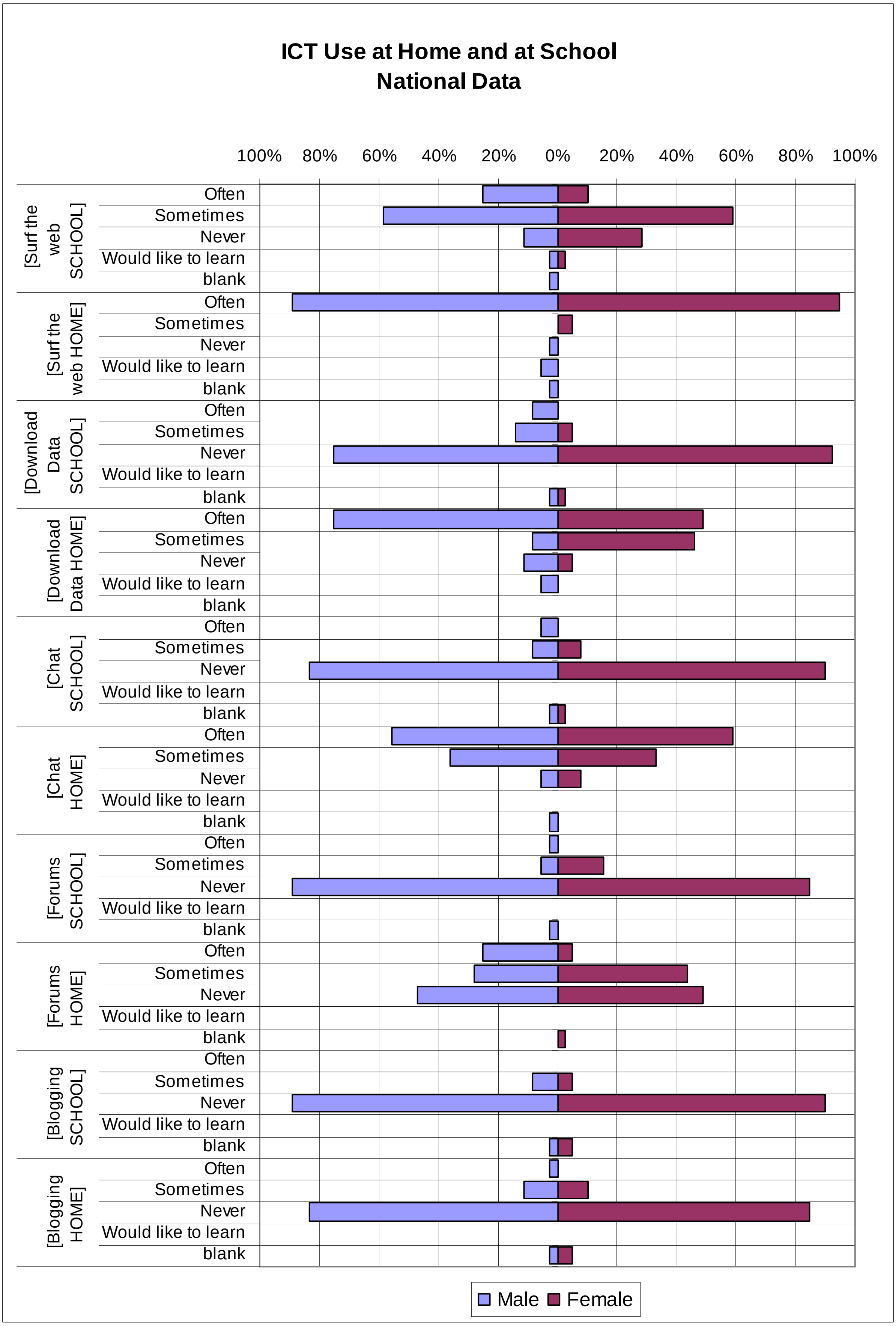


*Figure 3.2*: Use of internet and social software at school and at home, by sex, in percent.

## ICT-supported communication, Games and Educational Software (see figure 3.3)

*E-Mail*: E-mail is used sometimes at school (boys: 17% often, 31% sometimes; girls: 5% often, 46% sometimes), but often at home (boys: 78% often, 19% sometimes; girls: 79% often, 21% sometimes). In both contexts, girls use it slightly more frequently than boys.

*Creating Web Pages*: Only a few pupils create sometimes web pages by themselves, mainly at home (boys: 9% often, 20% sometimes; girls: 5% often, 13% sometimes). Especially boys (8%; girls: 3%) would like to learn creating web pages at school.

*Games*: No girls but about one fifth of the boys (19% often or sometimes) play games at school. A significant difference exists concerning pupils use of games at school. More male than female participants answered "sometimes" ($p < 0.05$; $\chi^2 = 25.36$). At home, games are played more often than at school, and boys play games significantly more often than girls (boys: 31% often, 36% sometimes; girls: 5% often, 36% sometimes; $p < 0.05$; $\chi^2 = 63.09$).

*Educational Software*: Educational software is used sometimes at school and at home, at school rather by boys (boys: 3% often, 25% sometimes; girls: 3% often, 18% sometimes), and at home more often by girls (boys: 3% often, 25% sometimes; girls: 5% often, 36% sometimes).

*Voice Communication*: Pupils hardly use voice communication applications at school, and also at home only half of the pupils communicate via voice transmission software. However, at home boys use it clearly more often than girls (boys: 25% often, 28% sometimes; girls: 13% often, 21% sometimes), and more girls (5%) would like to learn it.

<u>Summary figure 3.3</u>: All applications and activities – e-mail, creating web pages, playing games, using educational software and voice communication – are only used by a minority of the pupils, mainly at home. Girls use e-mail more often than boys in both contexts and boys show more activity in creating web pages, playing games and voice communication at home and at school. Boys would also like to learn more about creating web pages, and girls would like to learn about voice communication. Educational software is used more often by boys at school and by girls at home.

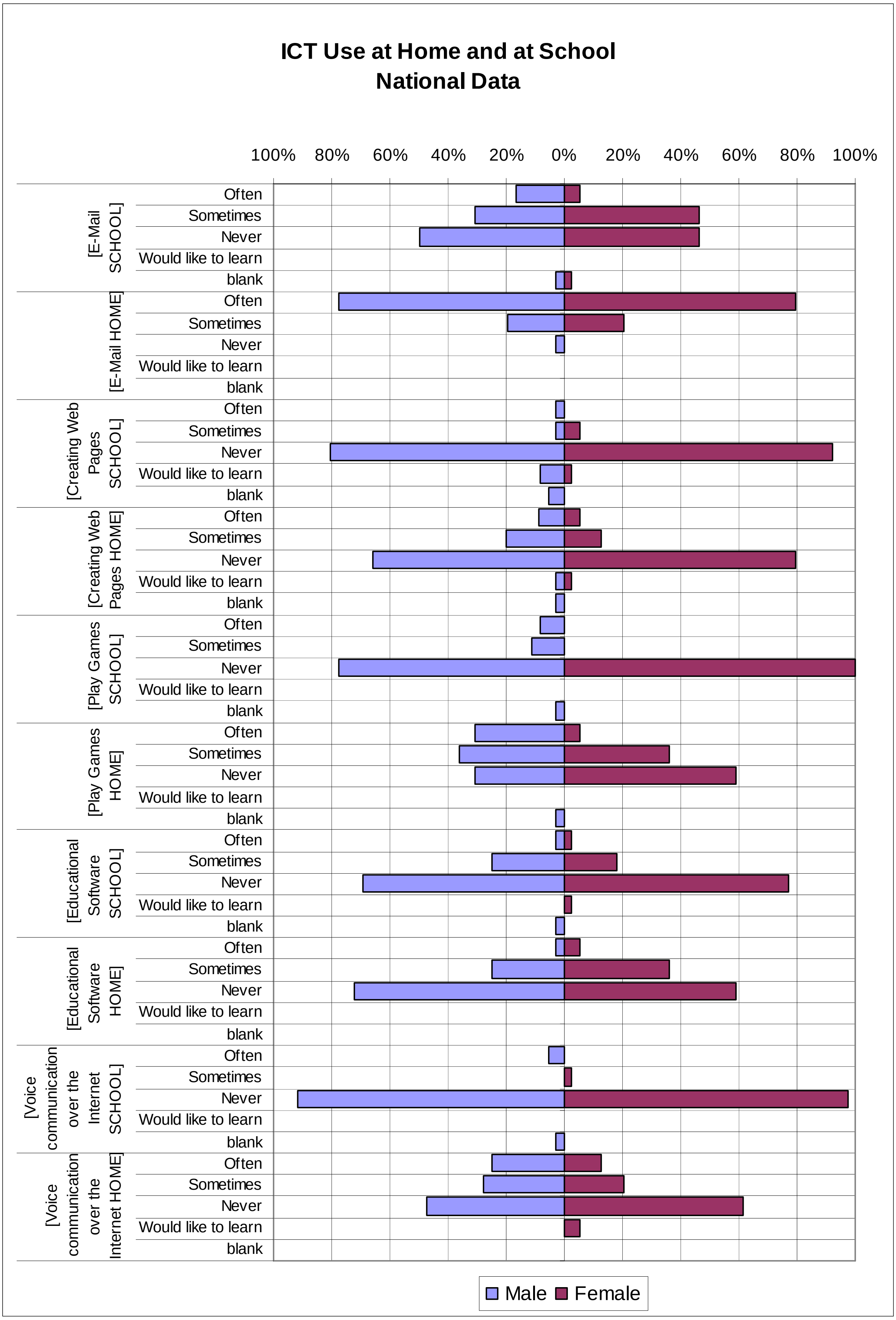


*Figure 3.3*: Use of ICT-supported communication, games and educational software at school and at home, by sex, in percent.

## Programming, social networks and internet research (figure 3.4).

*Programming*: Only a minority of the pupils perform programming activities at school (boys: 0% often, 11% sometimes; girls: 5% often, 3% sometimes); and only few more pupils program at home, especially boys (boys: 6% often, 25% sometimes; girls: 3% often, 5% sometimes). The difference is significant, showing that more male than female participants program at home "sometimes" ($p < 0.05$; $\chi^2 = 21.53$). More girls than boys would like to learn programming.

*Social Networks*: Social networks are used at school and at home, however clearly more often at home. At school, social networks are used by a higher percentage of boys often or sometimes (school: 53% boys, 26% girls; home: 91% boys, 92% girls). Concerning pupil's use of social networks at school a significant difference exists: more boys than girls selected the answer "often" ($p < 0.05$; $\chi^2 = 85.85$).

*Doing Research for School*: Most of the pupils work on internet research activities at school and at home, at school mainly sometimes (boys: 25% often, 50% sometimes; girls: 26% often, 69% sometimes), at home mainly often (boys: 61% often, 31% sometimes; girls: 67% often, 28% sometimes). In the school context and also at home, girls perform research activities more often than boys.

<u>Summary figure 3.4:</u> The activities – programming, using social networks and doing research for school – are all performed more often at home than at school. In both contexts, programming is more often performed by boys and research for school by girls. With regard to social networks, the percentage of boys who use it at school is higher than that of girls, and at home it is the other way around with more girls using social networks.

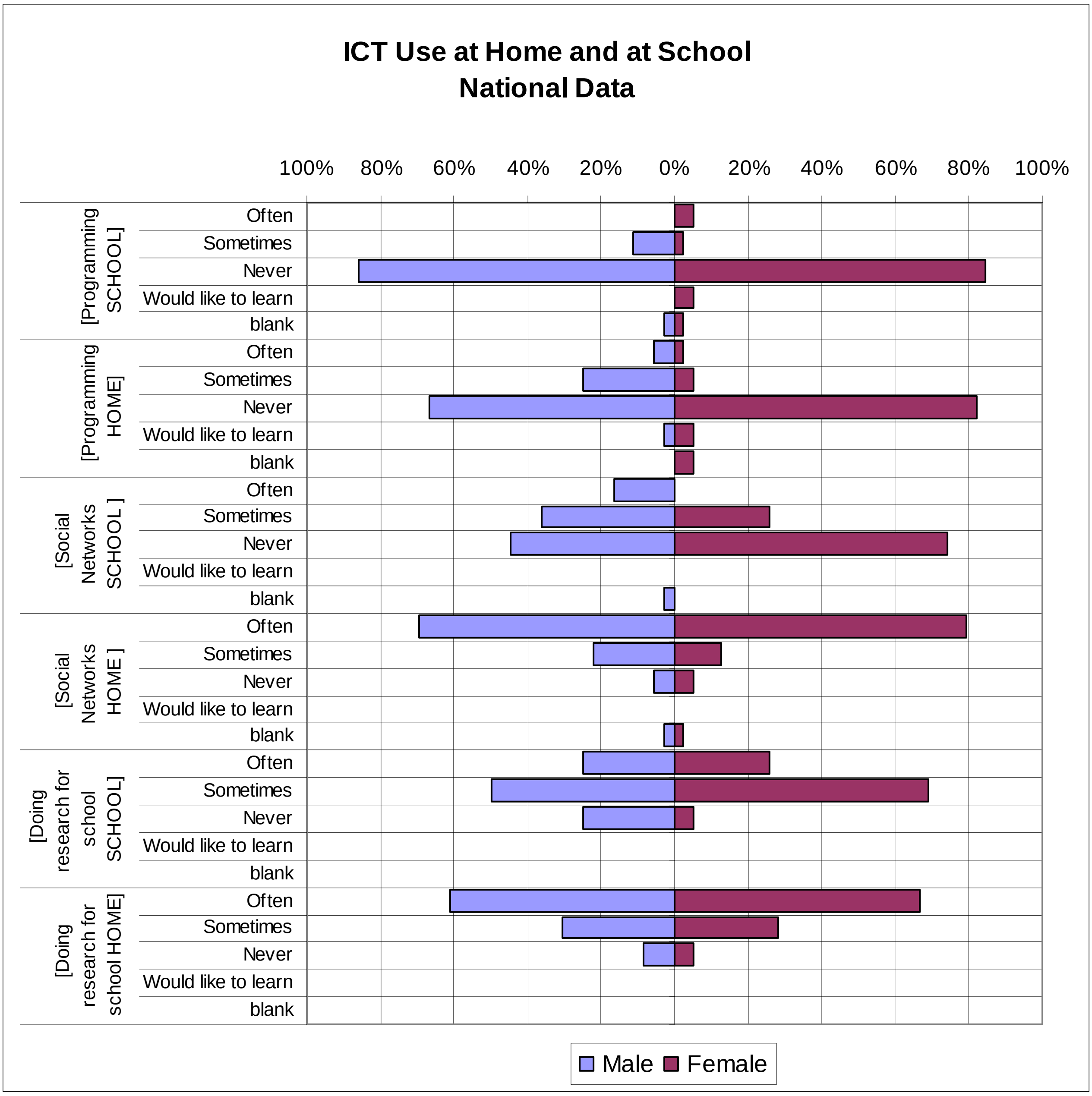


*Figure 3.4*: User of programming, social networks and internet research at school and at home, by sex, in percent.

### *3.2.2 ICT Use in Specific Subjects*

The ICT use in specific school subjects differs between subjects but is in general balanced for boys and girls. The computer is used in the majority of subjects by more than half of the pupils at least sometimes. In Biology, Politics, Geography and project work less than half of the pupils use ICT (see figures 3.5 and 3.5b). Below, outstanding results are described by subject.

*Information Technology* (Informatik/ Informationstechnische Grundbildung): This subject was not studied by the majority of pupils (boys: 78%; girls 79%). However, if it was studied, the computer was "never" used by most of the girls (18%), and also 11% of the boys "never used" it.

*Language/ Mathematics*: The subjects language (German) and Mathematics can be described as the two subjects in which pupils for sure use the computer. In both subjects nearly 100% of the pupils have used the computer "often" or "sometimes". Especially in Mathematics, the percentage of boys (39%) and girls (38%) who use the computer "often" is higher than in the other school subject (except for Economics: 56% of the boys use the computer "often"). None of the respondents stated that the computer was used "never"; however, between 3-8% of the pupils said they have not studied these subjects at all (although it is compulsory).

*Natural Sciences (Biology, Chemistry and Physics):* In natural sciences, the percentage of girls who "never" use the computer always exceeds that of boys (56% of the girls "never" used the computer in all three subjects). The difference (more than 20 percentage points) between boys and girls is especially high in Chemistry and Physics. Also, in Chemistry and Physics boys rather choose the category "often"; in Biology the result is more balanced (11% of the girls and 10% of the boys use the computer "often").

*History, Politics and Arts*: History, Politics and Arts are the only three subjects in which girls choose the category "often" more often than boys. Especially in Arts 21% of the girls (and 0% of the boys) use computers "often". However, summing up the categories "often" and "sometimes" the usage is equal for boys and girls in Politics (both 92%), but higher for boys in History (boys: 75%, girls: 69%) and Arts (boys: 67%; girls: 57%).

<u>Summary of figure 3.5a and 3.5b</u>: The computer was used in the majority of subjects "often" or "sometimes" by more than half of the boys and girls. Especially Language and Mathematics can be described as subjects that provide pupils with a chance to develop their digital literacy. In general, the ICT usage ("often" and "sometimes" summed up) hardly differs between boys and girls. However, in some subjects a slightly higher usage frequency of boys can be observed. For example, in natural sciences boys use it more "often", and although girls use ICT more "often" in Arts, History and Politics, the percentage of boys who use it at least sometimes is higher than that of girls.

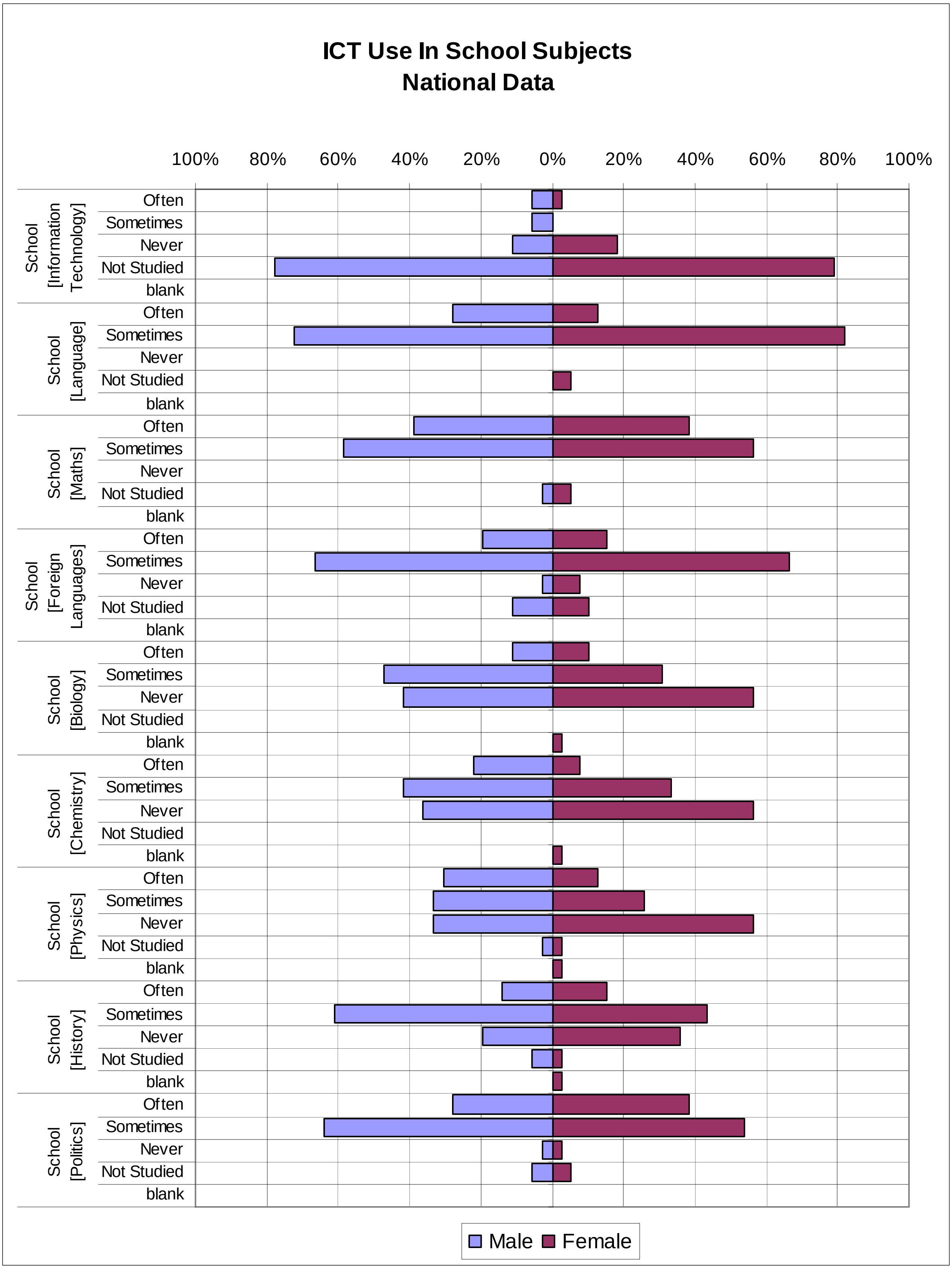


*Figure 3.5a*: ICT use in school subjects, by sex.

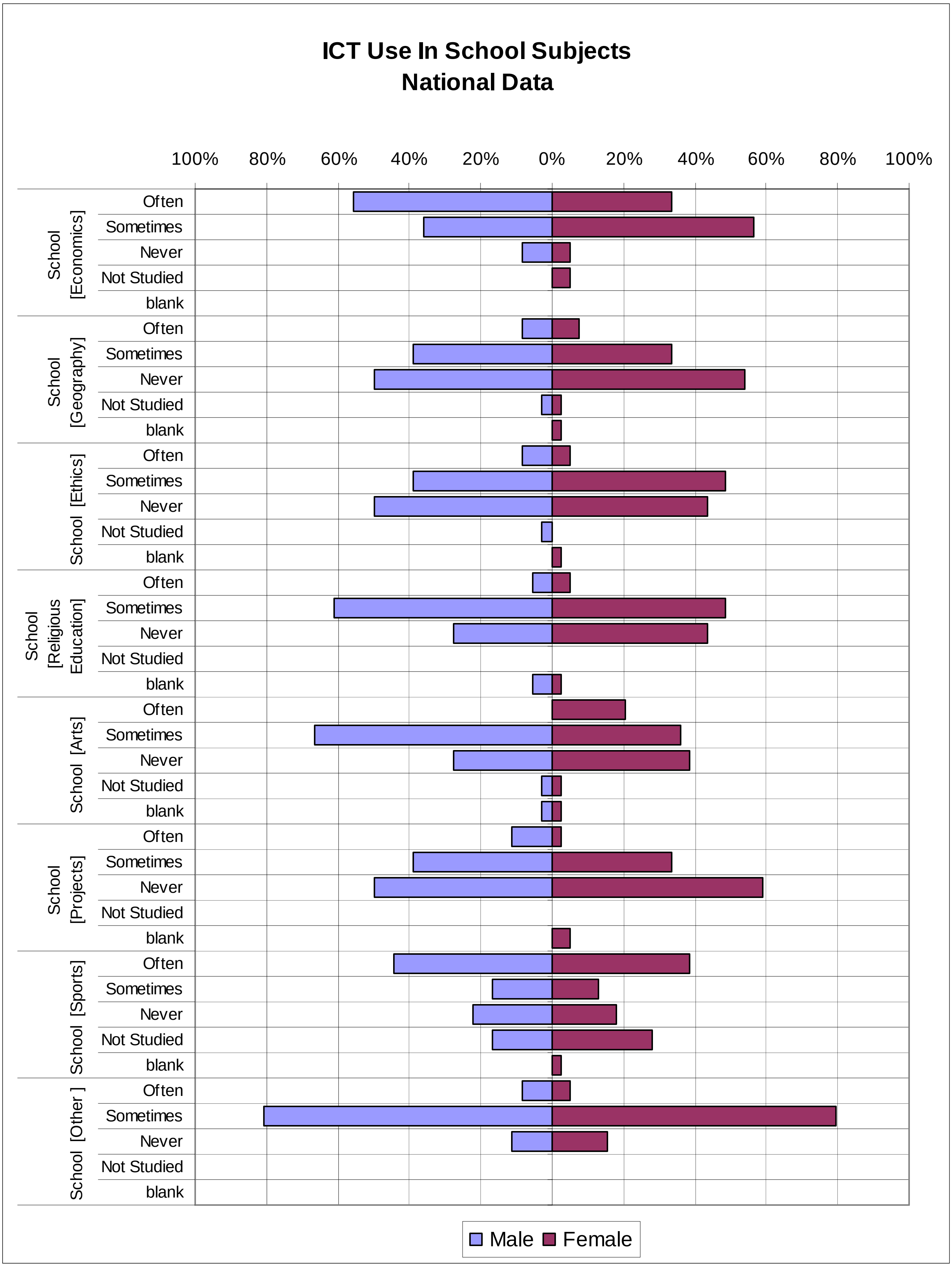


*Figure 3.5b*: ICT use in school subjects, by sex.

### *3.2.3 Use of Social Networks*

The results showed that 91% of the boys and 92% of the girls use social networks "sometimes" or "often" at home; and also more than half of the boys and one quarter of the girls use it at school. The PREDIL questionnaire also asked for details of social network usage, focusing on the activities that pupils perform while using these applications (response options: yes/ no). The results are presented in the following.

*Messaging*: Using the message functionality of social networks is the most important activity performed by boys and girls. For 89% of the boys and 92% of the girls write messages to other people in social networks is the main activity.

*Sharing Photos, Music and Videos*: Sharing media files is an activity more often performed by girls (67%, 49% and 23%) than boys (42%, 31% and 11%). The majority of boys and girls do not share media files at all.

*Playing Games*: Playing games does not play any role for girls; however, 31% of the boys use game applications of social networks ($p < 0.01$; $\chi^2 = 498.89$).

*Sharing Information and Status Updates*: Both of these activities are performed more often by girls (62% and 33%) than by boys (47% and 14%).

*Activities in Groups of Causes and Organizing/Attending Events*: Group activities and events are more important for boys. 11% of the boys (and 8% of the girls) are active in groups or causes; and 19% of the boys (and 13% of the girls) use social networks for organizing and attending events.

<u>Summary of figure 3.6</u>: In sum, the results show that – apart from using message functionalities, which is equally important for boys and girls – girls rather perform activities related to "sharing" (e.g. files, information), while boys play games, participate in online groups and organise or attend events.

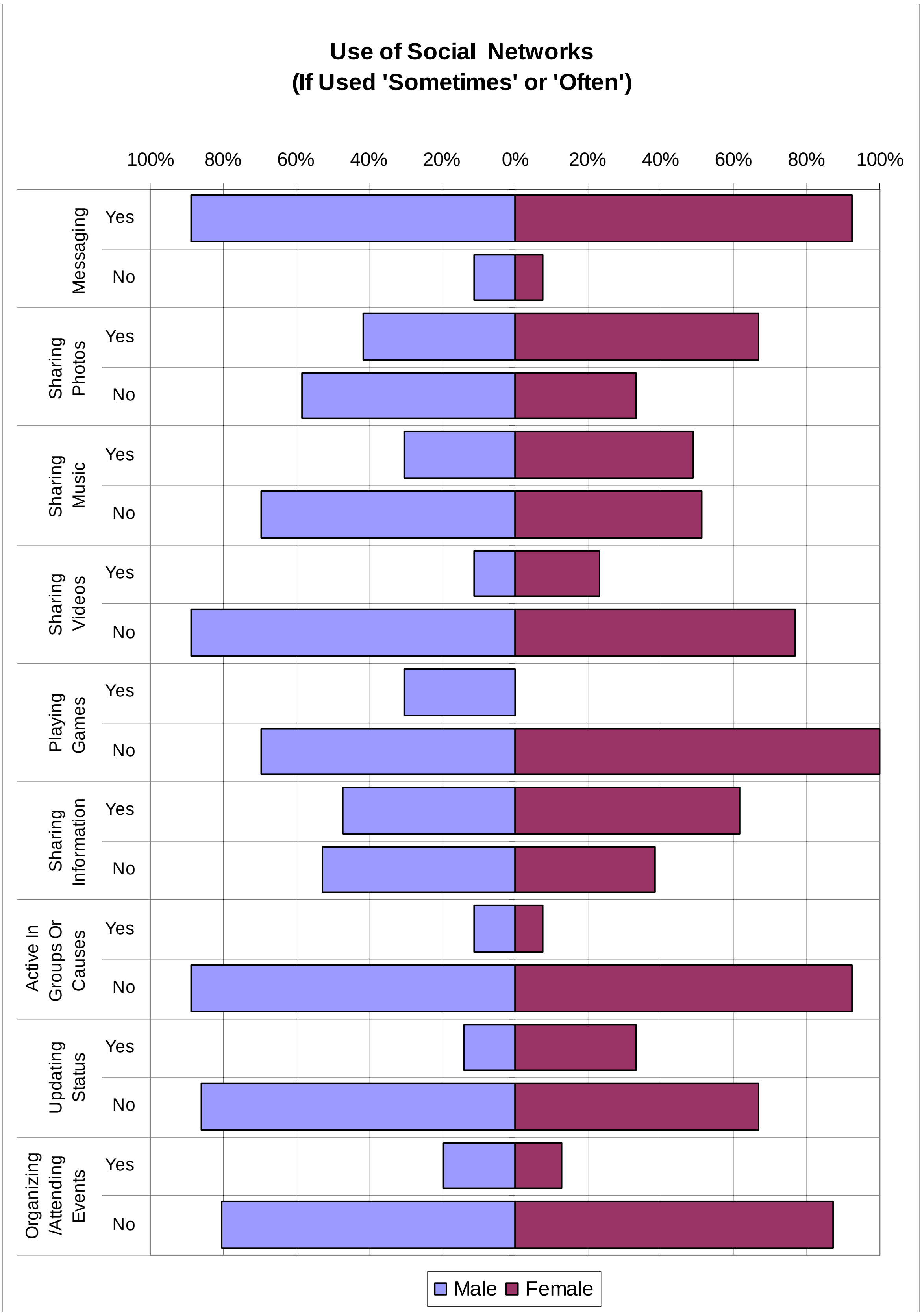


*Figure 3.6*: Use of social networks, by sex.

### 3.2.4 *University Course Considerations*

The pupils were asked about their future plans after completion of school, e.g. the field of university studies they consider, and the specific subjects which they would choose at university.

Summary of figure 3.7: Overall, 94% of the boys and 85% of the girls consider studying at university. Boys and girls consider the following fields for studying at university: Pure science (boys: 22%; girls: 33%) and humanities (boys: 25%; girls: 36%) are preferred by slightly more girls than boys, applied science (boys 42%; girls: 21%) and commerce (boys: 58%; girls: 49%) are considered rather by boys (see figure 3.8).

Summary of figure 3.8: Looking at the specific subjects girls rather prefer art/design, education/ teacher training, humanities, languages, law; boys prefer business and management, engineering/ technology, natural sciences, social sciences, communication sciences. With regard to choosing Art and Design as a subject, there is a significant difference. More girls than boys have answered it with "yes" ($p < 0.05$; $\chi^2 = 64.83$). Also, concerning the choice of Business Studies and Management Sciences a significant difference exists between boys and girls. More boys than girls answered this question with "yes" ($p < 0.05$; $\chi^2 = 20.65$).

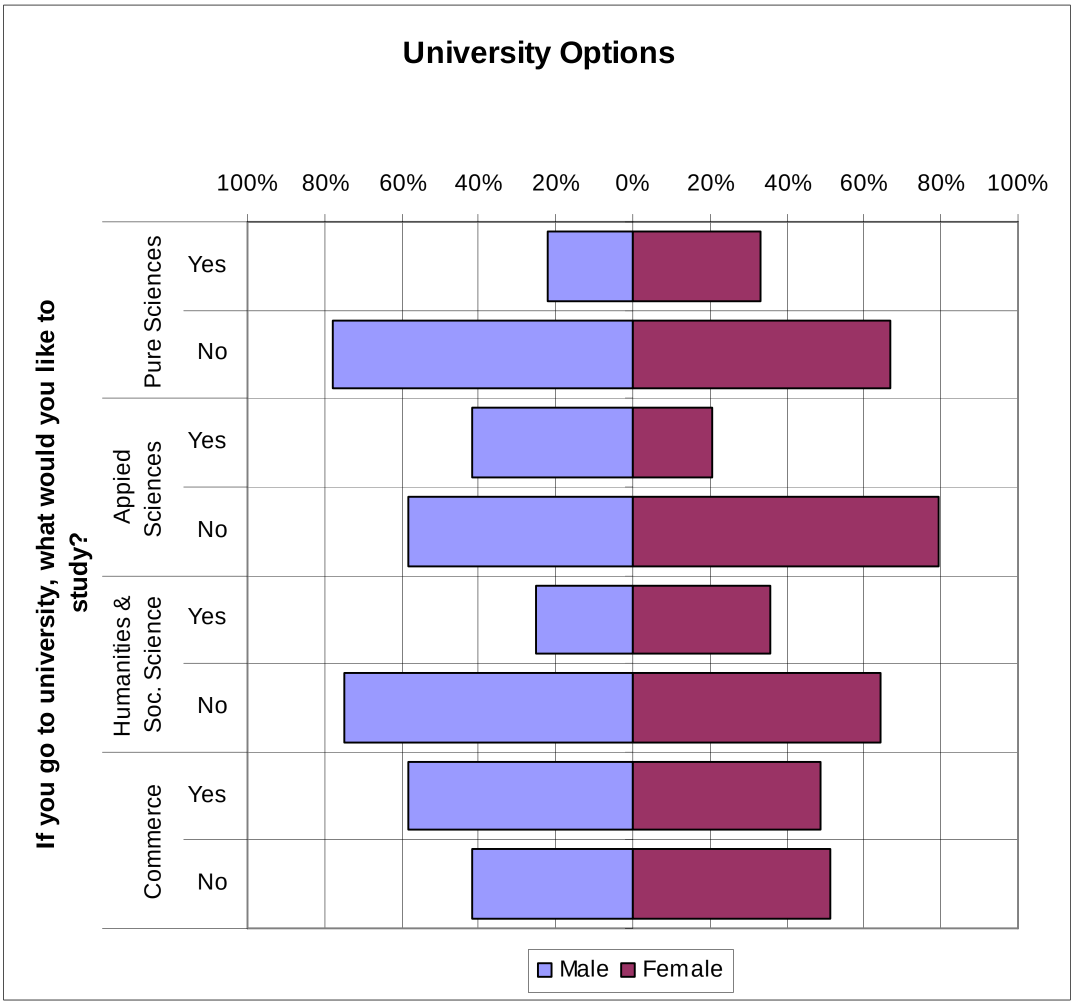


*Figure 3.7:* University course consideration by filled of study and by sex.

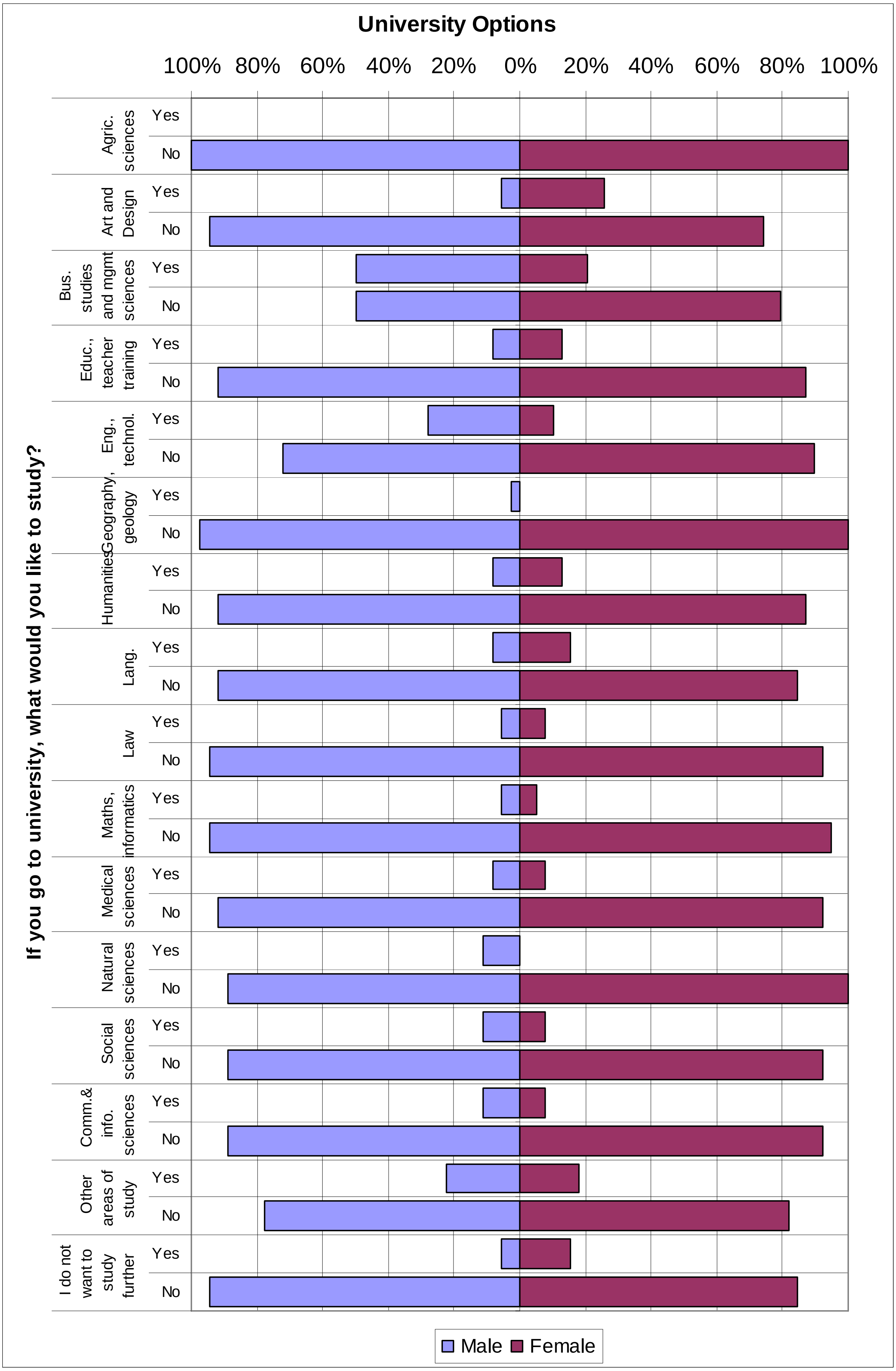


Figure 3.8: University course consideration by subject and by sex.

### 3.2.5 Attitudes towards ICT and gender

Additional, the online questionnaire included questions to gain deeper understanding of the pupils' perspectives and attitudes on the issue of gender and ICT. These questions focused on the computer competences of boys and girls, family influences and the treatment of boys and girls in the classroom. The pupils were asked to indicate their estimation of these issues (see figure 3.7) and were given the possibility to comment on the three issues – computer competences, family factors, and classroom treatment.

*Boys are better at using computers*: more than 78% of the boys and 28% of the girls agree with this statement. This difference is significant ($p < 0.01$; $\chi^2 = 247.72$).

Disagreement is only shown by some girls, and 59% of the girls do not have any opinion regarding this statement (see figure 3.7). The girls selected significantly more often the answer "without opinion" than the boys ($p < 0.01$; $\chi^2 = 329.08$).

> Comments on the statements "boys are better at using computers" show that boys and girls mainly consider the general 'interest in technology' and 'experiences with computers' (e.g. from using computers during free time for programming, gaming, software application) as important factors for the higher computer competences of boys. However, some girls and also a few boys point out that computer competence it is not dependent on sex, but on personal interests. Further some boys point out that boys are technically talented and have better technical understanding, and a few girls are of the opinion that boys can better concentrate on technology issues.

*Family factors affect motivation in ICT career choice*: About half of the boys (47%) and girls (54%) agree with this statement; and 36% of the boys and 38% of the girls disagree. Slightly more girls answered this question and boys more often did not reply at all (see figure 3.7).

> The comments show that family influences are seen by boys and girls mainly on two levels: the general situation of the family (e.g. general influences are admitted by the pupils without detailed specification of influence factors) and the socio-economic status of the family (e.g. especially, a lack of money for financing a computer at home is considered as important factor for low motivation and interest in ICT).

*Treatment of boys and girls in technical classes*: 82% of the boys and 90% of the girls agree that girls are treated better. No pupils are of the opinion that boys are treated better or that equal treatment takes place (see figure 3.9).

> In general, the majority of pupils think that girls are treated better. However, the boys who actually commented on these questions do hardly perceive differences in the treatment of boys and girls. They reported about equal treatment, although one boy pointed out that girls with less computer competences get more support in informatics lessons. Additionally, many girls who commented on this question do not perceive differences; however, there are as many girls who

point out that it either depends on the teacher or that they can report about situation where boy *or* girls were treated better.

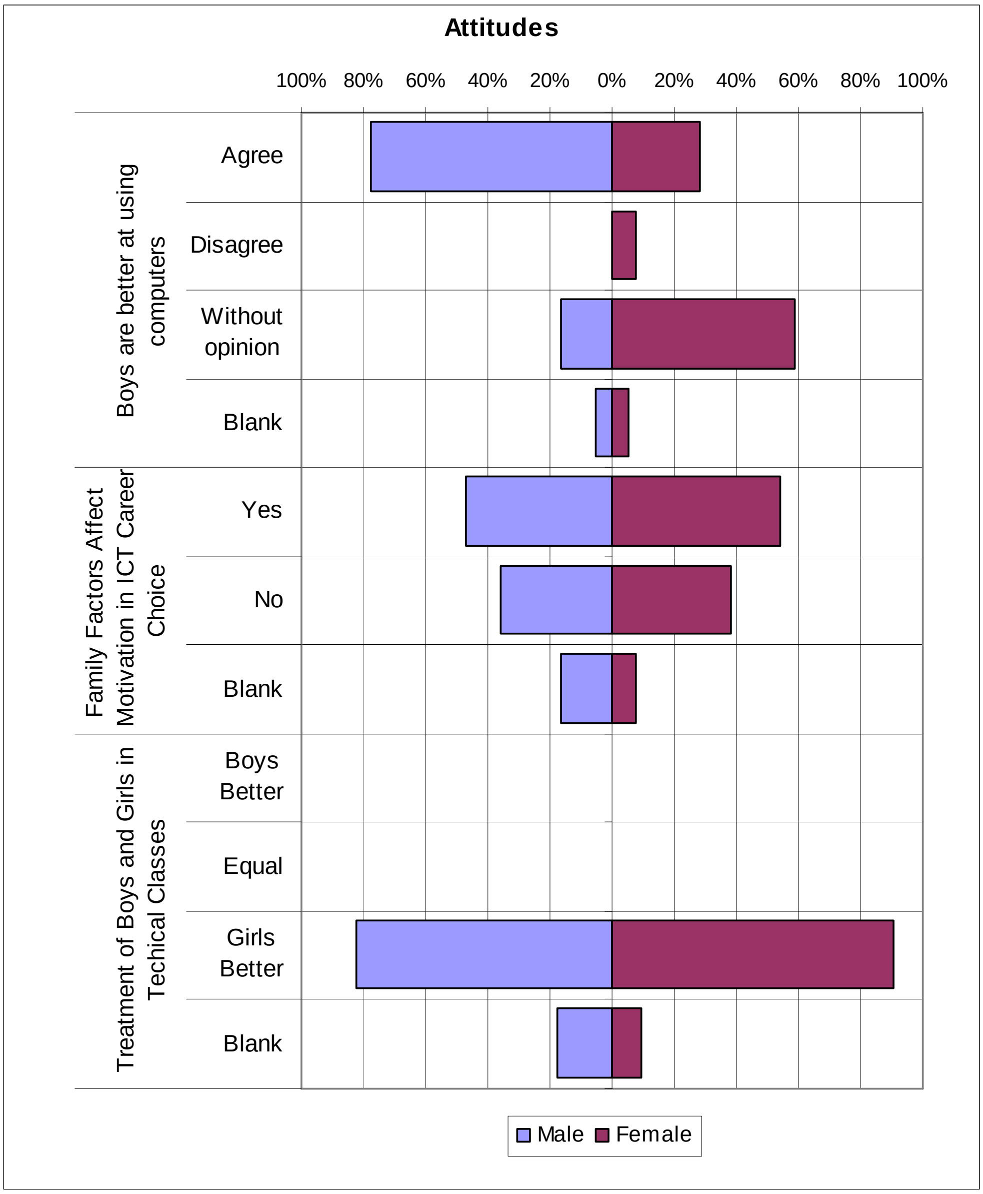


Figure 3.9: Attitudes towards Gender and ICT Aspects, by sex.

### *3.2.6 Characteristics of good informatics teachers and pupils*

The questionnaire asked the participants of the survey to specify their view of the characteristics of good informatics teachers, the characteristics of pupils who are good in ICT, positive aspects of studying informatics at university or following a professional career in the IT sector. The results are described and summed up below (translated examples from the answers are provide in brackets[4]). Although the results cannot be generalized, they give an idea of what pupils would need in order to better learn informatics at school, and of the patterns that pupils apply in the perception of other pupils who are good in informatics.

[4] The detailed open answers are annexed to this report (in German).

### *Good informatics teachers*

The question "What advice would you give to teachers to help students learn about computers/ICT?" was answered by the pupils with regard to several aspects. The answers covered advice aspects such as the explanations and information provided by teachers, the learning content, curriculum and practical relevance of lessons, the needs of pupils, the teaching and feedback methods, and teacher education.

The pupils give advice to teachers to teach basic knowledge in more detail and provide further explanations (e.g. "more explanations", "varying additional information"). Further, pupils consider it important that teachers design lessons with practical relevance for professional life (e.g. "practical examples", "teaching of specific/ up-to-date computer applications", "interesting lessons"). Teaching approaches should focus on group work and collaboration, and the computer should actually be used more often during lessons and certain programs should be made available for working at home (e.g. "integrate computers/ e-learning software, electronic communication into lessons"). Some female pupils also pointed out that the provision of high quality internet resources would be important, and one girl suggests starting teaching informatics already in lower secondary education. Two boys give advice to teachers to provide continuous feedback on the pupil's achievement and provide support for self-control of working progresses.

Male and female pupils used masculine expressions in their answers: if the advice given by pupils referred to teachers and pupils in general, the masculine German expressions "Leher" and "Schüler" were use only, instead of the additional use of the feminine expressions "Lehrerin" and "Schülerin", or neutral expressions such as teaching personnel ("Lehrpersonen") or learners ("Lernende"). These language characteristics are specific for the German language, and the result corresponds with findings from an analysis of informatics teaching resources, which show a bias in the usage of masculine and feminine expressions in texts (masculine expressions clearly exceed the number of feminine expressions; see figure 3.9 for a description of the resource analysis). Also, two male pupils directed their advice explicitly to a male informatics teacher; it remains open, if they either they were thinking of a specific male informatics teacher or if they think of informatics teachers as being male in general.

### *Pupils who are good in ICT*

The participants of the survey also were asked to describe boys and girls who are good in using information and communication technologies (ICT) by naming three characteristics of these pupils. The results are displayed below in the form of "word clouds[5]" – a graphical representation of a text which gives weighted prominence to words by the size of words: more frequent appearance of words in a text results in larger font size.

[5] The "word clouds" were created with the online tool Wordle (www.wordle.net). The word clouds are usually created from single words; expressions consisting of more than one word would be split. Therefore, the word clouds in this report make use of hyphens to link certain multi-word expressions.

**"Write three words to describe a girl who is good at computers..."**

**Girls** named the following characteristics of boys and girls who are good in ICT

Characteristics of boys

Characteristics of girls

**"Write three words to describe a boy who is good at computers..."**

**Boys** named the following characteristics of boys and girls who are good in ICT

Characteristics of boys

Characteristics of girls


## Description of word clouds

Girls hardly make any difference between boys and girls with regard to the central aspects that characterize pupils who are good in informatics. Interest in general, and interest in technology is most considered most important for high achievement in informatics. Additionally, the ability to think logically and curiosity are considered as central characteristics. However, girls pointed out that girls additionally need to be open-minded and have computer knowledge for being good in informatics. On the contrary, the central words used by boys to describe pupils who are good in informatics focus rather on stereotypical external characteristics. According to the boys, boys who are good in working with computers wear glasses are fat and have no friends; likewise, girls who are good in informatics wear glasses are blond and beautiful. However, the majority of characteristics used by boys to describe pupils who are good in informatics also refer to internal characteristics and abilities, e.g. technophile, intelligent, willingness to learn, interested, goal-oriented, etc.

### *3.2.7 Positive aspects of informatics studies and career*

The participants were also asked to name "at least one good thing about doing a degree in computing/ICT" and "one good thing about a career in computing/ICT". The answers are presented below for boys and girls separately.

#### Degree in computing / ICT

**Girls** named the following "good things about doing a degree in computing/ICT":

A degree in informatics is associated with good professional perspectives in future and also with good future perspectives in general (e.g. "importance/high demand of computer sector", "computer needed in all aspects of life", "better chances for working life"). Additionally, the specific computer knowledge gained through university studies (e.g. "computer knowledge is a requirement for many jobs") and the ability to solve computer problems at home by themselves (e.g. "repairing a computer") are considered as an advantage. Having a degree in computing/ICT would also support working processes by making them faster (e.g. "fast/easy working and communication"). A few of the girls also pointed out the introvert working methods, the lower number of social contacts as compared to other professions, and a pressure for continuous education.

**Boys** named the following "good thinks about doing a degree in computing/ICT":

Good professional perspectives and a general future orientation is related to having a degree in computing/ICT (e.g. "safe job", "better chances in working life"). Technical know-how and practical experiences are seen as consequences of ICT studies. Positive effects for solving computer problems at home, faster working processes and knowledge of applications and programming were named by some of the male pupils.

#### Career in computing / ICT

**Girls** named the following "good things about a career in computing/ICT":

Positive about a career in computing/ICT would be the high salary and the good future perspectives which are generally associated with working in the ICT sector (e.g. "future oriented", "good financial benefits"). A job as IT professional would provide opportunities for career advancement and the working processes are self-responsible and flexible, without manual work and with few direct contacts to other people (e.g. "working at home", "no manual work", "hardly working with other people").

**Boys** named the following "good things about a career in computing/ICT":

Apart from a general future orientation and the high salary some boys named only a few other aspects, such as the good career opportunities, the IT knowledge of the professionals and the fast working processes, performed at a desk. Two boys pointed out motivational aspects, e.g. the importance of having fun in a job and the interesting continuous developments of the ICT sector.

In summary, boys and girls named similar aspects of doing a degree in computing/ICT or following a career in this sector; although the girls provided more answers with more details than boys. It seems that the pupils have a general idea of the future relevance of computing and ICT; however, their understanding of having a degree in informatics is rather related to the development of knowledge and competences for solving computer problems and the application of computer programs in working processes; there seems to be only a vague idea of what computer scientist and IT professionals work actually looks like on a content level. However, with regard to the working conditions, girls pointed out the flexibility and self-responsibility and boys named general motivating factors, such as liking a job in general and the continuous development of the professional field.

### 3.2.8 Conclusions of the PREDIL Online Survey

Only few differences can be found in the usage of standard software by girls and boys, however, these differences show a tendency of stereotypical software application: Girls focus rather on software for writing and presenting and boys use database and spread sheet software more often. In this context, it should be considered that in languages and mathematics lessons pupils use the computer more often than in other subjects, however, the results show no differences in the usage frequencies of boys and girls for these subjects.

Internet usage is an important computer activity for all pupils, while more boys than girls use it at school, and more girls than boys use it at home. This result raises the question about the reasons for girls' not showing as much internet activity at school as boys (the same applies for specific internet activities, such as programming and the use of social networks). A closer survey of the usage behaviour would have to focus for example on usage times (e.g. during lessons, during free times at school), on the usage opportunities (e.g. support provided by teachers, availability of internet access) and the purpose of using specific applications.

Asked about their opinion of the computer competences of boys and girls, the results reflect stereotypical thinking patters: boys think that boys are better, and girls do not have a clear opinion, but still many girls also think of boys as being more competent in using computers. Differences in the interests and experiences of computer usage of boys and girls are considered as main reasons for the different competency levels and are the main characteristics of boys and girls who are good in using computers. Family influences are to some extent considered as important factors for these differences; however, only half of the pupils think that the family would influence a career decision in the ICT sector at all. The majority of pupils questioned in this survey are of the opinion, that girls are treated better than boys during technical classes. These results would need to be reflected in the context of empirical research on the self-efficacy of boys and girls with regard to technology usage (e.g. PISA, OECD, 2005): Mechtenberg (2010) argues that particularly girls, who are gifted for math, are losers because such perceptions depreciate their achievements.

The majority of pupils also consider continuing education at university after gaining their university entrance qualification ("Abitur"), although with a difference in the subjects: girls slightly prefer pure science and humanities, and boys prefer applied science and commerce. Girls and boys associate a degree in informatics with good professional future perspectives, advancement prospective and high salary; especially girls pointed out the positive aspect of being able to solve computer problems at home. These answers hint at a general lack of understanding of the professional field in the IT sector. Several pupils seem to consider studying informatics as a preparation or education for using computers at work (or at home) rather than seeing the IT profession as self-sufficient work.

# 4 Teacher Workshops - Reporting

At the PREDIL networking conference "Synergy Development between Policy and Praxis on Technology Enhanced Learning from a Gender Perspective"[6] in Slovakia the University of the Bundeswehr offered three teacher workshops about a) concept mapping, b) the 3R reflection method, and c) competency-based coaching. In the following, a short description of each workshop and the results is provided.

**Workshop a) – Concept Mapping**
Trainer: Sog-Yee Mok, M.A.

Concept Mapping is a method for teachers with the objective of illustrating and reflecting new content of subject matter in class. By means of this method, knowledge and phenomena could be better structured and represented. Knowledge is often presented in a linear text based way so that may impede the understanding of relations. The Concept Mapping method could be offered in this case. It facilitates the visual representation of different concepts and their relations; therefore this method makes the relationships with regards to content and consequences salient. By means of Concept Mapping, it is possible to involve your pupils in class actively and at the same time your pupils could learn to understand complex relations of one domain.

Concept Mapping is suited for answering the question about what are the gender differences concerning the assessment and usage of Information and Communication Technologies in school. In terms of this method teachers could reveal the perspective of females and males in class which may lead to the adaption of teaching design to the individual needs of the pupils as well as to clear pupils' stereotype thinking. The results of the Concept Mapping method can be considered a gender-specific answer to the following questions:

*What is ICT?*

Ask your pupils: "Please draw a concept map with all your ideas about ICT"

Are their views as you expected?

What do your learners think ICT is?

What surprises you?

What are the similarities and differences between girls' and boys' views?

Do the concept maps relate ICT to any other school subjects or any out-of-school activities?

[6] PREDIL networking conference, September $7^{th}$ -$9^{th}$, 2010 - Spišská Kapitula, Slovakia
http://predil.ku.sk/

*Workshop results*

The workshop aimed at practicing the Concept Mapping method in order to enlarge teachers' methodological competences. This was achieved by example-based application of the Concept Mapping method for gender-sensitive design of teaching approaches. In addition, teachers' reflected on stereotype behaviour of female and male pupils and on role models. The results were discussed and teachers learned how to address gender differences in teaching by integrating gender-specific contexts during your lessons. With the Concept Mapping method teachers can counteract the gender differences and it offers the opportunity to consider the pupils' requirements in class. Further, this method may promote gender-specific experience spaces for female and male pupils.

Six participants have taken part in the Concept Mapping workshop in total. Five of them were female and one was a man. Three female teachers were among these participants. One of the teachers already knew what Concept Mapping is but the workshop gave her some new ideas for the application in class for example for gender-sensitive teaching. Most of the participants intend to use the Concept Mapping method in the future.

## Workshop b) The 3R reflection method for teachers

Trainer: Kathrin Helling, M.A.

The 3R-Method is an effective instrument for analysing and implementing gender-specific dimensions. It can be applied in daily life, in projects and programmes, in public sectors, and in the context of school and teaching (e.g. Trontheimer, 2006; Stepanek & Krull, 2003). The application of the 3R-Method can be considered a gender-specific answer to the questions „who receives what? and "which are the related conditions?" For this purpose, the method has a focus on aspects of representation, resources and reality in the school context (see Box 1).

**R**epresentation – Who?

*In which way are women/girls and men/boys represented in learning materials?*

- e.g. the share of women and men in texts and pictures of school books?
- e.g. the quantity of women or men represented as active, leading, deciding?

**R**esources – What?

*How are resources at the school (time, space, finances) allocated to female and male pupils?*

- e.g. time spent on giving feedback to female and male pupils?
- e.g. do spatial conditions allow for gender homogenous/heterogeneous group work?

- e.g. facilitation of gender-specific interests, e.g. financial support for projects?

**R**eality – Why

*What are the reasons for the current conditions?*

- e.g. norms, values, stereotypes as basis of representations and allocation of resources?
- e.g. addressing interests of both genders equally?

Box 1. Application of the 3R method in a school context.

*Workshop results*

The workshop aimed at developing teachers' methodological competences by example-based application of the 3R-Method for gender-sensitive design of teaching approaches. Further, teachers' reflected on teachers' and pupils' behaviour and role models and discussed how to address gender differences in teaching by integrating gender-specific contexts during lessons.

At the end of the workshop, the participants (7 women, 3 men) were asked to set themselves a goal for their future work with pupils or in the education sector. Five participants (3 women, 2 men) handed a list of future goals to the workshop trainer. In the following, a summary of some of these goals and ideas for implementation is provided.

> Participant a) "I would like to share the lesson time equally between boys and girls. I try to be a good observer but I admit that if there are more boys and if these are very noisy, I pay more attention to them. […] I think it will have no finishing time. One can always improve and every year, the pupils are different and it is necessary to look for new strategies to give same opportunities to boys and girls".
>
> Participant b) "Make the BA (Ed) students think critically about gender: Dress in pink dress for lectures near world book day. (See Anne Fines "Bill's new frock")"
>
> Participant c) "Write in a diary my teacher actions and then reflect and rethink on them, to be aware about the nature of my teacher's actions (if they respect equally girls and boys)"
>
> Participant d) "To make teachers that I work with aware of the need for gender equality not only in the classroom but in all areas of school life. Discuss outcomes with teachers – observe lessons. Pass on methods of best practice. Resources in most schools will be difficult to find (one school is independent – fee paying) teacher training and an agility of mind for the teachers will be necessary."
>
> Participant e) "Helping setting up a thematic network on gender & ICT; Getting

1-2 participants from my institution involved in the network which should have a European character; Gender is not a priority in our institution. EU is not a priority in our institution. This has to be changed."

**Workshop c) Enhancing Female Entrepreneurship in ICT-Professions: Competency-based Coaching in Secondary School for Girls**
Trainer: Dipl.-Psych Katharina Ebner

Self-reflection is the process of thinking about oneself, one's behaviour, one's thoughts, values and beliefs. Reflecting oneself is closely bound to learning and change as it concerns the personal self-concept. Enhancing the self-reflection of students constituted the focus of the workshop which was dedicated to methods and situations enhancing self-reflection and facilitate the students' learning progress.

Beginning with the introduction of a scientific foundation of self-reflection and theory about how self-reflection enhances successful behaviour change, the participants first discussed prerequisites for consulting situations in which students are coached by teachers (e.g. personality style of the teacher, knowledge, position, structure of the consultation). Then, an overview of different methods enhancing self-reflection deriving from psychotherapy and coaching psychology was shown.

A structure of how to organize a consultation conversation enhancing self-reflective problem discussion then was introduced and served as a foundation for the following practice part: having systemic questions at hand which are proved as working highly self-reflectively, the workshop participants went together in groups of three people and worked through a case study: each person of a small group took a specific role, e.g. teacher, student, or observer, trying to assist a student suffering from motivation and decision problems.

*Workshop results*

The 30-minute-role play was carried out very actively by the workshop-participants – of all them teachers and scientists interested in theoretical profound ways of assisting students in solving their problems effectively and sustainably. They actively discussed their experiences in guiding a systemic coaching conversation and overran the 2-hour-workshop more than 20 minutes. They liked the systemic method and evaluated it as a helpful tool for their work as teachers heading towards being a coach and counselor as teacher.

# 5 Analysis of Resources

In the frame of the PREDIL project several project partners – including the Universität der Bundeswehr München – have analysed learning resources for teaching (with) information and communication technologies (ICT). The idea was to study online resources and text books from a gender equality perspective, revealing asymmetric relations and biases between the social categories of males and females in texts an pictures. as such resources are liable to influence the way pupils perceive ICT during school life.

In the following, a summary of the "Analysis of Resources – Germany" (Helling & Ertl, 2009) is provided. The complete report can be downloaded from the PREDIL project websites.[7]

### *Summary: Analysis of Resources - Germany*

The analysis focused on of learning and teaching materials for informatics lessons at secondary school level in Germany. It included materials for pupils – to be used during lessons, as well as materials for teachers – didactical materials and for teacher education. Further, a differentiation between offline (books, journals) and online (electronic resources, web portals) was made.

The analysis focused on the identification of gender aspects in the materials, e.g. the share of male and female expressions in texts, and the share of males and females described to be performing an activity or to be in a leading position. Also, pictures with people were considered regarding the number of males and females shown on it and how many of them were illustrated as being in a leading position.

Research shows that women do feel less addressed by texts with a majority of male expressions, and a reproduction of stereotypical socialisation processes is supported through explicit and implicit statements about gender in teaching materials (see Chapman, n.d.; Schneider, 2006; Wiesner et al., 2003). Although the resource analysis at hand can be considered exemplarily only, the results show a clear gender bias in all kinds of materials. In summary, it can be said that both kinds of materials, for pupils and for teachers, show a bias in the frequencies of men and women in texts and pictures.

The following graphic (figure 5.1) sums up the results for all analysed pupils' materials (not teacher materials) and represents it by showing a female and male figure sized according to their frequent occurrence (in per cent) in pictures and texts. A figure would have a size of 100%, if all persons on pictures, or all expressions in texts, would have been either female or male, and if no neutral expressions existed. Neutral expressions are not included in this graphic.

---

[7] http://www.unibw.de/paed/personen/ertl/predil; http://predil.iacm.forth.gr/

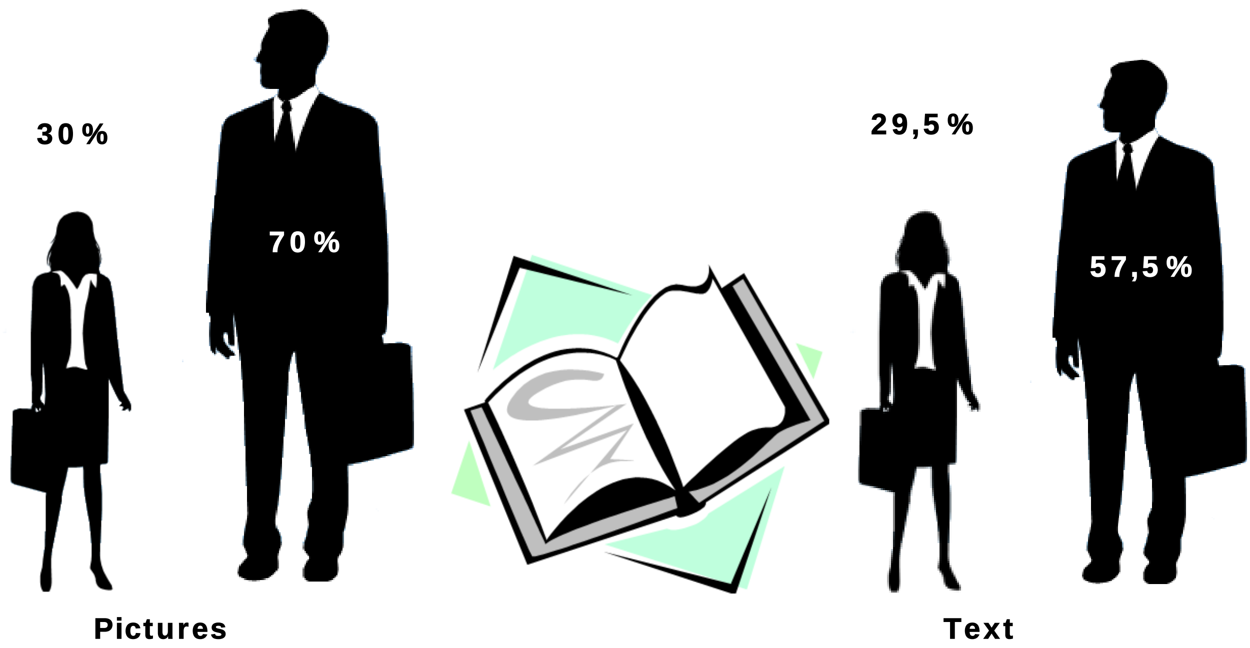


Figure 5.1: Number of women and men in pictures, and the number of female and male expressions in texts of offline and online pupils' materials (in %).

As consequence of the results, it would be necessary to rethink the quality assurance criteria and processes for the production of learning materials. Not only publishers need to take gender aspects into account, also teachers would need increased awareness for the issue of representing males and females in learning and teaching materials. This is necessary to improve the quality of materials shared with colleagues on internet platforms and also in order to address the issue of gender equality during informatics lessons and while teaching with information and communication technologies. The overall aim should be to support boys and girls equally and with a focus on gender sensitivity, starting with materials that are designed accordingly, and proceeding towards gender reflective teaching practices.

# 6 Publications

In the context of the PREDIL project, the team of the University of the Bundeswehr has published several papers and presentations about the project in general and issues of gender and ICT at school. The following section presents the abstracts of the main publications of project outcomes and provides the bibliographic references for further information.

### Journal article

Helling, K. & Ertl, B. (submitted). Repräsentation von Geschlecht in Lernmedien für Informatik. *MERZ Medien + Erziehung*. Manuscript submitted for publication.

Abstract (in German): Der Beitrag stellt eine Analyse von Lernmedien – Schulbücher und Online-Materialien – für Informatik und Inforationstechnische Grundbildung im Sekundarbereich vor. Der Fokus liegt auf der Darstellung von Männern und Frauen. Die Analyse bestätigt Ergebnisse der Schulbuchforschung anderer Fachbereichen: Es gibt eine ungleiche Darstellung der Geschlechter. Frauen sind unterrepräsentiert und werden weniger als aktiv oder in führenden Positionen dargestellt. Konsequenzen für die Qualitätssicherung von Lernmedien und deren reflektierte Anwendung werden für den Bereich der schulischen Erziehung diskutiert.

Ertl, B. & Mok, S. Y. (submitted). Concept mapping zur Reflexion von Genderphänomenen im Informatikunterrricht. *LogIn*. Manuscript submitted for publication.

Abstract (in German): Im Rahmen dieses Beitrags soll die Methode des Concept Mapping vorgestellt werden. Concept Mapping erlaubt es, Zusammenhänge darzustellen und somit Sachverhalte zu visualisieren. Durch die einfache Erstellung von Concept Maps lassen sich Inhalte sehr leicht zusammentragen; die vorgegebene Strukturierung hilft zudem dabei, diese während dessen zu visualisieren. Damit ist die Methode des Concept Mapping besonders geeignet für Lernkontexte mit komplexen Inhalten. Das heißt, Schülerinnen und Schüler können durch diese Methode komplexe Themen besser darstellen und verstehen. Durch die Darstellung werden insbesondere fehlende Konzepte und Verbindungen sehr schnell offensichtlich. Darüber hinaus lassen sich spielerisch formale Grundlagen für Beschreibungssprachen wie z. B. UML (Unified Modeling Language) oder Prozess- und Ablaufdiagramme erlernen.

### Edited book

Ertl, B.; Helling, K. & Kikis-Papadakis, K. (in press). The impact of gender in ICT use and profession: Comparisons between Greece and Germany. In C. R. Livermore (Ed.), *Gender and social computing: Interactions, differences, and relationships*. Hershey, PA: IGI Global.

Abstract: Gender is an important issue in the context of information and communication technologies (ICT). Studies show that ICT use is subject to gender bias, e.g. in relation to ICT use and interests. This contribution describes the current situation of gender and ICT professions in Germany and Greece. Based on an empirical study, it shows particular areas in ICT education that suffer from gender inequalities in both countries. Furthermore, the chapter elaborates how gender inequalities develop from secondary to professional ICT careers based on statistics from Germany and Greece.

**Confrence proceedings**

Ertl, B., & Helling, K. (2010). Genderunterstützung beim Lernen mit neuen Medien. In T. Hug & R. Maier (Eds.), *Medien - Wissen - Bildung. Explorationen visualisierter und kollaborativer Wissensräume* (pp. 144-161). Innsbruck: innsbruck university press.

Abstract (translated): Gender is an important issue in the context of media spaces and information and communication technologies (ICT). Studies show that ICT use is subject to gender bias, e.g. in relation to the time spent on ICT activities as well as to special interests in particular ICT topics. This contribution takes up the issue of how ICT education at school can help to promote gender equality. Based on empirical studies, it shows particular areas that suffer from gender inequalities and provides examples of effects in the classroom. Dysfunctional attribution patterns, for example, which may be evoked during classroom interaction, decrease girls' motivation in dealing with ICT and can also affect their performance negatively. The presentation will discuss three ways to support gender in media spaces: The approaches of reflecting gender stereotypes, re-attribution of ICT skills and performances and the use of (visualized) gender-scripts for supporting collaborative classroom processes.

**Conference presentations**

Ertl, B. & Helling, K. (2009, November). *Gender support in media spaces.* Paper presented at Medien - Wissen - Bildung, Innsbruck, Austria.

Ertl, B. & Helling, K. (2010, September). *Gender equality for digital literacy: Issues and solutions.* Paper presented at the International Conference on Operations Research, Munich, Germany.

Ertl, B.; Kikis-Papadakis, K.; Barajas, M. & Bramani, C. (accepted). Promoting gender equality in STEM classrooms. Paper presented at the 7th International Conference 'Leadership for an Inclusive and Sustainable World', January 27-29, 2011, Berlin, Germany.

Ertl, B. & Mok, S.-Y. (2010, September). *Comparative study on gender differences in technology enhanced and computer science learning: Promoting equity*, Poster presented at the Predil Networking Conference and Workshop, 7th-9th September 2010, Spisská Kapitula, Slovakia.

Ertl, B.; Mok, S.-Y.; Jodl, H.-J.; Gröber, S. & Pickl, S. (2010, September). *Remote controlled labs as mean for active learning.* Paper presented at the Predil Networking Conference and Workshop, 7th-9th September 2010, Spisská Kapitula, Slovakia.

Helling, K. & Ertl, B. (2010, September). *Gender sensitivity of informatics educational material for pupils and teachers.* Paper presented at the International Conference on Operations Research, Munich, Germany.

Helling, K. & Ertl, B. (2010, September). *The 3R reflection method for teachers.* Paper presented at the Predil Networking Conference and Workshop, 7th-9th September 2010, Spisská Kapitula, Slovakia.

Helling, K.; Ertl, B.; Barajas, M.; Civil, R. & Sedooka, A. (2010, September). *Gender sensitivity of ICT-related educational materials and resources for pupils and teacher.* Paper presented at the Predil Networking Conference and Workshop, 7th-9th September 2010, Spisská Kapitula, Slovakia.

Mok, S.-Y. & Ertl, B. (2010, September). *Concept mapping for teachers.* Paper presented at the Predil Networking Conference and Workshop, 7th-9th September 2010, Spisská Kapitula, Slovakia.

Mok, S.-Y. & Ertl, B. (2010, September). *Gender and career paths in ICT.* Paper presented at the International Conference on Operations Research, Munich, Germany.

# 7 Conclusion

The report at hand presented the results of different qualitative and quantitative surveys on the issue of gender and ICT, as well as an overview about related workshops delivered by the University of the Bundeswehr and the publications written by the PREDIL project team in Germany.

Coming back to the research questions posed in the beginning of this report, the following answers can be derived from the results presented above:

- How do teachers perceive gender in relationship to ICT use?

Teachers are somehow aware of gender issues that affect the relationship of gender and ICT. However, this applies for the teachers who participated in the interviews conducted by the University of the Bundeswehr and cannot be taken for granted in general. In fact, results from the interviews with students, IT professionals and also advice given by pupils also show that teacher education in this field is still necessary.

- How do pupils (of different grades) perceive ICT now and from a future perspective?
- How do female and male pupils perceive ICT with respect to their future careers?

The current perception of ICT needs to be considered in the context of school and leisure activities – pupils use certain software applications during lessons and the internet for research, with slight gender-differences in the focus on different software. Additionally, using ICT at home seems to be a matter of course, especially with regard to social networks. The pupils' future perception of ICT is positive. ICT is considered important, and a career in this field is clearly related to good job perspectives, advancement prospective and high salaries, although, the professional profile of a computer scientist is not clear to all. Interest in technology is the most important factor for following a career in the field of ICT.

- How do contextual factors influence engagement in ICT (facilitating or hindering)?

Especially the teacher was considered as an important facilitating factor for supporting the interest of girls (and boys) in technology and computers. The support includes gender-reflective teaching approaches (e.g. selecting gender sensitive teaching materials, supporting girls in the internal attribution of good achievements in informatics, providing good explanations and challenging tasks for interested pupils). The parents also influence the attitude of girls (and boys) towards technology; especially, if they provide chances of making ICT experiences already at home (which is supported by parents working in a profession related to the field in general).

In conclusion, it has to be noted that differences in the perception and usage of ICT exist between boys and girls, and that these differences manifest in the context of school education, but also at home. As a result boys and girls develop different interests in ICT and therefore consider it to a different extent in their career decisions. Thus, teachers need to be aware of the gender issues in the context of ICT and teacher education and further education should support the development of gender-reflective teaching approaches. Also, parents should be informed about possibilities to support their children in following a career in ICT. Clarifying the professional image of computer scientists – and describing its interesting aspects – would be another step in the process of motivating pupils to take up a career in the field of ICT.

# 8 References


Chapman, A. (n.d.). Gender bias in education. Retrieved from http://www.edchange.org/multicultural/papers/genderbias.html (May 11, 2007).

Mechtenberg, L. (2010). Warum Mädchen besser schreiben und Jungen besser rechnen können. Lob und Tadel wirken je nach Geschlecht unterschiedlich. *WZB Mitteilungen*, *129*, 20-23.

OECD. (2005). *Are Students Ready for a Technology-Rich World? What PISA Studies Tell Us*. OECD. Retrieved July 6, 2009, from http://www.oecd.org/document/31/0,2340,en_32252351_32236173_35995743_1_1_1_1,00.html.

Renn, O., & Pfenning, U. Nachwuchsbarometer Technikwissenschaften. Studieren in Deutschland. Erfahrungen, Erwartungen und Meinungen. Retrieved 19.08.2009, from http://www.acatech.de/de/projekte/abgeschlossene-projekte/nachwuchsbarometer-technikwissenschaften-nabatech.html

Schneider, C. (2006).Vom heimlichen Lehrplan zu gender-fairen Unterrichtsmaterialien: über Eisberge, Haltungen, pädagogische Standards und good practice. In Mörth, A. & Hey, B., Koordinationsstelle für Geschlechterstudien, Frauenforschung und Frauenförderung der Karl_Franzens-Universität Graz (Ed.), Geschlecht + Didaktik. Retrieved from http://www.uni-graz.at/kffwwww/geschlecht_didaktik/schneider.pdf (May 8, 2007).

Stepanek, B. & Krull, P. (2003). Ein Handbuch. Gleichstellung + Gender Mainstreaming. Dritte geringfügig überarbeitete Auflage im Auftrag des Landesfrauenrates Mecklenburg-Vorpommern e.V. Available at http://www.gm-consult-mv.org/downloads/ringbuch.pdf (17.05.2010).

Trontheimer, I. (2006). Die 3-R-Methode. Lehrer-Online. Unterrichten mit digitalen Medien. Available at http://www.lehrer-online.de/url/3r-methode (17.05.2010).

Wiesner, H. Schelhowe, H. Metz-Göckel, S., Kamphans, M., Peter, u. Schottmüller, H., Kedenburg, C., Tigges, A., Wienold, K., Jelitto, M. & Cho-Heinze, H. (2003, January). GM-Guideline: Gender Mainstreaming im Kontext neuer Medien. Wien. BMBWF. Retrieved from http://www.physik-multimedial.de/papiere/GMGuideline23Januar03.pdf. (May 10, 2007).

# 9 Annex: PREDIL Empirical Research Report

## *9.1 Qualitative Research Instruments*

### *9.1.1 Teacher Focus Groups*

**Scope:**

These focus groups will have two main goals:

1. Obtain information on teachers' representations about the situation of ICT in schools regarding gender issues
2. Obtain help on the design of the online questionnaire, which will have to be elaborated well in advance.

**Who:**

6 teachers [ideally from different schools] with experience of teaching ICT
*Do we want ICT teachers or teachers who use ICT in class a good deal?*

**Where:**

A room that makes discussion easy (whiteboard, table, comfortable seating…)

**Resources:**

An invitation to potential participants that includes a brief description for the participants (attached); a document to provoke comments (attached); administrative details; recording medium (digital recorder, paper, computer) for the group to use

**Duration: 60-90 minutes**

**Preparation:**

Identify participants; communications; assemble resources (including multiple copies of all the materials you have sent, for the people who forget to bring them along!). Organise refreshments. Send out materials a week in advance.

**Script 1 – Teacher representation of ICT and gender at school (in German)**

Diskussion über Erfahrungen, Beobachtungen, Perspektiven der Situation IKT und Schule; Fokus: Unterschiede/Gleichheiten/Besonderheiten/Zusammenhänge zwischen Mädchen und Jungen

- Einsatz von IKT/Medien im Unterricht (alle Fächer)
- Informatik-Unterricht, Informationstechnische Bildung

Verhalten im Unterricht

- Hilfestellung durch/für MitschülerInnen, LeherInnen
- Fragen stellen/beantworten
- Mitarbeit, Wortmeldungen
- Einzelarbeit, Gruppenarbeit
- Interaktionen (komptetiv, abwertend/anerkennend, veräppeln, Kontrolle des Computers)

- daktische Methoden
- Unterschiede zu anderen Fächern (Naturwissenschaften, andere Fächer)
- Rollenverhalten vs. Individualität
- ...

Leistungsunterschiede/ Zuschreibungen
- Einschätzung der eigenen Leistung
- tatsächliche Leistung (individuell vs. Klasse)
- Klassenleistung, Klassentempo
- Begründungen für gute/schlechte Leistungen (z.B. Fach/ andere Fächer, Schwierigkeit der Inhalte, MitschülerInnen, eigene Person, LehrerInnen, Mono/Koedukation, etc.)
- im Vorfeld vorhandene Kompetenzen, Vorwissen, Beganung
- Lernen aus Fehlern...

Interesse/Motivation
- Interesse an bestimmten Inhalten
- Fokus auf die Technik an sich vs. „was man damit machen kann"
- Einfluss von LehrerIn, SchülerIn, Elternhaus
- Bedeutung von Informatik/IKT für Berufswahl/ Studium/ Wahlpflichtfach
- Förderung/Einschränkung von Interesse und Motivation
- Umgang mit Medien (rezeptiv, aktiv gestaltend, neugierig, ängstlich, mutig selbstbewusst, kontrollierend, aufmerksam, aufgeschlossen, mit Spaß, etc.)
- ...

Lehrplan/Schule
- ab welcher Schulstufe
- Ausstattung an der Schule
- verpflichtend vs. freiwillig
- Monoedukation/Koedukation
- Theorie, Anwendungsorientierung
- Geschlechts-sensibler Unterricht
- Unterschiede zwischen den Ländern
- LehrerInnen Aus- und Fortbildung
- ...

Weitere Kommentare, Anmerkungen, etc.???

### *9.1.2 Student Itineraries*

- Allgemeine Informationen:
    - Alter
    - Bildungslaufbahn: welche Sekundarschulart? welches Studium? Übergänge? Wechsel von Schule/Studiengang?
    - Aktueller Status der Bildungslaufbahn? Studienabschnitt?
    - Geplanter weiterer Verlauf der Bildungslaufbahn? Doktorat? Karriere?

- Wann/Wie ist Ihnen aufgefallen, dass Sie sich für Computer/Informatik/Technik interessieren?
    - Gab es ein Schlüsselerlebnis?

  - Welche Fähigkeiten/Interessen haben Sie im Bereich Computer/Informatik/Technik und wie schätzen Sie Ihre Fähigkeiten ein?

- Wie beschreiben Sie Ihren Herangehensweise an Computer/Informatik/Technik, technische Herausforderungen?
  - Neugierig: d.h. alle Funktionen sofort ausprobieren?
  - Mit Verständnis: d.h. Ihnen sind die Funktionen direkt klar?
  - Emotional: d.h. macht Ihnen das Lösen technischer Herausforderungen Spaß?
  - Kompetent: d.h., Sie können technische Probleme selbstständig lösen und fühlen sich nicht überfordert?
  - In welcher Weise nutzen Sie Computer/Technik? (Studium? Privat? Wie häufig?

- Was haben Sie in ihrer Bildungslaufbahn als förderlich/ hinderlich empfunden?
  - Erfahrungen aus der Schulzeit? (z.B. Noten, Informatikunterricht, Verwendung von Medien im Unterricht, Koedukation)
  - Wie bewerten Sie dese Erfahrungen im Hinblick auf Ihre Studienwahl?

- Wer hat Sie in Ihrer Bildungslaufbahn/ Berufswahl wie unterstützt (privat, schulisch)?
  - Eltern (Beruf?), Geschwister, Freunde, Lehrer, Berater, Netwerke, etc.?
  - Gab es Personen mit Vorbildfunktion? Wer? Warum?
  - Wie haben Sie die Unterstützung/ die Personen wahrgenommen?

- Hatten Sie im Rahmen Ihrer Bildungslaufbahn/ Studium das Gefühl, dass ihr Geschlecht/ Geschlechtsstereotypen eine Rolle gespielt hat (bei Übergängen, Bildungswahl, auf dem Arbeitsmarkt, etc.)?

- Gab es weitere Faktoren, die Sie bei der Wahl des Studiengangs berücksichtigt haben?
  - Arbeitsmarktchanchen? Verdienstmöglichkeiten? Sozialer Status?
  - Dauer der Ausbildung?
  - Interesse für andere naturwissenschafltliche/technische Fächer?
  - Andere?

- Welche Erwartungen hatten Sie im Vorfeld an das Studium, und haben sich die Erwartungen erfüllt? Warum?
  - Anforderungen? Leistungsdruck? Inhalte? Studienbedingungen? Theorie vs. Praxis? Arbeitsstil? Konkurrenzsituationen? Geschlechteraspekte?
  - Wie sind die Erwartungen zustande gekommen?
  - Wie haben Sie sich über das Studium informiert?
  - Inwieweit hat Sie die Schulzeit auf die Anforderungen im Studium vorbereitet?
  - Was muss aus Ihrer Sicht an Grundkompetenzen in der Schule vermittelt werden?
  - Haben Sie darüber nachgedacht, das Studium abzubrechen? Bzw. würden Sie dieselbe Studienwahl noch einmal treffen? Zufriedenheit?
  - Wie gehen Sie Probleme bezüglich des Studiums an?

- Werden Sie nach dem Studium einen Beruf im Bereich Computer/Informatik/Technik ausüben?
    - o Wodurch wird diese Entscheidung beeinflusst?
    - o Welche Erwartungen/ Vorstellungen haben Sie von dem Beruf? Mit welchen Eigenschaften würden Sie den Beruf beschreiben?
    - o Welche Tätigkeiten,? Arbeitsatmosphäre, Arbeitszeiten, Weiterbildung, Unterstützung, Verdienst, Geschlechteraspekte erwarten Sie?
    - o Welche Pläne/ Ziele haben Sie für Ihre Karriere? Trauen Sie sich zu eine Führungsposition zu übernehmen?
    - o Können Sie sich vorstellen den Beruf mit Familie zu verbinden?
    - o Hat das Studium Sie angemessen auf den Beruf vorbereitet?

*The questions were developed by the PREMA consortium and refined by the University of the Bundeswehr on the basis of the career choice model of Dick & Rallies (1991) and the approach and results of the survey “Nachwuchsbaromerter Technikwissenschaften” by Renn, & Pfenning (2009).*

### *9.1.3 IT Professionals*

*The main focus of PREDIL is the under representation of women in the IT industry, and in IT-related education. We are also interested in reversing the flight from ICT and STEM in general.*

*We want to:*

- *understand some of the reasons for this decline*
- *find ways to reverse things*
- *increase the take-up of computing/ICT by girls*

*We want to get your story! In particular, about your motivations, your experiences of and feelings about computing/ICT, and about the people and situations that influenced important decisions you made.*

*We are interested in your educational pathway – how you come to be where you are, and what you want to do in the future.*

*We will also ask you for ideas on how to get more girls into computing/ICT!*

---

Sex:

Year of birth:

School type/qualification:

University Degree:

Current professional position/employment status:

Years of work experience in IT:

Education and career of parents:

### Educational pathway

How old were you when you decided whether or not you were good at computing/ICT?
What were the contributing factors (up to 3 factors)?

- Did you choose (advanced) Informatics courses already at school, or any alternative subject? Why?
- Why did you choose to study computer sciences at University?
- Why did you choose a career in computing/ICT?

- How did you come to the decisions (e.g. active choices? go along with what was expected? easy? with reservations? support by family, teacher? availability of information?)

### Informatics at school

- Describe the Informatics lessons at school (e.g. single sex? typical activities? roles of boys/girls/you? teacher treatment? funny? interesting? testing procedures?)

- The most interesting part of Informatics was…….. because?
- The most boring part of Informatics was…….. because?
- Do you think there have been important women Informatics in history? [names?]
- Do you think there are famous women in Informatics today? [names?]
- Why/why not?
- Did you learn anything about them in your Informatics lessons?

- What are the characteristics of a successful/unsuccessful Informatics teacher?
- What are the characteristics of a successful/unsuccessful pupil in Informatics?

### Your self-perception

- How did you know you were doing well in computing/ICT?
- If you don't understand something, what do you do?

- Is doing well in computing/ICT important to you? Why?
- Is doing well in arts/humanities important to you? Why?

- What makes YOU good at computing/ICT? (working hard? natural talent?)
- What makes YOU good at humanities and arts? (working hard? natural talent?)

### Influence of family (parents/ siblings) and friends

- Do you have discussions about school courses and careers? With whom?
- What is their attitude to
    - your education pathway/ Informatics/ Arts?
    - your achievements at school university career?
    - How did they support you?

### Your opinion

- For every girl student of computing/ICT, there are about 4 boy students. Why?
- For every woman working in the computing/ICT industry, there are about 5 men. Why?

- For me, positive/negative things about a career in computing/ICT could be:….. Why?
- For me, good/negative things about university study of computing/ICT could be:… Why?

- YOUR Advice on how to get more girls into computing/ICT -related courses?

- Would you like to work in IT sector also in the future? If no, why?

### Your position

- How many times have you changed employer in your professional career in IT sector?
- Are you satisfied with your financial assessment?
- Do you have enough free time, or do you devote your free time to work in any way after work hours?
- Do you take part in further education while at work? If yes, does your employer demand it or you participate from your own will?
- Are you satisfied with your career growth?
- Could you estimate percentage representation of men and women in your work team?
- Do you see any fundamental gender differences at your workplace?
- What are your ambitions in career growth in IT sector?
- Would you like to start business in ICT sector?

## *9.2 Quantitative Research Instrument*

### *9.2.1 PREDIL Online Questionnaire*

**ALLGEMEINE FRAGEN ZUR PERSON**

| | | |
|---|---|---|
| **Männlich** ☐<br>**Weiblich** ☐<br><br>**Jahrgang: - 19_____** | **Name der Schule: ______________________**<br><br>**Schulart:** ☐ **Gymnasium**<br>☐ **berufsbildende Schule**<br>☐ **andere Sekundarschulen**<br><br>**Schulträger:** ☐ **Öffentlich** ☐ **Privat** | **Wohnort:**<br>☐ **über 30.000 Einwohner**<br>☐ **bis zu 30.000 Einwohner**<br>☐ **bis zu 1000 Einwohner** |

Wir sind interessiert an Ihren Erfahrungen und Meinungen in Bezug auf Informations- und Kommunikations-technologie (IKT) und die Anwendung von IKT im Unterricht.

1. Erfahrungen mit Informations- und Kommunikationstechnologie (IKT)

1.1 Ihre Erfahrungen dieses Jahr IN DER SCHULE und ZU HAUSE (Bitte ankreuzen)

Wie häufig haben Sie mit folgenden Anwendungen und Tätigkeiten aus dem Bereich der IKT Erfahrungen **in der Schule** und **zu Hause** gemacht? Bitte kreuzen Sie an, ob Sie die Erfahrungen oft, manchmal oder nie gemacht haben. Kreuzen Sie bitte auch an, ob Sie (zusätzlich zu den Erfahrungen) vertiefende Kenntnisse über die genannten IKT-Bereiche im Unterricht erwerben möchten.

| **MS=Microsoft Office; OO=Open Office**<br>**Anwendungen und Tätigkeiten** | **Ort** | **Oft** | **Manchmal** | **Nie** | **Ich möchte diese Inhalte noch vertiefen** |
|---|---|---|---|---|---|
| Textverarbeitung | IN DER SCHULE | | | | |
| (z.B. MS Word, OO Writer...) | ZU HAUSE | | | | |
| Tabellenkalkulation | IN DER SCHULE | | | | |
| (z.B. MS Excel, OO Clac...) | ZU HAUSE | | | | |
| Presentationen | IN DER SCHULE | | | | |
| (z.B. MS Powerpoint, OO Impress) | ZU HAUSE | | | | |
| Datenbanken | IN DER SCHULE | | | | |
| (z.B. MS Access, MySQL, OO Base...) | ZU HAUSE | | | | |
| Bildbearbeitung | IN DER SCHULE | | | | |
| (z.B. MS Picture Manager, Photoshop, Corel, Gimp,...) | ZU HAUSE | | | | |
| Im Internet surfen (www) | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Daten herunterladen (downloaden) | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Chatten | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Diskussionsforen | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Blogging | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| E-Mails lesen/ schreiben | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Webseiten gestalten | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Computerspiele spielen | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Bildungs/Lern-Software verwenden | IN DER SCHULE | | | | |
| (für spezifische Fächer) | ZU HAUSE | | | | |
| Telefonieren über das Internet | IN DER SCHULE | | | | |
| (z.B. Skype, Google Talk, Jajah,...) | ZU HAUSE | | | | |
| Programmieren | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |
| Soziale Netzwerke (z.B. SchülerVZ, Facebook, | IN DER SCHULE | | | | |
| Twitter, Second Life, Tagged, H15,...) | ZU HAUSE | | | | |
| Online-Recherche für die Schule | IN DER SCHULE | | | | |
| | ZU HAUSE | | | | |

Wenn Sie beim Thema „Soziale Netzwerke" „oft" oder „manchmal" angekreuzt haben, interessieren uns im Folgenden genauer ob bzw. welche Anwendungen und Tools Sie benutzen.

Bitte kreuzen Sie alle Möglichkeiten an, die auf Sie persönlich zutreffen!

| | | |
|---|---|---|
| ☐ Messenger (Nachrichten schicken oder chatten) | ☐ Austausch von Videos | ☐ Status updates (tweeting) |
| ☐ Austausch von Fotos | ☐ Gemeinsam Computer spielen | ☐ Teilnahme an/ Organisation von Veranstaltungen |
| ☐ Austausch von Musik | ☐ Austausch von Informationen | ☐ Aktiv in Gruppen oder bezüglich spezieller Anlässe/ Themen/ Sonstigem (Welche?): ______________________ (Genauere Angabe) |

1.2 Wie oft nutzen Sie den Computer in den angegebenen Fächern in der Schule?

**(Bitte ankreuzen)**

Wie häufig haben Sie in den folgenden Fächern den Computer eingesetzt/ Aufgaben mit dem Computer bearbeitet? Bitte kreuzen Sie an, ob Sie den Computer in dem Fach oft, manchmal oder nie angewendet haben, bzw. ob Sie das Fach nicht haben/hatten.

| **Fächer** | **Oft** | **Manchmal** | **Nie** | **Das Fach habe / hatte ich nicht** |
|---|---|---|---|---|
| Informatik/ Informationstechnische Grundbildung (ITG) | | | | |
| Deutsch | | | | |
| Mathematik | | | | |
| Fremdsprachen | | | | |
| Biologie | | | | |
| Chemie | | | | |
| Physik | | | | |
| Geschichte | | | | |
| Politik/ Sozialkunde | | | | |
| Wirtschaft | | | | |
| Geografie/ Erdkunde | | | | |
| Ethik | | | | |
| Religion | | | | |
| Kunst | | | | |
| Projektarbeit/ Arbeitsgruppen | | | | |
| Sport | | | | |
| Andere (Welche?) ____________ ____________ | | | | |

## 2. MEINUNGEN UND EINSTELLUNGEN ZU Informations- und KOMMUNIKATIONSTECHNOLOGIE (IKT)

### 2.1 Meinungen über IKT in der Schule und eine Karriere im Bereich IKT

Bitte nennen Sie Aspekte und Eigenschaften, die für Sie oder andere Personen beim Umgang mit IKT relevant sind. Der Begriff „IKT" bezieht sich hier auf die unter „Ihre Erfahrungen…" (z.B. Textverarbeitung, im Internet surfen, Daten herunterladen) genannten Anwendungen/ Aktivitäten.

| | |
|---|---|
| (1) Was würden Sie einem/r LehrerIn raten, damit diese/r SchülerInnen besser beim Lernen im Bereich Computer/ IKT unterstützen kann? | • |
| (2) Nennen Sie drei Eigenschaften/ Merkmale eines Mädchens, das erfolgreich im Umgang mit IKT ist.... | •<br>•<br>• |
| (3) Nennen Sie drei Eigenschaften/ Merkmale eines Jungen, der erfolgreich im Umgang mit IKT ist.... | •<br>•<br>• |

Bitte nennen Sie Aspekte die für Sie im Zusammenhang mit einem Studium und einer Karriere im IKT-Bereich stehen. Der Begriff „IKT-Bereich" bezieht sich hier auf z.B. ein Informatikstudium, eine Karriere als Softwareentwickler, etc.

| | |
|---|---|
| (4) Nennen Sie mindestens einen positiven Aspekt den ein Hochschulabschlusses im Bereich Computer/ IKT mit sich bringt... | • |
| (5) Nennen Sie mindestens einen positiven Aspekt den eine Karriere im Bereich Computer/IKT mit sich bringt... | • |
| (6) Wenn Sie auf die Universität/ Fachhochschule gehen, welches Fach würden Sie dann gerne studieren?<br><br>☐ Agrarwissenschaft<br>☐ Kunst und Design<br>☐ Wirtschaftswissenschaften/ Management<br>☐ Pädagogik/ Lehramt<br>☐ Ingenieurswesen/ Maschinenbau<br>☐ Geographie/ Geologie<br>☐ Geisteswissenschaften<br>☐ Sprachwissenschaft | ☐ Jura<br>☐ Mathematik/ Informatik<br>☐ Medizin<br>☐ Naturwissenschaften<br>☐ Sozialwissenschaften<br>☐ Kommunikationswissenschaft<br>☐ Sonstiges (Bitte angeben):<br>________________________________<br><br>☐ Ich möchte nicht (an der Universität/ Fachhochschule) studieren |

## 2.2 Allgemeine Einstellungen/ Meinungen zum Bereich IKT

| | |
|---|---|
| Wer kann am besten mit dem Computer umgehen?<br><br>Bitte begründen Sie Ihre Aussage... | ☐ Jungen sind besser<br>☐ Mädchen sind besser<br>☐ Jungen und Mädchen sind gleich gut<br><br>_______________________________________________<br>_______________________________________________<br>_______________________________________________ |
| Sind Sie der Meinung, dass die Familie (finanzielle Verhältnisse, Familientradition, etc.) die Motivation und Entscheidung von Jungen und Mädchen für ein Studium und Karriere im Bereich IKT beeinflusst?<br><br>Bitte begründen Sie Ihre Aussage... | ☐ ja ☐ nein<br><br>_______________________________________________<br>_______________________________________________<br>_______________________________________________ |
| Sind Sie der Meinung, dass Jungen und Mädchen in der Klasse in technischen Unterrichtsfächern gleich behandelt werden?<br><br>Bitte erläutern Sie Ihre Aussage anhand von Beispielen... | ☐ Jungen werden besser behandelt<br>☐ Mädchen werden besser behandelt<br>☐ Jungen und Mädchenwerden gleich behandelt<br><br>_______________________________________________<br>_______________________________________________<br>_______________________________________________<br>___ |

## *9.3 Open Questions (Results)*

### *9.3.1 Attitudes towards gender and ICT*

**Wer kann am besten mit dem Computer umgehen? Kommentar:**

| **Jungen können besser mit dem Computer umgehen, weil…** | **Einzelaussagen - Mädchen** |
|---|---|
| Multiple Faktoren | KLISCHE! Auch wenn diese nicht von ungefähr kommen, möchte ich keine solchen pauschalen Antworten geben. Da kommen so viele Faktoren hinzu; Bildungshintergrund, Anlage, Umwelt...; |
| Computerspiele | Jungs sind evtl. bei ihren Spielen; [weil sie auch mehr am eigenen Computer arbeiten] und Spiele spielen; […] die Zeit, die sie außerdem mit Computerspielen verbringen, fördert ihr Interesse an anderen Bereichen der Technologie |
| Interesse | setzen sich eher damit auseinander, größeres Interesse; kommt immer darauf an, wie groß das Interesse ist; Es kommt immer auf die einzelne Person und ihr Interesse an IKT an, daher keine Geschlechtsunterschiede; beschäftigen sich mehr damit - mehr Interesse; Es kommt nicht auf das Geschlecht an sondern wie stark das Interesse dafür ist; interessieren sich meistens mehr dafür; […] die Zeit, die sie außerdem mit Computerspielen verbringen, fördert ihr Interesse an anderen Bereichen der Technologie; Interessenfrage!; Kommt auf das Mädchen/den Jungen an – Interessen; wer sich dafür interessiert kann auch gut mit PC\'s umgehen , Geschlecht ist unwichtig; Mädchen, bemühen sich darum es zu können, wenn Jungs daran kein Spaß hätten wären sie auch schlecht; es hängt nicht von Geschlecht ab sondern von Interesse |
| Erfahrung, Engagement | weil sie auch mehr am eigenen Computer arbeiten [und Spiele spielen}; Es kommt drauf an ob man sich mit dem Programm auskennt; Es kommt darauf an wie engagiert man ist; meist, wenn es um programmieren/Umgang mit PP, Word, Excel geht, Aber viele Mädchen schaffen das inzwischen auch schon; Jungen tüfteln, meiner Erfahrung nach, lieber an Programmen und ähnlichem herum; das ist sehr schwer zu vergleichen, Jungs sind tendenziell aber wesentlich geübter im Umgang mit Soft- und Hardware; In dieser Zeit gehen beide sehr gut damit um, da IKT im täglichen Gebrauch auch genutzt wird; weil sie sich mehr damit beschäftigen; die meisten Jungen in meinem Jahrgang kennen sich zumindest teilweise mit Programmieren aus, vielleicht auch weil sie mehr Zeit vor dem Computer verbringen |
| Fähigkeiten, Eigenschaften | Kommt auf das Denkvermögen an; sind geduldiger; sind mehr bei der Sache, konzentrierter; besser konzentriert |
| Aufgabenstellung | kommt auf die Übung drauf an |
| Geschlecht | Gleichberechtigung; Geschlecht bestimmt nicht über Intellekt der einzelnen Person; Emanzipation; beide Geschlechter können in diesem Gebiet gut sein; Es kommt nicht auf das Geschlecht an; Es gibt zwar viele Jungs die das gut können aber auch viele Mädchen |
| Sozialisation | weil es von ihnen von Anfang an erwartet wird sich auszukennen und deshalb beschäftigen sie sich eher damit; Generationsfrage! |

| **Jungen können besser mit dem Computer umgehen, weil…** | **Einzelaussagen – Jungen** |
|---|---|
| Computerspiele | Sie sammeln erste Erfahrungen an Computerspielen, deren Benutzung wohl eher typisch für Jungen ist. Mädchen kennen sich meiner Erfahrung nach fast ausschließlich in sozialen Netzwerken prima aus.; da sie mehr Computerspielen |
| Interesse | Kommt auf den Typ Mensch an -> Erfahrungen zeigt das Jungs mehr Interesse haben; sind interessierter an der Technik; weil sich Jungs allgemein mehr daran interessiert sind schon im klein alter; [Da sie sich technisch besser auskennen] und sich eher fürs Programmieren eines PCs interessieren; Jungs interessieren sich mehr für Elektro sachen; Jungen interessieren sich in den meisten Fällen mehr dafür; Sind am Thema Computer mehr und häufiger interessiert; je nach Interesse |
| Erfahrung, Engagement | in der Freizeit beschäftigen; früher Umgang mit PC; beschäftigen sich mehr damit in ihrer Freizeit; weil sie sich privat damit mehr beschäftigen; Da sie sich technisch besser auskennen [und sich eher fürs Programmieren eines PCs interessieren]; Aufgrund der Tatsache, dass Jungen sich wahrscheinlich eher mit diesem Themengebiet auseinandersetzen; weil sie sich auch fest mit dem Thema befassen; j. haben weniger Hemmungen, ergo mehr Erfahrung |
| Fähigkeiten, Eigenschaften, Begabung | Es ist so; weil jungen technisch talentierter sind; Technisch besser begabt; mehr technisches Verstehen; Jungs können meist einfacher; und logischer denken und sind bereit kleine Fehler in Kauf zu nehmen; jungen haben mehr Geduld; mehr technisches Verstehen; Mädchen tuen sich oft schwerer; Jeder hat Stärken und Schwächen; kommt auf die Person an |
| Motivation | Alles eine Frage der Motivation und der Computer-affinität des Individuums; Meiner Beobachtung nach haben Jungen Mädchen gegenüber in dieser Hinsicht den Vorteil, dass Computerkenntnisse auch schon bei Minderjährigen eine Art Statussymbol darstellen, während Mädchen sich in diesem Alter meist von der intensiveren Nutzung des Computers distanzieren. |

**Sind Sie der Meinung, dass die Familie (finanzielle Verhältnisse, Familientradition, etc.) die Motivation und Entscheidung von Jungen und Mädchen für ein Studium und eine Karriere im Bereich IKT beeinflusst? Bitte begründen Sie Ihre Aussage…**

| **Familieneinflüsse** | **Einzelaussagen – Mädchen** |
|---|---|
| Sozio-ökonomische Bedingungen | Finanzielle Aspekte spielen bestimmt auch eine Rolle, für die einen halt mehr, die anderen weniger. D.h. manchen ist das Geld wichtiger, als die persönliche Erfüllung, anderen eher letzteres.; kein Geld-> kein Studium-> keine Lust; ein Studium ist teuer; ein Studium ist teuer; wohlhabende Familien unterstützen ihre Kinder finanziell; weil wenn die Familie nicht genug Geld hat sie keine Ausstattung wie PC (somit kommt es gar nicht erst zum Interesse); Studiengebühren?!; finanzielle Gründe spielen wohl keine größere Rolle als bei anderen Studiengängen auch; sie bezahlen vieleicht das Studium, aber welche Richtung sie wählen ist ihre Entscheidung; Voraussetzung für eigene Erfahrung (durch finanzielle Mittel); wenn sie finanzielle Probleme haben, können sie sich keinen guten PC kaufen; Wenn man sich kein PC leisten kann, kann sich damit nicht ausführlich auseinandersetzen; hängt auch von der sozialen Schicht ab ob man einen eigenen PC besitzt |
| Familiensituation allgemein | hängt individuell von der Familie ab; schlechte Verhältnisse -> Schlechte Noten; weil es einen großen Einfluss innerhalb der Familie gibt; Die Familie beeinflusst die Berufs- & Studienwahl zwar im Allgemeinen, aber nicht im direkten Bezug.; Ebenso, wie die |

| | |
|---|---|
| | Familienverhältnisse, die Erziehung, fast immer die Berufswahl beeinflussen |
| Tradition, Modelle, Erwartungen | Auch das kann man so pauschal nicht sagen. Wenn einem viel an der Tradition liegt, wird derjenige wohl daran festhalten. Ansonsten ist auch ein Bruch denkbar; man bekommt gezeigt wie man es nicht machen will, oder ob man es genauso machen will; für eine Tradition halte ich die Branche für zu jung, allerdings: gezielte Erwartungen (je nachdem für oder gegen die Klischees) können(!) Druck ausüben; Eltern möchten dass ihre Kinder im Bereich IKT studieren, da sie das selbst machen oder studiert haben; Jungen bekommen im IKT Bereich mehr Unterstützung |
| Eigene Entscheidung | Da man in einem Alter ist, um selbst entscheiden zu können; die heutige Jugend kann sich durchsetzen; da die Studienwünsche erst in der Schule auftreten; Kinder sollten sich nicht von der Familie beeinflussen lassen; kommt auf die eigenen Interessen des Schülers an |
| Informationen | manche Familien wissen nicht was man alles Studieren kann; da die Studienwünsche erst in der Schule auftreten |
| Sonstige | ich denke, das Geschlecht spielt keine Rolle;; Kommt auf Abschluss an; anderes Umfeld |
| **Familieneinflüsse** | **Einzelaussagen – Jungen** |
| Sozio-ökonomische Bedingungen | Erziehung zahlt, sowie das Geld; Geschäftsmänner wissen wie wichtig Excel ist und meist sind diese ja etwas wohlhabend; wenn kein Geld da ist geht es nicht; In Deutschland gibt's genügend soziale Hilfe; Wenn der/die Schüler/in finanziell eingeschränkt ist kann man nicht alles studieren und nicht sehr motiviert da man einen Nebenjob hat; Studiengebühren/Uni; mehr Geld -> mehr Technik (immer auf dem neuesten Stand); Studium ist teuer; keine; ja, wie in jedem anderen Bereich auch. in wie fern die Wahrscheinlichkeit ein Studium aufzunehmen von der sozialen Herkunft abhängt muss hier nicht erläutert werden |
| Familiensituation allgemein | Kommt auf die Familienverhältnisse an; Sozialer Status und Bildungsmentalität des Familienumfeldes haben einen Einfluss auf Bildung im Allgemeinen; Sicher beeinflusst die Familie eine Studienwahl, aber besondere Aspekte, die speziell ein Informatikstudium begründen kenne ich |
| Tradition, Modelle, Erwartungen | Familie kann andere Pläne für ihre Kinder haben; ja, da sie Zuhause auch IT brauchen |
| Umgang mit Technik | Besserer PC= mehr Spaß da mehr Leistung; Ja, wenn man sich früh genug mit Elektro Sachen in Verbindung setzt lernt man schneller und mehr |
| Eigene Entscheidung | ist eine individuelle Entscheidung |
| Sonstige | sehe keinen direkten Zusammenhang; weil ich es so denke |

**Sind Sie der Meinung, dass Jungen und Mädchen in der Klasse in technischen Unterrichtsfächern gleich behandelt werden? Bitte erläutern Sie Ihre Aussage anhand von Beispielen...**

| **Behandlung im Unterricht** | **Einzelaussagen - Mädchen** |
|---|---|
| LehrerIn | Das kommt doch auf den Lehrer an!; teils teils, kommt immer auf den Lehrer an; Kommt auf die Lehrer & die Leistungsbereitschaft der Schüler an; für den Lehrer erscheint es selbstverständlich, dass jungen sich in diesem Bereich auskennen und er nimmt deshalb auch mehr Rücksicht auf Mädchen und erklärt ihnen zum Beispiel genauer was sie tun müssen; Lehrerin mag Mädchengruppen mehr; kommt auf Einstellung drauf an |
| Keine Unterschiede | Ich sehe kein unterschied; kannte bis jetzt keine Bevorzugung oder feststellen; Mädchen wird nicht weniger zugetraut als Jungs, damit zurechtzukommen; die Anforderungen sind dieselben, ebenso wie die Erwartungen; Lehrer verhalten sich gleich egal welches Geschlecht; gleiche Aufgabenstellung - gleiche Unterrichtsweise; gleicher Unterrichtsstoff - gleiche Arbeitszeit; jeder nimmt den gleichen Unterrichtstoff durch; ich habe keine Erfahrungen gemacht, dass ein Geschlecht besser behandelt worden wäre; bei uns wird nicht unterschieden zwischen Geschlecht |
| Verständnis, Begabung, Interesse | auf Mädchen wird mehr eingegangen wenn sie etwas nicht verstehen; bekommen vllt. anspruchsvollere Aufgaben da angenommen wird, dass Mädchen so was nicht können oder sich nicht dafür interessieren; aus eigener Erfahrung kann ich sagen dass Jungs primär besser behandelt werden, weil tendenziell von einem höheren technischen Verständnis ausgegangen wird. sobald Mädchen ihr technisches Verständnis einbringen und demonstrieren können ändert sich dies in der Regel aber ins Gegenteil; weil es immer heißt, dass Frauen schlechter sind; aber Jungs sind mehr intarsierter mehr ihr Themengebiet |
| Leistung | BSP: Physik-LK: 15 Jungen, 5 Mädchen...bei gleicher Beteiligung liegt die mündliche Note der Mädchen im Schnitt 3 Punkte höher; Lehrer trennen nicht von Geschlecht sondern von den Leistungen |
| **Behandlung im Unterricht** | **Einzelaussagen - Jungen** |
| Keine Unterschiede | alle Schüler müssen gleich behandelt werden; selbe Themen - selber Unterricht - selbe Exen und Schulaufgaben; Klar!! Gleichheit; Gleichberechtigung für alle!!!; Keine Ahnung, wahrscheinlich nicht.; Jeder ist gleich; Ich habe in meinen Unterrichtsstunden noch keine Unterschiede in der Behandlung von Jungen und Mädchen hinsichtlich der Nutzung eines Computers festgestellt; |
| Verständnis, Begabung, Interesse | Allgemein interessieren sich Jungen wohl eher für technische Unterrichtsfächer. Beide Geschlechter werden aber nicht verschieden behandelt; |
| Unterstützung | Man räumt Mädchen generell gerne einen Vorteil ein; schwächere bekommen in der Regel mehr Zeit; Da es in Klassen sehr selten informatikbegeisterte Mädchen gibt, werden die \"hilflosen\" Mädchen besser gefördert |

### *9.3.2 Characteristics of good informatics teachers and pupils*

**Was würden Sie einem/r LehrerIn raten, damit diese/r SchülerInnen besser beim Lernen im Bereich Computer/ IKT unterstützen kann?**

| **Rat an den/die LehrerIn** | **Einzelaussagen (m) oder (w)** |
|---|---|
| Erklärungen, Vertiefungen | Mädchen: Grundlagen erklären, mehr erklären; generell etwas erklären; abwechslungsreich vertiefen, Themen tiefgründiger besprechen; hilfreiche Programme/Lernprogramme genauer erklären<br><br>Jungen: Mehr erklären (3x), etwas vor der Arbeit zeigen; mehr Aufgaben mit den Schülern besprechen, Einfachere Beschreibung von Basisvokabeln |
| Praxisnaher Unterricht, Unterrichtsinhalte | Mädchen: Anforderungen im Beruf berücksichtigen, praxisnah unterrichten, Arbeitsaufträge an einem Beispiel am PC erklären, Themen am PC vorführen (zeigen wies geht), erst Theorie, dann in die Praxis umsetzen, erst Erklärung dann praktisch erarbeiten; mehr realer Praxisbezug, mit Bereichen die Schüler interessieren; mehr Praxis in den Unterricht reingeben; viele Praxisübungen; anschaulicher und interessanter Unterricht; mehr Praxis, weniger Theorie; man muss den Schülern beibringen wie man mit Programmen auf dem Computer umgeht; Im Unterricht sollten lieber vertiefte Kenntnisse in PowerPoint, Textverarbeitung u.ä. gelehrt werden, Programmiersprache ist meiner Ansicht nach weniger wichtig; Unterricht interessierter gestalten; Interessant gestalten, leichte Verständnisaufgaben, leichte Verständnis-Aufgaben<br><br>Jungen: Mehr Bezug zum Alltag/Lehrstellen; oftmals mehrere verschiedene und am einfachsten gehaltene Beispiele; leichtere Praktische Prüfungen; Unterricht anschaulicher gestalten (Bezug zur Realität fehlt); Interessanter gestalten; Der Lehrer sollte sich nicht nur mit Wikipedia Artikeln zufrieden geben; Bei Referaten könnte man etwas mehr Augenmerk auf die Gestaltung der PowerPoint Präsentation richten; Verwendung aktueller Programmversionen |

| | |
|---|---|
| Lehrmethoden | Mädchen: mehr Zusammenarbeit, eigenständiges Arbeiten mit Ausprobieren, Lernsoftware bzw. elektronische Kommunikation wesentlich stärker in den Unterricht integrieren; PC oder Programme für zuhause zur Verfügung stellen<br><br>Jungen: viele Projekte und Gruppenarbeiten; PCs in den Unterricht einbauen; Der Computer sollte häufiger und vor allem gezielter (also mit klarem Auftrag) eingesetzt werden; Mehr im Internet; mehr Zusammenarbeit |
| LehrerInnenbildung | Mädchen: Viele Lehrer kennen sich weniger beim Umgang mit IKT aus als ihre Schüler<br><br>Jungen: er muss immer up-to-date sein; erst einmal selber beherrschen; er solle sich selbst in seiner Freizeit mit den Möglichkeiten von IKT auseinandersetzen, um eine gewisse "Begeisterung" vermitteln zu können |
| Informationen bereitstellen | Mädchen: an hochwertige Websites heranführen, seriöse Informationsplattformen nennen |
| Bedürfnisse der SchülerInnen | Mädchen: mehr Aufgaben, damit es nicht langweilig wird, wenn man eher fertig ist;  mehr auf die Schüler zugehen<br><br>Jungen: besser auf Schüler eingehen; auf Schüler zugehen |
| Curriculum | Mädchen: Das Fach sollte bereits eher unterrichtet werden; mehr Stunden nutzen |
| Feedback | Aufklärung über den Niveaustand des Schülers; mehr Arbeitskontrollhilfe |

**Nennen Sie drei Eigenschaften / Merkmale eines Mädchens, das erfolgreich im Umgang mit IKT ist...**

| **Mädchen:** |
|---|
| - Selbstbewusst |
| - Emanzipiert |
| - Weltoffen; offen, offen |
| - Vorkenntnisse, PC-Know-How, Fachbegriffe |
| - Programmiert selbst Programme |
| - Technisches Verständnis; Verständnis für das Medium |
| - Kommunikation; kommunikativ |
| - Planen |
| - 10-Finger-System; kann schnell tippen |
| - Selbstbewusst im Umgang mit PC |
| - gut in Mathe |
| - logisches Denkvermögen; Logik; logisch Denken |
| - Technikinteressiert; technisch interessiert; Interesse an Technik; |
| - interessiert; interessiert; Interesse; interessiert |
| - Bewusstsein für neue Technologie |
| - Ruhig |
| - Wissbegierig; neugierig; neugierig |
| - Schnelle Auffassungsgabe; gute Auffassungsgabe |
| - Feingefühl |
| - Optisches Gestalten |
| - Informationen im Internet schnell finden |

| |
|---|
| - PowerPoint problemlos erstellen |
| - Grundkenntnisse in Excel und Word |
| - Intelligent |
| - Technisch begabt |
| - Freak |
| - Praxisorientiert |
| - Ehrgeiz |
| - Spaß |
| - Mitarbeit |
| - Genau |
| - Aufmerksam |
| self-aware; emancipated; open-minded, open-minded, open-minded; computer knowledge, computer knowledge, computer knowledge; knows how to program; technical understanding; communicative; planning; good at typewriting; self-aware in using computers; good in maths; logical thinking, logical thinking, logical thinking; interested in technology; interested in technology, interested in technology; interested, interested, interested, interested; awareness of new technologies; calm; inquisitive, curious, curious; quick of comprehension, quick of comprehension; sensitivity; optical design; designing PowerPoint presentations easily; basic knowledge in Word and Excel; intelligent, technically talented; practice-oriented; ambitious; fun; active part in lessons; exact; attentive |

| **Jungen:** |
|---|
| - Brille, Brille |
| - Computersprache |
| - Hübsch, attraktiv, hübsch, hübsch |
| - Blond, blond |

| |
|---|
| - Brünett |
| - Nachvollziehbare Lösungen |
| - Schnell genug um fristgerecht abzugeben, ist schnell |
| - Ehrgeizig, |
| - Klug, intelligent |
| - vernetzt denken |
| - lernbereit |
| - kooperativ |
| - zielstrebig |
| - technikbegeistert |
| - modern |
| - stellt weniger dumme Fragen |
| - Mitarbeit im Unterricht |
| - Souveränität |
| - Effizienz, effektiv |
| - Stärkeres Interesse an IKT als Jungen |
| - Selten |
| - Spielen WOW oder andere MMORPG |
| - Nicht an Eigenschaften sondern an Interesse an der Materie gebunden |
| - Offen |
| - Chatten |
| - Ratschen |
| - Rumalbern |

| |
|---|
| glasses, glasses; computer language; attractive; beautiful, beautiful, beautiful; blond, blond; brunette; conceivable solutions; fast working; ambitious, smart, intelligent, network thinking; willingness to learn; cooperative; goal-oriented; technophiliac; modern; poses only few silly questions; active in class; sovereignty; efficient, effective; rare; playing computer role playing games; not depended on characteristics but on interest only; open-minded; online-chat, chat; kid around; |

**Nennen Sie drei Eigenschaften / Merkmale eines Jungen, der erfolgreich im Umgang mit IKT ist...**

| **Mädchen:** |
|---|
| - Integriert |
| - Interessiert, Interesse zeigen, interessiert, Interesse, interessiert |
| - Technikinteressiert, technisch interessiert, Interesse an Technik |
| - Tüftler |
| - kreativ |
| - Bewusstsein für neue Technologien |
| - Schlau, intelligent |
| - Programmieren, Programmiert selbst Programme |
| - Spielen |
| - 10-Finger-System |
| - Selbstbewusster Umgang mit Computer |
| - Kennt Fachbegriffe |
| - Brillenträger |

| |
|---|
| - Logisches Denkvermögen, Logik |
| - Gute Mathematikkenntnisse |
| - Erfahrung durch Computerspiele |
| - Neugierig, neugierig |
| - Routiniert |
| - Gute Auffassungsgabe |
| - Verständnis für das Medium |
| - Technisch begabt, technische Begabung |
| - Schnell |
| - Laut |
| - Gelangweilt |
| - Aufmerksam |
| - Genau |
| Integrated, interested, interested, interested, interested, interested, interested in technology, interested in technology, interested in technology, nerd, creative, awareness of knew technologies, clever, intelligent, knows how to program, gaming, good at typewriting, confident computer usage, knowledge of technical terms, glasses, logical thinking, logical thinking, good at maths, experience gained through computer games, curious, curious, routine, quick of comprehension, fast working, loud, bored, attentive, exact |

| **Jungen** |
|---|
| - Dick, dick, übergewichtig |
| - untergewichtig |
| - Brille, brille, brillenträger |

| | |
|---|---|
| - | Keine Freunde, keine freunde |
| - | Interessiert |
| - | Attraktiv |
| - | Intelligent, schlau |
| - | Gut in der Schule |
| - | Mehr PC-Stunden |
| - | Kurse |
| - | Laptop-Unterricht |
| - | Logisches Denken |
| - | Vernetzt denken |
| - | Voraus denken |
| - | Lernbereit |
| - | kooperativ |
| - | zielstrebig |
| - | technikbegeistert |
| - | modern |
| - | schnell |
| - | lustig |
| - | laut |
| - | gelangweilt |
| - | effizient, effektiv |
| - | normal |
| - | Unabhängigkeit |

| |
|---|
| - Souveränität |
| - Interesse durch Computerspiele geweckt und PC-Erfahrung gesammelt |
| - Spielen WOW oder andere MMORPG |
| - Nicht an Eigenschaften sondern an Interesse an der Materie gebunden |
| - Programmieren |
| - Kalkulieren |
| - Planen |
| Fat, fat, overweight, underweight, glasses, glasses, glasses, no friends, no friends, interested, attractive, intelligent, smart, good at school, more computer lessons, courses, laptop-classes, logical thinking, network thinking, thinking ahead, willingness to learn, cooperative, goal-oriented, technophiliac, modern, fast working, funny, loud, bored, efficient, effective, normal, independent, sovereignty, interest and experience gained through computer gaming, playing computer role playing games, programming, calculating, planning, not depended on characteristics but on interest only |

### *9.3.3 Positive aspects of informatics studies and career*

**Nennen Sie mindestens einen positiven Aspekt, den ein Hochschulabschlusses im Bereich Computer / IKT mit sich bringt...**

| **Mädchen:** | |
|---|---|
| Zukunftschancen allgemein | gute Zukunftschancen, zukunftsorientiert, Zukunft, Zukunftsperspektive, Zukunftschancen da der IKT-Bereich immer wichtiger wird, |
| berufliche Chancen | höhere Chancen einen Beruf im Bereich Wirtschaft zu erlangen, Branche stark nachgefragt, gute berufsperspektiven, vielfältige Möglichkeiten, Vorteil im Berufsleben, Bessere Chancen fürs spätere Berufsleben, guter Job, spätere Berufswahl/ Einstieg; Computer braucht man heutzutage in jedem Lebensbereich z.B. Studium/Beruf, |

| | |
|---|---|
| Computerwissen und Erfahrung | mehr Ahnung von der Materie, Know-How, Erfahrung im Bereich PC, Wissensvorsprung in einem zentralen Bereich der Gesellschaft, gute Kenntnisse, hervorragende Computerkenntnisse; Computerkenntnisse sind in der heutigen Berufswelt immer wichtiger bzw. werden vorausgesetzt; Praktische Erfahrung |
| Computerprobleme | Man kann sich gut selbst helfen in diesem Bereich (PC zu Hause), Kein Problem mit PCs, man kann seinen PC selbst reparieren, zuhause Probleme selbst lösen zu können, man kann sein PC Selbst reparieren |
| Arbeitsweise | schnellere Erledigung von Arbeiten, einfacher Umgang im Arbeitsleben, Erleichtert viele Arbeit; schnelle Kommunikation; teilweise introvertierte Arbeitsweise, weniger soziale berufliche kontakte als in anderen brachen |
| Weiterbildung | hoher weiterbildungsdruck |
| Sonstige | Vorbereitung auf Ausbildung |
| **Jungen:** | |
| Zukunftschancen allgemein | Zukunftstechnologie, zukunftsorientiert |
| Berufliche Chancen | Zukunftsorientierte Ausbildung, zukunftssicherer Arbeitsplatz, bessere Jobaussichten, Fachkräfte im Bereich der IKT werden von Unternehmen gesucht. Die Wahrscheinlichkeit, eine Stelle zu finden ist also hoch; überall ein Job zu finden, \"sicherer\" Arbeitsplatz, Man hat bessere Chancen einen Job in de IT zu finden; Bessere Arbeitschancen durch bessere Kenntnisse; Erfahrung für den Beruf, besser fürs Berufsleben, gute Voraussetzungen im Beruf |
| Computerwissen und Erfahrung | Know-How, Know-How (IT), mehr Erfahrungen im Technik Bereich, gute Praktische Erfahrung und guter Umgang |
| Computerprobleme | Probleme daheim lösen, Probleme daheim mit PC lösen |
| Arbeitsweise | schnelles Arbeiten |
| Anwendungskenntnisse und Programmieren | Kenntnisse im MS-Office; Umgehen mit Programmen; Programmieren |

**Nennen Sie mindestens einen positiven Aspekt, den eine Karriere im Bereich Computer / IKT mit sich bringt...**

| | |
|---|---|
| **Mädchen** | |
| Zukunftschancen und -orientierung | Modern, Zukunftsorientiert; Computer/IKT wird nie aussterben und es besteht immer eine Nachfrage, Computer sind immer mehr auf dem Vormarsch, Zukunftschancen hoch, gute Zukunftsaussichten, gute Aussichten, zukunftssicher |
| Berufliche Chancen und Karriere | beruflicher Aufstieg möglich, hohe Aufstiegschancen; breites Spektrum an Betätigungsfeldern; Bessere Berufsaussichten |
| Verdienst | Zukunftschancen und somit Geld, gutes Einkommen, viel Geld, gute Verdienstmöglichkeiten, man verdient viel Geld, hoher Lohn, gutes Gehalt |
| Arbeitsweise | Kaum Arbeit mit den Menschen an sich; logisches Denken; arbeiten von Zuhause aus; Selbständiges Arbeiten am PC; keine körperliche Anstrengung |
| Computerwissen | Know-How; kennt sich gut aus und kann mitreden und vergleichen; Erfahrungen |
| Anwendungswissen | guter Umgang mit Software usw. |
| Computerprobleme | man kann seinen PC selbst reparieren; Aufwende im Privaten Leben |
| **Jungen:** | |
| Zukunftschancen und -orientierung | Zukunftsorientiert, PCs sind die Zukunft, IKT ist immer gefragt, Auch in der Zukunft wird man Fachkräfte in diesem Bereich benötigen, Chancen in der Zukunft; zukunftsfördernd |

| | |
|---|---|
| Berufliche Chancen und Karriere | große Auswahl am Beruf; viele gute Jobangebote; Arbeitsplatzsicherheit |
| Verdienst | viel Geld, hohe Gehälter, gut bezahlt, viel Geld zu verdienen |
| Arbeitsweise | Sitzen; schnelles Arbeiten |
| Computerwissen | Know-How (IT); immer up-to-date; Softwareentwicklung |
| Motivation | Ist schön, wenn man die Arbeit mag; Es gibt viele Entwicklungen, die den Beruf nie langweilig werden lassen |