PREDIL

SWISS NATIONAL REPORT

ICT, STEM and Gender

Luca Botturi & Chiara Bramani

Università della Svizzera italiana, Lugano

DRAFT – not for publication

Table of Contents

1. The Swiss Education System

Educational policy system background[1]

The responsibilities of the educational areas in Switzerland are subdivided between the Confederation, cantons and the municipalities. There is no ministry for education at national level. The main responsibility for education lies with the cantons.

Characteristics of the Swiss education system

As a whole, the characteristics for the educational and political system are:

- federalism (sovereignty of the cantons)

- decentralization (importance of the responsibilities of the cantons and municipalities)

- the subsidiarity of the state measures (i.e., the principle is that superior levels such as the Confederation or cantons can only pass regulations or undertake tasks where the subordinate levels are not in a position to do so),

- and the semi-direct democracy (national referendum, ballot initiatives, referendums).

Educational levels and categories

The Swiss educational system comprises the following educational levels or categories:

- Pre-school

- Primary school

- Lower secondary Level

- Upper secondary level: The upper secondary level comprises vocational education and further general education (specialized middle schools (Fachmittelschulen - FMS) and Matura schools).

- Tertiary level: The tertiary level consists of higher vocational training and universities. Higher vocational education comprises the professional and higher specialist examinations as well as the higher specialist schools (Höhere Fachschulen; HF). The universities are divided into the universities proper (cantonal universities and Swiss Federal Institutes of Technology) and the universities of applied sciences (Fachhochschulen - FH), which include the universities for art and music and teacher training universities (Pädagogische Hochschulen - PH).

- Quartery levels: Further education

- Special education.

---

[1] http://www.educa.ch/dyn/67389.asp

THE SWISS EDUCATION SYSTEM

PhD Doctorate

Master (5 years)

Bachelor (3 years)

TERTIARY

6

UNIVERSITIES INCL. FEDERAL INSTITUTES OF TECHNOLOGY
5A

UNIVERSITIES OF TEACHER EDUCATION
5A

UNIVERSITIES OF APPLIED SCIENCES
5A

Federal Diploma

COLLEGES OF HIGHER VOCATIONAL EDUCATION AND TRAINING
5B

Federal Diploma
Advanced Federal Certificate

PREPARATION: EXAMS OF HIGHER VOCATIONAL EDUCATION AND TRAINING
5B

CONTINUING EDUCATION

2

1

Mature

Specialised Matura + Certificate of Specialised Middle School (4 y.)

Certificate of Specialised Middle School (3 years)

Professional Baccalaureate + Federal Certificate

Federal Certificate

Basic Federal Certificate

4A ADULT MATURA SCHOOLS

SECOND VOCATIONAL TRAINING 4B

CONTINUING EDUCATION

UPPER SEC.

option 2*

MATURA SCHOOLS
3A

PREPARATION SPECIALISED MATURA

SPECIALISED MIDDLE SCHOOLS
3A + 3B

BASIC VOCATIONAL EDUCATION AND TRAINING (APPRENTICESHIP) option 2*
Vocational colleges + businesses + business-to-business courses | full-time colleges
Complement: professional baccalaureate (PB)
option 1: PB during the apprenticeship
option 2*: PB after the apprenticeship
3A + 3B

BASIC VOCATIONAL EDUCATION AND TRAINING
3C

COURSES TO BRIDGE GAPS IN TRAINING (10TH SCHOOL YEAR)

LOWER SEC.

PREP. MATURA SCHOOLS
2A

PERFORMANCE-BASED GROUPS

AI | AR | BE | FR | GE | GL | GR | JU | LU | NW | OW | SG | SH | SO | SZ | TG | UR | VS | ZG | ZH

AG | BL | NE | TI

BS | VD

PRIMARY

PRIMARY SCHOOL
1

SPECIAL NEEDS EDUCATION

Compulsory schooling
The diagram shows the present structure of the education system. The cantons aim at harmonising the structure of compulsory schooling. www.edk.ch > HarmoS

PRE-SCHOOL
0

© EDK CDIP CDEP CDPE, October 2008

ISCED
The diagram contains a link to the ISCED (International Standard Classification of Education www.uis.unesco.org).
The ISCED assigns an internationally defined code (ISCED 0 to ISCED 6) to each educational level. This ensures international comparability of educational levels.

ISCED 6
ISCED 5A + 5B
ISCED 4A + 4B
ISCED 3A–C
ISCED 2A
ISCED 1
ISCED 0

Degree

Transition: 1 Matura → Universities of applied sciences (practical training)
2 Professional Baccalaureate → Universities (additional qualifications)
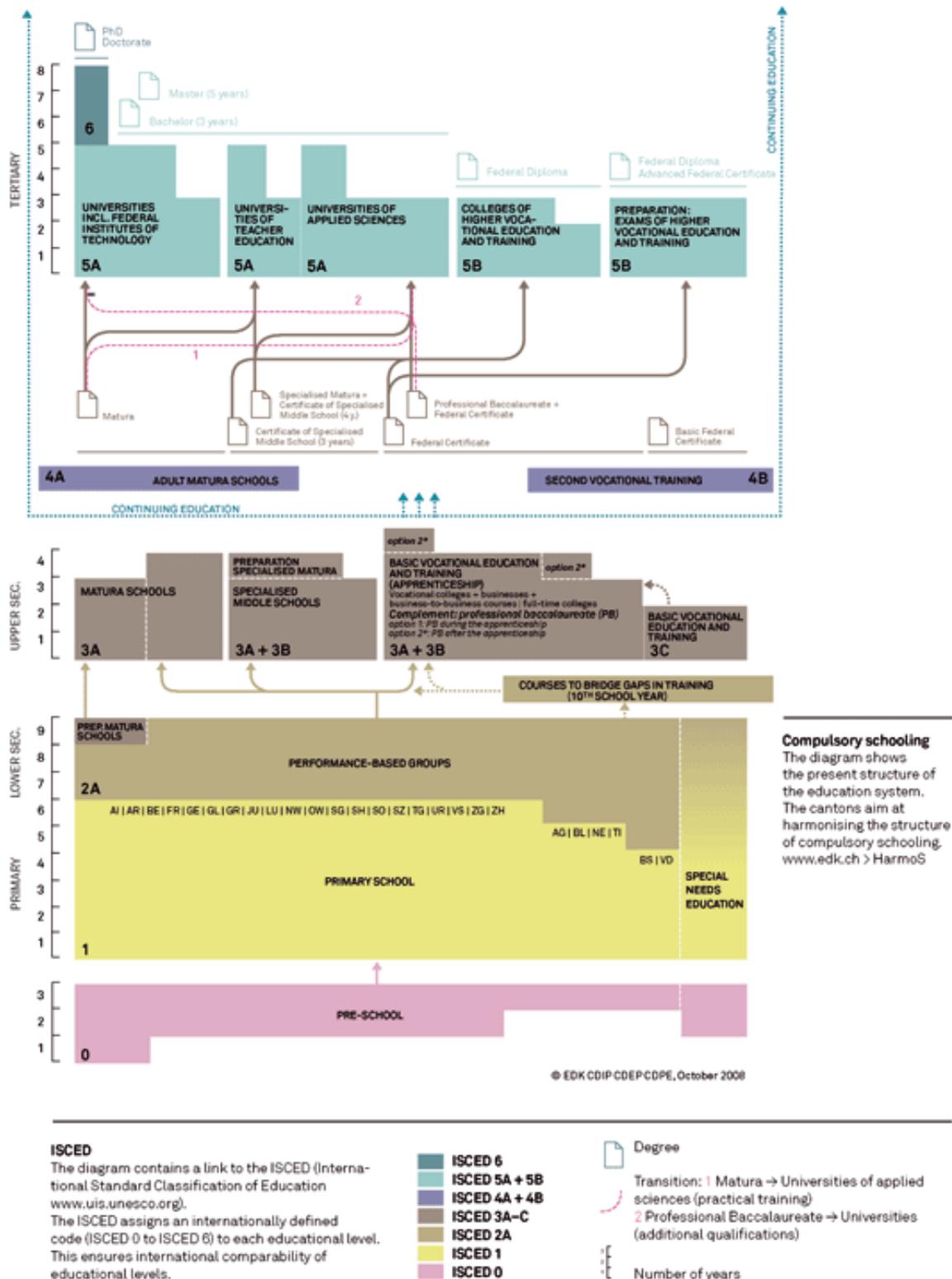
Number of years

Figure 1 - from http://www.edk.ch

4

Education at upper secondary level

After nine years of compulsory education, adolescents pass over to the upper secondary level. The upper secondary level is split up into general education and vocational education. General education students are students of Matura schools and Specialized middle schools (Fachmittelschulen). The vocational education can be enhanced with tuition in the vocational schools or in a full time school during the vocational training, such as training workshops or full-time vocational schools.

Graduation

Education at upper secondary level lasts from two to four years. Approx. 90% of the adolescents in Switzerland graduate with a certificate. Successful vocational education ends with the corresponding graduation certificate.

Depending on the type of graduation at the upper secondary level, studies at the tertiary level can begin - either at university (universities, Federal Institutes of Technology (ETH), universities of applied sciences (FH)), vocational education at tertiary level (Higher Universities of applied sciences (HF), vocational exams, higher vocational exams).

Development of the upper secondary level

Universities and universities of applied sciences and employment organizations have influenced the development of the upper secondary level since the beginning of the 19th century. The upper secondary level is currently undergoing a process of reform. Significant goals of this reform are facilitating access from one type of school to another, improving coordination and a generally enhancing quality.

2. Media Education in the Swiss School Curriculum

Swiss Country Report on ICT in Education

Switzerland has compiled its Swiss Country Report on ICT in Education for the European Schoolnet to be published in "Insight", the European Schoolnets' Information bulletin. The following information was taken from that report.

The education context and ICT

The main thrust of educational reform in Switzerland currently concerns the question of harmonization. Differences in education systems from one canton to another can be a considerable barrier to mobility within the country. One approach to the issue is to improve the coordination between the many actors involved in the education system. In May 2006, the Swiss population voted massively in favor of modifying the Constitution so as to oblige the Confederation and the cantons to coordinate their actions and collaborate more closely in the field of education from primary school to university. One key aspect was the will to fix the duration of each level of education and the specific objectives to be attained by pupils at the end of each level. The latter is the subject of the HarmoS project led by the Swiss Conference of Cantonal Directors of Education (CDIP).

Currently, HarmoS is being ratified by the cantons. It is the cantons (cantonal parliaments, with a possible, facultative referendum) who decide about whether to join the new agreement. Agreement accepted, the cantons initiate steps in order to harmonize their cantonal structures and objectives concerning compulsory education. The HarmoS agreement will come into effect once ten cantons have joined. It will only apply to those cantons which have ratified it. These cantons will then have a transition period of six years in order to transpose whatever adaptations are necessary within the HarmoS framework. To date, ten cantons have joined the agreement.

Today this achievement has been crowned by the establishment of a legal basis for educanet² and the Swiss Educational Server. Passed in February 2008, the "Federal Law Relative to Contributions Towards Common Projects of the Confederation and the Cantons for the Purpose of Piloting the Swiss Education Space" makes provision for the partial financing of the Swiss Educational Server, and consequently the educanet educational platform.

ICT in the curriculum

National curriculum

There is no national curriculum in Switzerland, as devising the curriculum is the legal responsibility of individual cantons. However, work is currently going on at both federal and regional level to harmonize the curriculum and other aspects of schooling during the years of compulsory schooling.

The national HarmoS project, developed by the Swiss Conference of Cantonal Directors of Education (CDIP) amongst other things aims to guarantee the quality of education by fixing standards to be attained by pupils in languages, mathematics and science at the end of the 4th, 8th and 11th year of their studies (including two years of kindergarten (ages 4 to 7, depending on the canton).

These standards can either be defined in terms of the content to be studied or the competences to be acquired. Experts are currently working on the definition of these standards and their propositions are to be ratified by the cantons via the CDIP.

ICT in the curriculum

Presently ICT does not figure systematically in the curricula of the cantons. However, the French-speaking curriculum mentions ICT as a tool for language learning and as a independent discipline within the field of general education.

School ICT plans

According to the PPP study, there are considerable differences between the linguistic regions when it comes to the development and implementation of a rationale for the integration of ICT in schools. In the German-speaking part of Switzerland, 33.4% of schools have such a concept whereas only 5.8% of French-speaking schools have an ICT rationale.

Survey

A survey currently being carried out by the CTIE (Centro Svizzero della Tecnologia dell'Informazione nell'Insegnamento) provides an overview of the political and educational measures addressing the integration of ICT in the Swiss Educational System. The survey was based on a questionnaire addressed to those responsible for such matters in the cantons and asks for them to report on existing measures.

With the exception of one canton, all agreed to participate in the survey. Initial results from the 25 answering cantons show that 20 of them specify concepts including components to further the integration of ICT. From a more didactic point of view, 18 cantons have adopted a curriculum which integrates ITC. Among the cantons without such a curriculum two mention that they are waiting for the forthcoming French-speaking curriculum (PER), which will provide a curricular program integrating ITC.

As far as October 2008 Canton Ticino did not have any specific measure for integrating ICT in the compulsory school curriculum.

ICT in teacher education

In the PPP (Partnership Public-Private) study on ICT integration in education over 70% of those responsible for ICT in schools pointed to the lack of knowledge and know-how on the part of teachers as being a barrier to objectives set for ICT use. As for the teachers, over half (57.1%) assessed their ICT competencies to be above average although women generally judged their competencies to be on average half a point less than men (on a scale from 1 to 5).

Practical integration of ICT in teaching and learning

The 2006 report of the CTIE on teachers' professional development in ICT use stresses that considerable progress has been made since the last report was published in 2001. Teacher development in ICT use is now organized in optional, in-service training courses although some courses have been made compulsory. Demand for courses from 2000 to 2004 was mainly centered on technical competences. However, the content of training is increasingly shifting towards methodological and didactical considerations and the practical integration of ICT in teaching and learning. In addition, efforts are currently being made to include pedagogical use of ICT in initial teacher training.

When asked to identify future challenges the Cantonal representatives in the PPP School on the Net pointed amongst other factors the need to achieve better integration of ICT use in teaching. Concern

was also expressed about the sustainability of ICT training when federal funding stops with the end of the PPP (in 2007).

A research carried out both in Canton Ticino and in two Italian regions (Umbria and Emilia – Romagna) about practices and attitudes of teachers toward technologies showed that teachers frequently use multimedia and technologies at home, while at school the use of ICT is much less diffused[2].

Cantonal ICT Competence Centers

The integration of ICT in schools – both for students and in teacher training – is supervised and promoted by competence centers at cantonal level. Each canton therefore has a specific ICT Competence Center[3].

---

[2] Annex A briefly present the results of the research.

[3] Annex B provides a list of the centers.

3. Internet Usage in Switzerland

The following diagram shows the use of internet in Switzerland since 1997 to 2004[4]. The percentage indicates the number of people who used internet at least once in the last 6 months. The rapid increase of users and the high penetration is apparent. In 2004 nearly 70% of the population had used at least once internet in the 6 months before they were interviewed.
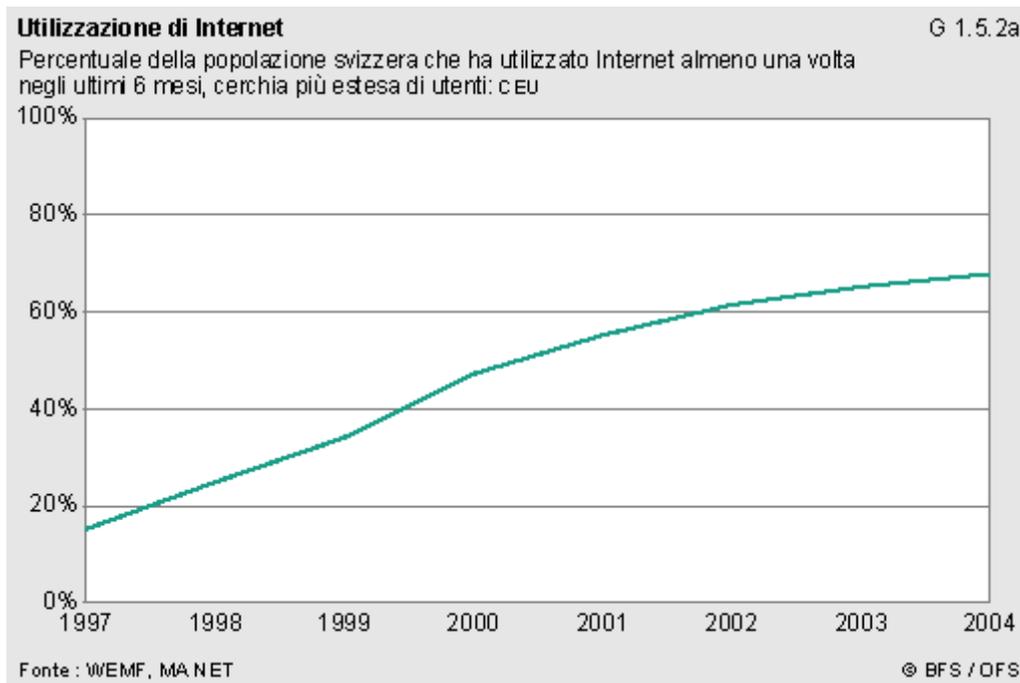
Figure 2 - Intenet use in Switzerland

The following diagram shows the use of internet in Switzerland between 2000 and 2004, with a distinction by gender. Both men and women increased their use of internet during the considered period (average from less than 50% to nearly 70%), but the percentage of women using internet is constantly inferior to that of men. However, the distance between the two figures slightly decreases over time.

---

[4] Data in this section are taken from
http://www.bfs.admin.ch/bfs/portal/it/index/themen/00/02/sektoriel/03_05/03_05_02/03_05_02_01.parsys.0004.Image.direct.gif.html
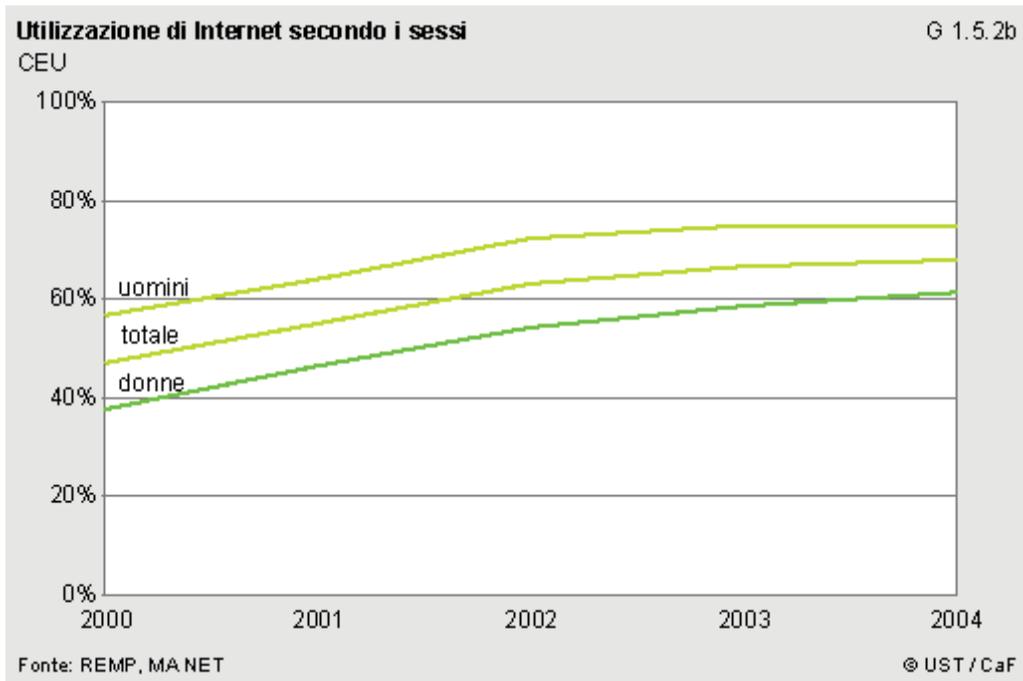
Utilizzazione di Internet secondo i sessi   G 1.5.2b

CEU

uomini

totale

donne

Fonte: REMP, MA NET   © UST / CaF

Figure 3 - Average internet use by gender

The following diagram shows the use of internet in Switzerland between 2000 and 2004 according to the different age. While all the age groups increased their use of internet during the period, according to the overall national trend, young people seems more keen to make a more pronounced usage.
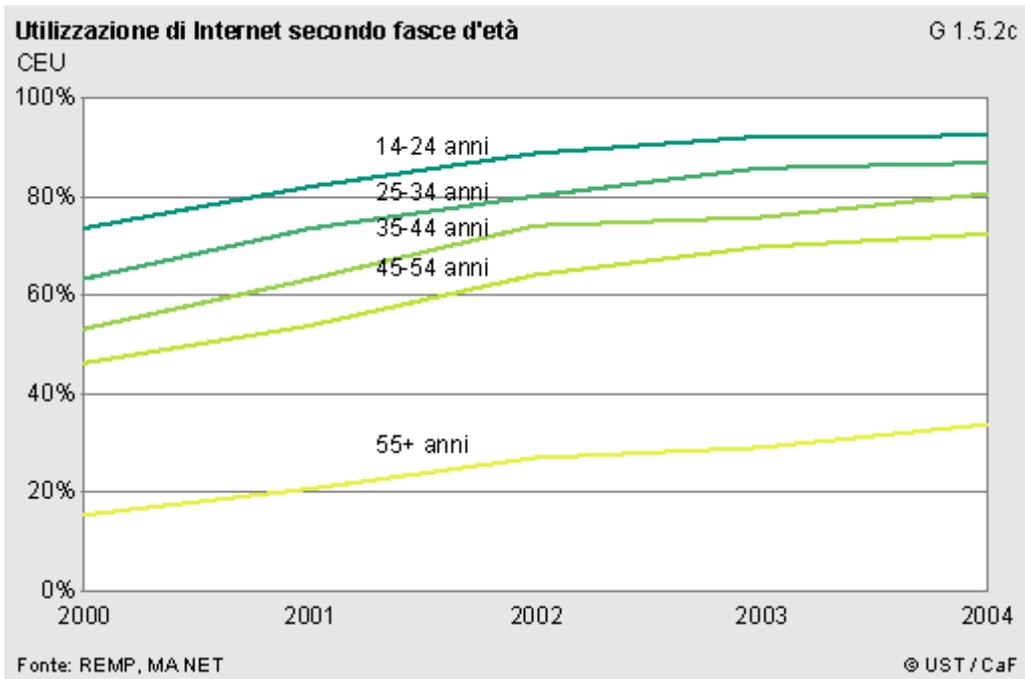
Figure 4 - Internet use by age

4. ICT and STEM at University

In 2007 more than 10'000 licenses[5], degrees and masters have been issued by *Swiss Universities and Technical Universities*. This number is increasing year after year. Since 1980 it has nearly doubled. The number of males obtaining these degree (licenses, degrees and masters) was constantly higher than the number of females, but for the first time, in 2006, this trend changed/reversed. For the coming years it is expected to be nearly the same percentage of male / female obtaining university degrees.

The number and the distribution according to the gender strongly depend upon the area of study. Social and humanities studies, Economics and exact and natural science register the wider number of licensees and degrees each year.

Distribution among males and females shows a predominance of the former for the technical and economic branches and of the latter for social disciplines, Medicine and Pharmacy and Law. Indeed, Technical Sciences (among which are Informatics and Computer Sciences) have the lowest rate of female versus male ratio.
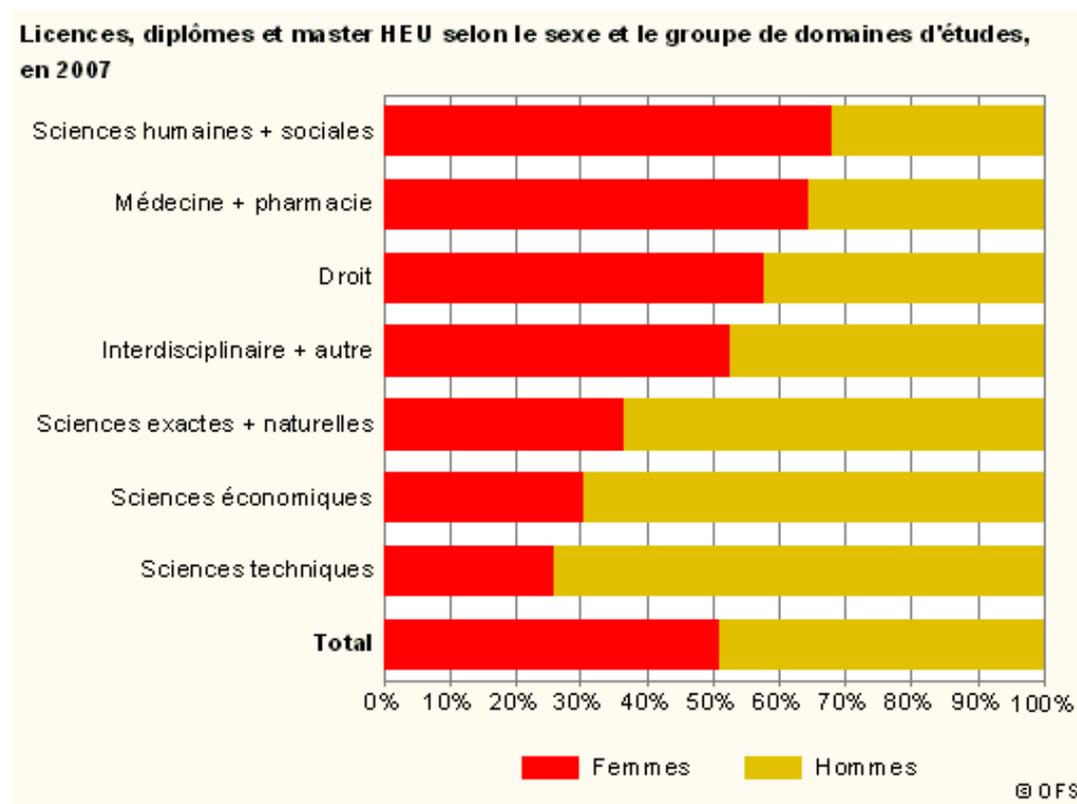

Figure 5 - Degrees by faculty and gender

---

[5] Data in this section are from
http://www.bfs.admin.ch/bfs/portal/fr/index/themen/15/06/key/ind1.indicator.10401.html

5. Income of Professions

The following diagram shows the level of income according to gender in Switzerland in 2006. The income is reported in Swiss francs and workers are divided in group ages: from 20 to 29 years, from 20 to 39 years, from 40 to 49 years and from 50 to 63/65 years. It clearly appears that income for males is generally higher than the income for females. While income for men steadily increases with age, for women it strongly increases between the age group 20 to 29 and 30 to 39, while after 40 years old it appears to decrease.
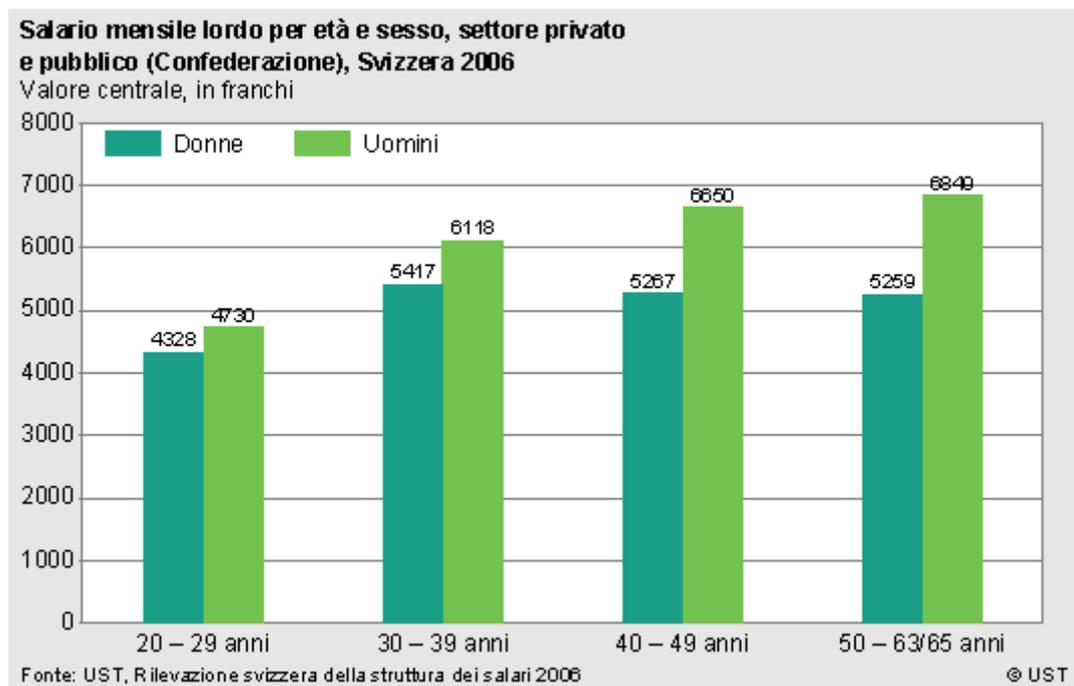

Figure 6 - average income by gender

7. Discussion

The Swiss school system is a complex field of study mainly because of its internal diversity : basically each canton enjoys a different system and has full decisional power on it. This makes it difficult to identify trends or nation-wide issues. To the purposes of the PREDIL project, this suggests that research should be conducted at a cantonal level, as only an extensive research at intercantonal level would be satisfactorily (but is undoable with current budget constraints).

As indicated by the data collected here, only a few cantons have a strategy for the inclusion of ICT in school teaching, and even fewer have ICT classes. However, the existence of an ICT competence center in each canton indicates the intention to take care of a smooth and effective exploitation of digital media in school teaching. Understanding what the strategies are, and how they are implemented in school teaching would make the subject for an interesting research, as few data are currently available.

When it comes to higher education, Switzerland seems aligned with international trends, that see a large gender gap in the selection of careers, where ICT and technical sciences see the lowest percentage of female students.

Annex A

Nuovi media per insegnare. Pratiche e atteggiamenti degli insegnanti di fronte alle nuove tecnologie: una ricerca nelle scuole italiane e nel Canton Ticino[6]

Un'indagine svolta parallelamente nel Canton Ticino e nelle Regioni Umbria e Emilia-Romagna, promossa dall'équipe del Prof. Carugati dell'Università di Bologna e sostenuta dall'Ufficio studi e ricerche del DECS, ha permesso di valutare la portata dell'impiego delle Nuove Tecnologie dell'Informazione e della Comunicazione (NTIC) nel contesto scolastico.

In particolare, l'indagine - nella quale sono stati coinvolti all'incirca 300 insegnanti- si proponeva di illustrare le strategie di impiego delle TIC nelle pratiche didattiche quotidiane dei docenti riconducendole ai diversi modelli teorici di resistenza/appropriazione delle innovazioni evidenziati nella letteratura sociologica e psicologica.

Dai risultati emerge un diffuso utilizzo di multimedia nella vita privata: programmi per ufficio, Internet ed e-mail sono strumenti di uso praticamente quotidiano per la maggior parte degli interpellati, e ciò esclude di fatto fenomeni di resistenza, ansia e paura verso le nuove tecnologie.

"Più selettivo" risulta invece l'impiego dei nuovi media in classe: prevalgono infatti applicazioni facilmente compatibili con le pratiche didattiche tradizionali (video-scrittura, esercizi, consultazione di cd-rom), mentre l'accesso alla rete o ad altri strumenti interattivi restano per il momento meno diffusi.

Alcuni fattori psico-sociali incidono sull'impatto dell'informatica in classe: gli insegnanti giovani utilizzano le nuove tecnologie per insegnare quando hanno atteggiamenti e valutazioni positive sul loro impatto didattico, viceversa gli insegnanti più anziani lo fanno soltanto se ritengono di possedere un elevato grado di competenze informatiche, e dunque solo se hanno ricevuto un'adeguata formazione.

Anche i fattori di natura organizzativa si rivelano decisivi. L'impiego didattico dei nuovi media è più frequente laddove la scuola offre un supporto logistico adeguato: anche i docenti meno esperti in informatica, infatti, introducono i multimedia nelle loro classi, ma soltanto se sanno di poter contare sul supporto tecnico di colleghi più esperti di loro. In conclusione, si può affermare che non esistono insegnanti innovatori e insegnanti ostili all'innovazione, ma esistono contesti organizzativi che frenano o facilitano l'impatto reale dell'innovazione.

---

[6] http://www.ti.ch/decs/ds/usr/caratteristiche/concluse/NUOVIMEDIA.asp

Annex B

Cantonal ICT Competence Centers

AG	Beratungsstelle digitale Medien in Schule und Unterricht	www.imedias.ch
AI	Erziehungsdirektion	www.ai.ch
AR	Volksschule Appenzell Ausserrhoden	www.ar.ch
BEdt.	Informatik Volksschule	www.schulinformatik.phbern.ch
BEfr.	Portail formation	www.erz.be.ch
BL	ICT Schulen BL	www.edu-bl.ch
BS	ICT an BaslerSchulen	www.edubs.ch
FL	Arbeitsstelle Schulinformatik FL	www.llv.li
FR	Die Integration der ICT in den Unterricht der Freiburger Schulen	www.fri-tic.ch
GE	Services Ecoles-Médias SEM	wwwedu.ge.ch
GL	ICT Glarner Schulen	www.ict.glarnerschulen.ch
GR	Pädagogische Hochschule GR	www.ict-zentrum.ch
JU	Centre d'Emulation Informatique Jurassien CEIJ	www.educ2006.ch
LU	Zentrum für Medienbildung	www.phz.ch
NE	Projet ICT	jahia.rpn.ch
NW	Bildungsdirektion	www.nw.ch
OW	Bildungs- und Kulturdepartement	www.ow.ch
SG	Fachstelle Informatik Volksschule	www.schule.sg.ch

SH	Fachstelle Informatik KITU	www.kitu.ch
SO	Beratungsstelle digitale Medien in Schule und Unterricht	www.imedias.ch
SZ	ICT Schwyz	www.ictschwyz.ch
TG	Fachstelle KICK-Zentrum für Medien	bildungsserver.phtg.ch
TI	Informatica Alta Scuola Pedagogica	www.aspti.ch
UR	Informatik	www.volksschule-uri.ch
VD	Centre de ressources HEP-VD	www.hep.vd.ch
VS	ICT in der obligatorischen Schule / ICT à l'école obligatoire	www.ictvs.ch
ZG	Organisation für Schule Kommunikation und Informatik Volksschulen OSKIN	www.oskin.ch
ZH	Bildung und ict	edu-ict.zh.ch