

BREAKING BARRIERS AND FIGHTING WINDMILLS: Strategies for attracting more women into higher ICT education in The Netherlands

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Abstract

In Europe there is a deep gender imbalance in ICT professions. Only about 15% of the ICT jobs are occupied by female employees. Although the situation varies in different sectors and European countries, a gender imbalance and a professional skills shortage are common features of the ICT labour market in Europe.

At a cost to both their own opportunities and society's ability to produce people with much-needed ICT skills, women continue to be underrepresented in ICT education. They represent less than 10% of the student population in ICT university programs. Although some of the barriers that women face have their foundations in cultural expectations established well before the college level, departments can take effective steps to increase recruitment and retention of women students.

Several strategies have been and are being adopted in Europe and in The Netherlands to increase the number of female ICT students.

Keywords: strategies, inclusion, gender, image, Europe.

1. Introduction

Young females do not feel attracted to ICT education, mostly because they think it will be too difficult and boring for them. Once they have decided to choose for an ICT education, some of them drop out for various reasons.

In order to enrol into ICT advanced or academic education young female students in secondary school usually think they have to possess technical skills. They expect to study technical subjects and a large share of mathematics. The image of advanced or academic ICT education is based on the idea that you will be working on computers all day. Regarding job profiles in ICT, (female) students mostly do not have any concrete ideas of what kind of jobs ICT professionals fulfil. Qualitative research shows job profiles are usually connected to 'working a whole day on a computer' and 'earning a lot of money' [1].

Existing barriers to women in ICT programs have been detailed in many reports [2]. To a large extent, computer science departments face the same recruitment and retention problems that affect other engineering disciplines, such as:

- patterns of discriminatory behavior that create an unsupportive classroom environment
- gender correlated differences in how students assess their own performance
- the scarcity of role models
- the lack of a sufficient critical mass to sustain supportive peer communities.

These common factors are all critically important in computer science. There are, however, additional, more specific problems that seem unique to or particularly pronounced in computer science, including:

- the level of ICT experience that students have prior to college differs markedly with gender.
- the culture that develops around ICT departments is often unattractive to women.

Many women who actually graduate in ICT education and start to follow an ICT career path, choose for another career path after a certain period of time [3]. Working and employment conditions seem to play an important role in the decision to choose for another career. Moreover, the dominant professional culture relies on male-dominated behaviour, values and expectations. The exclusionary culture of ICT reinforces the structural factors that disadvantage women. Women in ICT have to cope with this male dominated professional environment.

After a short introduction to the education system in The Netherlands I will describe the following:

- My research on the attractiveness of ICT studies in The Netherlands
- Choice selection of recent initiatives and research on women and ICT in Europe
- Several strategies that have been and are being adopted in Europe and in The Netherlands to increase the number of female ICT students.

2. The education system in The Netherlands

The Dutch education system comprises primary, secondary and higher education [4, 5, 6]. Primary education is compulsory from the age of five and lasts for eight years. Pupils' performances in the upper years of this phase determine the type of secondary school they should attend. Secondary education, which starts at the age of 12 and is compulsory until the age of 16, is divided into two consecutive vocational programmes, VMBO (junior secondary pre-vocational education) and MBO (secondary vocational education) and two parallel programmes, HAVO (senior general secondary education) and VWO (integrated pre-university education). The programmes vary both in length - from four to six years - and in the difficulty of their respective curricula, i.e. from vocational training (MBO) to university preparatory education (VWO). In general, students in Higher Professional Education will have graduated from a HAVO, VWO or MBO programme.

2.1. Higher Education

The Netherlands has 50 Universities of Professional Education (UPEs) and 14 academic universities, one of which is an open university offering distance education. The differences between the UPEs and the universities have become less marked in the course of time owing to collaboration between the two types of institution, general

trends in higher education and new legislation. Nevertheless, a number of differences remain. UPEs, which offer four-year bachelor's degree programmes and an increasing number of master's degree programmes, are more geared towards practical training. The programmes focus on specific occupations and include traineeships or work placements that provide students with practical work experience. Universities, on the other hand, traditionally offer four to six-year master's, post-graduate and PhD programmes. The UPEs have only recently begun offering master's degree programmes, in response to certain labour market demands. Some of these programmes are run in conjunction with English universities and therefore lead to an accredited Master's degree within the English educational system. The programmes are conducted mainly in English.

The Netherlands association of universities of professional education divides the 50 UPEs in seven sectors:

- Economics and management
- Engineering and technology
- Health care
- Behavior and society
- Agriculture and the natural environment
- Fine and performing arts
- Education.

2.2. ICT programmes

There are 13 academic universities that offer ICT programmes on a bachelor, master and Phd level. They offer different programmes. About 10% of these courses are Business oriented, 30% Software Engineering oriented and 50% Computer Engineering Oriented.

The 25 professional universities that offer ICT programmes on a bachelor and master level are united in the 'HBO-I Stichting', the Dutch cooperation of ICT courses in higher professional education. The HBO-I has described the bodies of knowledge for the three types of ICT programmes that the professional universities offer at the moment [7]: Business Information Technology (20%), Information Technology (50%) and Computer Science (30%).

Recently a number of ICT related programmes have been developed in the field of multimedia design. Some of these programmes are participating in the HBO-I.

Business Information Technology is traditionally an economic study, offered by economic faculties. Information Technology and Computer Science are located in technical faculties. More and more universities have created ICT faculties that offer the three (or four) types of ICT programmes. However, the Dutch association of professional universities does not acknowledge ICT as a separate sector. Therefore, most universities organise their ICT faculties in the technical domain. An important goal of the HBO-I is to put ICT - as a domain - in a broader, not just technical, perspective. Hence, one of the main issues and challenges for the HBO-I at the moment is to create a new sector ICT.

3. Gender imbalance in ICT professions and education

In Europe, the gender gap in access to and use of ICT has been reduced significantly. Still, however, the number of women who take a higher education in ICT is significantly smaller than the number of men. In fact, from the mid 1980s, the percentage of women professionals in ICT studies has actually decreased. In order to turn this unfortunate development and achieve a gender balance, action needs to be taken to recruit more women into higher ICT education.

Three types of factors can explain the gender imbalance in ICT professions [8].

- *Education and training.* Women are under-represented among ICT students (intermediate and higher degrees), as well as in vocational training and lifelong learning initiatives. ICT courses seem to be unattractive to girls and women. This imbalance has got worse during the last years, despite a diversification of ICT curricula.
- *Working and employment conditions.* The working conditions of many ICT professionals (working hours and rhythms, overlaps between private and professional life, etc.) are often not attractive. Voluntary working time arrangements are rare. Recruitment practices and career management are other sources of women's exclusion.
- *Culture.* The dominant professional culture relies on male-dominated behaviours, values and expectations, such as ICT applications in daily life (computer games, Internet services). The exclusionary culture of ICT work reinforces the structural factors that disadvantage women.

There are several reasons why it is important to recruit more women into ICT studies [9]. ICT is a growing industry with notable influences on society. Four arguments support the need for such recruitment efforts:

- The justice argument points to the fact that women may be deprived of an opportunity to contribute to and influence a growing and important technology in all parts of the society.
- The equal opportunity argument points to women's rights to the benefits offered by the ICT industry labour market.
- The resource argument refers to societal losses when the scientific and technological talents and experiences of women are not utilised.
- The labour market argument highlights women's potential role in contributing to the supply of computer science educated labour to the industry.

4. The image of ICT

One of the goals of the HBO-I, the Dutch cooperation of ICT courses in higher professional education, is to provide future students an accurate picture of ICT education at university level. In 1994 the HBO-I conducted a research among secondary and vocational education pupils and first year ICT students. Seven years later, in 2001, this research was repeated. Goal of the research was understanding the attitude of young people towards studying ICT, understanding the under-representation of women, gaining suggestions for effective strategies to change the gender imbalance in ICT programmes and hence increasing the number of ICT students. In this paragraph I will

discuss the results of the research in 2001 and – if significant - compare them to the results in 1994 [1, 10].

4.1. Method

The research was conducted in two steps: in depth interviews with 58 selected pupils, 17 girls and 41 boys, and a written survey among 515 pupils, 45% girls and 55% boys. The pupils lived all across The Netherlands and came from 13 different schools of secondary education.

4.2. Results

More than 50% of the pupils have started their orientation on further education. One out of five pupils has made a choice. These numbers are significantly higher than the results in 1994. Pupils start orientation earlier now. Pupils also use more information material than in 1994. They prefer to read brochures, talk to friends and relatives and surf the internet. They also visit the universities on information days.

The most popular studies are the economic programmes. This was also the case in 1994. However, there is a big gap between the preferences of girls as a separate group and boys as a group. To girls social studies are the most favourite. Boys choose technical studies, which are the least attractive for girls. Almost 20% of the pupils is interested in an ICT study. There is however a large difference between girls and boys: girls are hardly interested (2%) while almost a third of the boys is.

Pupils base their choice for further education first of all on the specialism and the profession they can have in the future. Course content and organisation of the university are the second reason for making a certain choice.

In 1994 pupils described ICT students in a stereotypical way: as nerds with no social life. In 2001 they have a much more realistic view on ICT students: normal people who like working with computers and are good at solving problems.

Half of the pupils know that ICT programmes are broad and practical, and that studying ICT also means that you have to solve problems. In 1994 ICT studies were considered difficult. In 2001 pupils find them no more difficult than other studies.

The results show furthermore that ICT is considered as technical.

4.3. Conclusion

The results show that the pupils have a pretty realistic view on ICT studies and a positive attitude towards high education in general. The economic studies are the most popular ones.

The technical image of ICT is a real obstacle for girls. They don't like technical studies, hence they don't consider ICT as a possibility for their further education.

Furthermore, the pupils show a lack of knowledge about concrete ICT professions.

4.4. Recommendations

Good information is vital in any attempt to increase numbers of students. The information has to focus on ICT in a broad perspective: ICT is everywhere. In this perspective it is also necessary to give pupils accurate information on ICT professions. The technical image of ICT drive girls away from ICT studies. The policy of the HBO-I aims at increasing the number of female students. Information activities for girls only have little effect when the universities maintain their technical and male culture.

Second, pupils start orientation on further education at an early age. It is important to give the right information to pupils in the first three years of secondary education. Furthermore, ICT students, both female and male, are important role models. It is recommended to bring them in contact with pupils to inform them about their studies.

5. European initiatives and research

There have been – and are - numerous analyses, initiatives, investigations and efforts all over Europe to recruit and retain more women in ICT. Here I will restrict the choice selection to four European projects.

5.1. WWW-ICT

WWW-ICT, Widening Women's Work in Information and Communication Technology, is a project within the European programme Information Society Technologies (IST), fifth framework programme [8]. Most existing studies have limitations and gaps that WWW-ICT intends to overcome. They are often limited to classical computer professions, while WWW-ICT intends to encompass new professions linked to new communication technology. They often concern the gender bias in initial training, while WWW-ICT will also take into account the vocational training system. Studies of the shortage of ICT professionals are mostly centred on the demand/supply relation, while WWW-ICT will also take into account the role of professional models and professional trajectories as a factor of integration or exclusion. The project's objectives are to provide a comprehensive and focused investigation of the gender gap in ICT professions and to propose some pathways to improve equal opportunities, women's participation in the ICT labour market and the quality of life in ICT professions. It aims at achieving four scientific objectives:

- developing a comprehensive understanding of the various aspects of gender disparities in ICT professions
- conducting empirical investigation of these disparities, through qualitative case studies and interviews
- identifying policy implications of equal opportunities in ICT professions
- disseminating results, recommendations and good practices to agents of change.

5.2. SIGIS

The SIGIS project, Strategies for Inclusion of Gender in the Information Society, is another IST project concerning gender issues in ICT. SIGIS addresses women as ICT users, at work and in everyday life, while WWW-ICT focusses on women in ICT professions. Most of the SIGIS reports are available on-line [9].

5.3. EQUAL

Funded by the European Social Fund (ESF), EQUAL tests new ways of tackling discrimination and inequality experienced by those in work and those looking for a job. The key principals of EQUAL are: transnational co-operation, innovation, empowerment, thematic and partnership approach, dissemination and mainstreaming to ensure that EQUAL informs policies and practice. The activities are structured on the four pillars of the European Employment Strategy: Employability, Entrepreneurship, Adaptability and Equal opportunities for women and men. In addition EQUAL has a separate theme which addresses the needs of asylum seekers [11].

5.4. PROM-ICT

The European Union Leonardo da Vinci Community vocational training action programme seeks to consolidate a European co-operation area for education and training. The programme actively supports the lifelong training policies conducted by the Member States. It supports innovative transnational initiatives for promoting the knowledge, aptitudes and skills necessary for successful integration into working life and the full exercise of citizenship, and affords scope for links with other Community initiatives - particularly the Socrates and Youth programmes - by supporting joint actions.

PROM-ICT, promoting ICT to female students, aims at developing innovative e-Content modules and counselling schemes. The innovative approach will be tested by educational professionals, vocational guidance counsellors from public employment services as well as companies. Hereby female students shall be supported in their decision making process as well as their career path in the sector information & communication technologies and new media [12].

6. Strategies for inclusion

It is no easy challenge to design instruments that serve to make more women apply to higher education in ICT. Several analyses come up with strategies for recruiting and retaining women in ICT education [1, 2, 9, 13, 14]. The most common mentioned strategies are listed below.

- Extensive gender inclusive advertising campaigns, including visibility effects in upper secondary school.
- Role models, for example women students as well as women faculty and professionals. One way of making role models visible is by focusing on women in advertisements or using women to promote ICT programmes in media or schools. However, it is above all important to provide role models through the appointment of women faculty and to use women students as teaching assistants as much as possible.
- Educational reform by improving the quality of teaching and tutoring, including training (male) teachers to raise awareness on gender aspects and stereotypes and make them sensible to both women's and men's learning skills and needs.
- Curricular reform aimed at contextualising ICT. Women students may particularly benefit from learning about the future uses of ICT education.
- Gender controlled composition of teamwork groups is important when the number of women students are low to avoid that women students feel marginalised.
- Providing a safe, gender-friendly and non-discriminating environment.

In order to achieve the best possible effect of inclusion efforts it is important to take into consideration that women are by no means a homogenous group. Stereotyping, drawing upon traditional images of women and femininity, is a bad strategy. Women do not feel targeted by stereotypes. Stereotyping makes women even feel less appreciated. Also note that women students in ICT usually are quite resourceful. They refuse to be treated as a group that need special attention. It is important to emphasise that inclusion efforts should as much as possible be presented as not directed explicitly toward women

only. On the contrary, they preferably should be seen as an offer to all students, men and women, even if they are motivated by a concern for women students.

Thirdly, relative numbers are crucial to avoid marginalisation of women students. In order to create and maintain a peer-supportive environment among women, there is a strong need to be beyond a certain critical mass of women. Case studies show that if one reaches a significant number of women students, ICT no longer appears as a particular masculine domain, but rather as an education just as suitable for women as for men. In cases where women are in a marginal position or underrepresented, it is a good strategy to facilitate the creation of networks in order to contribute to community building among women students or faculty.

There are two rather controversial strategies that are being discussed now in The Netherlands. One has to do with the allocation of quota. A quota of admittance reserved for women only is a way to signal that women are really wanted. Whether this is a good signal or not is the topic of many policy discussion. No one doubts that a sufficient number of women students is crucial to achieve for them a peer-supportive community and to make the education appear as more gender neutral. Opponents however state that quota stigmatize women as a group in need of help.

The second controversial strategy is introducing single-sex classes. One reason for the under-representation of women in ICT education at all levels of the Western education system is that computer classroom is not attractive to many girls. In mixed-sex classes boys dominate the classroom and even make the girls feel uncomfortable through both physical and verbal aggression. This leaves the girls marginalized in a physical sense; they tend to work on their own with little interaction with other students. Such an environment often results in girls feeling isolated when taking computing classes, particularly when they are in the minority. But are girls better off in single-sex schools? Some researchers contend that enrolling girls in single-sex schools shelters them from the real world and perpetuates the idea that girls must be protected from boys, and their masculine behavior. On the other hand, some experiments have shown this to be a successful strategy which benefits both boys and girls [15, 16].

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