



# Exchange of Good practices on gender equality

## Gender training in education

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# Gender training in science and engineering education

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## 1. Policy context and interventions

### 1.1 Introduction policy context of The Netherlands

The Dutch Ministry of Education, Culture and Science has a sub-department 'Directie Emanicipatie' in which gender is a core theme. Policymakers of this sub-department use a structural approach on gender issues related to all kind of disciplines such as safety, reproductive health, homo-emancipation, domestic violence, and also regarding education. Policy of this sub-department has different core themes, such as economic autonomy for women, more women in higher positions in public and private sectors and fighting the gender pay gap. In education one gender oriented theme prevails:<sup>1</sup>

- **To encourage more girls in science and engineering.**

This theme is already on the policy agenda for a longer period, interventions and effects are shortly discussed in this paper.

In The Netherlands we are inclined to consider that gender and education is no longer a priority, since girls and female students do even participate on a higher educational level than boys and male students. Female pupils and students do also graduate more often with a qualification than their male counterparts, as confirmed in recent statistics. However, this may be a very positive conclusion for related issues to gender and education. Looking into the choice for a particular education, we may conclude these reinforce gender segregation as female pupils opt for language, cultural and economic education and not for science and engineering. Regarding facts and figures in science and engineering education, male students are still a large majority in comparison to a marginalised group of female students. Such a gender segregated choice for education also reinforces gender segregation on the labour market. A large majority of female students choose for alpha education (language, cultural or healthcare education) and very little do so for science and engineering.

### 1.2 Policy debate on gender and education

The current debate on this issue is that women neglect a certain talent since they choose for education in which they can relate themselves and their peers (other women). Currently, many policy actions and interventions concern the

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<sup>1</sup> Meer Kansen voor Vrouwen. Nota Emanicipatiebeleid 2008-2011. Den Haag: Ministerie van Onderwijs, Cultuur en Wetenschap.

encouragement of female students for science and technical engineering.<sup>2</sup> I will summarize some of these which can be identified as interventions, in the following paragraphs. Remarkably very few policy actions, programmes or interventions are developed in order to encourage more male students into healthcare and education. Looking into shortages on the labour market in these sectors, this may be appointed as a troublesome development.

### 1.3 Policy interventions in the practice of education

In different educational stages policy interventions were implemented to encourage more girls in science and engineering education. For the different stages in education an example of a practical intervention is formulated and the output will be shortly discussed. Overall goals of these interventions were:<sup>3</sup>

- Positively change the perception of girls regarding science and engineering;
- Positively change gender-biased perceptions of teachers, deans, management and parents regarding science and engineering;
- Create awareness among teachers, deans and management regarding gender stereotyped perceptions on science and engineering and train them how to deal with this in education;
- Actively involve role models in science and engineering (young female professionals) for young girls and female students;
- Encourage girls to discover themselves their talents regarding a science and engineering career;
- Encourage female pupils with a Nature and Science/ Nature and Health profile to decide for a follow-up education and career in science and engineering.

#### 1.3.1. Primary education

In primary education it is considered important to encourage girls at a young age (from 10 to 12 years old) to choose for topics which concern science and engineering. Many Dutch girls grew up with stereotypical perceptions on science and engineering. VHTO, an organisation which encourages girls and women to choose for science and engineering, implements many interventions which have shown to positively influence choices of girls and women for science and engineering.

One of VHTO programmes in primary education concerns 'Talentkijker' (Talentspotter). In cooperation with a science centre in Amsterdam they challenge young girls and boys to spot their talent for science and engineering together with – for the most part female - professionals in science and engineering. Which skills are necessary to develop in order to become a professional in science or engineering? In different stages of this intervention teachers are trained in gender and

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<sup>2</sup> Merens, A., Brakel, Van den M., et al. (2010) Emanicipatiemonitor. Den Haag: Sociaal Cultureel Planbureau.

<sup>3</sup> Interview with project manager VHTO, Carolien de Neeve, September 2012.

science/engineering and the project in particular. Furthermore, parents of pupils are also involved in the project; they will be informed on the intervention and will discuss the role of science and engineering in their own profession. Girls are actively encouraged by means of a presentation, preparing questions for a professional in science and engineering. The whole intervention is implemented together with school in primary education.

### **1.3.2. Secondary education**

In both lower vocational training (vmbo) as in secondary education (havo/vwo) many interventions have been implemented by VHTO<sup>4</sup>. VHTO uses an integrated approach in which they involve the girls themselves, the teachers, deans and management of the school as all these levels interfere with the mindset of female pupils. A well working intervention – as part of this approach -are the ‘speed dates’ with female professionals in Science and engineering for young girls in second or third grade. The girls are introduced to different professions in science and engineering and can ask a female professional about her daily work and life. The emphasis is to show how many various skills and knowledge match to science and engineering, such as project management, communication skills, ICT driven skills

#### **Lower vocational training**

In practice the choice of female students in lower vocational training is reinforcing gender segregation. In 2010/2011 half of all female students choose for an education in the sector healthcare and welfare and only 5% for the technical/engineering sector. However, 48% male students were subscribed in technical/engineering education. In recent years the unique and strong collaboration of private enterprise sector, schools, funding organisations for education and trade associations known as TechniekTalent.nu is adopting VHTO’s integrated approach especially speeddating and Girlsday.

#### **Middle and high level of secondary education**

In middle and high level secondary education two decisive moments in time are important in the choice for a follow-up education.

- In the second or third year all pupils choose a particular profile. Four profiles during secondary education can be chosen: Science and Engineering, Science and Health, Economics and Culture, and Culture and Society. In chapter 2 some figures are shown of female pupils and how many of them choose for a Science and Engineering profile.
- In the year before female pupils finish their secondary school; this may be in the fourth or fifth year. These female pupils include those who already chose a Science and Engineering profile and have to make a decision for their follow-up education. Many female pupils with a Science and Engineering profile tend to choose for an education which does not match with such a profile (‘lost talent’).

The integrated approach of VHTO has sorted its effects, as outlined in chapter 2.

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<sup>4</sup> VHTO, National expert organisation on girls/women and science/technology.

## 2. State of the art and future developments

Due to policy interventions in the practice of education a slight increase of female pupils in science and engineering can be discerned. In particular in secondary education the effects of interventions were monitored and studied. It appeared that since these interventions were implemented more female students have chosen for a Science and Engineering profile. Moreover, increasingly more girls also opted for science and engineering education after their secondary school career.

### 2.1. Secondary education

On the highest level in secondary education (Vwo) girls choose for Science and Health (27,6%). A slight increase is to be seen in the percentage of girls which choose for Science and Engineering (7,5% to 10,1%). Overall, female pupils finish their secondary education more often and on a higher level than their male counterparts.

**Table 1: Female students (Vwo) divided by profile<sup>5</sup>**

2007/2008	NT	NG	NG/NT	EM	CM
Total of male and female pupils	7.002	9.618	6.831	14.353	5.024
% female pupils per profile	24,6%	65,4%	50,2%	51,6%	82,9%
female pupils divided over profiles %	7,5%	27,3%	14,9%	32,2%	18,1%
2011/2012	NT	NG	NG/NT	EM	CM
Total of male and female pupils	7.641	9.572	6.243	14.633	3.810
% female pupils per profile	28,9%	63,4%	47,5%	52,5%	80,7%
female pupils divided over profiles %	10,1%	27,6%	13,5%	34,9%	14,0%

NT: Science and engineering  
CM: Culture and society

EM: Economy and society  
NG: Science and health

On the middle level in secondary education (Havo) the majority of male and female pupils choose an Economy and Society profile. In 2011/2012 the percentage of girls in a Science and Engineering profile slightly increased.

<sup>5</sup> Source: Platform Bèta Techniek, adapted by VHTO.

**Table 2: Female students (Havo) divided by profile<sup>6</sup>**

<b>2007/2008</b>	<b>NT</b>	<b>NG</b>	<b>NG/NT</b>	<b>EM</b>	<b>CM</b>
Total of male and female pupils	6.609	10.420	2.420	25.976	12.218
% female pupils per profile	11,2%	57,8%	36,1%	43,7%	79,5%
female pupils divided over profiles %	2,6%	21,0%	3,0%	39,6%	33,8%
<b>2011/2012</b>	<b>NT</b>	<b>NG</b>	<b>NG/NT</b>	<b>EM</b>	<b>CM</b>
Total of male and female pupils	6.559	11.196	2.928	28.084	9.280
% female pupils per profile	16,1%	58,3%	38,6%	46,5%	80,5%
female pupils divided over profiles %	3,6%	22,3%	3,9%	44,7%	25,5%

Overall, in 2009/2010 more girls than boys successfully finished their secondary education. Girls also reached a higher level degree than male pupils in secondary education. Furthermore, statistics show male pupils drop-out of school more often than female pupils.

## **2.2. Higher education: applied science and academic level**

In 2009/2010 634.000 students were subscribed in higher education, of which 52% female students in applied science and 51% in universities. It can be considered that the gender problem in higher education is solved, unless the number of female students grows at the expense of their male counterparts in the near future. However, if we look into the choices for education, these are strongly segregated on gender. The percentage of female students which opt for science and technical engineering is very low, comparing to their male counterparts. If we look into science and engineering in applied science, the numbers show a very clear picture.

<sup>6</sup> Source: Platform Bèta Techniek, adapted by VHTO.

**Table 3: Inflow of female students in the ten most popular choices in science and engineering education (2011/12)<sup>7</sup>**

Education	Total of inscribed students	Women	% Women
Information engineering	2.034	82	4,0%
Building engineering	1.718	297	17,3%
Communication and multimedia design	1.682	515	30,6%
Product engineering	1.629	43	2,6%
Technical business engineering	1.330	110	8,3%
Biology and Medical Lab research	1.190	673	56,6%
Electrical engineering	1.094	49	4,5%
Civil engineering	724	53	7,3%
ICT studies	639	80	12,5%
Chemical engineering	621	190	30,6%

For studies such as Information engineering, Product engineering and Electrical engineering the inflow of female students is particularly low. Overall, female students tend to choose for engineering with a medical, societal or biological discipline, such as biotechnology, orthopedic technology or forensic research. On university level an increase of female students in science and engineering is shown. However, this increasing percentage can be mainly claimed by Architecture, Urbanism, Building services and Civil engineering.

**Table 4: Inflow in science and engineering in universities<sup>8</sup>**

Cohort	Total	Men	Women	% Women
2006/2007	5.032	4.183	849	16,9%
2007/2008	5.612	4.536	1.076	19,2%
2008/2009	5.991	4.799	1.192	19,9%
2009/2010	6.541	5.201	1.340	20,5%
2010/2011	6.165	4.704	1.461	23,7%

The inflow of female students in Electrical engineering, Product engineering and Technical informatics has not increased recently and stayed very low. Comparing to other European countries the percentage of female students in science and technical engineering is tremendously low, 15,6% towards 37,5% within 27 EU-states. Only Luxemburg scores lower with 9,8%.

<sup>7</sup> Source: VHTO, National expert organisation on girls/women and science/technology

<sup>8</sup> Source: VHTO, National expert organisation on girls/women and science/technology



## 2.3. Future developments

In the near future the topic of girls/women in science and engineering will be still on the agenda of policymakers. Till 2015 different policy targets of the Ministry of Education, Culture and Science are formulated in 'School aan Zet'. This programme also finances practical interventions on girls in science and engineering in primary and secondary education. The described interventions in this short paper will be continued and monitored in these years.

## 3. Transferability issues

In this chapter the good practices of Portugal, Denmark and Spain will be reviewed. In short their transferability will be discussed, as a whole or in parts. Subsequently, the constraints in transferability will be mentioned as well.

### 3.1. Good practice Portugal

The idea to integrate gender in citizenship education may be useful, also in The Netherlands. The integrated approach on teachers, professionals in education and on pupils and students is recommendable and appears to have a positive influence on target groups overall. Such an integrated approach could work in The Netherlands as well. In relation to the policy topics on gender and education, which prevail in The Netherlands, the approach and methodology would be more suitable for transferability than the content itself. Citizenship education is mandatory in primary and secondary education and it may be interesting to involve a gender perspective, although our cultural context differs very much.

In the former two chapters it is clearly stated that educational and academic expectations of pupils and teachers are gender stereotyped, especially in their expectations on science and engineering. Though, in general more female students attain higher results and more often graduate with a qualification, compared to their male counterparts. A lack of independence and assertiveness among girls, as the case seems to be in Portugal, is not in any case relevant to the Dutch context. In The Netherlands citizenship education mainly focuses norms and values in behaviour and attitudes of pupils and teachers. The protocol on the prevention of teasing among pupils is an important part of it (Onderwijsraad, 2003).<sup>9</sup> A strength regarding the transfer of this good practice would be that the Guides do not have the intention to create extra work for teachers, as they can use the Guides in the context of their existing teaching practices.

Overall, it would be interesting to develop an assessment tool to measure the impact of gender in citizenship education as is mentioned as a following step in Portugal.

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<sup>9</sup> Onderwijs en burgerschap advies 2003. Den Haag: Onderwijsraad.

### 3.2. Good practice Denmark

The second good practice of Denmark ‘magazine+ film/CD for girls and boys about body confidence and porn chic +teachers guide’ shows similarities with an educational intervention which was implemented on behalf of policy recommendation of ‘Directie Emancipatie’. This policy area concerns ‘media wisdom’ of young girls and boys. In The Netherlands it is reasoned that girls and boys have to deal with sexuality at a very young age. In order to increase their resilience concerning sexuality issues, young girls and boys get trained how to deal with these issues. The training focuses on the awareness of how different media deal (internet, television, gaming) with sexuality and encourages girls and boys to form their own opinions and decisions on that. Different training material was developed for pupils in primary and secondary education.

The Media Wisdom Expertise Centre, financially supported by the Ministry of Education, Culture and Science, developed training material regarding these reproductive health and sexuality and also implements the training for boys and girls in schools. Most of the developed interventions were integrated in the current curriculum of biology, health or in social participation. In Denmark educators were trained on the implementation of interventions. This was not the case in The Netherlands, but may be a good method to develop. How Dutch schools implement the training material (documents and dvd’s) is determined by the school itself, though they have to fit certain core objectives of the training programme.

Till now not much research has been done to determine the effectiveness of the interventions. One of the programmes for secondary education (‘Lang leve de Liefde’) has been evaluated and showed positive effects on knowledge and attitudes of the primary target group (pupils in secondary education).<sup>10</sup> Looking into the good practice of Denmark the implementation of the intervention was thoroughly monitored by a reference group which followed the project of the children’s book on gender roles and the educators’ guide. This direct way of monitoring the quality of interventions appears very useful.

The first good practice regarding the children’s book on gender roles and teachers’ guide may be very interesting to implement in The Netherlands as stereotyped gender roles are already constructed at a very early age. This also concerns perceptions on girls and science and engineering. Girls are very uncertain about their skills in mathematics and science at a very young age and teachers sometimes reinforce this uncertainty.<sup>11</sup> Creating awareness at a young age, 5-6-year-old children, on constructed gender roles and skills may be very useful and applicable to the Dutch context as well. Possible constraints may lie in the teachers’ approach as they are often not aware of their gender-biased perceptions. Especially in primary education this may be a problem since less than 15 percent of the teachers is male. Female teachers usually are alpha oriented. The problem on teachers’ awareness is discussed in paragraph 2.2. The debating issue on how to educate teachers on gender education would be very valuable for the Dutch context as well.

<sup>10</sup> Kocken, P. et al. (2007) Een inventarisatie van seksuele gezondheidsbevorderingsinterventies voor de jeugd van 10 tot 21 jaar. Leiden: TNO.

<sup>11</sup> Watt, H. (2004). Development of adolescents’ self-perceptions, values, and task perceptions according to gender and domain in 7th- through 11th-grade Australian students. *Child Development*.: Volume 75, issue 5: p. 1556–1574.

### 3.3. Good practice Spain

Spain has developed a training for teachers at all levels (infant, primary and secondary school levels) in order to promote equal opportunities between men and women and gender relations based on mutual recognition and freedom. However, only the first aim of these courses may be transferable to the Dutch context: To provide tools that allow teachers to analyse and review their teaching practices in order to enrich them, transform them and create ways to educate that encourage students to express themselves avoiding stereotypes. Regarding the unawareness of teachers' concerning their stereotypes of female and male pupils, this may be a good incentive to reflect on those stereotypes.

One of the other aims of the courses is to promote equality between men and women in pedagogic practices. In The Netherlands a 'reversed' gender problem concerning pedagogic practices can be discerned. Only 15,6% of the teachers in primary education is male. Regarding this problem we are looking into the curriculum of pedagogic education for primary teachers (PABO) and discussed whether this would be to 'feminine'. In secondary education male and female teachers are approximately equally divided (47,7% women, 52,2% men).<sup>12</sup>

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<sup>12</sup> Stamos.nl (Statextracts OESO).