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Degendering Science
- A Project to extending the Conception and Curriculum of the Natural Sciences at the University of Hamburg/Germany[1]

Degendering Science (DGS) is a unique project in Germany which employs a different strategy to make the natural sciences more attractive for women and other underrepresented groups than other measures in this field that are simply encouraging women. The concept of DGS aims at changing and extending the contents and the very understanding of what the natural sciences are supposed to be. This is based on the insight that one of the main reasons why women do not feel comfortable within the natural and engineering sciences as they are being taught and carried out today is because social, historical and philosophical aspects are not considered a valid part of the disciplines themselves (Bart 2000). Underrepresented groups within the sciences like women and racial minorities tend to also be underprivileged groups within society at large. Therefore they are more likely to have a complex relationship towards science and technology, since they are less likely to profit as much from the benefits and more likely to be confronted by negative aspects of the technosciences than their more privileged counterparts. Thus they might have a heightened interest in being able to reflect social aspects of technosciences. One strategy then to create more inclusive natural sciences is to change the curriculum of the sciences as well as finding ways to bridge the gaps between the technosciences on the one hand and the humanities, cultural and social sciences on the other. DGS, having its emphasis on gender related issues, especially aims at building two way streets (Fausto-Sterling 1992) between gender studies and the natural sciences. We want gender aspects to be integrated both in the curricula of the natural sciences and into gender & science studies to be part of gender studies programs, which are heavily dominated by social & cultural scientific approaches at this point. In finding strategies to reach these ambitious goals in the long run, we have to take the specific situation that we face in Germany at this point into account.

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No space for gender studies in the natural sciences

Higher education in Germany is organized in almost 360 different academic institutions. Almost 100 of them are public universities and 160 public universities of applied sciences. Others are for example art academies or colleges of public administration. The faculty members of these academic institutions are employees of the German state, even professors have the status of civil servants. This historically grown system of higher education has advantages and disadvantages for students. All universities have more or less equal reputation and all students have more or less free access to these institutions. The percentage of young people born in the same year attending institutions of higher education is almost 40%. But this very traditional system at the same time makes the universities hardly flexible to latest developments compared to universities in other countries with more private and economic orientations.

During the 1970s many (Anglo-American) universities and colleges started women's studies programs or science and technology programs (STS) that created space for the analysis of mathematics, natural science, and technology within their historical and social context and for the reflection of the social dimension of science and the gender question in science. At German universities both academic fields could hardly be institutionalised. There are no women's studies faculties, and barely any programs could be established, except for a few lecturers in the social sciences and the humanities who happened to do research in this field. Women's and gender-specific contents in research and teaching could even be less established in mathematics, natural and engineering sciences. In addition the common German university degree 'Diplom' in the natural sciences does not allow students to study in a broader interdisciplinary way or to change the main subject during a period of 5-7 years. For all these reasons students of natural science and engineering fields didn't get in touch with gender studies and feminist theories at their academic institutions.

In (Western) Germany, analyses of mathematics, natural sciences and engineering fields considering perspectives of gender relations began outside of the universities, when women students and professionals of mathematics, natural sciences and technology in the late 1970s started to share their experiences and ideas at the

”Congress of Women in Science and Technology”. This annual meeting of 300-600 women in higher education, professional training, or employment in scientific and technological professions takes place independently of any governmental or academic institutions, is organized by a group of volunteers, and was for more than 20 years the most important platform in German language for the exchange of issues in the field of gender & sciences studies. Up to now the long-standing efforts for an institutionalization of feminist science studies into natural science and engineering faculties at German universities are still scarcely successful and have just recently taken a promising turn. Since the reunification of Germany the structure of higher education study courses and the internal organization have been the subject of reform. The EU efforts of making the different systems of higher education of its member states more compatible (so called Bologna Process) further pushes the reformation and internationalisation of the traditional German university.

Initiatives for gender studies programs open new opportunities

In 1997 the Humboldt University of Berlin was the first university in Germany to develop a gender studies program. Since then more than 20 universities have started to provide gender studies programs. In general, they are connected with faculties of the social sciences and humanities, but the Humboldt University of Berlin, the Carl-von-Ossietzky University at Oldenburg (in the North-Western part of Germany) and the Albert-Ludwigs-University at Freiburg (in the South-Western part of Germany) connected their gender studies programs with the research on the medical sciences, the natural sciences, and computer sciences. Step by step more programs try to integrate the faculties and faculty members of the medical sciences, the natural sciences and engineering in their programs (Ebeling 2001).

In Hamburg a joint initiative of gender studies researchers of eight colleges and universities including the University of Hamburg started to develop a program in gender studies for their students in 1999. Most of the institutions involved have been offering a wide selection of seminars on women's and gender studies for quite some time. In fall 2003 gender studies started as minor course of studies for major courses of studies leading to a degree as a 'magister' (MA) or a 'diplom' (MSc). This minor in gender studies is unique on account of various characteristics:

(1) Three concentrations give a specific profile to gender studies at Hamburg University. Besides feminist theory and gender studies, these consist of the analysis of sexualities, identities and bodies from the perspective of Queer Studies, and the confrontation of technoscience with gender studies. This interdisciplinary approach enables the exchange between the natural and engineering sciences and the humanities.
(2) The concentration in technoscience represents the University of Hamburg's special focus on the feminist analysis of the natural and engineering sciences. Within this focus on technoscience, an attractive option are the seminars offered by the academic staff involved in (DGS) (see below). Not only students of gender studies, but also those of the faculty of education, e.g. science teachers, can obtain credits in these seminars.
(3) Gender Studies as a minor for 'magister' (MA) degrees has become popular at many German universities, but Hamburg University presents the first and up to now only option to choose gender studies as a minor for 'diplom' (MSc) degrees. This is especially interesting for students of the natural sciences as these courses traditionally lead to the MSc, the German 'diplom'.
Thus, at the University of Hamburg, it is possible to combine mathematics, physics and computer science with gender studies. DGS staff are currently working on the realisation of further combinations of gender studies with the natural sciences, e.g. earth science and biology. You can find more information on the program (up to now in German language only) at the official website (Spirgatis 2004).

Bridging the gap between gender studies and natural science (education)

This two way street is bridging the gap between gender studies and natural science at the University of Hamburg (see fig. 1). Students majoring in a variety of courses of studies like sociology (MSc / MA), English (MA), history (MA), physics (MSc) or computer science (MSc) can choose gender studies as a minor. And within gender studies they can choose technoscience as a concentration. But there are some students who complete their studies with state examinations like teachers, lawyers, theologians, and other. As long as this traditional state-run degree will not be transformed into the new bachelor and master system, these students cannot choose the gender studies minor, since they are not able to choose any minors at all.

Therefore they can only get credit for gender studies courses if they happen to be offered within their faculties, which is very common in the faculty of education, but hardly ever the case in the faculty of law or medicine.

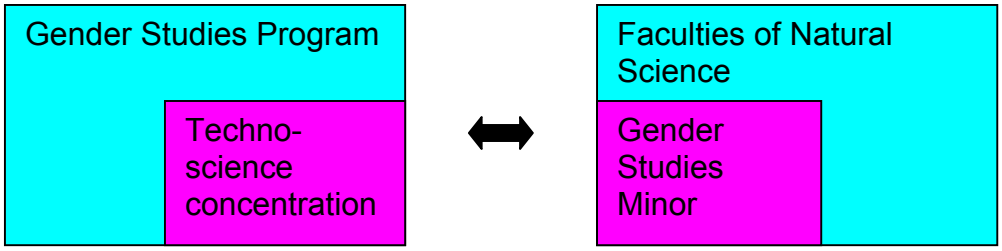

Figure 1: Two way street between natural science and gender studies.

To integrate future teachers, especially students of natural science education into the program, we started the project DGS. At the intersection of the gender studies program, the faculties of the natural sciences, and the faculty of education (Institute of Science Education) we teach courses in ‘gender & science studies’ and develop a curriculum module dealing with ‘gender & science studies’. Our students come from gender studies, are future scientists, and future science teachers (see fig. 2). Students of gender studies programs will focus on technological developments and scientific knowledge, masters of science will learn to reflect and discuss their work in a more interdisciplinary way, and science teachers will get sensitive to gender questions in their classrooms. All together they learn from each other in our interdisciplinary courses.

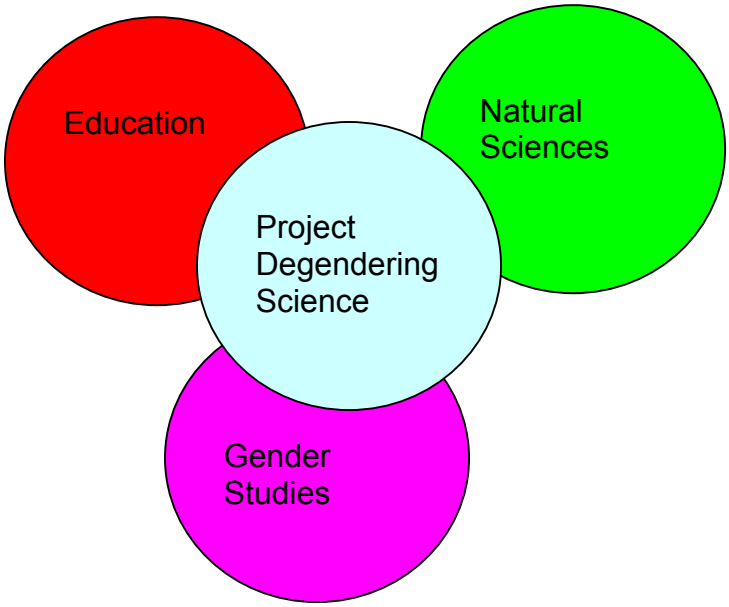

Figure 2: Degendering science situated at the threshold of three fields of studies.

A curriculum module for a future higher educational system

One of the next steps in curriculum development at the University of Hamburg will be to integrate this module into new structures brought up by the transformation process (Bologna Process) of the German higher educational system. We are developing the module (Figure 3) based on our experiences within DGS so far: it is harder to reach scientists if a gender based or feminist approach is too prominent within a seminar. At the same time gender & science studies cannot be worked out within mathematics, natural science and engineering themselves without extending the conception of natural science by adding social, historical and philosophical aspects as a valid part of this disciplines. Therefore we have chosen to offer both classes that concentrate on gender as well as classes with a broader critical approach, in which gender is one aspect besides others. We approach all topics with a feminist perspective. Our definition of feminism being to offer a critical examination of the sciences from an emancipatory perspective that started off historically striving for gender equality, but needn't be restricted to gender, also looking at other categories of social inequality like race, disabilities etc. and their interconnectedness with gender. This kind of feminist perspective is crucial to all the classes, even if this is not obvious on the surface.

SH	Module "Gender and Science Studies"	Elements (micro modules)
2-4	Basic terminology, theories and approaches of gender & science studies (introductory level classes)	a) Gender & Science Studies I b) Gender & Science Studies II
2-6	In depth discussions of some main areas of study within the field: Controversies in Science, Scientific Knowledge, Socialisation as a Scientist (advanced level classes)	a) The Science Wars b) Feminist Philosophy of Science c) The Making of a Scientist
0-4	Science in the Making: conducting research in the field, e.g. case studies, laboratory studies (research class)	a) Reflecting scientific experiments
8		

Figure 3: Students have to take 8 semester hours (SH) to complete the module Gender and Science Studies.

Due to the stage of the development in Germany, there is no common credit point system yet, so we still calculate the amount of time students spend on classes in the old system called semester hours. If a class takes place once a week for two hours each for the duration of one semester, the class will be rated 2 semester hours (SH). According to common standards, students have to take 8 SH to complete the module. They have to start taking an introductory level course. One will be dealing with sex & gender as the main focus, the other one will centre around broader fields of interest to students who want to reflect the natural sciences, like general ethical questions etc. This course will also mainstream gender aspects into its curriculum, so that gender aspects will always be a point of reference when approaching science studies issues. The students can proceed to the advanced level courses after completing at least one of the introductory classes. They may also choose to take both. The students have to take at least one course in the advanced seminar level and may take the research class at the end of their studies, in order to attain their total of 8 SH. On the advanced level we offer in depth seminars in some of the areas that we find especially relevant in the field of gender & science studies. Again, most seminars offer a broader approach to science studies issues in order for the students to have lots of connecting points to their own experiences and backgrounds, as well as to enable them to put the gender & science discussions into their general contexts. The three areas we offer advanced seminars in try to structure the field of gender & science studies how it presents to us at this point into epistemological questions, the question of the consistency of the different academic cultures of the

natural sciences and humanities which we have to transgress within gender & science studies and the question of the socialisation into scientists. If students have taken introductory and in depth classes in this module, they have acquired a basic understanding of the field and are then able to participate in a research project of their own. The emphasis here is put on fostering the skills of the students to connect their theoretical knowledge with empirical research methods. We therefore chose the approach of laboratory studies as a means for students to observe and reflect science in the making.

Classes on introductory, advanced, and research level

In the following I will give some examples of classes we have already taught developing this module for each level (introductory, advanced, and research). The introductory level seminar „The Natural Sciences and Gender Relations“ acquaints the students with the self-understanding of the natural sciences. It introduces crucial terms relevant to gender studies like sex and gender. The emphasis lies on discussing important research results of the field of gender & science studies, that are dealing with biology, chemistry, physics and technology from a reflecting perspective. Approaches that are analysing the connection between the natural sciences and gender relations on different levels were also taught: women in the sciences, the production of sex and gender through the natural sciences, and how gender relations are inscribed in scientific knowledge. The classification of these research approaches is subject of the seminar as well.

The advanced level seminar „Feminist Philosophy of Natural Science“ focuses on epistemological questions, especially on feminist alternatives to the concept of objectivity in the natural sciences. The seminar also introduces pre-feminist theories on scientific knowledge production to help students understand the theory-laden feminist approaches better and to enable them to situate them within the general discussion, among them the Edinburgh School’s strong program, social constructivism, actor-network-theory, Marxist standpoint theory. Then Helen Longino’s contextual empiricism (1990), Karen Barad’s agential realism (1996), Sandra Harding’s concept of strong objectivity (1991) and Donna Haraway’s term of situated knowledges (1991) are discussed in detail.

Currently we are teaching the research seminar “Reflecting Scientific Experiments”. It introduces students to case studies, theories and methods of science studies, especially laboratory studies, as well as gender analysis. Students learn how to observe the role of experiment within laboratories or classrooms according to ethnomethodology and go into the field. They can observe the role of experiment in scientific research and in science education (the latter they can choose to observe either in schools or in universities).

Conclusion

By establishing gender studies minors who offer a technoscience concentration we have started to build the much needed two way streets mainly from one direction so far. The biggest problem remains to ensure ongoing impact. We are still struggling to find better ways to actually get our issues into the curricula of the natural sciences themselves. The module could in theory be accepted by natural science faculties within their new curricula when creating BSc/MSc programs. But the difficulties we faced and are still facing in trying to have them accept gender studies as a minor show us that a lot of change has to come about yet before this will be a realistic option. It is still necessary to change the perception of gender studies and feminist theory by natural scientists. Hopefully natural science students who minor in gender studies will contribute to this process. But they will not have the power to question the prejudgements of scientists by themselves. They will at least need a national and international network of scholars and activists who are engaged in feminist science studies for a continuous, mutually supportive exchange of experience and strategies.

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