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RESEARCH REPORT

Girls' Groups and Boys' Groups at a Municipal Technology Centre

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This article describes the Swedish initiative of municipal technology centres from a gender point of view. These centres provide after-school technology education for children aged 6–16. By means of an ethnographic study, the effects of the use of single-sex groups in increasing the interest of girls and boys in technical activities have been studied at one of the centres. The importance of the gender of the teacher relative to the gender of the pupils is also considered. The results show that single-sex groups meant different things to boys and girls, and that the teachers' way of "doing" femininity and masculinity, respectively, in the different groups was of some importance. The results indicate that single-sex groups alone do not break down gender barriers. However, there are lessons to be learnt from a leisure-time activity that provides a different setting from that of single-sex science education in ordinary schooling

Introduction

The problem of recruiting girls to science studies and retaining them is discussed recurrently in both women's studies and among educational researchers and practitioners. A number of projects both inside and outside of school have been carried out to increase girls' interest in these subjects (Davis, 2002; Denner, Werner, Bean, & Campe, 2005; Guertin & Rufo, 2004; Lichtman, 1999; Rosser, 1998). This article describes one such project in the field of technology, in a municipal technology centre. The centre tries to encourage young girls to choose technical professions by two different means: introducing "gender-neutral technology" and working with both single-sex and mixed groups. In this article, the experiences from the single-sex groups are examined. This leisure-time activity in the field of technology, aimed at both sexes but concentrating especially on girls, brings to the fore some aspects of single-sex teaching that are less apparent in a school setting.

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What happened in the single-sex groups at the centre is interesting when one considers the co-creation of gender and technology in a society in which technology is regarded as masculine. Single-sex groups in this context highlight not only the gender of the participants (i.e., of both children and instructors), but also the gender classification of the activities in question. The aim of this article is to show how the gendering of technology permeates single-sex technology instruction, pointing at the problems but also at the possibilities in an after-school activity of this kind.

Municipal Technology Centres: Background

The Swedish municipal technology centres can be regarded as one of many efforts to interest girls in technological professions—even if their activities are not restricted to girls only, but aim to increase the interest of young people in general in technical careers. Even if they work with both sexes, one of the main aims is to increase the interest, self-confidence, and skills of girls in particular. One main feature of the technology centres is to provide children and youths between the ages of 6 and 18 with technology education that is pleasurable. They provide afternoon and evening activities, and also cooperate with schools. Municipal technology centres are supported by the Swedish Agency for Economic and Regional Growth (NUTEK), which helps municipalities to bear the cost of starting the technology centre. The reason that an important actor in the economic sector is taking an interest in the education of primary and secondary school children is the perceived lack of a technologically competent workforce. One aspect of this perception is the supposition that there exists a large female reserve that can be recruited into technical education and technical work. This is why municipal technology centres have the clearly expressed aim of recruiting young people with a breakdown of 50% females and 50% males to their activities, and providing them with tasks that girls find meaningful.

One interesting difference between a leisure-time technological centre and a school setting is the fact that the centres can create their curricula themselves. However, their offerings must be interesting enough for the children (or their parents); otherwise, they will have no participants in their activities. This means, for example, that the centres must to a certain extent adapt to the prevailing gender norms, as long as the children are not prepared to discard them. The technology centres are also well aware that their task is to inspire young people to apply for technical educational programmes, which means working with what is traditionally called technology. Thus, the freedom of the centres to design their own activities is still subordinate to general (gender-based) conceptions of technology in the educational system, at least to some degree.

This article is based on the field-work material that I collected in the first municipal technology centre in Örebro, starting in 2002. As an evaluator of the project, I have made recurrent visits to the centre during two and a half years. I have made observations on a number of courses (30 activities in different courses), repeatedly interviewed the staff (15 interviews, some of the staff being interviewed twice), taken part in informal and formal discussions, acquainted myself with a great number of

documents, and analysed some 200 questionnaires sent out to the children and teenagers attending the courses.[1] There are differences between the different technology centres, and it should be noted that when I refer to "a municipal technology centre" I am actually referring to the way the ideology has been carried out at the centre in Örebro during its first years of operation.

What Does a Municipal Technology Centre Provide?

The pedagogical ideology that the municipal technology centres are based on is "learning by doing". According to the basic ideology of the centres, the reason why girls are not as interested in technology as boys is that they are not encouraged to acquire the same experiences of artefacts—and especially of motion—in their early childhood. According to this ideology, when children grow older, boys who have had these experiences see technology as their domain, and do no allow girls to enter into the activities and discussions in which technical knowledge is exchanged and developed. In this way, technology becomes a boys' and men's thing with masculine attributes, from which girls feel alienated. The remedy for this is supposed to be to also allow girls to have tangible experiences of artefacts and to let them do it in contexts that they find attractive. They should learn to use tools that are normally used by boys and men, and to get a practical understanding of the basic laws of physics; but they should be able to do this in traditionally female domains, with traditionally female attributes, if they choose to do so.

Municipal technology centres are not only open to girls, however. The reason put forward for this is that nowadays even boys do not get this kind of practical technical knowledge in their upbringing. They might have a good grasp of the use of computers, but they have not had the basic hands-on experiences of tangible technology. This was the explicit reason for the initiators of the technology centres to assume that even boys would benefit from the approach the centres take to technology.

Mechanics and electronics were the basic areas being worked on by the technology centre in Örebro. The younger children, from age 6 years upwards, learned to use basic tools such as hammers, saws, soldering irons, and drills. They often made mechanical toys, but they even worked with simple electronic devices. The older children, roughly between 9 and 12 years old, made more advanced constructions—often with the help of electronics. The oldest, up to 16–17 years old, often used the resources of the centre to carry out their own projects, with suggestions, tutoring, and help from the instructors. The basic idea was to make technology fun. It was expected that girls would be more interested than boys in the aesthetic aspects of different artefacts, and so the design or finish of artefacts was also paid attention to.

A course at the centre meant a weekly visit, normally 90 min long. Courses had different themes. For the youngest there was[2] "Play with Technology" (creation of different mechanical and electronic toys), and after that one could enrol, for example, in "Basic Technology with Lego", "The Zoo" (making mechanical animals), "Jewellery Forge" (creating jewellery from different materials and with a variety of tools), "The Car Builders" (building a radio-controlled car), "The Design Mission"

(creation of practical and aesthetic designs for everyday artefacts), "Senses and Sensors" (building and programming robots), and "Your Own Technology Project" (free projects). The groups were either single-sex or mixed. Normally, there were no more than eight children to every group and they had two instructors. Because there was no stated curriculum, the whole course could be adapted to the skills and interests of the group. Most often, the children worked individually, constructing a device of their own. The instructors were aware of the importance of paying attention to and encouraging the girls—even if there was great variation regarding what this amounted to in different situations.

Why Single-sex Groups?

In the context of this article, the efforts, which involve teaching science and mathematics in single-sex classes in a school setting, are compared with the experiences from the leisure-time activity of a technology centre. These efforts have mainly dealt with science subjects, particularly physics, which is different from technology (e.g., Baker, 2002; Gillibrand, Robinson, Brawn, & Osborn, 1999; Hoffmann, 2002; Parker & Rennie, 2002). However, both areas are perceived as being masculine and both have both practical and theoretical exercises. In both subjects, boys tend to grab the equipment when doing practical exercises and both subjects also suffer from the lack of women, who do not choose them as professions. Thus, from a gender point of view, the physical sciences and technology are—if not the same—at least comparable.

Single-sex groups in science in a school setting have been one of the strategies used to encourage more girls to continue their science studies. Single-sex girls' groups also occur in free-time activities, which are set up with the same aim in mind. These initiatives are often based on research findings that boys tend to dominate in different ways in science classrooms (Baker, 1998; Guzzetti & Williams, 1996; Hoffman, 2002; Parker & Rennie, 2002; Echevarria, 2003). Boys get to do the practical experiments while girls function as their assistants, and teachers encourage boys more. During the 1990s, single-sex classes were also created—particularly in Australia and in the United Kingdom—for the benefit of boys, due to a growing concern for boys' relative under-achievement (Jackson, 2002; Martino, Martin, & Lingard, 2005; Robinson & Gillibrand, 2004; Warrington & Younger, 2003). In Sweden, experiments with single-sex classes have been almost non-existent. However, Berge and Ve (2000) reported a comprehensive action research project to increase gender equality at one school, and technology was one of the subjects taught. In this case, the expressed aim of the teacher with her technology teaching was to make girls familiar with everyday technology and to use herself as a role model to show both boys and girls that technology is not for men only.

There have been studies which imply that single-sex groups actually do increase the academic achievement and the interest of girls to continue their studies in science (Gillibrand et al., 1999; Hoffman, 2002). However, the results regarding the benefits of single-sex groups are equivocal. Jackson (2002), Younger and

Warrington (2002), and Baker (2002) have reported that single-sex groups are appreciated by the students, but that they do not improve the academic achievements of girls. According to Gillibrand et al., even if the academic results of girls were no better in a single-sex group than in a mixed group, more girls from the single-sex group chose to continue to study science. Even Baker found that the self-confidence of girls improved as a result of single-sex classes. This implies that the benefit of the single-sex group may mainly be an effect on interest, rather than on academic performance.

At the introduction of single-sex groups when the centre started, none of these findings were discussed. The groups were not introduced for pedagogical reasons. The creation of single-sex groups had to do only with the recruitment situation. They were simply a device to try to enrol the desired quota of girls, in spite of the greater interest of boys in this kind of activity, by reserving a certain number of places for girls only. Consequently, the possibilities of experimenting with girls' groups as a pedagogical tool were hardly used at all.

As the stipulated aim regarding the gender breakdown of the student population was to have half of each, the creation of girls' groups also implied the creation of boys' groups. The original plan was to have a number of groups for girls, an almost equal number of groups for boys, and a number of mixed groups, which would be balanced with respect to gender, and thus achieve a gender balance in the student body with slightly more girls than boys. It was normal that in the planning phase slightly more girls' groups were created, with the result that the course programme offered more places for girls than for boys. However, the girls' groups did not attract enough students, while a number of boys were waiting to get in, and so more boys' groups were created. In reality, some of the mixed groups became single-sex boys' groups, and some other mixed groups had more boys than girls, so the gender balance of the student body became the opposite of what was planned, with boys predominating slightly (normally about 60% of the participants). Making quotas for girls did help the organisers to achieve a more balanced situation, but it did not help completely.

Boys' Groups

Boys' groups in a school setting, most often science classes, are often described as being disruptive and not conducive to learning (Gillibrand et al., 1999; Jackson, 2002; Parker & Rennie, 2002; Robinson & Gillibrand, 2004; Younger & Warrington, 2002), even though there is also evidence to the contrary (Martino & Meyenn, 2002; Younger & Warrington, 2002). In the leisure-time activity of the technology centre, these problems were rare. They might sometimes appear with a female instructor whose legitimacy was questioned by the boys. But most often the boys were interested in the practical tasks. They worked individually but consulted each other. The courses with the male instructor resembled very much what is described as male socialisation into technical tinkering (Mellström, 2004). They resembled leisure-time activities where the boys tinker together, sharing their technical interest—whether it is radio transmitters, motorcycles, or Meccano. They also

resembled activities where a boy shares an interest with an adult man—most often his father—and they tinker together in a secluded place, the garage for example, where women do not belong. The parents of some boys at the technology centre expressed their satisfaction with the courses, and pointed out that there had not been any organised leisure-time activity previously for boys who were not especially interested in sports or in music. Thus, they were happy that there was an organised activity appropriate for boys, and even for their sons. One single mother told that she felt relieved because her son could learn about technical matters, which are a part of male socialisation, in spite of only having a mother who did not have such skills. The parents perceived the technology centre as being a place that helps boys to a masculine socialisation.

This implies that there were two parallel activities going on at the centre. While the girls were encouraged to enter into the male-dominated area of technology, a number of the boys got something like a traditional masculine socialisation in the area. (Some of the mixed groups functioned differently, as well as the groups supervised by the female staff.) According to the assumption that boys do not let girls into technical activities they perceive as their own, these boys might not make it easier for girls to thrive on technical educational programs.

Jackson (2002) and Warrington and Younger (2003) state that, in creating single-sex groups with the aim of improving the learning environment, there is a risk that the boys' groups may become sites where macho masculinity can be expressed. To avoid this, conscious and gender-sensitive work is required of the teacher. Ideally, if girls are trained to enter the male-dominated area of science and technology in single-sex groups, boys should—in their groups—be trained to let them in and welcome them. This can happen, for example, by helping boys to change their interaction patterns to more communicative and cooperative ones, and to train them in the working methods that often make girls excel academically. To point out the scientific and technical competence of girls would be one important part of the strategy.

The teachers at the centre did not engage in this kind of conscious gender work. It is not easy to do. To succeed in a school setting, such efforts require knowledgeable and committed teachers who are prepared to face opposition from the pupils, and maybe even from the parents and their own colleagues. To perform conscious gender work in changing boys' ways of working with technology is even more difficult in a leisure-time activity, where the satisfaction of the boys is important, as they have no obligation to take part in the activities, but can drop out any time they want. Besides, just as is the case with many single-sex projects at school, the aims regarding the boys' groups had not been considered by the staff at the centre. The boys' groups can be perceived as a kind of left-over after the girls' groups for the advancement of girls' interests had been created.

Girls' groups

In school projects where girls have been assigned to single-sex groups, these groups are most often described as well-functioning, communicative, and supportive. More

girls speak up; they are engaged in the subject and work efficiently. They feel that the teacher is more supportive and has more time for them. In particular, they appreciate not being disturbed by the boys (Baker, 2002; Berge & Ve, 2000; Gillibrand et al., 1999; Jackson, 2002; Parker & Rennie, 2002; Robinson & Gillibrand, 2004; Younger & Warrington, 2002).

At the centre, there were girls' groups like this. However, some of the girls' groups were more disruptive. Above all, the girls were not so concentrated on the tasks at hand. While the boys were eager to work on the technological tasks, the girls were more fidgety. They got bored, or they just did not like the tasks and lost concentration. For them, the social interaction in the group and with the instructors seemed to be much more important than for the boys. Some girls' groups that were working with tasks that could be perceived as less technical (such as marionettes or jewellery) functioned better. The girls could also get engaged in the decoration of the artefacts and seemed to be more interested in the appearance of what they produced, while the function seemed to be more important to the boys.

However, the instructors also observed that there were a few girls who were different from the others: girls who had an interest in technology similar to that of the boys. According to the instructors, it was sometimes a problem to make the work meaningful for these girls in single-sex groups, as the other girls wanted to keep it on another level. At the centre it was sometimes possible for these girls to get into a mixed group, if they did not find the interests of the other girls challenging enough. However, this was not always the case. These girls are the most likely to choose a technical profession in the end, and would probably do so even without the centre. For them, the single-sex groups did not work very well.

If the boys' groups resembled traditional boys' groups during leisure time, the same may have been true of the girls' groups. The girls divided themselves into small groups or pairs, and the social interaction was important. The project of creating an artefact might not have been conceived as a technical project, but as a production project and a design project. Many of the girls did not construct things because they enjoyed constructing things, but mainly because they wanted to enjoy the product. An example of this was the apparent indifference of many girls to building with LEGO. Building with LEGO means that you dismantle your creation afterwards, and for girls who often planned what they were going to use their creations for, this was not very interesting. Boys, on the other hand, seemed to be interested in the construction process itself rather than the product. The difference in the importance girls and boys pay to the context of a technical task is also discussed by Murphy (1996) and Hoffman (2002).

However, the girls continued to attend the courses at the centre. Obviously, the courses succeeded in meeting some needs. One need might be exactly the one of being in a girls' group. When the younger girls were asked what they appreciated at the centre, they did not speak much about the activity itself, but more about the social climate: "its nice working together", "its good when nobody laughs at you and the instructors are nice". The basic ambition of the centre was to teach girls technology in a positive social environment. However, the girls might rather have regarded

the centre as a place with positive social interaction where they—accidentally—also learned about technology.

The Instructors

Of the eight people who were employed at the centre during its first three years of operation, six were women. Most of the women had an education that was specially designed for technology centre staff. The two employees who were men had previously worked in a school environment. In addition, there were several trainee instructors: students from the technical programme in the upper grades of secondary school. Most of them were female, too. As all groups had two tutors, there was an opportunity to work with different constellations of instructor pairs in the different groups.

The importance of the sex of the teacher and the sex of the students in single-sex groups has hardly been studied at all. In fact, there are studies that do not even report the sex of the teacher. It can be expected that when there has been a choice, girls' groups have been taught by women and boys' groups by men. The general idea of providing role models has been one important reason for this. In particular, it is often assumed that girls need role models who can show that science is fun and a rewarding career (Rosser, 1998; Siann & Callaghan, 2004; Thom, 2002). (The importance of role models was, however, questioned by the findings of Betz & O'Connell as early as 1992, and again by Gilbert & Calvert in 2003.)

That boys' groups should have male teachers does not have to be the result of conscious reflection: as most science and technology teachers at school are men, it has been quite natural that the boys should have a male teacher. In addition, a female teacher in a boys' group in a masculine subject such as technology often experiences problems of legitimacy (Staberg, 1992); her technical competence is questioned by the pupils. This makes it more difficult for her to introduce new, less masculine aspects of the subject. Thus, if the aim of a project is to introduce new aspects of technology, a male teacher might have a better chance of succeeding.

The girls' groups at the centre had mostly female instructors, and the male instructors worked with the boys more than with the girls. However, one issue that earlier studies have not paid much attention to is the fact that sex does not equal gender among the participants or the instructors. A female instructor can be more or less feminine, and this applies to a male instructor, as well. The female instructors at the centre had crossed gender borders to various extents and in different ways. That is, they were different kinds of role models. A girl at the centre could find herself in a girls' group where there was a feeling of cohesion and femininity, partly because of the informal framework: how the instructor talked and what she talked about. It could be very different from being in a group with a female instructor who showed a much more untraditional form of femininity. These different ways of "doing femininity" are not discussed in studies of single-sex classes in science—perhaps because such studies most often only involve one female science teacher.

At the centre one of the girls' groups had a male instructor, but he was seconded by a female trainee instructor who was only a couple of years older than the participants. The girls in that group benefited from the technical knowledge of the male instructor, but his dialogue with the girls was quite short and focused. With the female instructor, the girls could talk more openly about the context of their creations, their abilities, and their inspiration. Thus, the combination seemed to serve them well:

> One of the girls accepts the idea of the male instructor and plans to build a radio receiver. "How should I start?" "Start with a drawing, so that we can have some kind of picture of what you want to do. Take a pen and a sheet of paper." The instructor disappears to the basement to help another student. The girl sits down and fiddles with her pen. "I really cannot draw", she says to the female trainee instructor who is standing beside her, and she erases the few lines she has made on the paper. "I don't know how to do this." "Just make some kind of picture to show him when he comes up—of the receiver and the loudspeakers."
>
> When the instructor comes up he sits down and looks at the picture, which is not very informative. The girl is standing beside him. She explains. The instructor listens and does not say very much. "What sort of material can we use?" he says half to himself. "We have to hide the electronics somewhere." He hums to himself for a while and comes up with a design that is quite different from the suggestion of the girl. He explains it to her, and she asks a couple of questions, but I'm not sure that she understands it all. He tells her to find some pieces of material that would be suitable. She goes to rummage in the boxes.
>
> Another girl plans to make a picture with blinking diodes. "What do you think a guy who is having his seventeenth birthday would like to have?" she asks the female trainee instructor. They exchange a few words about different suggestions. (Transcribed fieldnotes)

There were also mixed instructor pairs in the boys' groups. There, the same male instructor had lengthier and more engaging discussions with the participants, while the female instructors acted as helpers and were included in the male community to different extents. This resembles the descriptions of Jackson (2002) of boys' groups as masculine environments where women can be accepted as intruders. When boys' groups were supervised by women only, the technical skills of the tutors could be questioned—especially by the older boys, as one of the female instructors told me:

> I'm so tired of trying to be assertive towards these boys. [A male instructor] can handle a boys' group in another way; there's more weight in his words because he's a guy. And he has all his experience; he has always been tinkering. I have my education with a number of credits.

The young trainee instructors, who themselves attended a technical educational programme at secondary school, seemed to be more at ease in these situations than the grown-up women who had another background supplemented by the two-year instructor course in an all-female group. The young girls acting as instructors were sometimes more secure about their technical skills and, first and foremost, they were interacting in male-dominated groups during their own education and had learnt to

assert themselves in such groups. To some extent, they had learnt to "do" masculine gender. In the following description, the trainee instructor is just a couple of years older than the boys themselves. She is working with the male instructor mentioned in the earlier citation. She has also "always" been tinkering and speaks to the boys with authority. The fact that the situation—in my eyes—almost gets out of hand may have been due to her (and the boys) having a higher level of tolerance than I do:

> Before the boys start with their projects, the male instructor shows a propeller and talks about it. He asks the trainee instructor about a detail, but she does not know either. The boys detect a new object: a picture twinkling with diodes. They ask the trainee instructor how it works.
>
> The instructor goes to the basement with one of the boys. The trainee instructor wanders between the boys and when one or another is unoccupied for a while, she asks whether he is not going to start working soon. The boys ask her questions and she herself goes and helps students who seem to have problems. Two of the boys play with their propeller. They do it for a long while, before the instructor tries to discipline them. It gets more and more rowdy. The trainee instructor does not see everything, and her level of tolerance seems to be quite high. Eventually she says: "What if somebody gets that in his face?" One of the boys stops playing. She gives a direct message to the other: "Now, just put that away." The other boy stops, too. (Transcribed field notes)

To be able to work in groups of the opposite sex and promote new, less genderised thinking about technology among the students, men and women needed different skills. The women in boys' groups had to assert their competence, to create a manageable teaching situation but also to prove that technology is not for men only. The men in girls' groups had to make the girls believe in their own competence in a field that is predominantly masculine, and find common ground where the girls' wishes and preferences as to what should be created and why, and what kind of interaction should take place, could be combined with the instructor's own competence. As personal relationships seem to be more important for girls than for boys in developing an interest in technology (Lee, 2002), the competences required of male instructors in girls' groups include managing a personal relationship, at a professional level, with the girls in the group. Women especially, but also even men, probably need to be crossers of gender borders themselves, at least to some extent.

Single-sex or Mixed?

In several studies (Baker, 2002; Gillibrand et al., 1999; Jackson, 2002; Jackson & Smith, 2000; Parker & Ronnie, 2002), students, especially girls, are eager to continue working in single-sex groups for at least part of their studies. Teachers, for their part, seem to be less eager to continue such projects. The same applied to the technology centre. The number of single-sex courses fell every semester. At the end of the autumn semester of 2004, 60% of the participants (83% of the girls and 33% of the boys) stated in a questionnaire that they would prefer a single-sex group. However, in the spring semester of 2005 only 25% of the courses were single-sex. There were different opinions among the staff, but most preferred mixed groups.

One reason for this, as stated by the instructors, was that mixed groups were more fun, because one had a wider spectrum of different personalities to work with. These personalities were described in gendered terms, even if the instructors pointed out that all girls and boys were different. A mixed group gave you both the orderly ones, who were mostly girls, and those who seemed to have fun, who were often boys:

> I like mixed groups best, because then I get all kinds. I get those who sit and work and don't say a word; they work very well and carefully, but they are not always so much fun. It seems that they don't think it's so much fun themselves. And then I get the ones who are fun, and they can be careful, too. In mixed groups you get a better balance of all kinds. (Female instructor)

A second reason was said to be that girls and boys have to get along together anyway, if they are to continue in technical education and careers. This is contradicted by the studies (Younger & Warrington, 2002) showing that, after a period in a single-sex group, girls become better equipped to be assertive and active when they return to a mixed-sex environment.

Creation of single-sex groups for children younger than 10 years old was also regarded as unnecessary, as the impression of the instructors was that technology in this age group was not a gendered subject. The matter was perceived to be different among teenage girls, who were perceived as being difficult to retain, and for them single-sex groups might be one possibility of keeping them interested in attending.

It was not only that the instructors felt that single-sex groups were less fun and unnecessary. According to them, single-sex groups also had drawbacks. One was the difficulty in convincing boys about girls' technical competence when the classes were not mixed. Another issue was that of the gender border crossers. While many girls at the centre had preferences different from those of boys, there were girls who had an interest in technology that was similar to that of the boys. They might be compared with the female pioneers in the technological field who had a passion for science and technology even at a time when it was not generally accepted in society for girls and women to engage in such activities. Even today, girls going into engineering often seem to have been crossing gender borders already at a younger age (Gilbert & Calvert, 2003; Mellström, 1995; Walker, 2001). It is probable that the activities offered by the technology centre were attractive to these girls and that there was therefore a higher proportion of such girls than in ordinary school classes. The flexibility of the centre was valuable in providing a better possibility of changing from a single-sex to a mixed class than is common in single-sex experiments in a school environment.

Conclusions

What is known about single-sex groups in science and technology in secondary schools in different countries applied to a certain extent to single-sex groups in the leisure-time activities of a municipal technology centre in Sweden. However, there were also findings to the contrary. The findings thus far are based on a sizeable

amount of field notes and lengthy interviews with different members of staff, but they are only based on one technology centre. The results show features which would be interesting to study in greater depth, and the increasing number of municipal technology centres in Sweden offers an empirical field where these findings can be examined more closely.

Boys' groups, which in earlier studies in a school context have often been reported as being destructive, most often function very well in this setting. The reason may be the setting, implying that the negative reactions of boys in single-sex groups in schools could actually be a reaction to obligatory schooling itself (which is a suggestion of Baker, 2002) or to the nature of the tasks given at school—which would imply that science and technology education in schools would benefit boys more if it were more practical (reflecting Echevarria's, 2003, findings). Girls' groups in studies from single-sex education in school settings have generally been reported as being cooperative and helpful, but they were sometimes quite disruptive in the technology centre. This may also have to do both with the setting (girls allowing themselves to violate the rules more in a leisure-time activity) and the tasks (girls resisting the technical tasks that they do not find interesting enough). What we know about single-sex groups in educational activity would clearly be enriched by more studies of single-sex groups outside formal schooling.

One of the basic ideological problems of the centre was the idea of changing the girls, and not the boys, of tempting the girls to engage in technical activities they would not normally take part in, to gain experiences they would not normally have gained. This happened to some extent. Girls performed activities they would not have done at home. However, many of the girls did not seem to "change" and start appreciating technology in itself very much. Alongside the technical experiences, they also gained other experiences they may not have had at home—such as interacting in an all-female group, or having personal relationships with older girls and women in small groups, and this might have been more important than the technical activities. For the staff at the centre, it was enough that most girls learned to use at least some tools and be creative with different materials and electricity. And, in effect, this is an achievement *per se*, in a society in which technology is closely tied to masculinity.

The idea that achieving a more gender-balanced technological workforce would require a change in boys, and not only in girls, is not often put forward. It was not put forward at the centre, either. While the girls were expected to cross the norms put on their gender, the boys were free to strengthen their gender norms by getting support for their interest in a traditionally masculine domain. It is true that the technical artefacts they were working with were meant to be gender-neutral, and in that way the ties between masculinity and traditional technology were expected to become looser. However, the boys, just like the girls, often made gendered choices where possible. To a certain extent, the boys at the centre were "boys as usual", tinkering with "technology as usual", while the girls were expected to become "the new breed of technology girls".

Because the instructors had great freedom in choosing the content of the activities—according to the participants' and their own interests—it was possible for

the single-sex groups to become polarised. If interests other than traditional technology surface in the girls' groups (while the boys eagerly work with traditional technology), the gaps in technological knowledge and interest might be expected to widen instead of being bridged.

The gender of the staff is another issue. If the expectations and preferences of the participants in the single-sex groups are different according to gender, the supervisors also need to "do" gender in different ways in the different groups. To be able to be role models—not only for girls, but also for boys—it seems that female teachers need both a solid technological knowledge and a way of behaving in an all-male environment (even when the males are teenage boys), which is not always acquired during traditionally female socialisation.

A technological leisure-time activity for both boys and girls, rather than technology clubs for girls only, seems to have some advantages, besides being an interesting study object of pedagogical development. The first advantage is strategic. The centre has developed into a stable institution with six full-time employees. It would probably have been much more difficult to get a governmental agency or a city council to finance such an effort if it were for girls only, at least in Swedish society. To build up a permanent institution for leisure-time activities requires that both sexes be targeted.

The size of the centre also implies that the girls received what even single-sex technology clubs are offering: support, material, engaging tasks, and role models. Even if the activities were for both sexes, the majority of instructors were women. There were a variety of activities to choose from—some more female-labelled than others—and if the girls did not like one of them, they might try another. To some extent, they could choose whether they wanted to be in a single-sex group or a mixed group. If they were in a single-sex group, the situation was quite similar to the one in a girls' technology club.

Naturally, it was an advantage for the boys that the centre was not for girls only. As stated earlier, it gave them the chance to cultivate their technological interests and improve their practical skills; but from a gender point of view, there were additional advantages. The fact that the staff was predominantly female broadened the concept of technology to something that women can do. And even when the boys worked in a single-sex group, or did not regard girls in their mixed group to be quite as technically competent as themselves, they were still aware that there were lots of girls at the technology centre, and, thus, girls were at least gaining some competence and a right to exist in the field of technology.

All in all, the idea of introducing single-sex groups to achieve a gender balance in an activity that would otherwise have been dominated (in numbers) by boys, without any preceding pedagogical considerations, did show how strongly technological activities are gendered already in young children. To make the whole enterprise gender inclusive, so that single-sex girls' groups are not only a marginal anomaly, many aspects of the enterprise must be attended to: the sex and gender of the staff, the content of the activities, the sex and gender composition of the student body, the stated aim and the image of the activities, to name a few. In such a context, single-sex

girls' groups become not a solution in themselves, but one of the tools that can be used among others to increase girls' competence and interest in technology.

Notes

1. My evaluation was an activity separate from this article. I merely use the same data-set, with the permission of the mandators.
2. Available in autumn 2005, the fourth year of operation.

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