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In search of the new engineer: gender, age, and social class in information about engineering education

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ABSTRACT

It is widely argued that engineering education needs to change in order to attract new groups of students and provide students with knowledge appropriate for the future society. In this paper we, therefore, investigate and analyse Swedish universities’ websites, focusing on what characteristics are brought to the fore as important for tomorrow’s engineers. The data consist of text and pictures/photos from nine different Engineering Mechanics programme websites. Using a critical discourse analysis approach, we identify three societal discourses concerning ‘technological progression’, ‘sustainability’, and ‘neoliberal ideals’, evident in the websites. These discourses make certain engineering identities possible, that we have labelled: traditional, contemporary, responsible, and self-made engineer. Our analysis shows that universities’ efforts to diversify students’ participation in engineering education simultaneously reveal stereotypical norms concerning gender and age. We also argue that strong neoliberal notions about the self-made engineer can derail awareness of a gendered, classed, and racialized society.

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Recruitment; widening participation; norms; discourse analysis; identity positions

Introduction

In this paper we investigate how engineering education departments at Swedish universities represent their engineering programmes through their websites. More specifically, we focus on how texts from websites produce different possible identity positions for engineers and engineering students. Engineering identities are interesting to explore for several reasons. First, a key concern across the higher education sector is a focus on widening participation to under-represented social groups thus increasing student diversity (Archer and Hutchings 2000; Archer 2005). Widening participation has been a major component of government education policy in Europe generally (Lucena and Schneider 2008), and of engineering education specifically, where women remain strongly under-represented (Powell, Dainty, and Bagilhole 2012). Secondly, it is continuously argued that engineers of today need to change in order to function in the contemporary society (Adams et al. 2011). For example, apart from having a good conceptual understanding of basic science and mathematics, it is argued that engineering students also need to develop generic skills, such as creative and critical thinking, problem-solving abilities, and logical and analytical decision-making (Badran 2007). In addition, it is argued that the ‘new engineer’ needs to know how to work in teams given the importance of social skills in the workplace (Sahin 2010).
The new demands on engineering students are also visible in different pedagogical related changes within engineering education, for example, the implementation of project-based courses aimed at fostering better team-working skills as well as providing better learning outcomes (De Graaff and Kolmos 2007). New teaching approaches are also visible, for example, problem-based learning (Mills and Treagust 2003), cooperative learning (Smith et al. 2005), learning through workplace problems (Jonassen, Strobel, and Beng Chwee 2006), emphasising collaboration between universities and industry (Arlett et al. 2010), service learning (Rodriguez-Falcon and Yoxall 2010), and learning entrepreneurship (Mäkimurto-Koivumaa and Belt 2016). In the Swedish context, companies express that they would welcome the inclusion of other than technical components in the curriculum, such as communication or language qualifications – as long as this does not replace the technological core (Teknikföretagen 2012). In summary, the changes in engineering education can be understood against the backdrop of both the need to increase and diversify recruitment to engineering education (Hemmo, Love, and OECD 2008) and the need for engineers to handle contemporary societal changes (Adams et al. 2011).

The importance of investigating cultural characteristics within disciplines, among them engineering, in higher education has a relatively long history (Becher 1989, 1994). One way of approaching such issues is the concept of ‘culture change’, which is common within the educational community and was picked up in engineering education contexts in the late 1990s (Godfrey and Parker 2010). Godfrey and Parker (2010) argue that engineering education has a distinctive culture that is recognisable to its practitioners, but rarely has been characterised in research. An exception is the work by Tonso (2006), who carried out a large-scale study of engineering education culture on a U.S. campus. She showed how cultural forms of belonging were very important for students to be successful in engineering education. Student positionings enacted as part of the campus culture (such as geek, hard-worker, jock and slacker) were also carried into student group work and, thus, became integral to students’ emerging engineering identities. Du (2006), has also explored engineering identity in the male-dominated Electrical and Electronics Engineering Programme at a Danish university and found that engineering students associated the discipline with attributes such as problem-solving, analysis, logic, structure, focus, rationality, nerdiness, and masculinity. She saw a pattern that the nature of hard-core engineering subjects privileged men and acted as a barrier to women. A Swedish example is Ottemo’s (2015) exploration of the co-production of gender and technology as articulated in two engineering programmes: Computer Science and Engineering (male-dominated) and Chemical Engineering (female dominated). His ethnographic work shows how students at the same university have to relate to engineering identities differently. For example, the computer engineering students have to relate to the position of ‘geek’, that here is, someone who is extremely passionate about technology, but a position that may also be associated with whiteness and masculinity. The chemical engineering students, however, did not identify themselves as geeks, but rather as hard-working.

Engineering identity has gained a lot of attention because previous research has shown that students are disproportionately likely to leave engineering programmes when they feel their identities clash with the prevailing culture of the programme or field (Danielak, Gupta, and Elby 2014; Foer, Walden, and Trytten 2007; Marra et al. 2012; Stevens et al. 2008). Identity has also been used as a way to predict students’ choice of engineering as a career (Godwin et al. 2016). One important strand within the field of research on engineering identity has focused on gender issues, in particular the identities available for women within engineering (Du 2006; Faulkner 2007; Jorgenson 2002; Kvande 1999; Phipps 2002; Tonso 2006), but also on how career development is gendered (Holth, Almasri, and Gonas 2013). Similar research has also been carried out in neighbouring fields, for example in science education (Carlone 2004; Carlone and Johnson 2007; Gonsalves, Danielsson, and Pettersson 2016; Ong, Smith, and Ko 2017). Issues related to social class are less well explored, but have been brought to the fore in analyses of the construction of different classed masculinities (e.g. Mellström 1999; Wajcman 2000).
In this paper we approach identity in a different way from earlier research in the area as we take websites as the vantage point for exploring the production of identities. Websites are the focus of our investigation as they function as platforms where universities communicate their programmes and describe what kind of students they are recruiting into engineering. That is, what kind of student do the different universities and programmes want to attract? And what kind of engineer do they want to ‘produce’? A focus on websites is also because they are likely to adapt to contemporary societal demands in order to attract students. Our aim here is to investigate and analyse representations of the engineering profession in information about engineering programmes, and the two levels of engineering programmes bachelor and masters, using discourse analysis. In doing so we explore affordances and constraints for identity constructions in the engineering education of today. Our research questions are:

- What characteristics are brought to the fore as important for the contemporary engineer in the websites?
- Which identity positions are made available by these characteristics?
- How do representations of the contemporary engineer construct social categories, such as gender and social class?
- What are the differences and similarities in these constructs between the levels of engineering programmes (bachelor and masters)?

Data collection and research context

The empirical data consist of information texts, pictures/photos, and clickable student ‘interviews’ from six Swedish universities’ websites (nine different Engineering Mechanics programmes, downloaded 16 January 2016. The engineering Mechanics programme (EMP) is the branch of engineering that involves the design, production, and operation of machinery and is one of the largest programmes in Sweden in terms of student numbers (both at bachelor and masters level) (UKÄ 2016). We focus on the EMP as it represents one of the more traditional engineering programmes in Sweden, and as such could be considered as more resilient to changes in society than more newly-established programmes. In other words, if EMP websites emphasise new characteristics of an engineer, then this is an indication that these issues are of broad concern to all engineering programmes. Some of the universities described here provide two different Swedish EMPs, namely:

- ‘Högskoleingenjör’ (bachelor), a three year degree which combines theoretical elements of engineering with more vocational elements. The degree awarded is a Bachelor of Science (180 ECTS).
- ‘Civilingenjör’ (masters), a five year, more theoretical degree compared to ‘högskoleingenjör’. The degree awarded is a Master of Science (300 ECTS).

These two programmes are separated in the Swedish system; it is possible to continue from ‘högskoleingenjör’ to ‘civilingenjör’. However, this transit typically requires the student to supplement a number of courses to those already taken during the first three years, which involves effort and planning by the student. As such, this transit is not very common. We have therefore made the choice to look at bachelor and masters levels separately, making it possible to contrast these two levels in our analysis.

In order to create a diverse dataset our sample of nine EMPs was collected from different types of universities: two technical universities (Chalmers and Kungliga Tekniska Högskolan), two traditional research universities (Lund University and Uppsala University) and two more recently established universities (Linné University and Umeå University), see Table 1 for an overview. Within the broader engineering community in Sweden, the two technical universities are considered to have the highest status.
Typically, the information about an EMP consisted of a presentation of the programme (hereafter called information text) of about 300 words complemented with some pictures/photographs with links to ‘interviews’ with students (sometimes in the form of testimonials) that participated in the programmes, see Figure 1 as an example of a website.

The so called interviews were a significant feature of the websites. Eight of the websites (with LNU, master, as the only exception) were linked to interviews with students who participated in the specific programme, and the interview texts were all accompanied by pictures of the students. In total twenty students interviews represent the EMPs at the six different universities, see Table 2.

### Analytical framing and process

In the broadest sense, our analysis draw on discourse analysis. Different kinds of discourse analysis have in the last decades been increasingly employed within educational research (Wetherell, Taylor, and Yates 2001) including engineering education research (Case and Light 2011). Given the multitude of research employing such perspectives, there are of course many different interpretations of the notion of discourse, but the following broad definition suggested by Phillips and Jørgensen ((2002) 2006, 1) captures the core of the notion shared by social constructionist discourse analytical frameworks, defining discourse as ‘a particular way of talking about and understanding the world (or an aspect of the world)’. In summary, discourse analysis, then, is ‘concerned with the meanings that events and experiences hold for social actors’ (Wetherell, Taylor, and Yates 2001, 1). Further, a starting point for social constructionist discourse analysis is that discourses are not neutral and objective reflections of ‘what is out there’, but rather play an active role in creating and changing

![Figure 1](image-url). An example of a website (Chalmers, master degree). The website consists of a presentation (1), pictures and a link to an interview with a student/s (2). To the left (in black) a link to, among others, information about different bachelor degrees. To find the EMP bachelor programme specifically requires several ‘clicks’.
identities and social relations (Phillips and Jørgensen (2002) 2006). As such, discourses contribute to constructing social identities, relations, and knowledge systems (Phillips and Jørgensen (2002) 2006). Following from this, discourses cannot be understood as well-defined units with clear boundaries, rather, they are constantly under negotiation and transformation (Gee 2000).

More specifically, our approach to discourse analysis is inspired by critical discourse analysis, where discourse is seen as a form of social practice which both constitutes the social world and is constituted by other social practices (Fairclough and Wodak 1997). Consequently, texts (including visual images) are understood as produced as well as received and interpreted through discursive practices, and, further, social and cultural reproduction and change are understood as taking place in everyday (discursive) practices. That means that the (micro level) websites we analyse can never be understood in isolation. They have to be understood in relation to other texts and in relation to the (macro level) social context (Phillips and Jørgensen (2002) 2006). For instance, we interpret the so-called interviews as both directed and edited, and therefore showcasing what kind of engineering student the different universities want to display (and attract). Consequently, it is interesting to investigate how the student testimonials in the form of interviews take up (and reproduce) different engineering identities that make sense within one or several of the main discourses. Identity, from this perspective, is not concerned with an everyday understanding of identity as a somewhat static ‘core’ of a person; we employ and sociocultural understanding of identity rather than a psychological one (Gee 2005). Hence, identity is understood as a negotiated experience that is continuously constituted in relation to and in the intersection of different discourses. This means also that we interpret gender and other social categories as performative, a ‘doing’, as an effect rather than a cause (Butler 1990). Social class is seen as fluid and subjective and as something that is produced in intersections between individuals and social structures (Archer 2005). This is not underplaying the importance of a categorical understanding of class, where individuals are grouped according the socio-economic characteristics, or as a dimension of educational stratification, but the focus here is rather on how the students can be understood as ‘doing class’ in their relationship to engineering. As such, we want to shift the concepts of gender and social class away from what is typically male, female, or working class, towards investigating how such understandings are constructed through language (Keller 1992). In order to stress this shifting nature of gender, social class, and also identity, we have in this paper chosen to talk about ‘identity positions’ rather than identities.

In practice, the analysis developed as follows. We familiarised ourselves with the empirical data by repeated, careful readings of all available material on the websites (that is, information texts, photos/pictures, and student interviews). At this stage, we sought to gain an overview of the empirical data. Thereafter, we first analysed the information texts and thereafter the interview material, following these steps:

### Table 2. Overview of our data.

<table>
<thead>
<tr>
<th>EMPS</th>
<th>Information texts (number of words)</th>
<th>Interviews</th>
<th>Men</th>
<th>Women</th>
<th>Non-Swedish identity (name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTH master</td>
<td>318</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTH bachelor</td>
<td>337</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KTH master</td>
<td>246</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>KTH bachelor</td>
<td>322</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>LTH master</td>
<td>276</td>
<td>4</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>UU bachelor</td>
<td>420</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIN master</td>
<td>329</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIN bachelor</td>
<td>210</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>UmU bachelor</td>
<td>275</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total bachelor</td>
<td>1564</td>
<td>9</td>
<td>6</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total master</td>
<td>1169</td>
<td>10</td>
<td>2</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2733</td>
<td>19</td>
<td>8</td>
<td>12</td>
<td>5</td>
</tr>
</tbody>
</table>

* Linné University linked to an interview with two students that were interviewed together.
We got a systematic and structured overview of the material by conducting a micro level analysis of the information texts (Fairclough 1992), taking as its starting point the four broad themes of ‘the engineer’, ‘the technology’, ‘the education’, and ‘future potentials created by the education’. This analytical stage resulted in a table showing the words from each university website and themes.

The analysis was then directed at uncovering different ways in which the four themes (above) were ‘talked about’ within different engineering programmes. That is, it involved a translation from the actual wording to identity positions and discourses. For example, the quote: ‘What all mechanical engineers have in common is that they develop and build the sustainable society of the future’ (KTH, masters) points out that engineers are key to solving sustainability problems. Since the issue of sustainability is repeated many times and in different ways we analytically ‘translated’ it as a discourse (a ‘Sustainability discourse’), which constructs (or produces) an identity position for mechanical engineers (or students) to take up.

The next step was directed at intertextuality (Fairclough 1992), that is towards finding out whether our empirically grounded discourses at the text level were also found in other societal texts (for example, media texts, texts from different companies, and earlier research). If so, we concluded that the information texts draw on active societal discourses. In that way our micro level investigation of texts relates to a wider social context and macro level discourses.

Thereafter the focus was on possible future engineer identity positions in the information material, within or in intersections of the identified discourses. This resulted in identity positions, which guided our reading of the interview data.

In the interview data we looked for whether these drew upon the same discourses as activated in information texts, or whether other identity positions were picked up.

In the last step we looked for which student is ‘supposed’ to take which programme, that is what kind of engineering students the different universities expected, and wanted. This was done through identifying prominent characteristics that were brought to the fore in photos and interview texts to represent the individual students. The characteristics included both common, ‘surface level’ social markers used to categorise individuals (e.g. age and ethnicity) as well as skills that reoccurred in the representations of the students.

Findings and analysis

We present our results in three main sections in order to capture broad characteristics of the websites as well as identity positions. We start with the main societal discourses identified in the information texts. Thereafter we present engineering identity positions, and show how different identifying characteristics in the interview data help to produce the desirable engineering student.

Three societal discourses

In our analysis of the information texts we identified three main societal discourses producing knowledge about ‘technological progression’, ‘sustainability’ and ‘neoliberal ideals’. Our interpretation is that these societal discourses impact on both engineering education as well as what kind of student is to be recruited. We exemplify this by quotes from the websites as well as examples from texts originating from Swedish society (see Table 3). Of course, the discourses in the information texts are not discrete, but are linked to one another.

On a more detailed analytical level, the discourse of technological progression imbues a need for a, constantly growing, technology and technological progression in society. The focus within this discourse is on systems, products and solutions as having a value in and of themselves for the progress of the society. Consequently, engineers’ ability to contribute to technological progression is constructed as the foundation of the profession and as a necessity in the development of society.
The sustainability discourse is founded in the need to achieve a sustainable society and sees the resources of the earth as finite. This is signalled by the use of words such as ‘environment’, ‘sustainability’, and ‘resources’. For example, competence regarding environmentally sound choices is brought to the fore as one of several important competencies for an engineer. Sustainability is described as an integrated aspect of our society as well as all engineering practice in the information texts. Thus, the sustainability discourse is both activated as one of several elements that make up engineering practice and as something that is to permeate all aspects of engineering practice.

Within the neoliberal discourse the individual is produced as having the capacity and possibility of making their own, unrestricted choices in terms of, for example, areas of work and career development. Education is constructed as giving students the possibility of crafting their own professional profile, thus making them more attractive on the job market. It is continuously stressed on the websites that engineers are highly sought after by a wide range of companies (words used include: attractiveness, successful careers) and when presented in the context of the students’ (endless) possibilities to choose and craft an attractive professional profile this can be interpreted in terms of neoliberal ideas about the individual’s responsibility to make themselves fit to compete in ‘the market’. This discourse is further reinforced as the individual engineer’s success is produced as pivotal for the country’s global competitiveness. Within this discourse the universities provide contacts with other universities around the world as well as offering students practical courses within industrial companies where they collaboratively solve ‘real’ problems and have the opportunity to create their own networks.

### Table 3. The three main societal discourses with examples of texts that illustrate the discourses on micro- and macro levels.

<table>
<thead>
<tr>
<th>Discourse</th>
<th>Examples from website (micro level)</th>
<th>Examples from the Swedish society at large (macro level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The discourse of technological progression</td>
<td>‘The high tech society of today develop new products at an ever faster pace’ (LNU, master). ‘More and more technologically advanced products require an efficient production process and engineers with the right skills’ (UmU, bachelor).</td>
<td>‘Innovation and technology development are in Sweden and the EU an important area with strong ties to environmental policy’ (Swedish Environmental Protection Agency 2016).</td>
</tr>
<tr>
<td>The sustainability discourse</td>
<td>‘When to develop future products, processes and services, you need skills in areas such as science, engineering and project methodology and understanding of the ethical, economic and sustainability aspects’ (KTH, bachelor). ‘What all mechanical engineers have in common is that they develop and build the sustainable society of the future’ (KTH, master).</td>
<td>‘Engineers and technicians’ importance for sustainability work can hardly be overestimated. To harness the potential required a developed engineering role. / … / There is broad agreement on the importance of sustainability. Researchers, regardless science, politicians and business leaders regardless of ideology regardless of the industry the importance of sustainable development. More and more companies now see sustainability rather as a competitive tool than as a restriction. The traditional product is, under such an approach, carriers of the durability that customers want to buy’ (SKF 2016).</td>
</tr>
<tr>
<td>The neoliberal discourse</td>
<td>‘Other areas are also possible, and it’s really just you and your future employer that create the limits’ (LNU, master). ‘With a degree from this programme, young engineers have a very good start to a successful career in business’ (CTH, master).</td>
<td>‘In order to ensure that the conditions for entrepreneurship and innovation in Sweden is efficient, effective and continued international competitiveness should be revised regulatory framework as well as the innovation and entrepreneurship promotion efforts, as well as opportunities for increased cooperation. An inquiry is therefore given a mandate to identify obstacles and opportunities and to propose measures to improve and develop innovation and entrepreneurship climate in Sweden’ (Regeringsdirektiv [Swedish Government Directive] 2015).</td>
</tr>
</tbody>
</table>
**Engineering identity positions**

Different identity positions for future engineers are made available within, or in the intersections of, the main discourses described above. We have named these identity positions: the traditional, the contemporary, the responsible, and the self-made engineer.

**The engineer as a traditional technologist**

When the discourse of technological progression is articulated it can produce an identity position that can be understood as a rather traditional interpretation of the engineer, an identity position we have chosen to label ‘the engineer as a traditional technologist’. The term technologist, following the Oxford English Dictionary, refers to a person who is an expert in a particular field of technology. This is, for example seen in the following text from Uppsala University’s website:

> As a student at the Mechanical Engineering program, you get a reality-related education. You will work specifically with projects based on product specifications, as in the industry. You will also use software that mechanical engineers use in their worklife. (UU, Bachelor)

The focus here is on the engineer as acquiring a certain kind of deep knowledge, as formulated in the LNU masters text: ‘Deep knowledge of product development, to do the right things and do things right’. Furthermore, the competence acquired during education is mostly presented as being useful within rather traditional work areas for engineers:

> You get the required expertise in a variety of industries such as design, product development, manufacturing, energy conversion and energy use as well as distribution and recycling. (LTH, masters)

Consequently, one identity position made available within the discourse of technological progression suits people focused on technical problem-solving and design. Although this is an engineering position commonly described as providing a too narrow conceptualisation of the engineering profession (Trevelyan 2010), it is also argued that it is a position from which one is able to enter the profession (Faulkner 2007).

The traditional technologist position is also reproduced in the student ‘interviews’. For example, it is highlighted that a dream job is: ‘to work with construction or to develop the next generation of vehicles’ (Nils KTH, master). The discourse of technological progression is also articulated within the students’ interest for technology or science. However, here we have found a difference depending on level of education. An interest in technology and practical skills, such as tinkering with engines, is foregrounded in interview talk on the bachelor degree, and especially in the interviews with male students. This masculinisation of practical skills and interests is further underlined through an interview with a female student, Lisa (UmU, bachelor). Lisa is introduced as liking practical work and having an interested in machines. She says: ‘Our program is very practical, we can make things and work with our hands, I like it’. However, Lisa continues, and says:

> So far, it has been more common for guys to be interested in machines. But I think it’s changing. Now it’s more accepted that girls like to tinker and that is really fun!

Interestingly, Lisa needs to do some discursive work in order to defend this ‘awkward’ position, while simultaneously stressing how acceptable such an interest is for a woman nowadays. Since such a declaration would not be needed if it was interpreted as ‘natural’, we read it as sign of how masculinised the traditional technologist at bachelor level still is in Sweden. Another pattern is visible in the interview data from students taking a master degree: an interest, for instance a fascination for physical laws, is specifically foregrounded in interview data with female students. Irene, for example, says that: ‘The laws of physics and being able to calculate things fascinated me a lot’. We interpret this as both classed and gendered. It is classed in the sense that the ideal engineering student has more practical interests at bachelor level and more theoretical interests at masters level.
The engineer as a contemporary technologist

In addition to how the discourse of technological progression can produce an identity position of the engineer as a traditional technologist it also opens up a broader conceptualisation of engineering identity, in that it also can make a more heterogeneous identity position available, a position that is recognisable, for example, from the work of Faulkner (2007). This identity position draws on contemporary renegotiations of engineering that foreground social aspects of engineering as well as the importance of generic skills such as writing. This is visible in the following two quotes:

In the block engineering skills, you will learn communication, creativity and quality. (UU, bachelor)

During the training, you become a skilled machine technician, with more reality-based project work in cooperation with industry, training, other skills such as presentation techniques and report writing. (CTH, bachelor)

This identity position of the engineer as a contemporary technologist is also stressed as an asset for the engineer on the job market:

Mechanical engineers with skills beyond the purely technical are sought after in the labour market. (UmU, bachelor)

What is characteristic of this identity position – and that makes it a position within the discourse of technological progression – is that the ‘softer’ skills of engineering are always mentioned in direct connection to technological skills, using the technological skills as a stepping stone to arguing for the importance of other skills. This is exemplified by Jennifer (KTH, master): ‘I want to meet a lot of people in my everyday work while practicing my technical skills’. In the interview talk, other students also draw on this discourse in talk about their future careers. Carlos, for example, says that he would like to go ‘beyond the technological part, build bridges between different relations and to work with people’ (Carlos KTH, bachelor). Harry has a similar way to talk about his future:

My dream job is a position at a somewhat smaller consulting company where I can use the technical knowledge I have after a graduation at KTH. I want to meet many different people when I work, and together with them solve problems. (Harry KTH, master)

The responsible engineer

In the intersection between the discourse of technological progression and the sustainability discourse, we have identified an identity position that can be described as the engineer as the key to solving the world’s environmental problems. This is made in two ways: either technological progression is portrayed as unproblematic or as problematic. When technological progression is described as trouble-free the engineer is crucial to provide solutions:

Society is making increasing demands for sustainable solutions in areas such as transport and energy. The masters in mechanical engineering will create a profession that contribute to the solutions. (CTH, master)

This identity position, thus, makes the engineer a powerful player in how humanity is to come to terms with contemporary environmental challenges, but without acknowledging how the discourse of technological progression in itself may be problematic from a sustainability point of view. When awareness of sustainability is constructed as integral to engineering practice, the engineer, unless they are able to take such aspects into account, becomes part of the problem:

To develop future products, processes and services, you need skills in areas such as science, engineering and project methodology and understanding of the ethical, economic and sustainability dimensions. (KTH, bachelor)

In this construction of the ‘the responsible engineer’ a more nuanced conceptualisation of sustainability is made possible, one that not only includes environmental aspects but also economic and social ones. This kind of engineer is also foregrounded as an engineer needed by society, thus making the engineer attractive on the job market:
The aim of the Mechanical Engineering programme is to meet society’s need for engineers who take on a sustainability perspective while developing technologies for safe and environmentally friendly energy and energy conversion. (LTH, master)

In the interview talk, this identity position was more difficult to find. It was only reproduced in two female students’ interviews. In Nadja’s (KTH bachelor) interview, there was talk about how she wanted to contribute to a sustainable society: ‘But I do feel that I should be beneficial and contribute to a more sustainable society’. Likewise, Isabella’s (KTH, master) interview talk activates the sustainability discourse when she says that she wants to ‘combine working with people, problem solving and making the world better’.

**The self-made engineer**

The neoliberal discourse constructs the possibilities of becoming an engineer and having a successful career as an individual project, without taking into account social structures. It thereby produces a subject position from which the individual student only has to rely on her/himself. With enough strength and desire everyone can make it:

Do you want to realize your ideas by developing new technologies from concept to finished product? It can become reality if you study mechanical engineering at Uppsala University. (UU, bachelor)

You have great opportunities to influence your career path and spend some time abroad. (KTH, master)

This position, which we call the self-made engineer, was well represented in the interview talk. Generally, the interview talk highlights successful careers, where students can become both ‘challenged and develop personally’ (Ida LTH, Master). The words ‘broad education’ were used in many interviews, which we interpret as a synonym for the possibilities and unrestricted choices the students have, in terms of areas of work and career development:

I have no specific dream job at the moment, I think of new things to do every day. To study to become a ‘civingenjör’ is a big plus because the job itself varies and that makes it possible for me to afford to continue to dream although I have chosen a programme. (Rezwana KTH, Master)

Rezwana in the example above can continue to dream because her education provides her unlimited choices.

**The perfect student – as represented in the student interviews**

As shown above, the student testimonials in form of interviews can be understood as producing and being produced by the identified discourses, but the interview talk can also be looked at from the perspective negotiating how different identifying characteristics, such as gender, ethnicity, age, social and study skills are represented. Next we present how the student interview talk foregrounds such identifying characteristics in order to more explicitly show what kind of engineering students the universities value and expect.

**Gender and ethnicity**

The majority of the interviewees were women, eight men and twelve women. However, this pattern is not reflected at both levels of engineering. More men than women were interviewed at a bachelor level (six men and four women), whereas only two men were interviewed in contrast to eight women at masters level (see Table 2). These numbers should be seen in light of the statistics of these two EMPs, where 12–15% are women at bachelor level (UHR 2016), and 25% are women at masters level. We interpret this overrepresentation of women in our interview data as a consequence of the universities’ wish to show that women are both capable and welcome in the EMPs. Two universities (KTH and UmU) used students that had non-Swedish names and/or presented themselves as non-Swedish, four of them at bachelor level and one of them masters level. Again, this representation can be interpreted as indicating that students from different cultural backgrounds are welcome at
these universities, especially at bachelor level. However, our analysis also revealed other patterns and characteristics of the desirable student.

Age
Apart from the fact that the student interview data on the websites show photos of young-looking people, youth was also made explicit in the interview talk. For instance, students’ talk concerned ‘enjoying life as a young person’, or pointing out the importance of moving away from home in order to become a part of the university. It was also often mentioned that this relocation involves getting new close friends:

Uppsala felt nice and I had friends that recommended both the city and the university. There is such a sense of belonging here and so many students, that we have become like a big family. (Robin UU, bachelor)

The interview talk with Robin puts forward the lifestyle of a young adult with no responsibilities to take care of children and so on. Family, parents and children are more or less non-existent in the interview data.

Only one interview comes with an alternative narrative around age. Sofie, although looking young in her photo, is portrayed as older than other students who are interviewed. She has had a former career as a teacher, has family responsibilities and is successful in the engineering programme. As readers we get to know that she commutes from another town every day:

I take the train at quarter to eight [every day] even though we only have lectures half of the day, then I stay the rest of the day to study. Usually I’m home about five o’clock. If I study on the train both going there and on my way home, I have a good foundation to succeed. In the evenings and weekends it is all about the family. (Sofie UmU, bachelor)

In this story the family is more central than friends or exercising, and she compensates for her limited time by studying very hard. Sofie’s former experience is here described as something that makes her successful: she is used to working 40 hours a week and it is therefore no problem to study on the train every day (in order to have time for her family at weekends). This experience makes her more ‘effective and structured’, and because of her deviant age she thinks that she is able to make contributions because ‘we all think differently’. Sofie describes her position of being an older engineering student as something not to be ‘scared of’ and by doing so the interview talk simultaneously illustrates what the age norm (being young) is.

Hobbies and social skills
The theme of hobbies recurred strongly in the interview talk, producing students as socially skilled, and with calls for new students to not miss out on the university’s social activities:

For me it’s so obvious that you should get involved in various things during your time as a student because it is fun, social and has given me many new friends. (Erika LTH, master)

As above, the interview talk highlights friends, not family bonds, as the most important people for students. Key here is that none of the students describe how they do something by themselves in their spare time, such as reading books or playing online games, repeatedly positioning social engagement as one of the main characteristics of being an engineering student. The students’ spare time could be summarised as involving friends and doing sports, thus producing students as not only social but fit.

Study skills and time management
Apart from being young, social and fit, the ideal engineering student needs to have study skills. In many interviews the importance of balancing the time between studying and socialising is underlined. In the interview talk, new student applicants are advised to be prepared to keep work and fun in a productive balance:
My advice to new KTH-students is to find their own balance between studying and other interests. To study at KTH requires a lot of time, and it is time worth spending, but don’t forget to have fun! Spend time with a lot of people! Your fellow students are really important and you have real fun with people! All the KTH’s activities make this easy, so do get involved! (Carlos KTH, bachelor)

Here the ideal engineering student needs to balance her or his time because s/he is very hardworking and very socially active. It is also pointed out that there is an expectation of putting another kind of energy into studying than in high school:

It’s not possible to be a slacker like in high school. But studying is more social [than in high school] because we study together. Everyone helps each other and makes sure to pass all the tests, so in that way it isn’t actually harder. (Robin UU, bachelor)

The message to the reader is that although the education is tough it is not an impossible endeavour, because of all the friendly and helpful students. The importance of socialising instead of only focusing on the studies is put forward here. Likewise, in the interview talk with Philip (KTH, master), the need to spend time and energy on studies is foregrounded but there is also a strong recommendation to avoid isolation (by only studying) because your fellow students can become ‘life-long friends’.

**Discussion and conclusion**

In this paper we have used critical discourse analysis to identify three societal discourses in the websites: ‘technological progression’, ‘sustainability’, and ‘neoliberal ideals’. These discourses make certain engineering identities possible, that we have labelled: traditional, contemporary, responsible, and self-made engineer. Common to all these positions is that they include certain skills or qualities that are linked to employability in the texts. For instance, the traditional technologist has ‘deep knowledge of product development’ that is required in ‘a variety of industries’. The theme of employability is, of course, connected to the neoliberal discourse, where the student’s education is primarily an opportunity to craft her or his own future. However, there is a tension here, since the student’s education choices are pivotal within this discourse – when students are responsible for their own success there is a risk of ‘wrong decisions’. This is exemplified by the term ‘broad education’ in the interview texts that can be interpreted as a sign that the risk of ‘wrong decisions’ (that close down opportunities) has to be reduced. Another tension in how the engineering profession is portrayed in the websites is between tradition and innovation, specifically concerning educational content where traditional ‘hard’ engineering subjects are balanced with, for instance, economy, management, and sustainability. A third tension is between the engineer as a specialist and as a generically-skilled problem solver. A fourth tension is between the engineer’s responsibility towards the environment and the need to compete and perform well in the market. In the interview data we identified additional tensions. For instance, tensions between being young or (in this context) old, studying hard and socialising, and being practical or theoretical.

Somewhat surprisingly, we did not find any ‘geek’ identity positions, which are described in previous research (Du 2006; Ottemo 2015; Tonso 2006). Although the students did admit enthusiasm for technology and science we could not find what we would characterise as a strong passion for those subjects, or any student who spent preposterous amounts of time on anything geeky, or any position in contrast to exercising and having lots of friends. There is also an absence of students’ relation to alcohol, which Ottemo (2015) has described as central for doing masculinity within the Swedish engineering community. Although there are students who in the interview talk mention parties as fun, alcohol is not portrayed as obligatory or even important. Instead, socialising with friends and doing sports dominate the interview talk thereby distancing the students from the image of the unhealthy, indoor geek. This is interesting since the purpose of the websites is not just to communicate to future students about their programmes but also to attract applicants. Our study indicates that universities consider that the sporty student with many friends is the most successful position to focus on when recruiting students. This portrayal can be understood as at least partly a
consequence of how the geek has historically functioned as a STEM gatekeeper (Margolis and Fisher 2002; Ottemo 2015). However, this relatively non-discipline specific portrayal raises questions about what distinguishes the engineering student from students in other academic disciplines (Becher 1994). In addition, given that previous research shows that students are likely to leave engineering programmes when they feel their identities clash with the prevailing culture of the programme (Danielak, Gupta, and Elby 2014; Foer, Walden, and Trytten 2007; Marra et al. 2012; Stevens et al. 2008), the value of changing the websites without putting work into changing the culture of the programmes can be questioned.

The main recipients of the websites are the potential future students, who may be attracted to or repelled by the message. On the one hand, our findings can be understood as different universities’ efforts to widen participation in engineering education and thereby attract people who traditionally do not become engineers. On the other hand, our analysis of how these different engineering and student positions are discursively produced, also reveals traditional gender and age norms concerning who the engineer is to be. Based on our analysis, we can summarise some advice that we believe is useful for ongoing discussions concerning the construction of universities’ websites, recruitment and engineering education generally. First, the education overall is described in very broad terms, reinforced by several discourses that lead to a very diverse range of professional roles from the same engineering programme. This may be appealing for students who are uncertain about their future but makes the message about education and engineering as a profession rather dissipated. Second, how to present the overall image of the typical (and ideal) student is a delicate matter. In the analysed texts the image of the engineering student is very specific: to be young and sporty and in addition to that have both social and study skills (Umeå University is an exception here). This image is almost diametrically opposed to how engineering students describe themselves (Du 2006; Ottemo 2015; Tonso 2006). To replace the image of the geek with the image of someone young and sporty is actually to switch one stereotype with another. We understand that that this ‘new’ image might have wider appeal (Margolis and Fisher 2002; Ottemo 2015) which is good, but this image might be less honest and thereby counter-productive: if potential future students believe in this image, they might be disappointed when they begin their studies; and if the students suspect the testimonials to be untrue, these texts lose their purpose. The texts from Umeå University illustrate an alternative example of how it is possible to provide diverse images of engineering students on the same website. We would also like to point out that we see a risk that identified neoliberal notions about the self-made engineer could derail an awareness of how society is structured by gender, social class, and ethnicity. We believe that student engineers, both for their own sake but also in their future work, in addition to social skills, need knowledge about and practice in reflecting on how engineering can challenge injustices in our society.

Our results show distinctions between the two engineering programme levels, making different student identity positions available. For instance, the bachelor education is described as being for students who wish to develop products, while the masters education is for students who wish to develop society. Bachelor websites present vocational options while masters websites present wider career options. A bachelor student is expected to learn to understand and improve technology, while a masters student is expected to develop technology. Our interpretation of this is that the two programme levels reproduce social class differences. The different programme levels are also gendered in the sense that more female students are visible in interview talk at the masters than the bachelor level. Our analysis of the interview talk further points out that female students’ choice to become an engineer is more often produced through their strong interest in school science subjects, while male engineering students more often talk about machinery or technically-advanced products as their motivation for studying engineering. This is in line with previous research that claims that women become engineers through rational choice while men choose the path of engineering because of their passion for technology (Holth 2014).

The three societal discourses presented in this paper can be traced in earlier international research. For example, Blewitt and Cullingford (2013) explore the sustainability discourse’s impact
on various academic disciplines. Several studies also show how neoliberal ideas in the higher education sector create higher demands for performance, effectiveness and flexibility among students and academics (e.g. Ball 2012; Kim 2017). In our analysis of the interview data only two of the three discourses are clearly echoed: the discourse of technological progression and the neoliberal discourse. The identity position of becoming a responsible engineer was backgrounded, especially in relation to the identity position of the self-made engineer. One interpretation of this is that the neoliberal discourse impacts strongly on how the Swedish universities communicate their EMPs. That the interview talk repeatedly frames engineering education as a ‘broad education’, meaning all doors are open for an engineer is another sign of that. In the future it would be interesting to interview high school students on how they perceive the texts in relation to the geek position and their future career choices.

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