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The new engineer: Gender and social class in information about engineering educations

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General description on research questions, objectives and theoretical framework

Historically engineering has been a profession predominately for men with a close relationship to technology. However, over the last decades this view has been under negotiation, and more heterogenic images of the engineering profession has developed, with expectations on leadership and “soft skills” (Mellström, 1999). For example, it has been argued that an engineer today needs to, apart from having a good conceptual understanding of basic science and mathematics, also possess generic skills such as creative and critical thinking, problem-solving abilities, and logical and analytical decision-making. In addition, they need to know how to work in teams since social skills are “needed to work in today’s workplace” (Sahin, 2010, p. 519). These changes of the demands and images of engineers have brought on changes of engineering education: Swedish 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 did not replace the technological core (Teknikföretagen, 2012). One response from engineering educations to the changing demands on the engineer is the implementation of project-organised courses with the aim of fostering better team-working skills as well as providing better learning outcomes (De Graaff & Kolmos, 2007). The changes in the engineering education can be understood both against the backdrop of needs to increase and diversify the recruitment to engineering educations (Hemmo, Love, & OECD, 2008) as well as the need for engineers to be able to handle contemporary societal changes (Adams et al., 2011). In the light of the contemporary transformation of the engineering education and vocation it becomes relevant to consider the consequences for engineering identities. Earlier research on identity related to engineering professions and educations has often focused on gender issues, in particular the available identities for women within engineering (Du, 2006; Faulkner, 2007; Jorgensen, 2002; Kvande, 1999; Phipps, 2002). Du (2006), who explored engineering identity as a Danish university, found that engineering students associated the discipline with attributes such as problem-solving oriented, logical, structured, focused, rational, analytical, nerdy, and male. Issues related to social class are less well-explored, but has been brought to the fore in analyses of the construction of different classed masculinities (Mellström 1999; Wajcman 2000). In this paper we intend to explore some of the possible affordances and constraints for identity constitutions in the engineering educations of today:

The purpose of this paper is to explore representations of the engineering profession in information material about engineering educations, seeking to identify continuities and tensions between traditional understandings of engineering and contemporary demands on the profession.

-What characteristics are brought to the fore as important for the contemporary engineer?
-How are gender and social class constructed in representations of the contemporary engineer?
-What are the differences and similarities in these constructs between different universities and different levels of engineering education (bachelor and master)?

Theoretically, our research is positioned within feminist post-structural theories (Butler, 1990/1999) where gender and other social categories are seen as performatively constituted. Drawing on Butler’s concept of performativity we interpret identity as an active process, a ‘doing’. Analytically, this theoretical stance is operationalised through an approach 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 & 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 every day (discursive) practices. Hence, discourses contribute to constructing social identities, relations, and knowledge systems (Phillips & Jørgensen, 2002/2006).
Methods/methodology

The focus of the paper is the Engineering Mechanics programme (EMP) (the branch of engineering that involves the design, production, and operation of machinery). This choice is motivated by how this programme represents one of the more traditional engineering educations, and as such could be considered as more resilient to changes in society than more newly established programmes such as, the Interactive Media Technology programme (that is, more likely to be reproducing traditional understandings of engineering). The empirical data consist of information material about EMPs (as presented on university websites), rather than documents outlining the actual structure and content of EMPs. The reason for this is twofold: 1) information material is likely to contain the strongest identity markers in terms of communicating what kind of student is to be recruited to become what kind of engineer, 2) the websites are likely to be more adapted to contemporary demands. Typically, the information about an education consists of a presentation of the programme of about 300 words complemented with some pictures/photographs. It is this multi-modal information material that we make use of in our analysis.

In order to create a diverse data set our sample consists of traditional, research universities as well as technical universities, and relatively recently established universities. In order to create a diverse data set our sample consists of two traditional research universities (Uppsala University and Lund University), two technical universities (KTH and Chalmers), and two relatively recently established universities (Linné University and Umeå University).

Furthermore, within the EMP, we analyse the two different levels of engineering education existing in Sweden, namely:

- ‘civilingenjör’, a five year, more theoretically focused degree, that is considered equivalent to a Master of Science, and
- ‘högskoleingenjör’, a three year (bachelor) degree which combines theoretical elements of engineering with more vocationally focused elements.

Our analysis is inspired by critical discourse analysis (Fairclough & Wodak, 1997). We draw on Fairclough’s (1992) three-dimensional model for analysing language, but combine the model’s second and third levels. This means that we analyse the websites on a ‘text level’ and a ‘discursive level’. On the text level we investigate, for example, words, wordings, text ‘producer’-‘consumer’ relationships, and identity constructions, and on the discursive level we look at intertextuality and interdiscursivity. The two levels are analytically separated but the mapping of discourses on the discursive level is underpinned by the text level analysis.

Expected outcomes/results

Our preliminary results show clear distinctions between the two engineering programme levels, making different student identity positions available. For instance, the bachelor education (BE) is described as an education for students who wish to develop products, while the master education (ME) is for students who wish to develop society. BE websites present options within the vocation while ME websites present wider career options. A BE student is expected to learn to understand and improve technology, while the ME student is expected to develop technology. One interpretation is that the two programme levels reproduce social class differences.

The universities also promote their engineering educations differently. Some of the universities have a tougher tone (e.g. pictures/photographs of machine systems, and texts assuming that the reader is ‘already-technology-informed’) while other universities have more human oriented and environmental focused tone (e.g. photos of female students and texts about solutions for a sustainable world). These differences can be read as reflections of Swedish discourses stressing that Sweden, on the one hand, need to become a high-tech country (the desire to engage the ‘already-technology-informed’ students), and on the other hand, need to engage more female students into engineering.
Furthermore, we identified tensions in how the engineering profession is portrayed. One tension is between tradition and innovation, specifically concerning educational content where traditional ‘hard’ engineering subjects are balanced with, for instance, economy, management, and sustainability. Another tension is between the engineer as a specialist and as a generically skilled problem solver. A third tension is between the engineer’s responsibility towards the environment and the need to compete and perform well on the market. Our initial analysis shows that the analytical approach has potential to develop important knowledge about changes and continuities within engineering education and what kind of identity positions that is open to ‘the new engineer’.

References


