Descriptions and analyses of the science classroom with a social class perspective

Introduction
Earlier studies show that there is a continuous trend that students do not pass Chemistry, Physics, and Biology to a greater extent than in any other school subject. In addition, earlier research show that there is a relationship between low achievements in science education and low socioeconomic background (OECD, 2007; The Royal Society, 2008; SCB, 2011; SNAE, 2011a, 2009, 2008; Svensson, 2006, 2001; Turmo, 2004). Moreover, high achievements and success in school science have been shown to act as a gatekeeper to higher education, broadening life chances of those who succeed, while limiting the future opportunities of those who fail (Gorard and See, 2009; Goyette and Mullen, 2006; Nyström, 2009). Thus, when considering science education and socioeconomic background, a picture emerges of subjects where many students fail which implies that students from low SES are excluded from highly valued positions in education and society. Despite the aim to give all children an equal education and equal possibilities, school science contributes to a reproduction of social inequality (Linder, Östman and Wickman, 2007; Tobin, Seiler, and Walls, 1999) and there is a risk that science classrooms become associated with elitism and inaccessibility and developed into “places where students become intimately acquainted with issues of power and inequity, and with the hierarchies of race, class, and gender” (Carlone et al, 2011, p. 481). However there is a lack of research regarding the relationships between social inequalities and school science and how this relationship is manifested in the classroom. Furthermore, a number of researchers call for additional perspectives when describing and analysing the science classroom regarding social inequalities (Carlone et al, 2011; Ross, 2009; The Royal Society). Therefore the overall aim of the research described in this paper1 is to contribute to a more complex and multi-faced description and analysis of the relation between inequalities in education, focusing on social inequalities in the science classroom.

Theoretical and analytical framework
The notion socioeconomic status is widely used in many educational research settings however complex. For instance, the components in the concept differs qualitatively (Turmo, 2004) and the concept does not take into account in the specific context and its variations such as every day practices in a classroom (Cederberg, Hartmar and Lingårde, 2009). Therefore this research use the notion social class since it takes into account the context and the field where the students can be found. The context in this research refers to the science education field (Bourdieu, 1998) with focus on the science classroom. As a starting point for the research process, and based on earlier studies (Carlone, 2004, 2003; Lemke, 1990; Mehan, 1979; Sadler, 2009; Wellington and Osborne, 2001; Wickman and Persson, 2008) and the Swedish curriculum (The Swedish National Agency for Education, 2011) this context, the science classroom, is characterised and featured as a (1) a practical subject, (2) a communication subject, (3) and a prototype of science. With the characterizing of the science subject and the social class perspective as a backdrop, the aims of this research will be elaborated on through the theoretical frameworks from foremost Bourdieu and Bernstein2. The elaboration will be done through descriptions and analyses of what ways of acting and talking that are (not) valued in the science classroom and

---

1 This paper briefly describes parts of a larger research project (NN, 2012) that will be published November 2012.
2 For definitions and descriptions of the different theoretical and analytical tools please see forthcoming thesis.
how these (not) valued ways of talking and acting can be related to social class. Following research questions are developed and will be applied:

- How is this specific science classroom situated in the field of science education?
- How is this specific science classroom organised?
- What are valued and important in this specific science classroom?

The first question will be answered through descriptions and analyses making use of following concepts as analytical tools: field (Bourdieu and Waquant, 1992), doxa (Bourdieu and Waquant, 1992), and code (Bernstein, 1975). The description and the analysis of how this specific science classroom is organized will done with the following analytical tools: classification (Bernstein, 1975), framing (Bernstein, 1975), triadic dialogues (Lemke, 1990), regulative and instructional discourse (Bernstein, 2000), vertical and horizontal discourse (Bernstein, 2000). The final question will answered using following tools: habitus (Bourdieu, 1990, 2010), cultural capital (Bourdieu, 1991, Bourdieu and Passeron, 1977), recognition and realization rules (Bernstein, 2000).3

Method
Inspired by an ethnographic approach (Beach, 2005; Marcus, 1998; Willis and Trondman, 2002; Wolcott, 1990) the data was produced through observations, field notes, interviews and questionnaire in a Swedish compulsory school. The students aged fourteen and fifteen, were followed during a five weeks unit on physics (mechanics). The data were analysed in two steps, the first step aimed to make overviews and organize the data in ways which made further descriptions and analyses possible. The second step more clearly brought in the analytical tools. This was done with episodes from the classroom and answers from interviews and questionnaires. To exemplify briefly, classroom episodes were placed in the science education field context and were looked upon with for example the analytical tools framing, instructional and regulative discourse. Students were described and analysed in these episodes with for example habitus and cultural capital as tools. Additional perspectives were brought in through interviews and questionnaires regarding for instance students’ background and interests. In the end the descriptions and analyses were brought together into one story where the aims were to give complex and multi-faced descriptions and analyses of the science classroom with a social class perspective. The aims was also to show practices, activities and students that illustrated and deepened our understanding of social class in science class rather that to generalize or show one definitive whole picture (Clifford, 1986).

Findings
The descriptions and the analyses resulted in a number of findings, three main themes built upon the above presented characterization of science education field will be shortly described here: Firstly, the results showed that unconsciously or not, the teacher adapted her teaching to the way the classroom was built. The organization of the premises influenced the organizations of the pedagogy and since the classroom was strongly influenced by science and its sociohistorical legacy not only the classroom itself became a prototype of science but the pedagogy (Carlone, 2004, 2003). In addition, hidden negotiation changed what was valid transmission of knowledge (Bernstein, 1975) for this particular class and the results revealed that the knowledge threshold in the classroom was lowered. This was done unconsciously and in hidden negotiations (often with

3 For definitions and descriptions of the analytical tools please see forthcoming thesis (NN, 2012).
good intentions) between the students, the teacher, sociohistorical legacy of science education, and a social discourse about the school. It created a knowledge threshold, a least common denominator which became diverging not only for students from lower social classes but for all the students in the classroom.

Secondly, the descriptions and analyses of the classroom communication showed that being able to translate, interpret and adapt to new or changed ways of talking increased the possibilities to understand what ways of talking and acting that counted as valid or not. Some student brought into the specific dialogues in the science classroom a habitus (Bourdieu, 1990) that could be transformed into a cultural capital (here: ways of talking) (Bourdieu, 1990) which gave them advantages. However it was not their background (often from a higher social class) itself that gave familiarity and in turn advantages, it was in the particular practice and in interplay between the dialogues and the students that this became visible. What ways of talking was created and influenced in an intricate interplay between the practices in the classroom, the teacher, and the students often in hidden negotiations. Together they constructed what ways of talking that was valued and how you could act and talk in the science dialogues. What also was shown was that in weakly framed (Bernstein, 1975) dialogues in this classroom entailed options and freedom. However it was freedom for few (foremost students from a higher social class). The analysis of the communication furthermore showed that in strongly framed (Bernstein, 1975) dialogues, more students could be heard and evaluated. However, it became a communication based on the lowest common denominator the argumentation and the complexitivity of the dialogues and the scientific knowledge were narrowed and the teacher used an everyday, horizontal discourse (Bernstein, 2000). This in turn might in the long run exclude all students and narrow their room to manoeuvre since several researchers (e.g. Nylund and Roswall, 2011) claim that students need vertical discourses to gain more room to manoeuvre in the educational system as well as in the society.

Thirdly, laboratory work lessons could be lessons filled with curiosity, freedom and exciting challenges. However another pictured emerged in this very common way to work in this classroom. For example, the regulative discourse totally dominated the instructional discourse (Bernstein, 2000) and became decisive; it was the organization of content rather than the mere content that was important. In addition, there were at least two parallel codes (Bernstein, 1975) that needed to be translated and adapted to in the classroom. Laboratory work in this classroom was a social process that needed to and expected to be performed in groups. However this became problematic since the grades rewarded you individually. In addition, the reactions and the effects of a hierarchical class marking process became deeply problematic in an activity built upon students working in groups. For example, the students in this classroom had different status and ranking in the classroom and this became visible in the laboratory work episodes. In addition the groups, in many cases built upon member ascribed to the same social class, became safe havens where the students found room to manoeuvre and their ways of talking and acting were valued. However this undermined the students’ possibilities to for example be fairly evaluated and get a chance to work with other students that could help them in the educational system. The laboratory work units left the students blaming themselves for not understand or feeling stupid even though this was the outcomes of complex interplays between practices and presumptions in the science field, the curriculum, social class, school premises, school doxa and codes.
Conclusion and contributions to the science education field
Through descriptions of analyses of this science classroom with a social class perspective this research revealed that room to manoeuvre, possibilities, options and success was a collective process. It was shown that science learning and teaching were deeply complex and that “the basic point-of-view is that science is a social process” (Lemke, 1990, p. xi). This implies for example that there are no reasons for students to blame themselves, neither can we blame their background or talent. Neither can the science subject itself be blamed when discussing reproduction of inequalities. Inequalities in education must be seen from collective, social process and perspective often manifested in hidden, unconscious negotiations between all the actors in the field. This was for instance exemplified when looking at successful students that had a feeling for the game (Bourdieu, 1990, p. 109) for the classroom activities and used their cultural capital, a capital valued in this specific science classroom. Social class clearly gets manifested and sometimes created and established in the science classroom with its activities and practices however in collective social processes where many actors interplay. There are no simple solutions to the problems seen in school and society today regarding inequalities in educational system, widening gaps and distinctions between social classes. However as much as inequalities, distinctions and limitations are created in specific situations and practices in collective, hidden negotiations and processes I claim that it is exactly there that equalities, possibilities and room to manoeuvre can be found.

References


