

Reproduction of Inequalities in the Teaching and Learning of Science

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Authors note

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The paper briefly describes research that will form the foundation to the thesis that will be presented in 2012.

Abstract

Being good at science is a qualification needed to reach prestigious higher education and societal positions. Since the pass rate in the science subjects is lower than in other school subjects and failure in school science subjects is correlated to low social class, it has been showed that science is a factor in the reproduction of an unequal society. The way science is taught and learned in schools thereby contributes to an unjust society where children from e.g. disadvantaged socioeconomic backgrounds have less chance to succeed. Thus, the overall aim of my research is to contribute to our understanding of how school science reproduces unequal structures in society. Data were collected at Swedish compulsory schools with ethnographic methods. Results were discussed and analysed using concepts derived from Bourdieu and Bernstein. Preliminary findings indicate that habitus play a role in the science classroom and influence how students react and respond to teaching instructions, goals and criteria. Moreover, the first analysis point out that when framing is weak, student with inappropriate cultural capital fails.

Keywords: reproduction, inequalities, science classroom, Bernstein, Bourdieu

Background of the study

Many students do not reach the goals for science (Physics, Chemistry and Biology) set by their national curricula. Failure in science has by researchers been demonstrated to be more strongly correlated to social class than any other school subject. Foreign background correlates both to school failure and to social class, which makes the situation particularly complex (The Swedish National Agency for Education, 2009a, 2009b; Egelund & Eidesgaard, 2009; Gonzales et al., 2008; Gorard & See, 2009; Goyette & Mullen, 2006; OECD, 2007; Turmo, 2004). Moreover, success in school science has been shown to act as a gatekeeper to higher education, thus broadening life chances of those who succeed, while limiting the future opportunities of those who fail (Barton, 1998; Broady & Börjesson, 2008; Goyette & Mullen, 2006; Linder et al, 2007). Linder et al. (2007) argue: "Instead of equipping students to participate thoughtfully with fellow citizens building a democratic, open and just society, school science will be a key factor in the reproduction of an unequal and unjust society" (ibid, p.8) while Tobin et al. (1999) assert that "there is a risk that school science simply maintains the status quo and pushes minorities even further toward the margins" (ibid, p.172). In addition, this study is based on prior research which has shown that both success and failure at school play an important part in reproducing social and economic structures (Apple, 2001; Bernstein, 1990; Bourdieu & Passeron, 1977; Harker, 1990; Willis 1977). A critical perspective is applied, arguing science and science education as fields including, excluding or embedding certain discourses, values, beliefs and power (Anderson, 2007; Apple, 2009; Kelly 2007; Lemke, 1990). Based on this research, my specific research interest concerned in what ways the reproduction of inequalities are shaped in the science classroom. The focuses are, thus, on the manifested processes and

activities in the science classroom, as well as how these were experienced by the actors, foremost the students.

Analytical framework

In this study, theories derived from sociology of education will be used in the analysis of the collected data. In order to set the scene to the analytical process, this paper will briefly discuss the notion reproduction and the concepts habitus, cultural capital, classification and framing. Reproduction is often strongly connected to ideas regarding class, power, unequal and discriminative social and economic structures in society. According to Bourdieu & Passeron (1977) *reproduction* could be seen as a "transmission of cultural capital cross generations" (ibid, p. ix). In this setting the transmission is considered to maintain social and economic (visible as well as hidden) structures, often legitimated by dominant groups in society. According to Bourdieu & Passeron (ibid), school plays an important role in the reproduction and they argue that "the school helps to make and to impose the legitimate exclusions and inclusions which forms the social order" (ibid, p. x). As Bourdieu so have theories developed by Bernstein contributed to the idea of reproduction and its role in school (Blackledge, 1993). In the research informed by Bourdieu (Bourdieu & Passeron, 1977; Bourdieu, 1990, 1992) and some interpreters (Blackledge, 1993; Harker, 1990; Mills 2008a, 2008b; Reay, 2004, 1995) the concepts habitus and cultural capital are of particular interest. *Habitus* could be explained as as "the system of dispositions to a certain practice" (Bourdieu, 1990, p.77). Bourdieu also explains it as a "socially constituted nature" (ibid, p. 11). Habitus entails a sense of the game or "you could have a feeling in certain practices or places like a 'fish in water'" (Bourdieu, 1992, p.127). However, the consequences might be that you experience the opposite. In school situations, such as laboratory

REPRODUCTION OF INEQUALITIES IN THE TEACHING AND LEARNING OF SCIENCE

work or in a group discussion, that could imply a feeling of misunderstanding or alienation¹. The concept capital can be described as values, assets and resources that you possess. There is e.g. economic capital in the strict sense (i.e. money), as well as *cultural capital* (i.e. knowledge and educational qualifications). Capital can be shared, improved and converted (e.g. grades). There are researchers (Broady & Börjesson, 2008; Goyette & Mullen, 2006; Turmo, 2004) claiming that the concept *cultural capital* could be of special interest in science education. In the research presented here, cultural capital will be used to understand, for example, which students that are excluded from the science taught in the classrooms and what kind of cultural capital that are valued in the science classroom.

The concept classification and framing developed by Bernstein² have been used “to analyse the underlying structure of the three message system, curriculum, pedagogy and evaluation, which are realizations of the educational knowledge code” (Bernstein, 1974, p. 366)). *Classification* has by Bernstein (1996) been described as regulating “what discourse is to be transmitted and its relation to other discourses in a given set (e.g. a curriculum)” (ibid, p.102.) For example, this could be between academic subjects in a curriculum (Maton, 2000). Bernstein (1974) emphasized that “[c]lassification here, refers, not to *what* is classified but to the *relationship* between contents” (ibid, p.366, authors italics). The role of classification within a school “can be seen in the structure of the timetabling and the arrangement of and use made of the spaces within the school ... also in the arrangement of the subjects and the importance they assume in the timetabling” (Chien & Wallace, 2004, p.2). This hierarchy is easily recognizable by some students while others do not understand the structures of the school. If classification could be seen as power relations, *framing* could be explained as what way the “the realization of power arrangements is transmitted” (Chien & Wallace, 2004, p.2). For example; framing

REPRODUCTION OF INEQUALITIES IN THE TEACHING AND LEARNING OF SCIENCE

includes the way in which it is legitimated to talk and to act, which give the student the necessary skills to “maneuver around the space of the classroom and the school” (ibid). Or if we use Bernstein’s (1996) own words: “The principle of the framing regulates how the discourse is to be transmitted and acquired in the pedagogic context” (ibid p.102). Likewise classification, framing can be strong and weak, “[w]here framing is strong there is a sharp boundary, where framing is weak a blurred boundary, between what may and may not be transmitted. ... Strong framing entails reduced options; weak framing entails a range of options” (Bernstein, 1974, p.366). As with the concepts habitus and cultural capital, classification and framing need to be set in motion, they are analytical tools to be used when working with data and theories of reproduction can be useful when trying to understand mechanism of exclusion and inclusion in school science.

Research questions

Based on prior empirical and theoretical research, following research questions are applied:

- How is the reproduction of inequalities shaped in the science classroom, regarding aims and purposes, goals, content, and assessment practices and criteria?
- How is the reproduction of inequalities shaped in the science classroom, regarding classroom interactions and relations?
- How do students’ positions regarding gender, ethnicity and foremost socioeconomic background correlate and interact?

Method

The research was collected at two Swedish compulsory schools. A first study was carried out in spring 2006, at a compulsory school set in a multi-ethnic urban area. The data were collected during science lessons with students aged 13 and 14 (year 7). The students were followed during 2 ½ months including units of Biology and Chemistry. A second round of data was collected spring 2010 at another compulsory school, set in a middle class area in a small town (population 10 000) with students with foremost Swedish background. The students, aged 14 and 15 were followed during a 5 week unit on Physics. Data was collected according to an ethnographic research design (Atkinson, 2001; Hammersley, 1986; Reay, 1995; Willis, 1977). The data sources were derived from observations, interviews, video and audio recordings. The collected data also included field notes and examples of student work, such as written class work, tests, and homework. Besides, student questionnaires similar to the *PISA 2003 Student questionnaire* were collected. Thus, the data that now are processed contains e.g. information regarding the students, their homes and families. It includes information regarding their interests, their thoughts about school and future. Besides, the data consist of a number of observations and recordings from such as laboratory work, instructions, assessments and group discussions.

Crucial considerations for criteria and aspects that will be focused during the process of analysis are related to the concepts habitus, cultural capital and classification and framing. One way to accomplish this is to describe and analyze the relations between students' different habitus' and socioeconomic backgrounds and how they respond and react to the way science education is organized and presented by the teachers. For example; how do the students react and respond to assessments and laboratory works? How do the students react and respond to content and instructions? What are students' and teachers' thoughts about e.g. grades,

education, and future? To illustrate briefly: The very first unit of analysis has concerned *goals and criteria*. The interviews and questionnaire gave me a good picture of the students and the teacher's expectations. Observations, recordings and student works provided a (sometimes different) picture how students depending on their socioeconomic background responded and acted towards the teacher, their peers and content. The next step will be to apply the theoretical framework on this particular unit.

Preliminary findings

The research presented here is in progress, however, the first preliminary analysis indicates that socioeconomic background and habitus play a role in the science classroom and influence how students react and respond to teaching instructions, goals and criteria during a session of laboratory work. For example, some students seem to have the capability to understand what is happening, while others struggling to translate and interpret what is expected to happen. This might also be understood through the theoretical framework; when *framing* is weak, student with inappropriate *cultural capital* fails. The first preliminary statistical analysis points to the fact that the students' expectations about their grades and possibilities to success in science could also be correlated to their *habitus*. Moreover, the findings indicate that previous research made by e.g. Tobin et al (1999) still is relevant and necessary.

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REPRODUCTION OF INEQUALITIES IN THE TEACHING AND LEARNING OF SCIENCE

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REPRODUCTION OF INEQUALITIES IN THE TEACHING AND LEARNING OF SCIENCE

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REPRODUCTION OF INEQUALITIES IN THE TEACHING AND LEARNING OF SCIENCE

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Footnotes

¹The concept *spielraum* has been used by Roth & Tobin (2001) in a similar way.

²Bernstein and Bourideu could be seen as counterparts, more elaborated on i forthcoming paper.