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Science for whom?

Case studies of two male primary school student teachers' constructions of themselves as teachers of science

Abstract

This paper investigates intersections of gender and the teaching and learning of science in case studies of two male primary school student teachers, exploring how these student teachers negotiate identities as teachers of science. The project works from dual theoretical starting points. Firstly, the project is founded in a feminist post-structural understanding of gender as performative, something 'done' in a social context rather than an inherent characteristic of a person. Secondly, learning is, following situated learning theory, conceptualised as involving the constitution of an identity. Empirically, the paper draws on semi-structured interviews with two primary school student teachers specialising in science. The paper explores the two student teachers' classed and gendered interpretations of school science, in particular how they use these interpretations as a means for them as male teachers to fit into the primary teacher role with its feminine connotations. Finally, some implications for teacher education are discussed.

INTRODUCTION

Learning to teach is a complex process of becoming, where past, present and future come together in dynamic tensions (Britzman 1991). Thus, one of the major challenges for a student teacher is the developing of a new professional identity, negotiating the tensions and continuities between their own educational biography and the norms and expectations of the teacher education programme. Consequently, teacher identity has gained a lot of interest both within theoretical and empirical investigations, as noticed in a recent review article by Beauchamp and Thomas (2009). However, most such studies have dealt with the 'generic' process of becoming a teacher, rather than issues related to the teaching of specific subjects. Considering teacher identity in the context of the teaching of specific subjects adds additional complexity, in that student teachers need to simultaneously negotiate disciplinary culture and content as well as 'generic' aspects of what it means to be and become a teacher. This complexity has been previously explored in secondary contexts (see, for example, Helms 1998 and Moore 2007), and to a lesser extent in primary contexts (Danielsson & Warwick 2013). However, I would argue that although primary teachers may be less likely to have a professional identity ac-

quired from the affiliation with a subject area (Helms 1998), this does not make it any less important to consider primary teachers' subject specific identity negotiations – both as a means to understand the challenges which some primary student face in relating to certain subjects, but also better to understand how the teaching of a specific subject may function as an entryway into primary teaching for students.

Previous research about science and pre-service and in-service primary teachers has to a large extent focused on their conceptual understanding. A major concern, in particular in early research, was primary teachers' science content knowledge and numerous studies explore student teachers' and teachers' understanding of specific concepts such as energy (Summers & Kruger 1992) and the greenhouse effect (Groves & Pugh 1999). A general finding of these studies – carried out in a variety of different countries – is that the explanations primary teachers give to concepts often are incomplete (see, for example, Groves and Pugh 1999; Heywood 2005). Research also shows that many primary teachers have low levels of confidence when it comes teaching science, in particular the physical sciences (Harlen, Holroyd & Byrne 1995; Harlen 1997). In particular, it has been shown that primary student teachers feel more comfortable teaching biology and earth science concepts than physics and chemistry concepts (cf. Sharp et al. 2009). Thus, a recurring theme in research about primary teachers and science is a focus on their difficulties with the teaching and learning of the subject. Consequently, science courses for primary student teachers often rest on a well-founded assumption that the students have a weak background in the subjects and low confidence in teaching the physical sciences. Hence, many such courses are designed to explicitly tackle issues with self-confidence and creating a curiosity for science and a positive attitude towards the subject. For example, Mulholland and Wallace (2002) explore issues of transition in a longitudinal study of beginning Australian primary teachers' struggles to learn to teach science, focusing on the border-crossings necessary in this learning, from pre-service to in-service teacher and from non-science person to science student.

In this paper I approach the issue of primary student teachers and science teaching from a different perspective, by focusing on student teachers who express a strong belonging in science. The paper explores how two male primary student teachers construct science and science teaching, as related to their own participation in both primary teaching and science, and in relation to their future pupils' potential participation in science. In the case studies I particularly focus on how their constructions of science and science teaching can be understood as related to social class and gender. In doing so, this paper is situated in the sparsely explored intersection of two previously well-explored areas of research: primary teachers and science, and primary teachers and gender.

The aim of this paper is to investigate how two pre-service primary teachers constitute identities as teachers of science, by focusing on the following research questions:

- How do these student teachers construct 'science'; in particular, in relation to what do they construct school science?
- How can their constructions of science and school science be understood as related to gender and social class?
- What are the potential consequences of how science and school science are constructed for the accessibility of science for different groups of students?

CONCEPTUAL FRAMING

The case studies presented in this paper are, following situated learning theory, founded in an understanding of learning as a process of social participation (Lave & Wenger 1991; Lave 1996). From this perspective, the engagement in social practices is the way in which we learn, but also the way in which we form who we are. As expressed by Brickhouse (2001), 'learning is not merely a matter of acquiring knowledge, it is a matter of deciding what kind of person you are and want to be' (p. 286). In other words, learning science, and learning to become a primary teacher, goes beyond the learning

of concepts and skills – it also involves the constitution of an identity, both in the case of the primary teachers and their pupils. From this perspective identity is understood as a negotiated and negotiating experience, a continuous work, something we do to ourselves as well as something that is done to us:

Identity can in this way be seen as being related to a competent and convincing performance of a particular role; it is defined not just internally by the individual but externally by the group's inclusive or exclusive attitude to that individual. (Paechter 2003, p. 23)

In exploring the identity constitution of the two primary student teachers this paper focuses particularly on their enactment of gender and social class within the context of becoming primary science teachers. As such, the analysis is founded in a feminist post-structural understanding of gender as performative, something 'done' in a social context rather than an inherent characteristic of a person (Davies & Gannon 2005; Hey 2006). However, conceptualising gender as performative does not mean that all kinds of 'performances' are possible; subjects can only take up those positions that are available to them (Honan, Knobel, Baker & Davies, 2006). Paechter (2007) explains:

masculinities and femininities, while performative in nature, are not arbitrary; what can be performed is highly dependent on time, place and circumstances, including the power/knowledge relations in a specific context (Paechter 2007, p. 40).

But, as pointed out by Davies (2006) it is important not to confuse the importance of external powers with a passive, deterministic shaping of the subjects. Important for the purpose of this paper is that such a conceptualising of gender, as something that is created and negotiated by the individual in response to a specific social setting, aims 'not to document differences between men and women, but to multiply possibilities, to demassify ways of thinking about "male" and "female"' (Davies & Gannon 2006, 319). Thus, it opens up possibilities for portraying the nuances in the student teachers doing of gender. Furthermore, employing masculinity as an analytical category (Connell 2005) highlights how men are positioned in different ways within science communities' contexts of power, and can, thus, help to unpick the relationship between science and masculinity. Moreover, social class can in a parallel fashion also be conceptualised as a situated doing, something fluid and subjective, produced in interactions between individuals and social structures (Archer 2003). In other words, class is seen as a process in which social class positions, differences and inequalities are socially constructed (Archer 2003). Social class, and gender, is in this way conceptualised as fluid and subjective, as produced in interactions between individuals and social structures (Archer 2003). Such a view contrasts a categorical conceptualisation of class, in which people are grouped according to their socio-economic characteristics (Archer 2003).

DATA COLLECTION, PARTICIPANTS AND ANALYSIS

The research presented in this paper is part of a larger research project, which set out to explore primary school student teachers' relations to the teaching and learning of science, at two universities, one in Sweden and one in the U.K. This paper deals with the Swedish context, where primary school student teachers specialising in science were interviewed. These students were enrolled in a four year teacher education programme, which includes a one year full-time science course. This one-year science course is specifically designed to prepare the student teachers for the teaching of 6-11 year olds, with the aim of creating a curiosity about science among the student teachers. It focuses mainly on science content knowledge, but also integrates elements about how to teach science in schools as well as longer periods of school placements during the second semester.

In this paper I present two case studies of male pre-service teachers, both from working class backgrounds, specialising in science teaching, here called by the pseudonyms Bosse and Henrik. They were chosen for this paper because they talk eloquently and reflectively about the teaching and learning of science, and their own relation to science, and because they offered both similar and different perspectives on their emerging teacher identities in this context. Henrik had his mind firmly set on

wanting to teach children of the ages 6–9 years, whereas Bosse was more indecisive, but leaning toward wanting to teach somewhat older pupils. Henrik was in his late 20s and Bosse in his late 40s.

The empirical material used in the analysis comprises of two hour-long semi-structured interviews (Kvale 1996), conducted in Swedish. The interview protocol was designed to elicit discussion around the interviewees' emerging identities as teachers. The two main themes of the interviews were the teaching of younger children (for example, what they perceived as important qualities for a primary school teacher and why they had chosen to become primary school teachers) and the teaching of science (for example, their own relation to science and how they wanted to teach science to young children). The interviews were audio-recorded and transcribed verbatim, but with little additional detail.

The analysis began by repeated readings of the interview transcripts, noting down preliminary themes to be explored further in subsequent rounds of analysis. The interview transcripts were then entered into Nvivo, a data analysis software for qualitative analysis. I coded the transcripts relating to the preliminary themes, which were grounded in the research questions and the literature review. These initial themes included the interviewees' own experiences of science both in and out of school, their description of the primary teacher, how they pictured themselves teaching science in school and their reflections about themselves as role-models. The initial themes were later refined and developed through iterative readings and re-codings of the transcripts, guided by the conceptual framing. In this refinement I narrowed down the focus of analysis to themes explicitly dealing with science and re-coded the transcripts with more detailed codings, relating to, for example, how Bosse and Henrik expressed the relations between technology, science and school science, and their use of dichotomies in their construction of science and science teaching (such as practical/theoretical). In doing so I was particularly interested in differences and similarities between Bosse's and Henrik's narratives. Finally, informed by the conceptual framework, I explicitly sought to establish how their constructions of science and science teaching could be understood as related to social class and gender.

RESULTS

Constructions of science – in relation to what?

Neither Bosse nor Henrik had particularly liked school themselves, but both said that mathematics and science were their favourite subjects. In his own schooling, Henrik was struggling with dyslexia and found school in general challenging. However, throughout his negative school experiences mathematics and science were always a retreat, where he could rely on his technological skills. When we talked about his favourite subjects in school he said:

Well, I think that maths and science, both because, science is a bit, well, in lower secondary I did find it difficult, but I always thought that it was fun and I've been kind of technologically minded, and that has been my strength and theory has always, always been difficult for me, learning-wise and also to be able to relate to.

In contrast to Henrik, Bosse never talked about having struggled in school; although Bosse did not particularly like school either. He talked in similar vein to Henrik, about science and mathematics being his favourite subjects in school, mainly because he 'found them easy':

Bosse: [Science and maths] were less demanding, thanks to that, I've never, or in school I never did any homework, or I did the homework once to check, and then I almost got full score on some physics exam, and then I thought, well I'm not stupid, and then it doesn't matter how it goes.

Bosse and Henrik both grew up in rural, predominantly working-class areas and both stressed that this countryside upbringing had been important in igniting and shaping their interests in science. Henrik self-identified as a practical, technological person, and his interest for science had very much grown out of a childhood fascination for technology, a fascination that was supported by his father and his older brother. Henrik described his father as technologically skilled and consequently science

and technology were the school subjects where he could support Henrik:

And that's very dependent on my dad who is, well, he's never studied at university, but he is technically skilled and quite, yeah, it's those subjects where I've had to most support from home. Those areas that, mostly my dad, I've gotten the most help in school, it's where he has his own knowledge and, yeah, I think, it's my strong subjects.

In his talk about school science, Henrik over and over again came back to the importance of not only valuing theoretical knowledge, but also practical skills. He also elaborated on how he does not think it is necessary for the children to use a scientific vocabulary, but rather to allow them to explore for themselves and use everyday words:

To try to use the children's own language and... in that way allow them to explore for themselves and create a, well, it doesn't have to be so square and word-wise, you can call it melt, instead of using the theoretically complicated words.

In essence, Henrik is constructing school science as a hands-on, practical subject, preferably expressed through everyday language and related to everyday life. However, this is a construction that is made in contrast to a perceived valuing of theoretical knowledge within the science community, a valuing he opposes, but in a sense also reinforces, by constructing it as the norm:

Anna: If you think of a student who is successful in science, what characterises them?

Henrik: Well, that I find very difficult, because we were on placement recently and there was some student, whose father probably was a professor or something at [the Faculty of Science and Technology] [laughs] and it was like, he definitively had the theoretical knowledge, but he found the connection to the practical so difficult, and I can think that, yeah, having the theoretical knowledge is clearly... But it's also about being able to apply it in your context, in different situations, so in my eyes, someone who is skilled at science is to have an understanding for physical situations and not just know the theory behind, but also being able to understand the physical laws in the world we live in.

Henrik also said that, prior to enrolling in his current course, he viewed academia in general as 'extremely theoretical and square', and the scientist within academia as a 'theoretical person'. Thus, when Henrik constructs school science as a practical subject this largely is done in contrast to science as an academic, theoretical discipline.

Bosse also said that he wanted to teach a practically oriented science; during the interview he repeatedly came back to wanting to teach science using a lot of experiments and when I asked him to give examples from his own teaching they also tended to focus on experiments. But in contrast to Henrik, his negotiation of the boundaries of school science did not take place in relation to the academic discipline of science, and its perceived demands on theoretical skills and knowledge. Instead, Bosse related science to other 'theoretical' school subjects, which he claimed that demand more studying:

Bosse: It possibly takes some more logical thinking and such, but I think, that's needed in the other [subjects] too. It's like, no, well, possibly maths and some chemistry, because there's a particular way of thinking needed maybe. In many of the other subject, it's enough if you just work hard. [...] [In science and mathematics] it has to be a bit more of a problem-solving skill. It's somehow another way of thinking, even if, also in those subjects you will do fine if you study hard.

Even though Bosse did acknowledge that you can 'do fine' in maths and science also by studying hard, there is still an underlying assumption that science is at least more accessible to the student who is capable of a particular way of thinking.

Overall, in Bosse's and Henrik's descriptions of school science, science and technology were intertwined and when they gave examples of interesting and successful science teaching, the examples exclusively came from the realm of physics, bordering on technology. Throughout the interviews they

stressed the importance of teaching science as a practical subject, with a focus on experiments and connections to the pupils' everyday lives. The emphasis on physics in Bosse's and Henrik's constructions of science is further reinforced by them distancing themselves from biology. Henrik barely mentioned biology or chemistry during the interview, and when he did talk about biology it was in the context of what he perceived to be a skewed view of knowledge within a biology course he had taken. The focus of this course, he said, was on memorisation of different species, something he found impossible to cope with and which he thought would be of no use for him as a teacher. The same kind of distinction between physics/technology as practical, relevant and concerned with understanding on one hand and biology as irrelevant and focused on memorisation on the other was also made by Bosse:

Because biology was a lot of plants and plant names and things like that, and to memorise names, that I find difficult, I don't like that, I like to experiment.

However, Bosse also talked about wanting to convey an environmental awareness through his science teaching and says that he had grown fonder of biology with age:

It's really other subjects that are closer to my heart, but you grow into biology too, thinking that it get more interesting. Because, I can feel that it actually becomes more and more fun. [...] You've grown into biology, starting to grow up, I don't know. Become interested in that, instead of cars and explosions and stuff.

Thus, Bosse contrasted biology and physics/technology also in the sense of biology being related to maturity whereas physics/technology is more related to the immature interests of his youth. This is a construction that resonates well with Mellström's (1999) characterisation of the world of technology as a world of 'eternal youth', where boys' childhood-play with technological toys (i.e. a certain child masculinity) continues into a professional technological world that rewards 'boyish' curiosity and inventiveness. Like the engineers in the study by Mellström (1999) technology as a men's way of life has been founded in early childhood for both Bosse and Henrik and while they have not grown up to become engineers, they have in a sense turned primary teaching into a 'technological world'.

MAKING SCIENCE ACCESSIBLE

In the interviews Bosse and Henrik talked about wanting to teach a similar kind of science, focused on experiments, inquiry and related to everyday life. This is not surprising considering that the science course Bosse and Henrik were enrolled in explicitly encourages teaching by inquiry with a strong connection to everyday experiences and applications. Furthermore, several studies have shown that teachers typically construct good science teaching as child centred, emanating from the children's interests and focused on their construction of their own understanding (King et al. 2001; Levitt 2001; Skamp & Mueller 2001). However, what makes Bosse's and Henrik's constructions of such a practically oriented science teaching interesting is the targeted audience for whom they construct it.

I argued earlier that Henrik constructed school science largely in contrast to science as an academic discipline, whereas Bosse constructed school science in relation to other school subjects. Their reasons for wanting to teach a practically oriented science are, however, similar as they saw such a science teaching as more inclusive, as a possibility to make science accessible for pupils who could not cope with or would not be interested in a more theoretically oriented science teaching, i.e. pupils they saw as resembling themselves. For Henrik, teaching science using experiments and links to everyday situations was a way to make the potentially difficult subject of science accessible for academically less able pupils:

I really value the possibility to do it using experiments and to include everyone, because I think it's a subject that some people find difficult and difficult to relate to.

Later he said that he would like to teach science ‘practically, physically’ and I asked him what he means by this, and once again he returned to the issue of making science teaching as inclusive as possible:

Well, both experiments with physical material and not just sit there with paper and pen, but to also, that aspect is important to be able to document your own knowledge, but still, this to work with materials in order to connect theory and practice. Which in my opinion and my experience increases the chances to include as many as possible, because it’s more difficult for those who are practically minded to take in pure theoretical knowledge.

Bosse had a more specific group of pupils in mind with his practically oriented science teaching. In contrast to Henrik, he never talked about science as being perceived as difficult, rather, science and technology are blending into an arena where the more disorderly, otherwise less academically achieving pupils can excel:

But the ones, when I was in school, who were, acting out, or like, the sort of disorderly pupils, [technology] was a subject where they could relax and excel and have an outlet for...

When I asked him to give examples of science teaching that he has perceived as particularly successful he also returned to a teaching sequence on the boundary between physics and technology:

Bosse: Another thing that impressed them was, we built loud-speakers, because they hadn’t thought that that would work, you just take a magnet and some paper, and in the beginning we didn’t really get it to work, because I just had some old radio or whatever it was that was to be connected to the loud-speakers. ‘Yeah, that’s obvious, it’s never going to work.’ And it was in particular the ones who are a bit disorderly, who started talking like that, but then it did work, because we realised that the sound is going to be very weak, so they had to be perfectly quiet for it to be noticeable. And that really impressed them. Because then it was them who took charge instead and told the others to be quiet and listen and they were so happy that they had succeeded with something. Because they are always told that they are failing. And then they actually succeed with something. Anna: And you think that was important for them in particular?

Bosse: Exactly, in particular those who are struggling. As you can hear I’m feeling strongly for them.

Throughout the interview Bosse came back to this last point, how he felt particularly strongly for the academically weaker pupils, the ones ‘who are struggling’. Many students state that wanting to make a difference in children’s lives is their reason for going into primary teaching (Carrington 2002), and Bosse also talked about wanting to support children in more general terms. However, it is specifically through a particular interpretation of science and technology teaching that he wanted to make a difference for a particular group of students.

I would argue that the way he was constructing school science as a subject appropriate for these pupils can be interpreted as him caring for them, in resonance with expectations on primary teachers as carers for children. In some senses the association of teaching young children with the feminised activity of caring puts male primary teachers in a position where they are acting against cultural interpretations of masculinity, but simultaneously there are also expectations on male teachers to act as male role-models. Consequently, Sabbe and Aelterman (2007) argue, male teachers constantly have to negotiate between being ‘real (traditional) men’ and being ‘good teachers’ (being counter-stereotypical and nurturing). Hence Bosse’s positioning of himself as a caring for these disorderly pupils, a positioning that is tied to a particular interpretation of science/technology, can in part be understood as a reconciliation of these competing demands. This also resonates with how previous research has shown that there are explicit expectations on male teachers to be able to handle such unruly pupils, and that one way to do so is to align themselves with the ‘lads’ (Jackson 2010; Skelton 2001). In doing so, the male teacher is, Skelton (2001) argues, able to locate himself as properly masculine, in a teaching profession that is generally equated with femininity.

DISCUSSION

Becoming a teacher is a complex process. As expressed by Carter and Doyle (1996): 'the act of teaching, teachers' experiences and the choices they make, and the process of learning to teach are deeply personal matters inexorably linked to one's identity and, thus, one's life story' (p. 120). When becoming a primary science teacher this complexity is further accentuated by how this area is ambivalently gendered: primary teaching is an occupation associated with women and femininity, while science and science teaching, in particular as related to the physical sciences, is associated with men and masculinity.

Overall, I would argue that the way Bosse and Henrik construct mathematics, science and their own participation in science needs to be understood in relation to two separate but compatible discourses about maths and science: one of science as being practical and hands-on in contrast to other 'theoretical' subjects; and one of science as demanding specific qualities in terms of problem-solving and logic in contrast to subjects where hard work is sufficient (among these including biology constructed as relying on memorisation). Furthermore, I would argue that it is the interrelation of these discourses that makes science accessible for Henrik and Bosse as working-class men. Firstly, a construction of science as practical and closely related to technology could also be seen as related to a doing of class; as a way to reconcile the participation in a working-class masculinity with a participation in science (Danielsson 2011). How Bosse and Henrik construct school science as practical, experimental, and related to technology can be understood as closely associated with the enactment of a particular, classed masculinity. Mellström (1999) argues that, in Sweden, being practical has traditionally been valued highly and is also tightly interconnected with 'being a man'. Consequently, science is an area where you can succeed based on both practical and analytical abilities (Danielsson 2011), which makes it an academic area accessible to Bosse and Henrik as working-class men. Secondly, since achievement in science and mathematics is viewed as at least partly relying on innate abilities, in Bosse's case, it could also be argued that possibility for a perceived effortless achievement in science, thus the construction of an acceptable school-boy masculinity (Jackson and Dempster 2009; Warrington et al. 2006), has been important for his participation in the discipline. Thus, Bosse was as a school pupil able to construct himself as an effortless achiever in these subjects, thus constructing an acceptable school masculinity (Jackson and Dempster 2009; Warrington et al. 2006).

Partly, I would argue, it is this construction of (school) science as a practical subject, where you can achieve effortlessly, that has made the femininely connotated profession of primary teaching accessible to Bosse and Henrik as working-class men. Thus, for them, science has been the gateway to primary teaching rather than the other way around. But, while science teaching can be said to provide a way for Bosse and Henrik to enact a particular, classed masculinity within the feminine realm of primary teaching, it is important to keep in mind that teaching as an occupation is also associated with masculine traits such as authority, control, and discipline (Rich 2001). There are also often very explicit demands on male teachers to act as male role-models, in particular for the boys they teach (Skelton 2001), and as such their gender is constructed as a competence in itself. By constructing school science as a practical subject, closely aligned with technology, where academically weaker pupils can excel, I would therefore argue that Bosse and Henrik are also fulfilling such expectations on them to act as traditional, male role-models for their pupils.

Previous research has also raised the issue of how primary teachers need to wrestle the demands of caring and performing activities (Forrester 2005), and I would further argue that Bosse's and Henrik's construction of school science can provide new perspectives on this tension. Surely, their particular enactment of science teaching is tied to allowing academically less able pupils perform in this subject area, but it goes beyond that. By giving these pupils the possibility to succeed academically Bosse and Henrik are also aiming to build their self-confidence and, in Henrik's case, provide for them the same sort of safe-haven that science was for him in school. Thus, their teaching of science is not just concerned with helping pupils to perform, but, I would argue, is a way for them to care for these students.

Throughout the interviews, both Henrik and Bosse expressed a deep caring for disorderly and/or academically less able pupils. In particular Henrik returned to the importance of inclusive teaching, a standpoint that needs to be seen in the light of how inclusive teaching is strongly advocated in the Swedish curriculum. However, it is but interesting to reflect on how his ideal of inclusive teaching is enacted within the specific curricular area of science. By constructing school science as a highly practical subject Henrik is challenging notion of science as abstract, theoretical and difficult, but what stands unchallenged are notions of science and technology as a male enterprise. Wajcman (1991) has characterised the gendering of technology in terms of two masculinities, one practical, working-class version, based on physical strength and machine-related skills and one with middle-class connotations based on 'the professionalized, calculative rationality of the technical specialist' (Wajcman 1991, 144). Bosse's and Henrik's descriptions of their own participation in science and technology very much echoed the former of these, and as such reproduce stereotypical ideas about science and technology as a male enterprise. Consequently, I would argue that teacher education needs to problematise the notion of inclusive teaching and how it may be enacted within different curricular areas: Who is included and who is excluded by a particular kind of science teaching? In the physical sciences in particular, the difficulty that many girls express for identifying with these subjects (Brickhouse, Lowery, and Schultz 2000) may be obscured by the current focus on 'boys' underachievement' (Warrington and Younger, with Bearne 2006). Furthermore, Henrik's construction of school science as practical, accessible, and applicable to everyday life is done in relation to science as an academic discipline. This is in some senses not problematic, it might even be commendable, after all the aims of science and school science are very different (Martín del Pozo, Porlán & Rivero 2011). Nevertheless, such a construction of school science may also create an unnecessary distance between school science and science, where the academic discipline of science is assumed to be what school science is not – that is, theoretical, inaccessible, and not applicable to everyday life. Thus, a teaching aiming to facilitate pupils' border-crossing into school science (Aikenhead 2001) may not necessarily ease a further transition into higher education in science.

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