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Inspiring Engineers? Student ambassadors and the importance of learning contexts in HE outreach activity

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Abstract: *Over the last decade employing student ambassadors has been increasingly popular in university outreach activity across the UK. Engineering skills are perceived as important to meet the demands of increasingly globalised economies and there has been a focus in outreach work on this subject area. The focus on increasing and widening participation in engineering in the UK has been driven by both the need to find new talent to sustain the British economy and by anticipated benefits to society as a whole. Ambassadors are widely held to be effective in aspiration and attainment-raising work and are frequently cited as role models for pupils by both policy-makers and practitioners. There is, however, no educational research into what pupils learn during interactions with students and whether ambassadors do contribute to increasing and widening participation in engineering.*

The focus of this paper is the impact of the learning contexts in which ambassadors worked on pupils' learning. The paper draws from a larger study of the outreach work of student ambassadors in STEM (science, technology, engineering and maths) subjects. It deploys in depth ethnography drawing on approaches from across the social sciences to trace the discourses surrounding student ambassadors. The positioning of ambassadors, how this impacts on their relationships with pupils and the learning that takes place were considered using social psychology and grounded theory.

Findings indicate that discourses employed by pupils, ambassadors and organisers relating to teaching and learning were notably different in different learning contexts. In learning contexts where ambassadors work as subject experts alongside pupils, pupils can identify closely with them as fellow students. In this capacity student ambassadors can contribute to inspiring young engineers and potentially disrupt and challenge pupils' gendered, raced and classed trajectories within engineering.

Introduction

This paper draws on the findings from a study of student ambassadors' outreach work with school pupils, undertaken to increase diversity or Widen Participation. The study focuses on a new university in London and the outreach work undertaken by the university and partner organisations in Engineering and related STEM subjects (science, technology, engineering and mathematics).

The explosion of student ambassador and mentoring schemes in UK universities (Colley,2003) in the first decade of the 21st Century was part of UK and international policy to expand involvement in higher education (HE) to upskill the workforce to meet the demands of increasingly globalised economies. WP policy innovation under New Labour governments was targeted to encourage diverse groups, defined by their lower socio-economic status, ethnicity and gender, to access HE generally and particular subject areas, notably STEM (Science, Technology, Engineering and Maths). Student ambassador schemes were part of this drive. Ambassadors were held to be effective in aspiration and attainment-raising work and were widely viewed as role models for pupils by policy-makers and

practitioners (HEFCE, 2005, 2009). There is, however, no educational research exploring the work of student ambassadors.

The analysis focused on a range of events including an engineering camp, a summer school, a series of workshops and a single day challenge. Discourses related to teaching and learning were present at all events but were notably different in different learning contexts. These discourses and how they positioned ambassadors and school pupils and impacted on the learning taking place amongst pupils is the specific focus of this paper.

The argument for Widening Participation in Engineering

The importance of STEM subjects to the national economy has been highlighted (Leitch review, 2006; Lambert review, 2003; Sainsbury review 2007; UKCES, 2009; CBI, 2010). The CBI, in their 2010 education and skills survey, outline the urgent need for these STEM skills by UK businesses. The UK Commission for Employment and Skills (UKCES) predict that 58 percent of all new jobs will be STEM related and that there will be 'massive replacement demand' (2009: p92).

In 2009, Lord Browne, then President of the Royal Academy of Engineering (RAEng), suggested that 'diverse teams produce better results in engineering' as 'different experiences and ways of thinking often lead to innovative outcomes'. He also commented that the professions should 'reflect the diversity in our society' (2009, RAEng: p1). Professor Matthew Harrison, Director of Education at the RAEng identifies the contribution that STEM careers offer for social mobility as STEM occupations are often found in professions (2011). Indeed a recent study indicates that there are 'positive wage premia from holding a range of qualifications at all levels in a STEM subject (Greenwood, Harrrison & Vignoles, 2011: p.24). Engineering could then provide women, minority ethnic and working class groups with well paid careers.

HE recruitment to Engineering Subjects

Engineering has been identified as a strategically important and vulnerable subject (SIV). Recent findings of the HEFCE advisory group about SIVS (HEFCE, 2009) suggest that though numbers of students in chemistry, physics and mathematics are increasing, numbers of students in engineering programmes continue to decline as a whole (though there are differences between sub- disciplines with civil and chemical engineering numbers actually increasing (p3)).

The percentage of women studying undergraduate level engineering at UK HEIs is still very low at 13 percent in 2009 (RAEng: 2009). Female students are severely underrepresented in all engineering subjects; only 7 percent of students studying mechanical engineering are women (Engineering UK, 2011). The pattern of underrepresentation of women, particularly in the physical sciences and engineering, is also repeated in Europe (Siann & Callaghan, 2001) and in America (NAE, 2008).

In terms of minority ethnic participation, engineering courses recruit better than some other related disciplines; just over 20 percent of undergraduates in engineering and technical subjects were drawn from minority ethnic groups compared to only 10 percent in the physical sciences. African and Asian male students are quite well represented, particularly in electronics engineering but other groups are underrepresented (Conner et al, 2004; HESA, 2009).

A problem identified for engineering has been that there is little general understanding about engineering and what engineers do (Engineering UK, 2011) There is also confusion around educational pathways into the profession and a perception that engineers earn less than other professionals such as those working in medicine, accountancy or law (ibid.). School pupils often describe engineers as being people – and particularly men – who fix things such as car mechanics, computer engineers or electricians (Canavan, Magill and Love, 2002).

STEM identities, school science and the gender divide

HE applicants in engineering subjects need STEM qualifications at KS5, and to access elite institutions, they need to attain high grades. Any attempt to widen participation in engineering is circumscribed by a relatively high drop-out rate in school science after KS4 and comparatively low numbers taking up STEM subjects at KS5. The problem of lack of student engagement with science has been ongoing for three decades (Ormerod and Duckworth, 1975; Schibeci, 1984; Osborne, Simon and Collins, 2003). Lack of engagement with mathematics at KS5 is also problematic for recruitment to HE.

A recent survey conducted by researchers at the Institute of Education (Reiss, Hoyles, Mujtaba, Riazi-Farzad, Rodd, Simon, Stylianidou, 2010) illustrates the gender divide in students' intentions to continue with maths and physics post 16. Only 5 percent of girls expressed the desire to pursue physics compared to 13 percent of boys and 15 percent of girls planned to continue with maths compared to 22 percent of boys.

Engaging school pupils and particularly girls with STEM subjects during their time at school and raising their awareness and knowledge of engineering is clearly important. Recent research also indicates that students' desire to take up STEM subjects is dependent on complex interactions between different aspects of their identities (Hughes, 2001; Archer, Osborne, Dillon, Willis and Wong, 2010). This research indicates the need for pupils to identify more closely with STEM subjects and see science and STEM identities as 'viable ways of being' (Davies, 2006) if patterns of participation are to change.

Method: A multi-stranded approach

The study on which this paper draws was conducted over a two year period 2008 -2009 and centres on Bankside, a new university in London and their ambassadors' WP outreach work in engineering and related STEM subjects. Activities were funded by the university, Aimhigher and the Accessing Engineering Project (AEP) a HEFCE funded project based at the university at the time of the study.

A problem for researching student ambassadors' work with school pupils is that in many contexts encounters are extremely brief, lasting for only a day or even a few hours. It is clearly difficult to make any claims for the impact of ambassador work when exchanges are so fleeting.

The aims of the study from which this paper draws were to explore the learning that is taking place during interactions between student ambassadors and school pupils, the interplay of learning contexts and identities and how this impacts on how and if pupils identify with ambassadors and the processes of this dis/identification. Given the fleeting nature of exchanges between school pupils and ambassadors, identifying a strategy for analysing these encounter provided many challenges.

Ball (1994) stresses the need, when analyzing policy, for a range of approaches: 'a toolbox of diverse concepts and theories – an applied sociology rather than a pure one' (ibid: p14). Likewise, I have drawn on 'diverse concepts and theories' including Foucauldian discourse analysis (Hollway, 1984; Parker and Sholter, 1990; Parker 1992; Willig, 2001; Wetherell and Potter, 1992; Wetherell, 1998, 2001) and the theories of post-structuralists, especially Butler (1988, 1990, 1997a; 1997b); Butler's theorisation of identity as being constituted through 'sustained social performances' (1988: p8), and of 'identity as being intensely relational' (Hey, 2006: p452) has shed particular light on processes of dis/identification between pupils and ambassadors. I have used a 'toolbox' that specifically draws from practices in social psychology, ethnography and grounded theory. The two approaches followed most explicitly have been a constructivist approach to grounded theory (Charmaz, 2003) and, from social psychology, the six steps to analysis suggested by Willig (2001). Ethnography has been central as it has allowed me to observe a wide range of ambassador/ pupil interactions. Combining these approaches enabled me to provide a systematic comparative analysis of discourses across contexts.

By tracing the discourses relating to student ambassadors during each activity I was able to trace patterns in how these discourses were the same and different and how they positioned ambassadors and school pupils. These approaches have given me the tools to provide a rigorous analysis of student ambassador work, despite the fleeting nature of their contact with pupils.

The activities

I have observed and held informal group conversations/ focus groups across various STEM widening participation activities. Those discussed in this paper areoutlined in Table 1 and were organized by the AEP or associated organizations or by the central WP unit at Bankside. However, the conclusions drawn are actually based on a wider range of activities in other STEM subject areas.

As well as observing the activities themselves, I observed the ambassador recruitment process; attended meetings, interviewed key members of staff about their work and talked to organizers and teachers during events and activities. All focus group/ inetreview conversations were transcribed in full.

Table 1 Bankside: activities and participation in research by pupils and student ambassadors

Activity and venue	Length of activity	Yr grp.	Nos. of school pupils and ambassadors present	Nos. of school pupils/ SAs in focus groups (recorded and transcribed)	Conversations held informally with participants during activities
Train Tracks (TT): Canary Wharf	1 day	7-10	30 pupils 6 SAs	1 conversation/ focus group with 4 Yr 10 girls during practical activity	1 ambassador at the end of the day 10 pupils throughout the day
Engineering Camp (EC): rural university campus	4 (2 days attended)	9	80 pupils 8 SAs	1 paired interview with ambassadors	2 ambassadors during the evening disco 15 pupils
Maths workshop (MW): south London school classroom	4 sessions attended	11	10-20 pupils 4-5 SAs	1 to 1 interview with 1 ambassador focus group with 4 pupils	conversations held with 3 ambassadors 8 pupils during the sessions
Summer school (SS): Bankside University	5 days (3 days attended)	10	25 pupils 7 SAs	1 paired interview with SAs focus group with 6 pupils	10 pupils during activities

The participants: gender, class and ethnicity

I made sure that I consulted similar numbers of male and female ambassadors at events. All the AEP activities targeted pupils from south east London state schools from 'deprived' boroughs, according to the 2004 Multiple Deprivation Index (IMD) with extremely low participation rates in HE. The maths workshops (MW) were again held at a south east London school within one of these boroughs. These indicators together with those gathered during conversations suggest that pupils are predominantly from working class and lower middle class (Brooks, 2003a) backgrounds. The overwhelming majority of the student ambassadors were the first generation in their family to progress to HE and many were from south east London themselves with some having attended the same schools as pupils. Again this gives an indication of their too being from working and lower middle class backgrounds. Pupils and ambassadors were ethnically diverse with the largest group represented being Black African.

Learning practices

A key focus in WP research and evaluation has been on the quantifiable outcomes of activities in terms of increasing participation amongst underrepresented groups in HE (Gorard et al, 2007). This 'audit society' (Colley, 2005) has diverted attention away from the details of the learning taking place during outreach activities and the significance of the different pedagogies employed. My analysis of ambassador work reveals patterns in the learning which reflect the type of activity engaged in, the pedagogical approaches used and how these influence the relationships between ambassadors and

pupils. Ambassadors are differently positioned (Willig, 2001) in these contexts as 'teachers', 'career advisers', as 'students like us' and even as 'friends'. This positioning in turn affects the nature and content of the learning that takes place, whether it is largely subject based knowledge or 'aspiration raising'. My research study indicates that the balance of informal and formal attributes in these learning contexts 'inevitably changes the nature of the learning' (Colley, 2005: p31). Stakeholder interests are crucial and dictate the focus and nature of much activity.

Important stakeholders in these contexts are teachers as requests from schools defined some activities described here. Other stakeholders were subject experts, Engineering specialists who contributed to the design of activities for the AEP. There has been a significant move in HE Engineering in the UK and internationally to active problem/project based and experiential learning (Albanese and Mitchell, 1993; Sainsbury, 2007; Arlett, Lamb, Dales, Willis, Hurdle, 2010; Northwood, Northwood and Northwood, 2003). These pedagogical approaches are viewed as more engaging for women and more diverse students (Arlett, Lamb, Dales, Willis, Hurdle, 2010; Boursicot and Roberts, 2009) and are reflected in some of the outreach activities observed which were organized as part of AEP. However, there are significant differences between HE teaching and the aims of outreach work as outreach work in all contexts considered here is focused on 'aspiration raising' rather than increasing subject based knowledge.

I now present a series of vignettes (Finch, 1987) of different activities to illustrate how the pedagogies employed and their formal and informal attributes impact on the positioning of ambassadors and school pupils and define and constrain the learning that takes place.

Attributes of formal learning and their effects

In all contexts the ambassadors were employed to work with school pupils but in different capacities depending on the views and objectives of stakeholders and organizers. None of the activities were set up by the ambassadors themselves. As Colley (2005) identifies, an understanding of this 'wider context' is vital when considering any learning that is taking place.

The differences between 'learning situations' have been theorised in terms of formal and informal learning (Simkins, 1977; Hunt, 1986; Eraut, 2000; Beckett and Hager, 2002; Hodkinson and Hodkinson, 2001; European Commission, 2001; Colley, Hodkinson and Malcolm, 2003). Colley, Hodkinson and Malcolm (2003) suggest that in practice 'elements of both formality and informality' can be found in every 'learning situation' and suggest that instead of these being described as formal or informal, formality and informality should be identified as 'attributes' of these situations. They use the term 'attributes' advisedly both to suggest that learning has many attributes and to highlight that the labels are 'attributed' by writers and that learning is not 'inherently formal' or 'informal'. Colley, Hodkinson and Malcolm (2003: p30-31) outline four main groups of in/formal learning attributes, 'process', 'location and setting', 'purposes' and 'content'. These provide a useful framework for exploring the different learning contexts considered here.

Taking Charge and Teaching the Syllabus

The focus on raising attainment in schools and particularly on raising the levels of achievement of groups of borderline C/D GCSE pupils, especially in maths, have become a pressing concern (Williams et al, 2010; Gillborn & Youdell, 2000). The pressure of school league tables has focused attention on these 'borderline' groups which has inevitably translated into the types of requests made by schools for student ambassadors. This ubiquitous and heightened preoccupation with test results has led to the dominance of a credentialist discourse in relation to educational activity; this discourse has been taken up and practiced (Willig, 2001) by organizers of WP activities and functions as a 'regime of truth' (Foucault,1980) in the context of outreach work. Supporting learning for examination success is assumed by practitioners to be an intrinsic part of their practice.

At one south east London school student ambassadors worked with Year 11 pupils during Maths Workshops (MW). These sessions ran after school two days a week. A teacher was present during the sessions and student ambassadors circulated amongst pupils, helping them with questions from GCSE exam papers. This type of student tutoring has become popular in the UK (Colley, 2005) and is identified by Colley as an attempt to 'increase informal attributes of learning in situations traditionally regarded as formal' (2005: p32).

These learning contexts however, had a number of notably formal attributes (Colley, Hodkinson and Malcolm, 2003). The ambassadors were working with pupils on exam papers where in terms of 'content' their learning is 'propositional' (true/false) and outcomes are 'rigidly specified'. In terms of 'purposes' the learning is the 'prime and deliberate focus' of the activity and is 'designed to meet the externally determined needs of the exam board'. In terms of 'process' the approach taken by ambassadors in this context is 'didactic' and the assessment of the learning is to be the 'formal' GCSE exam (Colley, Hodkinson and Malcolm, 2003: p31-32). The location of the sessions in a school classroom is another 'formal' attribute in this context.

During the MW ambassadors were positioned in formal 'didactic' roles (Colley, Hodkinson and Malcolm, 2003) similar to teachers. Pupils' discursive constructions of the ambassadors' work reflect this. They repeatedly commented on the difficulties they experienced with explanations given by ambassadors. They also drew on discourses relating to the professionalism of ambassadors and expected ambassadors to take the lead in interactions. Ambassadors were generally, then, viewed by pupils as inadequate substitutes for real teachers – though having any help was seen as better than having none.

The teachers involved identified issues posed by positioning (Willig, 2001) ambassadors as teachers of GCSE maths when they have had no experience or training. Teachers' accounts related closely to those of pupils. Positioning student ambassadors as teachers simply because of their subject expertise in maths is evidently problematic. The ambassadors were taking up this positioning, to various degrees of success, and enacting being a GCSE maths teacher. Far from 'increasing informal attributes' (Colley, 2005), in this learning context ambassadors embedded existing formal attributes. This practice (Willig, 2001) was seen at times to impact negatively on pupils' confidence and sense of self-efficacy in maths with pupils unable to understand the ambassadors' explanations.

The ambassadors were being used here to drive up pupil achievement in maths and facilitate the school in maximising pass rates at grade C to improve their position in the league tables. The effectiveness of ambassadors in supporting this aim is questionable but it is also important to question the learning about maths that this approach reinforces. This narrow focus on examination practice, in Williams et al's (2010) view, presents maths as having 'exchange value' with pupils only focusing on their learning for exams in order to gain access to the next stage in their schooling. Williams et al suggest that this promotes identities amongst pupils as surface learners rather than as 'users of mathematics'. These data reveal that embedding STEM ambassadors in such existing contexts with many formal attributes does not support engagement with maths as a subject or encourage progression.

The Engineering Camp (EC) presented a very different learning context. Pupils and ambassadors stayed at a campus university for four days (the camp occurred during the university holiday period so no students studying there were in residence at the time) and were involved in practically oriented engineering activities reflecting experiential learning approaches increasingly found in HE. However, the ambassadors' role as 'supervisors' responsible for ensuring that pupils completed projects within the available time, again positioned ambassadors in particular ways. As in the MW, the help of ambassadors was generally welcomed by pupils, who identified less time being taken up waiting for help from teachers as a benefit. However this help was also viewed as prescriptive. Discursive constructions of ambassadors as being there 'telling' pupils what to do again relates to the 'propositional' 'content' and 'didactic' 'process' seen by Colley, Hodkinson and Malcolm (2003) as attributes of formal learning.

Positioning ambassadors as responsible for the learning of pupils reflects the trend discussed by Colley (2005) for students acting as learning mentors in schools. However, the data illustrate that activities where ambassadors are responsible for pupils' learning are problematic: creating social distance and conferring formal 'didactic' attributes on the ambassador-pupil relationship.

Managing difficult behaviour

There was much ambiguity surrounding the authority of ambassadors and how far they should be responsible for managing the behaviour of groups of pupils; an issue identified by Ylonen (2010) in her study of Aimhigher ambassadors and the HEFCE (2010) evaluation of Aimhigher Associates. Discursive constructions of ambassador work amongst managers, organisers and stakeholders pointed to the reality of their positioning as authority figures expected to control the behaviour of

school pupils. This positioning was seen by teachers as beneficial, providing them with both classroom support and even free time.

At the EC, where ambassadors were positioned as 'supervisors' directing and managing pupils, this noticeably affected ambassadors' ability to develop social or even effective working relationships with pupils. The difficulty of this positioning was discussed by both pupils and ambassadors on the EC. During conversations with pupils over the two days it emerged that many did not differentiate between the help provided by ambassadors and that provided by teachers and other adults present. Pupils repeatedly referred to all adults as 'supervisors'. Indeed, pupils on the EC identified the work of ambassadors as being predominantly disciplinary and several pupils expressed some hostility towards them.

These discursive constructions of ambassadors' work were echoed in the account of a teacher who was accompanying a group of girls on the course. She suggests that the ambassadors need 'assertiveness training' so that they can 'take on a teaching assistant role'. This teacher's own position informed her view of the work of ambassadors. Her focus is how ambassadors can most effectively support the curriculum learning of pupils through maintaining order and through supporting the academic input of the teacher.

These data present a picture of how stakeholder interests, particularly those of teachers and schools, impact on the positioning of ambassadors. An issue for outreach activities is gaining access to school pupils (Gartland, 2009; HEFCE 2010). Organizers of activities within universities inevitably attempt to accommodate the wishes of teachers in order to reach pupils. In the case of Aimhigher, partnership working with schools and other stakeholders was written into funding agreements. In these various contexts these interests positioned ambassadors as there to support the work of teachers and schools but in ways that undermined ambassador pupil relationships.

It is also worth questioning what subject specific learning ambassadors facilitate. During the MW the emphasis on 'mathematics for exchange' supports and reinforces the 'credentialist' regime of truth operating across education and particularly in secondary schools. The MW and the EC are both contexts where the learning process and content of activities dictate that ambassadors' take up formal didactic positions in relation to pupils. The location of activities is also significant with the school classroom contributing to increasing the attributes of formality found in the MW.

Attributes of experiential and informal learning

The activities studied could be placed on a continuum of their formal and informal attributes with the MW at one end and the Train Tracks (TT) event at the other. The Summer School (SS) at Bankside also had comparatively more attributes of informal learning. If we consider 'process' these activities were more 'negotiated' and there was no planned formal assessment or pressure on ambassadors to ensure particular learning outcomes. There are no 'predetermined learning objectives', 'curriculum' or 'external certification' (Colley et al, 2003). The learning during the TT activity took place in the TT offices. There were attributes of formality at these events, learning about maths, engineering and physics concepts were planned and activities were carefully timed and structured. In fact the careful planning and timing of these events contributed to them engaging pupils better than had been the case on the EC. This curriculum learning though was not the main aim. The 'purposes' were somewhat ambivalent and so outcomes were to an extent 'learner determined' as there were no clearly defined expectations about what specifically pupils would learn.

The attributes of the 'content' of the learning are also largely informal as outcomes are somewhat 'serendipitous' and the emphasis was on 'uncovering knowledge derived from experience' (Colley et al, 2003: p31). So while the activities did have a planned outcome, and that was to raise awareness about and enthusiasm for careers in engineering and STEM, such an outcome could only be 'activated by individual learners' (Becket and Hager, 2002) as a result of interactions with ambassadors and with the activity itself. The learning experience was certainly more organic (ibid.); learning took place as a consequence of undertaking the task and through unplanned conversation with ambassadors. These events were activity and experience based and collaborative (ibid.) with pupils and ambassadors working together in a team.

Working collaboratively (Beckett and Hager, 2002) and supporting pupils with 'uncovering knowledge derived from experience' (Colley et al, 2003) rather than being prescriptive was important to the

development of positive relationships between ambassadors and pupils in these contexts. Student ambassadors listening to pupils, allowing pupils to lead and 'negotiate' their own learning and to explain their views without 'interruption' were important informal 'attributes' of these learning contexts and facilitated warm and more open relationships between pupils and ambassadors.

A key difference in how pupils were learning during TT and the MW was that the former provided pupils with practical 'experiential learning'. According to constructivist thought (Piaget, 1966; Vygotsky, 1978; Schon, 1983; Kolb 1984; Boud, Cohen and Walker, 1993; Boud and Miller 1996), experiential learning, is 'concrete experience, reflective observation of experience, abstract conceptualism and active experimentation' (Colley et al, 2003) and is 'supportive and enabling rather than intellectually prescriptive' (Kyriacou, 2009: 53). This experiential approach was recently advocated by Lord Sainsbury (2007) who outlined the need to develop 'experience led' engineering degrees. As this approach to engineering education is gaining hold in UK universities (Arlett, C., Lamb, F., Dales, R., Willis, L., Hurdle, E. ,2010) these strategies appeared to have filtered down into some of the outreach work considered here. This is likely to have been supported by the input of subject specialists involved with the AEP.

Pupils worked with ambassadors on subject related 'experiential' activities across the different learning contexts: during the SS at Bankside the pupils worked in groups with ambassadors programming and building robots; during TT pupils and ambassadors worked practically together building train platforms and tracks. During TT pupils and ambassadors were provided with a set of real world problems and pupils had to develop a cost effective solution which involved drawing on their science, design and maths knowledge. This practical 'experiential' learning was also present during the EC but other attributes of formal and informal learning varied. The balance between experiential learning and more didactic practices, whether student ambassadors were positioned as working collaboratively with school pupils, and whether pupils were allowed to 'activate their own learning' varied.

Practical, experiential and collaborative working

During the Summer School (SS) at Bankside pupils identified the 'authority' of the ambassadors as key difference between them and their teachers. Pupils discussed how ambassadors 'hint' rather than 'tell' them 'what to do'and how this lack of 'telling' enables them to learn more independently; using their own 'initiative' and allowing for individual interpretation. These accounts resonate with Colley et al's (2003) description of informal attributes of processes, content and purposes in learning contexts. They also resonate with the 'active experimentation' through 'experiential learning' that they describe. The pupils discussed how the relationship with ambassadors was 'easy' and 'comfortable'. This ease appeared to be closely connected to the learning context and the positioning of ambassadors within it.

During TT and SS ambassadors described how they could 'mentor behaviour' by modelling what they expected, by working collaboratively with pupils and by actively engaging in practical tasks. They did not have to manage any difficult behaviour and were involved in 'making' and practice with pupils, where there was no written work or need for assessment. Ambassadors were not responsible for the more formal attributes associated with the 'externally determined needs' of the curriculum (Colley et al, 2003). This learning environment and their positioning within it enabled ambassadors to develop relationships that were not restricted by the status driven positionings of pupils and teachers in schools.

The learning contexts also impacted on the pupils' learning in particular subject areas. During TT a group of girls described how working with the student ambassador had facilitated them in thinking about their 'future'. The informal attributes (Colley et al, 2003) of the day's activities were important in this: the activity was 'student led', negotiated' and allowed pupils to 'uncover knowledge' which was 'derived from their own experience'. Pupils explained that the activity had demonstrated to them that a job in design in an engineering context allows for creativity. They also talked quite thoughtfully about what they understood engineering to be. Their accounts suggested a genuine engagement with and understanding of some of the challenges associated with engineering including working in teams, the need to 'work' things out 'in small stages' and the need for 'initiative'.

Shared Learning and Subject identities

In learning contexts with more attributes of informality (Colley et al, 2003), pupils and ambassadors discursively constructed (Willig, 2001) themselves as sharing student identities. This shared identity

developed while they worked collaboratively and alongside one another. Pupils described ambassador as like ‘friends’ and even ‘cousins’ and siblings in these contexts (Gartland, 2012; Gartland, Hawthorn and McLoughlin, 2010).

Similarities in students’ and pupils’ age and status as students were identified as enabling pupils to see becoming a university student as a logical ‘next step’. During the TT event one pupil commented that the ambassadors’ status as students enabled them to ‘seem like us’. Pupils also discussed how the combination of ambassadors being older – though still young - more experienced, having more expertise but still studying, enabled them to talk and relate to each other.

Discussion: What were pupils learning?

Ambassadors’ work with pupils during the MW was defined by credentialist discourses circulating within schools, key stakeholders in WP work. Pupils in these contexts were focused exclusively on practice for GCSE maths exams. There was little identification between ambassadors and pupils in this context as ambassadors were clearly positioned by the ‘formal attributes’ of the learning environment as teachers of the maths syllabus. However, as Williams et al (2010) discuss this focus on the ‘exchange value’ of maths encourages identities amongst pupils as ‘surface learners’ rather than as ‘users of mathematics’. Ambassadors only served to support this ‘surface learning’ and pupils and teachers were both dubious of the quality of the support.

In contrast, the TT event challenged and extended pupils’ understanding of engineering by providing pupils with the opportunity to engage in practical activities that provided insights into real world applications. Working alongside ambassadors in small groups facilitated discussion about the task as well as about STEM subjects and the ambassadors’ own experiences and trajectories. The location of the activities at a workplace may be significant to their engagement and to this understanding. These ‘informal attributes’ (Colley et al, 2003) of the learning context appeared significant to the learning that was taking place.

However, the EC illustrates that practical activities do not necessarily engage pupils in this way. The positioning of ambassadors as supervisors responsible for the behaviour of pupils and the didactic approaches taken by supervisors in relation to pupils’ work undermined relationships.

During activities where ambassadors worked collaboratively alongside pupils on practical activities, pupils did view them as both ‘like themselves’ and the ‘next step’. Post-structuralist theories about creating individual subjectivity are useful here. As Butler identifies, people are essentially social and ‘are comported towards a ‘you’ (Butler, 2004a: p.45 in Davies, 2006). Butler’s concept of ‘performativity’ resonates with student ambassadors’ conscious performance of identities as ideal students, with school pupils joining in this performance. Pupils’ future identities as university students, and university students within STEM subject areas, may be constituted through such performances. This has potential for engaging diverse groups of pupils with STEM subjects and particularly engaging more girls (Gartland, 2012).

Conclusion

The findings of this study indicate that the learning that was taking place amongst pupils was defined by the learning contexts within which ambassadors and pupils were placed. Discourses employed by pupils, ambassadors and organisers relating to teaching and learning were notably different in different learning contexts. A key finding that warrants further exploration is that in learning contexts where ambassadors work as subject experts alongside pupils, pupils can identify closely with them as fellow students. The study indicates that in this capacity student ambassadors can contribute to inspiring young engineers, potentially disrupting and challenging traditional gendered, raced and classed trajectories within engineering.

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