Perception of Identity in Science Education (POISED): A pilot study of research with Secondary school students in England and India

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Abstract

The idea for the POISED project developed from the partnership of the School of Education, University of Leicester, a comprehensive 14-19 school in Leicestershire, and the link of this school with a 4-19 Academy in India following the English national curriculum. Because of the notions of one of the Science teachers at the Leicestershire 14-19 school was that the behaviour and interest in Science seemed to be very different from what he had seen in schools in India we decided to look at how students view themselves as science students and citizens, and possibly how carers/parents view their children in these areas. A collaborative project with a school in India would foster a greater understanding between students from India and England about school life and engage students with online technology. It would also help students and teachers to have a greater understanding of life, work and school in India and England, through considering students and teachers’ perspectives on this.
When students at the Leicestershire 14-19 school had been approached and attended meetings to discuss the ideas for this project it became clear that one of the objectives for this study could be to help students develop as researchers and communicators. The students were very excited about the multicultural dimension and the idea of developing their identity as Science students and Researchers. There were very keen on helping to develop ideas of how to make this collaboration successful. After completion of the first phase of this project, the idea is to involve Inner City Schools in Leicester with a high percentage of second or third generation of pupils from Asian immigrants, and an all boys school and all girls school.

**Keywords:** students’ construction of identities, learning in science, students’ views of pedagogy, students’ views of science

**Introduction:**

Accessing students’ perspectives in England is encouraged by DCSF (2008) and is framed by two major education policies. ‘Working Together: Listening to the voices of children and young people’ (DCSF, 2008) sets out how engagement in learning can be improved by giving young people a say in decisions that affect them and how it helps them develop a more inclusive school environment. How Science Works (HSW) is the key to the new KS4 Programme of study in Science (QCA, 2006). The section on ‘communication’ states the requirement that pupils learn to develop arguments, use scientific, technical and mathematical language, conventions and symbols and ICT tools, while the section on ‘application and implications of science’ states the requirement that pupils should be taught to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions.

The POISED project (see Diagram 1) developed from the partnership of the School of Education, University of Leicester, a Comprehensive 14-19 school in Leicestershire, and the link this school has with an Academy in India for children of 4-19 years which follows the English national curriculum. The Leicestershire school was already in partnership with the School of Education for training novice teachers.

One of the Science teachers at Leicestershire 14-19 school thought that the behaviour and interest in Science amongst students in this school seemed to be very different from what he had seen in schools in India, especially the 4-19 Academy mentioned above. This germinated the idea that it would be interesting to investigate how students viewed themselves as science students and citizens in both schools, how teachers viewed themselves as scientists and how that affected their teaching, and possibly how carers/parents viewed their children in this area, too. This would help students and teachers to have a greater understanding of life and work in school science departments and how their quality of learning might be improved.

Whilst it would be interesting in itself to study the views of teachers and students of science in the Leicestershire 14-19 school about their work-related identities, a collaborative project with a school in India would add another layer of meaning to understanding what shaped students’ views of themselves as science students. Further, a project which worked with schools in India and England would foster a greater understanding between students from India and England about life and work in school science departments in the two countries, as well as giving staff further insights into how to help students engage with learning. Since the communications between England and India would be online, it would also help students to engage with online technology.
The focus on education in England and India is particularly appropriate in Leicester, since ‘approximately 40% of Leicester’s population has an ethnic minority background and the city is projected to have a non-white majority population sometime after 2011 (LCC, 2008)’. The largest ethnic minority group, 28% of the total population, ‘are Gujarati Indians, originally either from East Africa, especially Uganda and Kenya, or from Gujarat, India’ (LCC, 2008). People of Indian origin also form significant ethnic origin groups in other cities in England.

An important element of this project is to try to involve students as well as teachers in it as research participants, not just as data providers. We think this is potentially empowering for the students, helping to develop their skills as learners, and will also give the research a more precise focus by engaging with students’ own concerns about what it means to be a student of science. That will help us understand the development of their identities and impact on understanding their part of the science national curriculum. ‘Student voice’ (Fielding, 2004; Rudduck and Flutter, 2004; Busher, 2009), ‘collaboration’ and ‘identity’ (Giddens 1991; Kearney 2003) are the main theoretical frameworks for this study.

**Building the project web site**

To start this project, we developed a pilot study with the Leicestershire 14-19 school with the intention of bringing in an Indian 4-19 Academy, with which the school already had contacts, as soon as we had developed a website for the project. On the virtual learning environment (VLE) of the Leicestershire 14-19 school, a website has been allocated for POISED, accessibly only to the people involved in the project. The front page of the POISED Website explains what the project is, including
showing the diagram (Diagram 1 above) of the concept of the project. It also includes a welcome statement, inviting participants to give feedback on the site and answer the online questionnaire on being a science student. The welcome statement was linked to audio/video feeds from some of the main project coordinators.

**Developing the web site**

The project website was at the core of the project. To work out what to put on the website, and to begin to get teacher involvement with it and the rest of the project, we held a series of meetings with the staff, explaining to them what we wanted to do and discussing with them how we might go about doing it. From these meetings it emerged that the two IT technicians in the school were very enthusiastic about the project and willing to build the web site for us as it would help the learning of students in the school. We also brought a group of Y10 students together, through the enthusiasm of the two teachers involved in the project, to discuss what guidance we should give to people using the website (see Table I).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Guidelines on using this site</th>
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</thead>
<tbody>
<tr>
<td>No hurtful remarks on people’s blogs or photos,</td>
<td></td>
</tr>
<tr>
<td>Approval of sensitive data,</td>
<td></td>
</tr>
<tr>
<td>Students have option to opt out,</td>
<td></td>
</tr>
<tr>
<td>Do not hand out personal details on line, e.g. e-mail or phone numbers,</td>
<td></td>
</tr>
<tr>
<td>Be respectful about other students’ English/communication,</td>
<td></td>
</tr>
<tr>
<td>Don’t use offensive language or photos on the website,</td>
<td></td>
</tr>
<tr>
<td>Use standard English,</td>
<td></td>
</tr>
<tr>
<td>Be friendly,</td>
<td></td>
</tr>
<tr>
<td>If you talk about people don’t use their real name (use pseudonyms),</td>
<td></td>
</tr>
<tr>
<td>Keep everything secure and not revealing passwords</td>
<td></td>
</tr>
</tbody>
</table>

Clearly visible on the front page of the website is the opportunity for participants to answer the questionnaire, join a discussion board and open their own journals (diaries) to discuss and reflect on their experiences as students of science. Guidance on how to use the website is clearly visible. The front page also includes links to recent BBC Science News items that are related to the English National curriculum for Science and provides a site for conferences so participants can chat with each other online. The website is used for the following student activities:

1. Surveys and questionnaires
2. Keeping science diaries in the form of blogs
3. Putting on photographs, audio clips and video clips to illustrate their diaries
4. Discussion board for research ideas

Students will be asked to complete an initial questionnaire online about their views of themselves as science students. When the 4-19 Academy from India joins in, its students will complete the same questionnaire. In due course, students will also be asked to join in with a discussion board about their changing views and experiences of being students of science, to open a journal, if they wish, and to attach relevant photographs to it as they want. When students from the 4-19 Academy in India join in the discussion board and journals will be used as the basis for conversations between students and with staff about the experience of being and becoming science students in the two schools in the two countries.
76 people were registered on the website for the pilot phase of the study, of whom 10 were teachers, 1 was the site administrator, and 65 were students at the Leicestershire 14-19 school (27 boys/38 girls). Of the students, 50 were members of the Journal Club (20 boys/30 girls), 8 were members of Year 10 (4 boys/4 girls), and 7 had no designation. Of the teachers and administrators (9/11) had logged on by mid August 2010. Of the students, 16 had logged on by the same date. The last figure was affected by the website not going live until May 2010 when many of the members of the Journal Club were in the middle of public examinations. Despite energetic efforts by the project coordinators it was difficult to contact many of the students to encourage them to participate.

**Conceptual framework**

In a study by Osborne and Collins (2001) of pupils' and parents' views of the school science curriculum some of the comments of the pupils were that they didn’t like the repetition of topics, that they wanted time to discuss issues and more contemporary relevance. A complementary study of Osborne et al. (2003) focused on what ideas about science should be taught in school science. It appeared there was a clear consensus. An important element was the nature of science or ‘How Science Works’ (HSW) which is part of the Key Stage 4 (KS4) Science curriculum in England (QCA, 2006). Later Osborne and Dillon (2010; p. 59) mention that science is ‘being a practice which is both shaped by and which shapes society’.

Essential elements of the HSW are that the pupils learn to develop arguments, use scientific, technical and mathematical language, conventions and symbols and ICT tools. The pupils should also be taught to consider how and why decisions about science and technology are made, including those that raise ethical issues, and about the social, economic and environmental effects of such decisions (QCA, 2006). Both of these elements require students to ‘talk science’, which helps the students to learn how to communicate effectively and increases the understanding of concepts (Howe at al., 1992). Bennett et al. (2004) found that pupils’ learning was significantly improved through group discussions based on conflicting views (a combination of existing views within the groups and views presented by a facilitator).

Part of the research of Bennett et al. (2004) focused on ‘collaborative learning’ supported by computers. In this project we want to encourage this kind of learning. Learning through interactions should employ multiple social activity structures, encourage pupils to listen and learn from each other and engage pupils as critics of diverse scientific information (Linn and Hsi, 2000). To encourage students to use the internet and technology outside the classroom, it will be important to stimulate all pupils involved. High achievers become deeply interested and knowledgeable or skilled in a topic (Ito et al., 2008), but there is much less evidence about what motivates young people and low users of technology (CIBER, 2008). In this study we intend to involve students of all different levels of attainment.

Of particular interest in our project is the attitudes of students towards Science and how taking part in the POISED project influences these attitudes. In a Norwegian study on the Relevance of Science Education (ROSE), involving 20 countries (Schreiner and Sjøberg, 2007) it was clear that the more developed the society the more negative was the response to the item ‘I like school science better than most subjects’. They concluded this was a reflection of values and identity of contemporary youth and that girls had a more overall negative response. On a Likert scale of 1-4 (1= strongly disagree, 4 = strongly agree) the average response of English boys to this item was 2.3 while it was 1.6 for girls. Interestingly, in Gujurat, India, the average girl scored 3.2 and boy 3.3. Hopefully by joining pupils from the UK with pupils in Gujurat will reveal some areas for consideration regarding these differences. In the UK the majority of pupils don’t want to continue studying science at KS5
and even KS4 because of a perceived difficulty; this is particularly because of an increased need of mathematics in Physics (Spall et al, 2004). Murphy and Whitelegg (2006) found that girls in particular have a negative attitude towards Science because of the way it was taught in school. From their research into student identity it seems that deeply rooted ideas are embedded in British culture and society about the nature of science: the scientist being in a white coat, male dominated, empirical evidence, all based on data analysis. But science is a lot more than this. Murphy and Whitelegg (2006) found that girls don’t necessarily want to be the kind of people who fit this stereotype of the scientist, especially in Physics.

School processes often serve to disempower students from levels of responsibility which they experience as a matter of course outside school. ‘Out of school many young people find themselves involved in complex relationships and situations, and carry tough responsibilities, but that ‘in contrast, the structures of secondary schooling offer, on the whole, less responsibility and autonomy than many young people are accustomed to…’ (Ruddock and Flutter, 2004, 1). Where young people are consulted and have the opportunity to discuss public policy and issues that have direct relevance to their own lives, this can have the impact of serving as a catalyst for future community involvement, whilst raising their general levels of motivation and productivity (Potter 2002 and Clough and Holden 2002). However, Hancock and Mansfield (2002) suggest that, although the idea that teachers should consult children in order to be better informed professionals has been increasingly recognised, education lags behind some other child services in terms of heeding what children have to say.

To legitimate stronger student influences on the construction of schooling, Ruddock and Flutter (2004) outline five ‘advocacies’. These are: the importance of helping students to develop their identities and individual voices; the need for young people to be able to ‘speak out’ about matters that concern them; a recognition that in the task of change, students are the ‘expert witnesses’; the need for policy-makers and schools to understand and respect the world of young people; and the importance of preparing young people to be citizens in a democratic society’ (p. 101).

Curriculum opportunities should be made for students to discover real life moral issues embedded in all subjects and which are relevant to their own narrative experience (Deakin, 2000; Williams et al., 2003). This view is supported by the QCA (2006) in its document on the Science Curriculum (in England). Student participation also needs to be fostered through positive attitudes or progressive practices. Inclusion, influence and strategies for consensual change have to be worked on (Taylor, 2002).

**Objectives of the study:**

From the preceding discussion and contacts with the field emerge key objectives for this study. To investigate:

- How teaching and learning processes in schools are influenced by national curriculum frameworks within science education
- How upper secondary school students and teachers relate their understandings of science to the world outside school, including their community and home life.
- How upper secondary school students view themselves as science students and citizens
- How carers/parents view the role of science and learning about science in their children’s lives
- How teachers view science and themselves as teachers of science and how that affects their teaching
• Differences between the views of students and teachers in upper secondary schools in England and India
• What part online technologies play in helping students and teachers to develop their identities and skills as science workers
• The impact of this project on students learning in science

Methodology and methods

An interpretative approach is taken in this study to investigate the meanings which participants ascribed to their actions as students or teachers of science. The study uses a mixed methods approach to try to explore broadly what a range of students (and teachers) think about being students of science, as well as investigating in depth how some students perceive their development as learners and practitioners of science. The former aim is addressed through an online questionnaire that is discussed below, the latter through online and face to face interviews the questions for which were derived from the questionnaire, and through students keeping blogs of their changing thoughts about being students of science.

To facilitate clearer understandings of students’ perspectives on schooling, Thomson and Gunter (2005) worked with a small group of students as consultants to develop a ‘students-eye’ set of evaluative categories and questions: these ranged from what makes the school ‘good’, how teachers help students learn and what choices students have and want to the quality of food available and whether being in groups with friends is good for learning – or not (abstract). The Voices project (Cremin, Mason and Busher, in press) similarly worked with students to find out their own and their teachers’ perspectives on schooling. There are clear advantages of listening and talking to students in order to gain their opinions and perspectives on classroom teaching and learning (Rudduck, 2004 in Demetriou and Wilson 2010) and help teachers find ways of improving the teaching and learning in their own classrooms.

Involving participants in the construction of a study helps to address the issue of trustworthiness since it allows participants on whom a study is focused to comment on the relevance of research foci and questions to them. It also addressess the matter of empowerment discussed above, by encouraging participants, in this case students and teachers and other staff, to take part-ownership of a project rather than merely being objects of study. This study drew in a group of 15 Y10 students through the offices of teachers involved with this study, to discuss the construction of the questionnaire - what questions might be asked - and, by implication the interview schedule, since the latter came out of the former, and to discuss the ethical rubrics that might govern online interaction between participants. We have yet to ask those students who participated to consider and comment on the findings of the pilot study or the accuracy of their interview transcripts because summer holidays have intervened.

The questionnaire invites participants (students and teachers) to reflect on their identities as science students / teachers and on their interests in the sciences inside and outside school and, in the case of students, relate these to their current performance in science subjects and to their intended future careers. A copy of the pilot questionnaire is shown in Appendix one. The quantitative data will be analysed with simple descriptive statistics. The qualitative data will be analysed thematically.

The questionnaire was supplemented by semi-structured interviews with individual students and teachers, carried by one of the researchers face to face and recorded digitally. It is intended to allow researchers to pursue in depth themes that are already included in the questionnaire. Permission to record the interviews in this way was sought at the start of each interview, and participants were
reminded that they could ask to stop the recording at any time. When the Indian school is integrated into the project it is expected that some of the interviews will be carried out online, either telephonically or on the web (James and Busher, 2009). We intend to repeat these interviews every six months to investigate how students’ and teachers’ views of themselves and science are changing. A copy of the pilot interview schedule is shown in appendix two of this paper. The qualitative data was analysed thematically.

In Autumn 2010, students will be invited to construct blog-diaries and share these with their friends in the project about their changing thoughts about science and being involved in science lessons and other activities. The blog-diaries will be guided by questions/ prompts, and participants will be encouraged to supplement them with photographs or diagrams to enrich other people’s understanding of their views on science. Some of these blogs will be used to construct enriched interviews with the researchers (Busher, 2009). The photographs will be taken and analysed using approaches for visual ethnography suggested by Prosser (2006) and Wall & Higgins (2009).

Bibliographic information of participants such as age (students)/ years of experience (teacher), sex, subject specialism (staff), father’s/mother’s/ family’s job (students), active religious practice, ethnicity, and student attainment data will place a context around participants’ responses. In addition the policy, curriculum and social contexts of schools involved in the study will be used to construct the contexts in which teachers and students talk about their identities.

Although it is not the intention of this paper to discuss in detail the ethical issues involved in this project, we have already gained permission from university, school and parents for students to take part in the questionnaire, the interviews and the online conversations. This ethical framework makes participants aware of the risks they potentially run, from which we will try to guard them, through taking part in this project. In constructing this we have followed some of the work of James and Busher (2007, 2009).

**Findings from the pilot study**

Students registered on the POISED web-site at the Leicestershire 14-19 school were asked to complete questionnaires online about their views of themselves as science students. Eight students tried to answer the questionnaire, five of whom were girls. Six were from Year 12 and two from Year 10. Five out of eight students liked science or science subjects (including geology), three liked Maths, English and History, and other subjects were liked by several of them. Most of the students who answered the questionnaire were ‘high flyers’ with six of them currently getting grades of A* - B for ‘A’ level subjects. Six of the students thought Science was very important for their careers (Table 2)

<table>
<thead>
<tr>
<th>Table 2 Career ambitions of participants</th>
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<tbody>
<tr>
<td>Law/ legal practice (AB) to work in the army, as a PTI (physical training instructor) (BC) Dentistry (LC) Geologist/Mining Engineer (RL) teacher of History (CP) art lecturer (JM) a doctor (RW) journalism /other aspects of English (MW)</td>
</tr>
</tbody>
</table>

They were well aware of the unpleasant consequences for their preferred careers of not achieving in their public examinations at least the grades they were already gaining.
Eight students took part in interviews that explored in more depths issues raised in the questionnaire, but only one answered both the questionnaire and the interview. Four participants were girls, five were students were from lower sets, and six were from Year 10. After the interview on student indicated she would have been preferred to have been interviewed together with one of her friends, as some other students had been. The outcomes of these interviews are presented after a discussion of the outcomes of the questionnaire.

**Critique of questionnaire**

The Questionnaire appeared long on the screen: there were 57 questions and 5 concerning the Questionnaire’s construction. Each request for an example to illustrate the answer to a question had to be shown as a separate question on screen, rather than as one question asking for a particular number of examples, as might happen with a hard copy questionnaire. Not all students offered a critique of the questionnaire but the views of those that did are shown in Table 3.

<table>
<thead>
<tr>
<th>Table 3 Students comments on the questionnaire:</th>
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</thead>
<tbody>
<tr>
<td>there are way too many questions. (AB)</td>
</tr>
<tr>
<td>there are too many example questions (AB)</td>
</tr>
<tr>
<td>when you put example one two and three, it quite hard to answer that many (BC)</td>
</tr>
<tr>
<td>the repetition of examples (JM)</td>
</tr>
<tr>
<td>Are the questions about what grades you are achieving and what you are targeting to achieve related to A level or GCSE? (LC)</td>
</tr>
</tbody>
</table>

Students’ views on how long it took them to answer it (Table 4) were very varied and seem to lend support to one student’s view that the questionnaire was too long. Given the few who did answer, it is not possible to gain a sense of how long it might take most students.

<table>
<thead>
<tr>
<th>Table 4 Length of time students claimed it took them to answer the questionnaire</th>
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<tbody>
<tr>
<td>over 2 hours (AB), about 1 hour (LC), 45 minutes, however multitasking with other things (RL), 20 minutes (RW), About half an hour (MW), no comment (BC) (CP) (JM)</td>
</tr>
</tbody>
</table>

Table 5 seems to bear out the views expressed by the students in Table 4 about the number of examples needed per question.

<table>
<thead>
<tr>
<th>Table 5 Number of examples given per question where requested</th>
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<tbody>
<tr>
<td>Question</td>
</tr>
<tr>
<td>24 (what do you like about Science lessons)</td>
</tr>
<tr>
<td>25 (what don’t you like about Science lessons)</td>
</tr>
<tr>
<td>28 (impact of science on your</td>
</tr>
<tr>
<td>Life</td>
</tr>
</tbody>
</table>

This also indicates a possible way to resolve the problem: by only asking for one example per question, with the option, perhaps, of a second example if respondents would like to present one.

The Questionnaire could also be subdivided into its three constituent sections: Self and School; Self and Science; Science, the family and yourself, and participants given the option of either completing each section as a separate questionnaire or completing all three sequentially at one time.

Students suggested some additional questions that might be asked:
- You could ask questions to see if having a positive attitude towards the teachers/class/subject has a positive influence on grades and vice versa.

**Views on learning**

While their answers were interesting, too few students answered the questionnaire to be able to be sure that the patterns that emerged in their answers were representative of students generally in the school. None the less their answers presented an interesting range of views, which we have tried to reflect below.

The students gave a range of answers on the substantive topics covered by the questionnaire:
- What they like/dislike about school
- How gender affects their identities as science students
- What they like to learn in science
- What they like & dislike about teachers’ practices in science
- Why science is important as a subject
- How they would like to continue to be part of the project

**What they like/dislike about school**

What students seemed to like in the main about school was learning and socialising. 6/8 students said, ‘I enjoy the social side of school but I also enjoy learning new things in lessons that interest me’. However 2/8 students welcomed being treated fairly: ‘The fact that everyone is treated with equal opportunities’.

There was a lot more variation in student answers about what they disliked. 3/8 referred to the opposite of what some students said they liked, being treated unfairly, or the unpleasant behaviours of other students. 4/8 talked about teaching and learning issues. For example, one said, ‘sometimes I dislike a topic I’m doing in class, or a particular lesson might not be that interesting, but generally I enjoy school’. One mentioned ‘the size of the school means it really lacks a sense of community’.

**What they like to learn in Science**

Students were asked to identify three topics that they particularly enjoyed when learning science.
The three main themes that emerged from the eight students were, ‘How things work’, ‘how to apply this knowledge to real life situations’, and ‘how the human body works’. As one student wrote, when asked for an example to illustrate her choice, ‘I like being able to use the knowledge I gain in chemistry at a molecular level to explain why some things happen in our bodies’.

**What they like / dislike about teachers’ practices in Science**

Students were asked to identify three aspects of science teaching that they particularly enjoyed or disliked when learning science. The three emerging aspects that they liked were ‘Doing practicals’, ‘Making lessons fun’ and ‘[teachers having] good relationships with students’. As one wrote to illustrate her choice, ‘I have two very good teachers who are easy to talk to and generally funny and open without being too “friendly” this makes my lessons enjoyable, relaxed and a good environment to learn’. Another explained: ‘The [teachers] adapt their teaching styles in order to accommodate for every pupil’s style of learning’.

Only one main aspect of practice emerged clearly as a theme that students disliked. 3/8 students disliked other students’ behaviour stopping them from learning. One mentioned patronising teachers. Another mentioned doing work too quickly. ‘In triple science, we seem to rush through some of the modules even though our test on them isn’t in January’.

**Why Science is important as a subject**

Students were asked to identify three reasons why they thought Science important as a subject for them. The three main themes that emerged were, ‘the development of medicines’, ‘how things work’ and ‘the environment’. Another issue that was mentioned was the linkage of science to industry, such as the food industry which was immediately relevant to their lives.

**Ways of remaining involved in the project**

Students suggested various ways in which they would like to continue being involved in the project, but only 7/8 students answered this question.

- Taking photographs (of self and/or others) (all)
- Interviewing other students about their views of being science students & writing a report on this (6/7 student)
- Keeping a diary/journal/blog (4/7)
- Helping other students with the project (2/7)

**Analysis of the interview data**

The eight students interviewed gave a range of detailed responses to questions that were linked to those asked in the questionnaire. There were no criticisms of the interview schedule and students seemed to have no difficulty understanding the questions.

**Views on learning**
What students like/dislike about school

Of the eight students interviewed many expressed the view that they enjoyed going to school to see their friends. They claimed it helped them to learn. A typical comment was, ‘I like going to school and see my friends and stuff like this and I think the fact that I have my friends around helps me learn’ (St T, Yr 10). Other views included, ‘...the freedom for you to choose to what you want to do later in life’ (St A, Yr 12), ‘learning about new things’ (St S, Yr 12) and doing science from several students.

The dislikes were far more diverse with none attracting more than two students: writing, poorly written exams, working from textbooks, some topics are boring or difficult, having to catch up on missing work, teacher practice (just being talked to, no variety in teaching and learning styles).

How gender affects students’ identities as science students

One topic was articulated very clearly by one of the female interviewees, with corroboration from one of the males, that of gender discrimination. The following is a close paraphrase of her comments:

I am the only girl in year 10 in systems and control and I get a lot of insults from the boys. There are a lot of lessons where my opinion hasn’t been counted as the others. One of my classmates said I was the only one who had the potential to get an A*, because everyone else was thick. Systems and Control is typically a male dominated subject. It pushed me to try to be an equal but I still haven’t got there. (She acknowledged that she was very good at practical stuff unlike some males). It is hardly surprising that if a girl is on her own in a classroom with all boys and is insulted for an hour and a half that she becomes a bit gobby. At the start of the year the boys insulted me and told me to go Food Technology, telling her to not be there at all. I stuck it out because I really enjoyed the subject. Towards the end of the year there were the insults but they accepted I was part of the class. She is one of best in her class at her work, along with two or three of the boys (St P, Yr 10).

What students like to learn about in Science

Not surprisingly no topic attracted support from more than a few students, but there was a distinction between liking particular subject areas (e.g. Environment/ Nature, Science, food technology, space/the universe, textiles, mathematics, atoms, engineering, electronics) and general aspects about knowledge (e.g. link with everyday life, theory, other people’s theories & opinions, knowing more than others). As one student said, ‘...erm- physics -erm- science basically guides my life and find what I want to do, who I want to be and what is important in my life really...’ (St A, Yr 12). Some students talked about dislikes in Science (general ‘Biology’, or more specific ‘viruses’).

What they like/dislike about teachers’ practices in Science

While many aspects of teachers’ practice that students like in Science only attracted support from a few students (working together, using power-points, making leaflets, distance learning, Independent
learning, listening to lectures, after school sessions), some attracted considerable support. For example eight students liked ‘doing / making (practicals)’, six students appreciated getting, ‘Help from Teacher’, four students enjoyed both lessons that were fun and going on science related trips.

**In what ways do students see themselves as researchers**

Four students had some notion of themselves as researchers, although this was articulated in the most complex way by just one Y12 student. This notion had various parameters like, ‘understanding the unknown’, ‘research in the real world’, ‘gaining knowledge’. One student commented that, ‘the notion of research in my head is more negative than actually doing the research (which she actually seems to like doing) (St P). The negative view of research seemed to come from how research was introduced to her by a teacher in a former school.

**Why Science is important as a subject**

When asked why science was an important subject, three main themes emerged: Link with everyday life (4 students), how things work (4 students), and environment (3 students). There were a range of other views (learn about nature, linked to food, nuclear weapons, linked to medicine) but most of them gained support from only one student. One student indicated that they did not think Science was important, either generally, or to their future lives.

**How do children learn about science in India**

A similar question to this in the questionnaire led several participants to admit that they knew little about the topic, or about India. Among the interviewees, five out of eight students admitted that they did not really know, while also admitting that they knew very little about India. The rest of their answers on this question were, therefore, guesswork. However one student was very keen to remain involved with the project because, ‘I think it will probably sort of make us more aware and open our eyes a bit to the different way of learning or the different culture and how they learn and stuff like this because I think —eh- our way of learning and their way of learning will all be very similar though some, the way they go about it and stuff like that is very different and I think —eh- it will probably — eh- educate us more and stuff and make us realise how lucky we are and stuff like this and sort of give us a bit more drive to do well in Science, I think’ (St T).

**Ways of remaining involved in the project**

When asked about the different ways in which they would like to remain in the project, many of the responses reflected thinking about working with children from India, rather than England, unlike the students who answered the questionnaire. Six students said they wanted to remain involved in order to learn from them, while six also said they wanted to go to India. This was linked to the idea by five students that they would be able to teach / help the Indian students. There were other suggestions offered, such as keeping a diary, but only by one or two students.
Discussion and Conclusion

The outcomes of the pilot study fall in to two main sections, a critique of the instruments and, for what it is worth given the very small numbers of participants involved, emerging themes from the questionnaires and interviews.

Critique of the instruments

- The questionnaire needs shortening to remove repeated request for examples and to ensure that it can be completed in about 40-45 minutes in total, with subsection taking less time.
- The questionnaire needs to be restructured so that participants can leave it and return to it without (as happens at present) them being locked out of uncompleted questionnaires.
- The questionnaire should be re-written and subdivided into three sections
  - Self and School;
  - Self and Science;
  - Science, the family and yourself
- Analysis of teacher interviews needed
- Comments of students on transcriptions and interpretations of findings needed.
- There were no critical comments about the interviews, but one student said she would have preferred to be interviewed with a colleague rather than on her own.

Emergent substantive themes

In view of the small number of participants little credence can be placed on these emerging themes, although they do seem to fit with existing literature on what students like or dislike in schools and classrooms, and how gender has an important impact on girls’ choice of subject in mixed-sex schools.

- What they like / dislike about school
- How gender affects their identities as science students
- What they like to learn in science
- What they like / dislike about teachers’ practices in science
- Why science is important as a subject
- How they would like to continue to be part of the project

That the students who took part in this pilot study would like to continue to be part of the project seems to lend substance to the views of other researchers into the empowerment of students and the efficacy of student voice as a constituent element of constructing interesting learning process.

References

Clough, P and Holden 2002 Education for Citizenship: Ideas into Action London: RoutledgeFalmer,

*Deakin, 2000;

Demetriou H and Wilson E (2010) Children should be seen and heard: The power of student voice in sustaining new teachers Improving Schools 13 (1) 2010


LCC, Leicester City Council (2008) *The Diversity of Leicester: Summary of key facts* Leicester: Leicester City, UK


*Williams et al., 2003*
Appendix 1

The pilot questionnaire

SELF AND SCHOOL:
1. What do you enjoy about school?
2. How does this affect your learning?
3. What do you dislike about school
4. How does this affect your learning?
5. What encourages you to learn?
6. Who encourages you to learn?
7. What is your future career ambition?
8. Why do you have this ambition?
9. What are your favourite subjects (choose at least two) and why?

<table>
<thead>
<tr>
<th>Subject name</th>
<th>Reason for choice</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

10. What grades do you currently achieve for Science, Maths, English, Design and Technology? Please tick the appropriate box for each subject. Tick only one box for each subject

<table>
<thead>
<tr>
<th>Average Grade at present</th>
<th>A*</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Science</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>English</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Design &amp; Technology</td>
<td></td>
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</tbody>
</table>

11. What are your target grades for these subjects?

<table>
<thead>
<tr>
<th>Target Grade</th>
<th>A*</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maths</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>English</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Design &amp; Technology</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
12. If you don’t achieve your target grades, how will this affect your career plans?
13. If you don’t achieve your target grades, how do you think your parents/ carers will respond to this
14. If you don’t achieve your target grades, how will this affect your view of yourself as a scientist?

**SELF AND SCIENCE:**
15. What do you like about your Science teachers?
16. What do you like about their teaching?
17. How do you think the children in England are taught in Science?
18. How do you think the children in India are taught in Science?

19. How important is Science for your future career? Tick the box most closely fits your view

<table>
<thead>
<tr>
<th>very important</th>
<th>important</th>
<th>Some importance</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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</tbody>
</table>

20. Please show your level of interest in each area of Physics

<table>
<thead>
<tr>
<th>Areas of Physics</th>
<th>Very interested</th>
<th>interested</th>
<th>Some interest</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy transfer, efficiency and environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical power</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radiation to transfer energy</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Radiation for communication</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>The solar system as part of the universe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy, Work and Power</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
21. Please show your level of interest in each area of Chemistry

<table>
<thead>
<tr>
<th>Areas of Chemistry</th>
<th>Very interested</th>
<th>interested</th>
<th>Some interest</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical changes and atom rearrangement</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Patterns in chemical reaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Making new materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Properties and uses of materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Changes in Earth surface and atmosphere</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Organic and intensive farming</td>
<td></td>
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</tr>
</tbody>
</table>

22. Please show your level of interest in each area of Biology

<table>
<thead>
<tr>
<th>Areas of Biology</th>
<th>Very interested</th>
<th>interested</th>
<th>Some interest</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interdependency and adaptations of organisms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variation, evolutionary changes, measured and classified</td>
<td></td>
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<td></td>
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<tr>
<td>Genes and functions</td>
<td></td>
<td></td>
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<tr>
<td>Maintenance of body – responses and systems</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Environmental and genetic factors affecting human health</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effects and indicators of human activity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vital signs and blood disorders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
23. Please show your level of interest in each area Technology

<table>
<thead>
<tr>
<th>Areas of Technology</th>
<th>Very interested</th>
<th>interested</th>
<th>Some interest</th>
<th>Not interested</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designing and Making</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exploring materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using ICT to support making</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designing for markets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using ICT to link with the world outside school</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ensuring quality production</td>
<td></td>
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</tr>
</tbody>
</table>

24. What do you like most about Science lessons? (give 3 examples)

<table>
<thead>
<tr>
<th>Example</th>
<th>The reason why chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td></td>
</tr>
<tr>
<td>Example 2</td>
<td></td>
</tr>
<tr>
<td>Example 3</td>
<td></td>
</tr>
</tbody>
</table>

25. What don’t you like about Science lessons? (give 3 examples)

<table>
<thead>
<tr>
<th>Example</th>
<th>The reason why chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td></td>
</tr>
<tr>
<td>Example 2</td>
<td></td>
</tr>
<tr>
<td>Example 3</td>
<td></td>
</tr>
</tbody>
</table>

26. What would make Science teaching more exciting for you?

27. How could you improve your own learning of Science?
Science and Society

28. How is Science useful in your life? (give 3 examples)

<table>
<thead>
<tr>
<th>Example</th>
<th>The reason why chosen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td></td>
</tr>
<tr>
<td>Example 2</td>
<td></td>
</tr>
<tr>
<td>Example 3</td>
<td></td>
</tr>
</tbody>
</table>

29. How have you seen Science changing your life at home?

30. What do you think are controversial issues in science? (give 3 examples)

<table>
<thead>
<tr>
<th>Example</th>
<th>What is your opinion on this?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example 1</td>
<td></td>
</tr>
<tr>
<td>Example 2</td>
<td></td>
</tr>
<tr>
<td>Example 3</td>
<td></td>
</tr>
</tbody>
</table>

31. How does Science affect your personal beliefs (faith / religion)?

32. How important do you think Science is for your life?
1 is very important / 4 is little or not important. Tick the box that most closely fits your view

<table>
<thead>
<tr>
<th>Very important</th>
<th>important</th>
<th>not important</th>
<th>not important at all</th>
</tr>
</thead>
</table>

SCIENCE and FAMILY and FRIENDS

33. According to your friends how important is Science to you?
Tick the box that most closely fits your view

<table>
<thead>
<tr>
<th>Very important</th>
<th>important</th>
<th>not important</th>
<th>not important at all</th>
</tr>
</thead>
</table>

34. According to your teachers how important is Science to you?
Tick the box that most closely fits your view

<table>
<thead>
<tr>
<th>Very important</th>
<th>important</th>
<th>not important</th>
<th>not important at all</th>
</tr>
</thead>
</table>
35. According to your family how important is Science to you?
   Tick the box that most closely fits your view
   
<table>
<thead>
<tr>
<th>Very important</th>
<th>important</th>
<th>not important</th>
<th>not important at all</th>
</tr>
</thead>
</table>

36. Do you think that music is important in your life, at home?
   Tick the box that most closely fits your view
   
<table>
<thead>
<tr>
<th>Very important</th>
<th>important</th>
<th>not important</th>
<th>not important at all</th>
</tr>
</thead>
</table>

37. What is the reason for your answer to the previous question?

**The Questionnaire**

Now you have answered the questionnaire, please tell us if there were any questions you did not understand, or thought silly

Please give us your suggestions for any other questions that you think important for this that we have not asked

Would you like to continue to be involved in this POISED project?

If so in which ways would you like to continue to be involved in this POISED project

How long has it taken you to complete this questionnaire?

**Appendix 2**

**LETTER TO STUDENTS for pilot Interviews**

Dear Student,

Please see below some questions we would like to ask you in an interview. By answering these questions you will support the POISED project research team. We may ask some related questions. The interview is likely to last for about 30 minutes.

POISED is a collaborative project of Secondary school teachers and students, tutors from the School of Education, University of Leicester, and secondary schools in India. It is investigating how students construct their identities as Science students and how this relates to their school experiences, their views of Science in their lives and in the context of the school curriculum as defined by government policy.
Your views on science are important to us, so we can improve the teaching of science. One other benefit to your self will be that you can add this to your CV when you write out University applications and job applications.

We look forward to your responses.

With regards,

H. Bushe, M. Tas, M. Asmal, E. Warden, B. Green and K. Cyster

**Pilot Interview Schedule for Students**

**POISED**

**June 2010**

Introduction of self and the project; ask for student name and year group

1. **What do you enjoy about school?**
   - Prompt 1 – Why haven’t you mentioned Science? (if not mentioned at all)
   - Prompt 2 – What about other subjects?
   - Prompt 3 - How would you describe Science?

2. **What would you like to do in the future?**
   - Prompt 1 – Role of Science? (if not mentioned at all)
   - Prompt 2 – Role of Being a Researcher – finding out about things?
   - Prompt 3 - what does being a researcher mean to you? [but this might be instead in Qu 5]

3. **How well are you doing in Science?**
   - Prompt 1 – Grades?
   - Prompt 2 – Which Science(s)? How well in each?
   - Prompt 3 – Other subjects (Technology, Maths, Geography)

4. **How are you helped to learn in Science?**
   - Prompt 1 – What (else) would help you?
   - Prompt 2 – What would help you the most?
   - Prompt 3 – how do you like to learn? And how does teaching in science fit with this?
   - Prompt 4 - how does or how has gender affect(ed) your learning?
   - Prompt 5 - Is there any topic or way of learning you would like to do but don’t (yet) do?

5. **What excites you most about Science lessons (or particular Sciences if mentioned before)?**
   - Prompt 1 – What topics do you prefer
   - Prompt 2 - How do you see yourself in the role of researcher in science lessons?
   - Prompt 3 - what doesn’t excite you about science lessons?

6. **How important is Science outside the school?**
   - Prompt 1 – How is Science useful in your life?
   - Prompt 2 - in different countries, or for different people
7. What excites you most about Science outside school?
   Prompt 1 – things you read about, see on TV or online, films, aspects of the physical world. Give examples of topics

8. How do you think pupils in India learn Science?
   Prompt 1 – how do you know that - evidence for?
   Prompt 2 – How important do you think Science is to children in India?
   Prompt 3 – How important do you think Science is in their everyday lives? As they may perceive that?

9. What part do you see yourself playing in this project?
   Prompt 1 – As researcher; as a supporter of other’s research; as a writer of the project developing?
   Prompt 2 – Having contacts with India and science students in India Is there anything else you would like to say?

THANK YOU FOR YOUR TIME. We’ll keep you posted about the developments of the project.

This document was added to the Education-line collection on 16 November 2010