RESEARCH PAPER

Bangladeshi girls choosing science, technology, engineering and maths

An exploration of factors that affect Bangladeshi girls' achievement in, engagement with, and aspirations in STEM subject areas.

Research conducted in the London Borough of Tower Hamlets 2007–2008

Executive Summary

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Executive Summary

Introduction

"Bangladeshi identity means different things to girls and parents within the Bangladeshi community, and girls and parents are engaged in an active process of reproducing some traditions, and creating new ones."

- Bangladeshi identity means different things to girls and parents within the Bangladeshi community, and girls and parents are engaged in an active process of reproducing some traditions, and creating new ones.
- At GCSE in 2007, slightly more Bangladeshi boys than girls attained two science GCSEs at A* to C (44% of girls and 46% of boys), a reversal of the situation in 2006 (46% of girls and 43% of boys). This is somewhat lower than the national proportion (50% in 2007). Fifty per cent of Bangladeshi girls attained a GCSE in maths at grades A* to C; fewer than the national average (56% of all pupils attained a GCSE A* to C in maths in 2007).
- At A-level in The London Borough of Tower Hamlets, fewer girls than boys study physics and maths, but more girls than boys study biology and chemistry.
- Girls, teachers and parents perceived science and maths as more difficult than other subjects. Girls linked the study of science and maths particularly to medicine, accountancy and finance, and indicated they might not choose STEM subjects because they had no interest in those careers.
- Girls tended to regard STEM subjects as male subjects because the classes were male dominated, and because they felt there was more encouragement for boys to study them.
- Girls said they did not enjoy studying science and maths when they felt rushed or overwhelmed by information, they had bad relationships with their teachers, and when they felt their teachers had poor subject knowledge. Some teachers were similarly concerned about having to cover too much content in too short a time at GCSE. These experiences might put girls off studying STEM subjects at A-level.
- Girls said they enjoyed science and maths when they had time to think about it, when they perceived the content to be relevant, and when they received clear explanations and a variety of learning activities. These factors encouraged them to study STEM subjects.
- Girls who had access to STEM enrichment activities were positive about them, but the activities were often described as rather divorced from the classroom. Access to these activities appeared to be uneven, especially for lower attaining groups.
- Girls in the study had high aspirations, most frequently in law, medicine and teaching, but also in a range of other diverse careers. Many saw themselves as engaged in a process of social change and planned to challenge traditional expectations about careers for women.
- Parents told us that the most important factor in their daughters' choice of career should be her interests and aptitudes, describing a context of cultural change in relation to women's employment and careers.
- Teachers were often unaware of the career aspirations of the girls they taught, had few opportunities to discuss careers with their students and had stereotyped ideas about the kinds of careers Bangladeshi girls would follow.
- Very few girls had aspirations in careers in non-medical sciences, engineering or technology. This was linked both to a lack of information about what these careers involved, and also to the girls' perceptions that these careers required people with masculine characteristics, which they did not see themselves as having.

The study

The research was commissioned by the London East Thames Gateway Aimhigher Partnership and CfBT in response to the finding that Bangladeshi women are an under-represented group in occupations in science, engineering and technology (Jones *et al*, 2005). The aims of the research were to explore the factors that affect Bangladeshi girls' achievement in, engagement with, and aspirations in science, technology, engineering and mathematics (STEM) subject areas in the London Borough of Tower Hamlets (Tower Hamlets).

The research design

The research design had two strands: a quantitative analysis of contextual data for Tower Hamlets, and qualitative case studies. The contextual data was made up of the GCSE and A-level results in Tower Hamlets in 2006 and 2007. Case studies were carried out in three schools and a college in Tower Hamlets where more than 50% of the students were of Bangladeshi origin. They consisted of focus group interviews with 32 Year 10 girls, paired interviews with 12 Year 11 girls and group interviews with 20 Sixth Form students (64 girls in total). In addition, we interviewed science or maths teachers, and in one location a careers advisor (8 interviews in total). We also contacted parents through schools, recruiting at a parents' evening and through a Saturday school. We interviewed six parents in total, two of whom were interviewed in Bengali (Sylheti dialect). All participants were guaranteed confidentiality and have been given pseudonyms to preserve their anonymity.

Bangladeshi identities and cultural change

> *"There are a lot of clever girls who are Bangladeshi but they don't get jobs because [they dress in Hijab]."*

Bangladeshi identities were thought of and lived by the participants in diverse ways. Their relationships with Bangladesh were complex. Some girls and parents referred to Bangladesh as 'home', visited regularly, had close links with family there, and felt that attitudes in Bangladesh played an important part in their decisions about life in London. In contrast other interviewees saw British or London Bangladeshi identities as quite different from the identities of girls in Bangladesh. The girls identified some things about themselves or their families as typically Bengali or typically Asian, but some as specific to their area of London, or their particular family traditions. There were also differences between girls from different socio-economic groups. Teachers did not always reflect the full extent of this diversity when talking about the girls, sometimes talking about the Bangladeshi girls in their school/college setting as though they reflected all Bangladeshi girls or all Asian girls in London.

In interview, participants reflected that there were sometimes particular expectations of them because they were Bengali. Some were anxious about discrimination that might arise from the popular perceptions linking terrorism and the Asian community, as one girl explained 'there are a lot of clever girls who are Bangladeshi but they don't get jobs because [they dress in Hijab]'. They also talked about expectations within their own community about the kinds of jobs that were suitable for girls. However, some of the interviewees felt that these expectations were changing:

> *When I was younger it was very limited the way I was thinking, because I was always*

> *Several girls envisaged challenging traditional expectations, and saw this as a positive thing.*

[thinking about] *our culture and how a woman's role is.* [But] *as you get older, society has opened its mind up… I'm going to be a working person.*

Several girls envisaged challenging traditional expectations, and saw this as a positive thing.

Shouldn't it be like 'This is a Bengali girl who's doing this and not all Bengali girls do that'. So it will make you one in a million, so wouldn't you shine out?

Parents and a Bangladeshi teacher reflected that Bangladeshi girls were achieving better in education, and this meant they could aspire to more careers. However, neither the parents nor the teachers discussed cultural change to the same extent as the girls who participated.

Implications:

There is a need to be open to the ways in which Bangladeshi cultural identities are changing, as Bangladeshi young people accept and modify some traditions and forge new cultural identities. Otherwise those that work with these young people will make assumptions based on fixed notions of Bangladeshi culture and identity.

Choosing to study STEM

There is no evidence that Bangladeshi girls in Tower Hamlets are under-achieving in science or maths relative to Bangladeshi boys, or other girls in Tower Hamlets. In Tower Hamlets in 2007, Bangladeshi girls entered and attained similar science and maths GCSEs to other girls and to Bangladeshi boys in Tower Hamlets. A smaller proportion of girls in Tower Hamlets attained two science GCSEs, and a maths GCSE, than girls nationally in 2007, although this may be explained by the levels of deprivation in Tower Hamlets. Reflecting national patterns, girls in Tower Hamlets are under-represented in physics and maths at A-level, where more boys than girls choose to study maths and physics. However, more girls than boys choose to study biology and chemistry. The proportion of girls taking A-levels who are studying for biology and chemistry A-levels in Tower Hamlets is similar to the national patterns (unfortunately this data was not available by ethnicity).

We found that the girls' subject choice at GCSE and A-level was influenced by a wide range of factors including career ambitions; interest in and enjoyment of the subject; self-perceived ability; perceived difficulty of the subject; the options on offer in the school/college; previous experience of studying the subject; the assessment method; and others.

Girls described weighing up these factors before making decisions. Some consulted their parents, siblings or teachers, but participants agreed that the final decision rested with the girls themselves.

Science and maths were sometimes perceived as necessary only for careers in restricted fields. Biology and chemistry were considered good subjects by girls and parents because of their link to medical careers, and maths because of the link to accountancy and finance; however, this also had the effect of narrowing their appeal. Girls and teachers indicated that girls might choose not to study STEM subjects because they had no interest in medicine, accountancy or finance.

Implications:

Better information about STEM careers will help STEM subjects to be seen as relevant to a wider range of careers. There may also be scope for portraying these subjects as having worth in themselves, as well as for particular careers.

Science and maths were often described as difficult subjects. In some cases girls and

"Girls tended to regard STEM subjects as male subjects (especially physics and technology), both because the classes were male dominated, and because they felt there was more encouragement for boys to study them."

parents felt that higher grades would be possible in other subjects and chose not to study science and maths. Girls described parents who boasted about their daughters' studies in science because of the status of science and maths as 'difficult subjects'. Teachers were aware of the perceptions of science and maths as hard subjects. While some teachers indicated that they felt higher attaining students were more likely to study science and maths, others argued that low attaining pupils could find them interesting and enjoyable too, and there was evidence among the girls that some of the lower attaining girls liked science.

Implications:

Pupils of all abilities can find STEM subjects interesting and relevant, and schools, teachers and careers advisors can challenge perceptions that STEM careers and subjects are only for high achievers.

Girls tended to regard STEM subjects as male subjects (especially physics and technology), both because the classes were male dominated, and because they felt there was more encouragement for boys to study them. As one Year 11 student highlighted:

> *Technology is deemed to be like a male subject, very male dominated anyway. And I think loads of girls, they are directed in a different direction altogether, they* [the school] *are not really encouraging certain subjects.*

Perceptions of scientific and mathematical subjects as natural, rational and logical further reinforce their masculine image, as these characteristics tend to be associated with men. This can compound concerns that they are difficult subjects. A Year 11 girl told us that *'I know like one or two girls who are actually good at science and maths but they are too scared to take them'.* Neither parents nor teachers made any reference to the perception of STEM subjects as masculine, although some college teachers observed that maths classes they had taught in the past had been male-dominated.

Implications:

Perceptions of STEM subjects as masculine and success in STEM subjects as due to 'natural ability' need to be challenged in order for more girls to consider studying them. Opportunities to reflect on gendered perceptions of STEM subjects could be built into professional development for teachers and careers advisors, and schools could develop plans to challenge images of subjects as masculine and feminine.

The experience of studying science and maths at school influenced later choices. Subject choices were constrained by a number of school/college level factors, including whether there was an option to study three sciences, whether other subjects had to be given up to study triple science, and for the tier of exam paper entered. For some girls, the significance of these factors only became clear after their 'choices' had been made. Although very significant to the girls, these were not factors that teachers commented on at all, and the parents interviewed gave no indication of being aware of these decisions. A number of the girls commented negatively about the fast pace at which science content was taught at GCSE, describing *'changing different topics all day'* and *'getting too much information'* and feeling 'rushed' and confused by this. A Year 10 pupil reflected that:

> *I think I like sitting down actually going through stuff thoroughly and not just briskly going over it.*

Girls said they did not enjoy studying science and maths when they had bad relationships with their teachers, and when they thought their teachers had poor subject knowledge. In contrast, participants said they enjoyed science and maths when they perceived the content to be relevant, and when they received clear explanations and a variety of learning activities. Some had experience of being the only girl in a technology class, and this impacted negatively on their enjoyment of the subject. Teachers also talked about the crowded curriculum and the difficulties they faced in making time for science/maths enrichment activities. Especially

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at GCSE they often felt that their teaching was so constrained by these factors that it made little difference in the subject choices of their pupils, although the girls' comments suggest this was not the case. Parents did not comment on their daughters' experiences of science or maths lessons, except to mention that they often did not understand the content their daughters were studying.

Implications:

As far as possible, girls who choose STEM subjects should be timetabled together. Both teachers and pupils are concerned about the crowded science curriculum at GCSE, especially for those who continue to study three sciences at GCSE, and in some cases girls think this makes science lessons less enjoyable.

Some STEM enrichment activities (such as maths clubs or science activity days at universities) are intended to influence girls' choices of STEM subjects. Access to these activities was uneven, with some lower attaining girls who were interested in science feeling they had not had the opportunity to participate in enrichment activities. Girls who had experienced enrichment activities generally spoke positively about them, although there was no evidence that the activities had influenced their subject choice, as the activities were often described as rather divorced from the classroom. Teachers were unsure about the value of these activities, and found them difficult to combine with their teaching responsibilities and the crowded curriculum, although all felt that ideally the school would offer more.

Implications:

Targeting of STEM activities should be coordinated in ways that include and encourage all those with an interest in or enjoyment of related subjects.

Career aspirations

Girls in the study had high career aspirations, most frequently hoping to work in law, medicine and teaching, but also including the diplomatic service, childcare, social work, office work, art therapy and hairdressing. The parents we interviewed were generally aware of the details of their daughters' aspirations, and one commented how very frequently her 14-year-old daughter's aspirations changed. Teachers seemed to have little knowledge of the aspirations of the girls they taught, often because they found the pressure of a crowded curriculum gave few opportunities for talking with girls about their career ideas. They were usually unaware of the destinations of previous pupils, and this may have contributed to some of their stereotyped ideas about the aspirations of Bangladeshi girls, which focused on law, medicine and teaching. While these were the most frequent aspirations among the girls we spoke to, the girls discussed a wide range of different careers and teachers did not seem to have appreciated this diversity.

Implications:

Teachers may be unaware of the range of ambitions among Bangladeshi girls, and are relying on outdated ideas about the futures that girls aspire to. Providing teachers with more information about the destinations of their pupils might help them encourage and support pupils in their career choices, and challenge some of the stereotypes about the careers Bangladeshi girls aspire to. Professional development sessions should provide time and space for teachers to reflect on gendered and racialised stereotypes of which careers are suitable for which students. Space should be created in the curriculum for teachers to discuss careers with pupils, and to challenge stereotypes held by pupils about STEM careers.

"What mother doesn't want her daughter to go to university?"

The girls told us that their parents were mainly supportive of their aspirations, and this was certainly true of the parents interviewed, who talked about having high, realistic and achievable ambitions for their daughters. All of the parents hoped their daughters would attend university, with a mother asking *'What mother doesn't want her daughter to go to university?'* Most girls indicated that they discussed their career ideas with their parents, and there was evidence of a process of negotiation between parents and their daughters, with parents expressing ideas and daughters taking some parts of their advice, and contesting others. Parents indicated that their main priority was for their daughters to be academically successful, to gain a degree if they had the interest and ability, and to find a 'decent' job, which led to financial security and personal development. Some parents had personal preferences for particular careers, based on their own experiences, their perceptions of their daughter's strengths and weaknesses, and their understanding of the flexibility and independence offered by different careers. However, they also told us that the most important factor in their daughters' choice of career should be her interests and aptitudes.

For the girls in the study, career aspirations were expressions of the kind of person they wanted and believed themselves to be. Parents saw these choices in similar terms, encouraging girls to select subjects at which they were good, and careers that suited their personality. Career choices were also related to how participants wanted to be seen by others. Several girls noted that certain careers would make them 'shine' in the community, while others might be less favourably regarded. Parents (and girls, although to a lesser extent) stressed the importance of a 'decent' job rather than a job that might have other people talking behind their backs. Girls, parents and a Bangladeshi teacher expressed a sense that a wider range of occupations were now perceived as 'decent' and prestigious, in addition to law and medicine.

In relation to STEM careers, a number of the girls mentioned aspirations in medical careers but far fewer expressed interest in careers in other sciences, engineering or technology, partly because girls and their parents knew relatively little about jobs in these sectors. Several teachers believed that parents and pupils had relatively little knowledge about these careers. However, there was little evidence that teachers had engaged in sustained discussion with girls and their parents about possible career pathways in STEM. Although most of the girls and parents believed that technology, engineering or mathematics could provide 'decent' careers for women, both girls and parents commented that Bangladeshi women were rare in these sectors. Most girls and parents did not express interest in technology or engineering careers for themselves or their daughters as these careers tended to be associated with men, as one Year 10 student told us:

> *'Men do engineering, and stuff that you need technology for. It's only for men, you get me? And ladies, they don't get no jobs out of it'.*

Science and technology were also associated with masculine traits. Girls tended not to see themselves as having the right interests and aptitudes for STEM careers in these areas, and their parents supported this view. Those girls who were seen as suitable for STEM careers were often seen as tomboys. A small number of girls and parents believed STEM careers (with the exception of medicine) might be unsuitable for girls because of the male-dominated working environment, and the physical demands that some associated with engineering.

Implications:

Provision of information about these careers in non-medical sciences, technology, engineering and maths could help Bangladeshi girls and parents make informed choices. Information about careers related to biology and chemistry might be particularly useful for girls and parents, given the relative strength of recruitment to these subjects among girls. This information should challenge the perceptions that non-medical science, technology, engineering and maths are careers that require masculine characteristics.

"They should make sure that there's enough girls in each of the groups and not just in a particular girly thing. Because most of the girls, what did they do? Healthcare and teaching and stuff, and most of the boys did business."

A number of factors were mentioned that shaped career aspirations. Girls and parents stressed the importance of pursuing careers linked to subjects that the girls enjoyed. Girls and teachers agreed that the media could sometimes inspire people to think about a career, and teachers felt that the media did not often present scientists in a positive way although overall girls and teachers felt the influence of the media was limited. Career guidance had helped some girls to be very well informed about their career options, but some claimed they had received no advice at all. Individual guidance, especially mentoring from someone in a relevant occupation, was seen by the girls as the most valuable form of careers advice, and several spoke eloquently about their positive experience of mentoring (however, as mentors came from business and law, they had not encouraged the girls towards STEM careers). The careers advisor highlighted some of the difficulties of liaising with schools and getting to know pupils when providing careers advice.

Implications:

Girls saw individual advice and guidance as important; especially when it came from someone they had got to know through a mentoring relationship. Mentors from STEM occupations in these schools could help to break down some of the stereotypes around STEM careers, and challenge some of the perceived barriers.

Most of the girls had some work experience, but for many this was not in the area of work to which they aspired because they or the school did not have access to the relevant workplace, and the girls often felt it had little impact on their aspirations. Participants told us that work experience where they could contribute and complete tasks was the most useful, and a few girls felt that work experience of this kind had helped shape their career aspirations. In one school where pupils were offered taster days for different careers, a Year 11 girl suggested that:

> *'They should make sure that there's enough girls in each of the groups and not just in a particular girly thing. Because most of the girls, what did they do? Healthcare and teaching and stuff, and most of the boys did business'.*

Work experience was not a factor referred to by teachers or parents when discussing the career aspirations of girls.

Implications:

For some girls, work experience was a factor in shaping their aspirations. Monitoring of the gender balance of work experience placements, and consideration of ways to challenge gender stereotypical placements would be helpful.

Girls were aware of some economic factors (such as the cost of a university education) that might impact on career aspirations and some could give examples of family members or friends whose plans had been curtailed by economic factors. However, they did not anticipate such difficulties for themselves. Teachers and parents were also aware of these factors, but saw them as only rarely significant.

Several teachers mentioned a cultural bias towards careers in medicine among Bangladeshi families. While one or two of the girls talked about medicine being 'an Asian thing to do', and cited a number of family members in medical careers, there was little evidence that interviewees felt pressured into these kinds of careers, and both girls and parents were positive towards careers outside the medical profession. Participants acknowledged that there were 'traditional' careers that were associated with Bangladeshi girls. However, almost all of the girls told us that cultural traditions were changing, and many felt that their career aspirations should not be limited by tradition. Girls saw social factors such as tradition, cultural expectations and religion as dynamic, fluid and open to change. While some saw potential restrictions, others saw themselves as engaged in a process of social change and planned to challenge expectations. Parents also spoke about the cultural changes in their community. In contrast, teachers placed a great deal of emphasis on cultural norms and family

> *As previously, it is important that teachers, careers advisors and those working with Bangladeshi girls are aware of cultural change, and the ways in which these communities are challenging tradition.*

attitudes to STEM careers and careers for women, and much less on the possibility of cultural change.

Implications:

As previously, it is important that teachers, careers advisors and those working with Bangladeshi girls are aware of cultural change, and the ways in which these communities are challenging tradition.

For the girls, a particularly significant factor in career choice was whether they believed a career could be combined with family responsibilities. This was often seen to be more important than media or tradition, and some girls indicated that they had ruled out career options on the basis of their observations that the career would not combine well with family life. Several female teachers commented that the 'family-friendly' nature of teaching would make it a very suitable career for the girls.

Implications:

Girls and teachers had relatively little information on which to base judgements about the compatibility of different career options and family responsibilities. Given the importance girls in the study attached to finding a family-friendly career, careers advice could incorporate information about ways STEM employers are creating family-friendly working environments to encourage female applicants.

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