

## Executive summary

The STEM Ambassadors programme, funded by UKRI and delivered on its behalf by STEM Learning, supports the engagement of students in science, technology, engineering and mathematics (STEM) subjects and careers across the UK. STEM Ambassador activities are intended to positively influence attitudes to STEM, research and innovation; enhancing both students' attainment in STEM and the likelihood of those students pursuing STEM careers and/or research in the future.

Sheffield Institute of Education (SloE) ran focus groups to explore the perspectives of young people on the SA programme and STEM more widely to consider how the programme fits within their worldview and priorities.

Perceptions of the SA programme and similar STEM enrichment activities were positive even amongst students who identified as not 'STEM-friendly'. Visitors generally provide some interest beyond the normal school experience.

The most successful sessions involved activities where students engaged in experiments or construction activities themselves. This contrasted with listening to talks which were almost always viewed negatively. One exception was amongst senior students in the process of applying for university or further training who valued the talks about careers and the process of application. This suggests two strategies might be appropriate in schools: an engagement or recruitment strategy earlier on to attract more students followed by a retention strategy at 16+ to facilitate their progression into STEM at 18+.

Student-led projects were valued more highly than pre-designed experiments. The warmest comments were reserved for situations where SA had supported student-initiated projects and had acted as brokers finding other researchers with relevant experience to support the students. The role of on-going mentor adopted by some SA and other STEM enrichment volunteers was viewed as particularly powerful.

Students valued on-going relationships with STEM-enrichment individuals and projects. They responded well to SA, particularly those that were nearer their age and experience, who engaged with them over multiple occasions. Other successful STEM enrichment activities (e.g. STEM Clubs, inter-school visits) which were predictable and ongoing were valued by staff and students.

Perceptions of STEM in students are largely formed by their experiences in schools and SA and STEM Clubs probably only impact significantly on students who are already 'STEM-friendly'. However, many students who do engage report their positive dispositions towards STEM are confirmed. STEM-friendly students tend to regard STEM as creative, involve problem-solving and have a positive impact on the world. Students who do not identify as STEM-friendly tend to regard the subjects as closed, about knowledge, difficult and a constant search for a 'single correct answer' compared with their preferred options in Arts.

Students, particularly STEM-friendly ones, expect STEM to have a positive impact on individuals, society and the planet more widely. The social value of STEM was mentioned routinely in the FG and students explained that their motivation to follow STEM projects was, in part, to 'make the world better'.

# Recommendations

## **Move to an activity-led programme, prioritising face-to-face interaction**

The most positive comments about the SA experience, or STEM lessons in school, were always concerned with activity (e.g. experiments, construction activities) as opposed to 'just listening' to a talk. This is not surprising and chimes with much of the existing research evidence, but its importance requires that it be mentioned again. Any SA event that involves student activity is much more likely to lead to engagement and encourage students to return for more STEM events than a talk. While the young people consulted for this current research were open to online experiences with SA, they clearly prefer face-to-face interaction at schools or visits to SA's place of work.

## **Ensure students and schools have control rather than employers**

Any activity is better than no activity, but the most successful experiences occur where students have a degree of control and ownership. It is when they are designing their own experiments or researching their own projects that students' most positive comments are elicited. The ethos in a school will affect the extent to which students are able to, and expect to, take ownership of their own learning and any STEM enrichment activities on offer. However, the SA programme should look for ways to promote student-led initiatives as the assigned default.

## **Distinguish between recruitment and retention strategies at primary and secondary**

Unsurprisingly, primary schools show limited understanding of careers in STEM, while at the upper reaches of secondary school the mechanics and complexities of university entrance begin to dominate. SA activities in primary should therefore probably emphasise 'recruitment strategies' showing STEM as inclusive, creative and fun in an attempt to grow the pool of potential STEM practitioners. In secondary school, and particularly in those that are more effective at getting their students into universities, an emphasis on STEM careers and courses with advice on both the possibilities (e.g. 'you could consider all of these medical careers beyond 'being a doctor'') and practicalities (e.g. 'the following items would look good on your UCAS form') of progression to avoid leakage of STEM candidates into other fields.

## **Build in sustainability and seek to link with other local STEM initiatives, such as HEIs and employers**

Many local school clusters already operate links between primary and secondary schools and between secondary schools and local colleges or universities. These ongoing programmes make valuable contributions to maintaining the STEM pipeline, and SA should look to actively engage and participate in these wherever possible. Emphasising local availability of SA rather than their specialisms or research areas might help to do this. It might be useful to consider prioritising institutional links between universities and schools which can be developed and sustained over years rather than individual SA links. SA are often younger researchers who may be required to move nationally, or internationally, to progress their research careers.

## **Emphasise the social value of STEM and its potential for good**

When asked, students typically speak of their hopes for a better future, and STEM can be aligned with this by emphasising the work of STEM practitioners at a large scale, for example in combating climate change and developing pollution-control technologies, clean energy and novel drug and treatment provision. Where students choose their own projects they typically choose ones that have a very obvious social value. Emphasising STEM contribution to a better future and a fairer present will tend to encourage students into the discipline and even those who choose to follow other pathways (e.g. languages, arts) will retain a positive view of STEM.