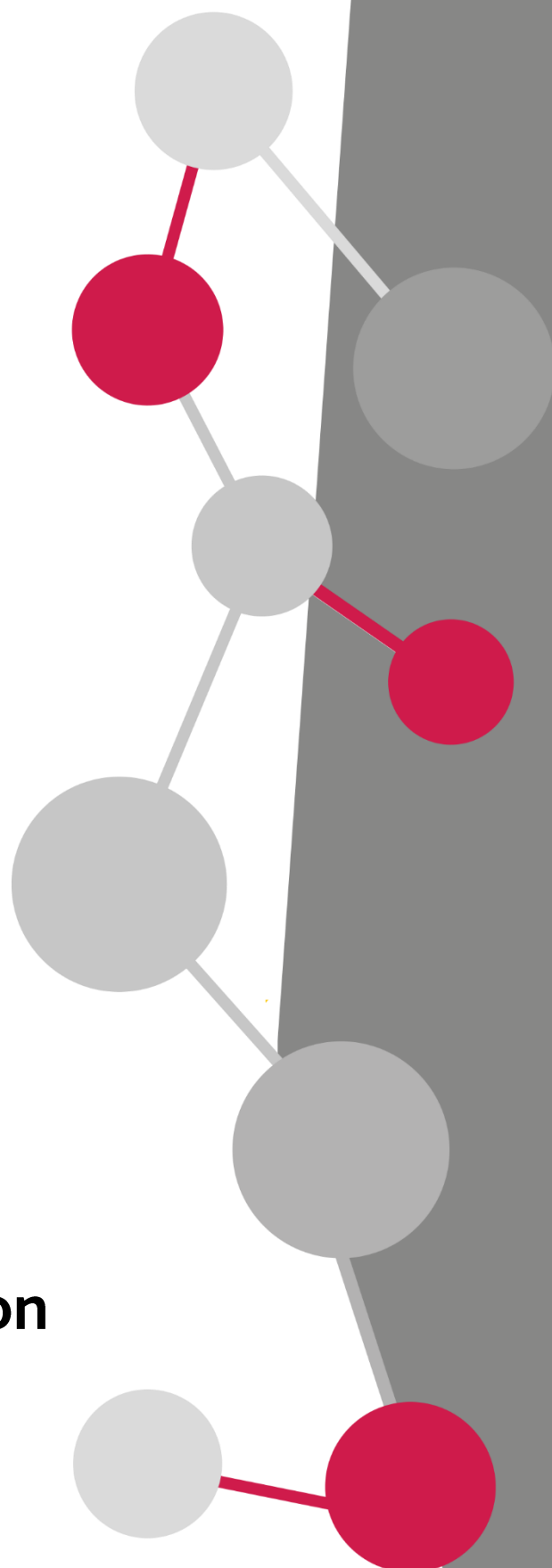
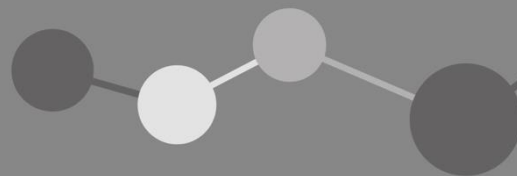




# **ENTHUSE Partnership: Lloyds Register Foundation Interim Evaluation April 2020**





## Executive Summary

**ENTHUSE Partnerships** are intensive 2-year programmes that enable schools to raise aspiration and achievement by investing in teaching, working collaboratively with each other and with STEM Learning.

The Lloyds Register Foundation is supporting an intensive programme of ENTHUSE Partnerships. The first cohort of 20 partnerships involves 93 schools aiming to raise achievement in STEM and stimulate interest in and enthusiasm for engineering.

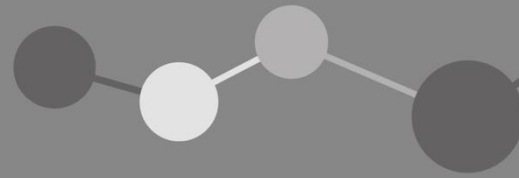
One year into their two year action plans, these Partnerships are demonstrating impact: students have increased interest, attainment, motivation and careers knowledge, and teaching and leadership of STEM subjects has improved.

- **Interest in STEM has increased:** girls and boys show increased interest in studying STEM subjects. Over half of girls and two thirds of boys want to learn more about working in STEM, an increase of 10%.
- **Attainment in STEM has risen:** 94% girls and 98% boys are meeting / beating age-related expectations, up from 88% and 69% before the Partnerships started.
- **STEM career aspirations have increased:** 28% of girls and 52% of boys would like a STEM career when they are older, compared to 24% of girls and 43% of boys at the start of the programme.
- **Understanding of STEM careers has increased:** more students are aware of the qualifications and routes to progress in STEM, particularly amongst boys where the proportion reporting that they understand these has risen 19%.
- **Self-efficacy and motivation have increased,** almost half consider themselves the kind of person who could have a STEM career, a rise of 8%. Four in 10 female and 6 in 10 male students intend to study STEM subjects in future.
- **Careers information is increasingly embedded in STEM teaching:** teachers are more confident using careers to provide context when teaching STEM and do so more often. They are also more aware and better equipped to draw on the enrichment opportunities offered by STEM employers.

STEM Learning use the *STEM Flight Path* to track engagement and progress with STEM subjects. At this stage, **Lloyds Register Foundation supported ENTHUSE Partnerships are showing impact in line with that of the STEM Flight Path.**

Interest, attainment, motivation and careers knowledge have all increased, while teaching and leading of STEM subjects is also improving. It is expected that further, longer-term benefits of these ENTHUSE Partnerships will become apparent in the future. Long-term evaluation of previous ENTHUSE Partnerships is ongoing, with early findings showing that students engaged with an ENTHUSE Partnership experience long-term benefits, leading to increases in STEM subject uptake, and ultimately engagement with STEM careers.

STEM Learning, April 2020.



## Impact analysis

### 1. Background:

The demand for Engineers in the UK is rising, with 203,000 level 3+ engineering related roles to be filled annually to 2024, and an annual shortfall of 59,000 engineering roles which go unfilled ([Engineering UK, 2018](#)). The pathway between school and a career in STEM has 3 potential points for dropout where students have a choice about which subjects to study to a higher level or the option of a career:

1. GCSE options;
2. At the end of Key stage 4 following completion of Post 16 qualifications;
3. Following completion of further and / or higher education.

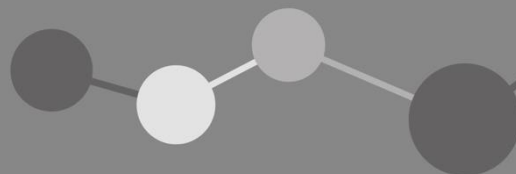
Given that in the future a greater number of people will be needed to fill the annual skills shortage, work is clearly needed to attract more young people to work in this sector. There is also a substantial disparity in career opportunities being considered by students coming to the end of their schooling and in further education.

[Wellcome's Science Education Tracker 2019](#) (March 2020) found that 11% of boys ranked engineering as one of their top five future career choices, but only 2% of girls ranked engineering in their top five choices. Additionally, the [Engineering UK Brand Monitor report](#) (2019) highlighted that there is a need to raise the knowledge of both parents and teachers where engineering is concerned: only 30% of teachers and 27% of parents surveyed reported they knew "quite a lot" or "a lot" about what engineers do. On a positive note, however, the brand monitor found 96% of teachers and 83% of parents would recommend a career in engineering to their students or children, and the proportion of young people who would consider an engineering career has risen to from 40% in 2013 to 51% in 2017.

ENTHUSE Partnerships are designed to address issues of underachievement and low aspirations in STEM at a local level by supporting collaborative activities between schools. By addressing these local issues and needs, the programme attempts to ensure more students continue along this pipeline to ultimately make more informed decisions about further study and a career in STEM.

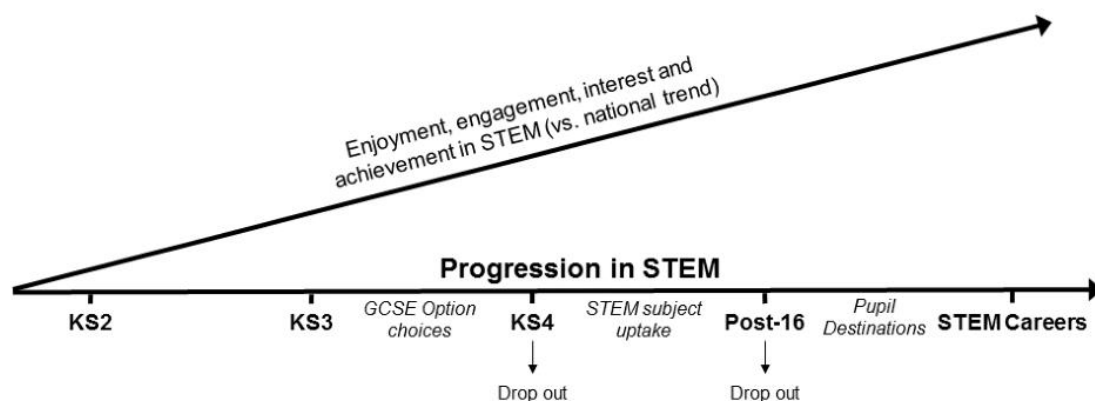
### 2. Aims and Outcomes:

The Lloyds Register Foundation ENTHUSE Partnerships specifically aim to create a generation of more able young people with increased awareness of STEM careers and specifically, careers related to Engineering. We will improve STEM engagement and achievement, raise aspirations and improve career destinations through a structured programme of teacher development, student enrichment, and opportunity for all students – regardless of background - to work with STEM employers. This final point is especially important as the Gatsby careers benchmarks form part of the [Government's careers strategy](#) (2017). Benchmark 5: "Every student should have multiple opportunities to learn from employers about work, employment and the skills that are valued in the workplace" is particularly noteworthy, as evidence reported in the careers strategy highlights how multiple encounters with employers significantly reduces the chances of a young person being considered not in education, employment or training (NEET).



STEM Learning use the STEM Flight Path to track engagement with, and progress in, STEM subjects – see Figure 1. This flightpath enables us to track the impact of ENTHUSE Partnership support against drop-out rates, also taking into consideration student attitudes, student attainment and teacher attitudes.

Increasing pupils' enjoyment, engagement, confidence and interest in STEM leads to higher achievement and increases STEM career aspirations.



#### Measures of STEM career aspirations:

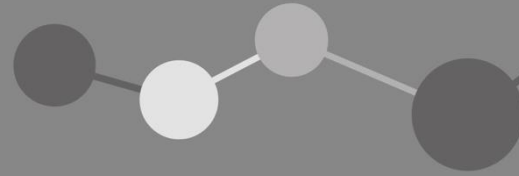
1. Achievement
2. Enjoyment, engagement and interest
3. Inspiration (contextual teaching)
4. Ambition/motivation
5. Self-perception/self-efficacy and confidence

#### ENTHUSE Partnership Programme data:

- Attainment and progress
- Pupil voice
- Case studies
- Teacher-assessed pupil aspirations
- National Pupil Database
- FE destinations

Figure 1: STEM Flightpath for ENTHUSE Partnerships

Lloyds Register Foundation ENTHUSE Partnerships are making an impact in line with the STEM flightpath. It is expected that the positive trends seen in the first-year data will continue in to the second year. In addition to this, further longer-term analysis of previous ENTHUSE Partnerships is taking place, early indications show that students engaged with ENTHUSE Partnerships experience long term benefits from their involvement.



### 3. Impact Data Analysis:

Our impact analysis is conducted at three points during the 2 years of support: start of partnership, end of year one, and end of year two. To evaluate programme impact we use a suite of assessment tools to measure:

1. Student attitudes towards STEM
2. Teacher attitudes towards STEM
3. Student attainment in STEM subjects

Career aspirations are measured across all 3 assessment tools in a variety of ways. As outlined in Fig 1, the impact measures indicating a rise in STEM career aspirations are:

Student impact measures:

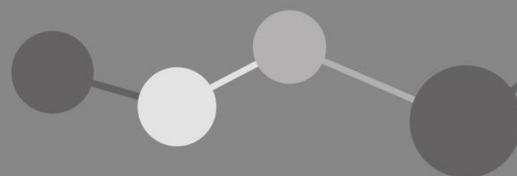
- Achievement and attainment in STEM subjects
- Enjoyment of and engagement in STEM subjects
- Confidence and interest in learning STEM
- Inspiration (providing real world context to the subject being taught)
- Motivation in lesson and ambition to pursue a STEM career
- STEM Identity - is a STEM career or further study for me?
- Increase in meaningful encounters with STEM employers

Teacher impact measures:

- Understanding of careers options and awareness of further study routes
- Confidence in finding STEM and Engineering careers teaching materials
- Confidence in finding STEM and Engineering careers guidance materials
- Confidence in contextualising the curriculum with Engineering examples

#### 3.1 Key findings:

- More students making the grade: 94% of girls and 98% of boys are working at age-related expectations or higher compared to 88% and 69% respectively at the start of support;
- 72% of boys and 57% of girls want to learn more about STEM, a rise of 5% and 7% respectively compared to the start of support;
- 39% of girls and 58% of boys agreed they see lots of examples of how what they are learning is used in the real world, an increase of 10% since the start of the programme;
- 29% of girls and 52% of boys agreed they would like a job in STEM when they are older, an increase of 5% and 9% compared to the start of the programme;
- 37% of girls and 67% of boys agreed they were the sort of person who could have a career in STEM, a rise of 5% and 15% respectively compared to the start of support;
- 38% of girls and 59% of boys intend to study STEM subjects in the future, a rise of 2% and 5% respectively compared to the start of support;



- By engaging with the STEM Ambassadors programme, partnerships have developed meaningful relationships with a number of employers (both engineering and STEM focused), this has led to a 16% increase in opportunities for young people to meet employers and learn about the world of work;
- We have seen a 66% increase in engagement with STEM Ambassadors through enrichment competitions and in-school or STEM Club projects. By increasing the presence of employers in these activities, students are given more opportunity to discover the career opportunities available in engineering and STEM-related industries;
- Teachers are 20% more likely to feel confident giving informal careers advice to students than at the start of support;
- Teachers are 15% more likely to know where to find high quality teaching resources than at the start of support;
- Teachers are 17% more likely to use real life STEM contexts to enrich their teaching;

The results highlighted above are taken from the assessment toolkit which is completed as part of the ENTHUSE Partnership. Results from each of the three areas of the toolkit will be discussed in turn.

### 3.2 In depth analysis - Student attitudes towards further STEM study and STEM careers:

At the start of the programme representative samples of students were asked to complete a survey examining their attitudes towards STEM. Students were asked to rate their agreement with a series of 17 statements spread across four different categories. This survey is then repeated at the end of the first year and will be repeated at the end of the second year. Figure 2 shows the pattern of responses in each category.

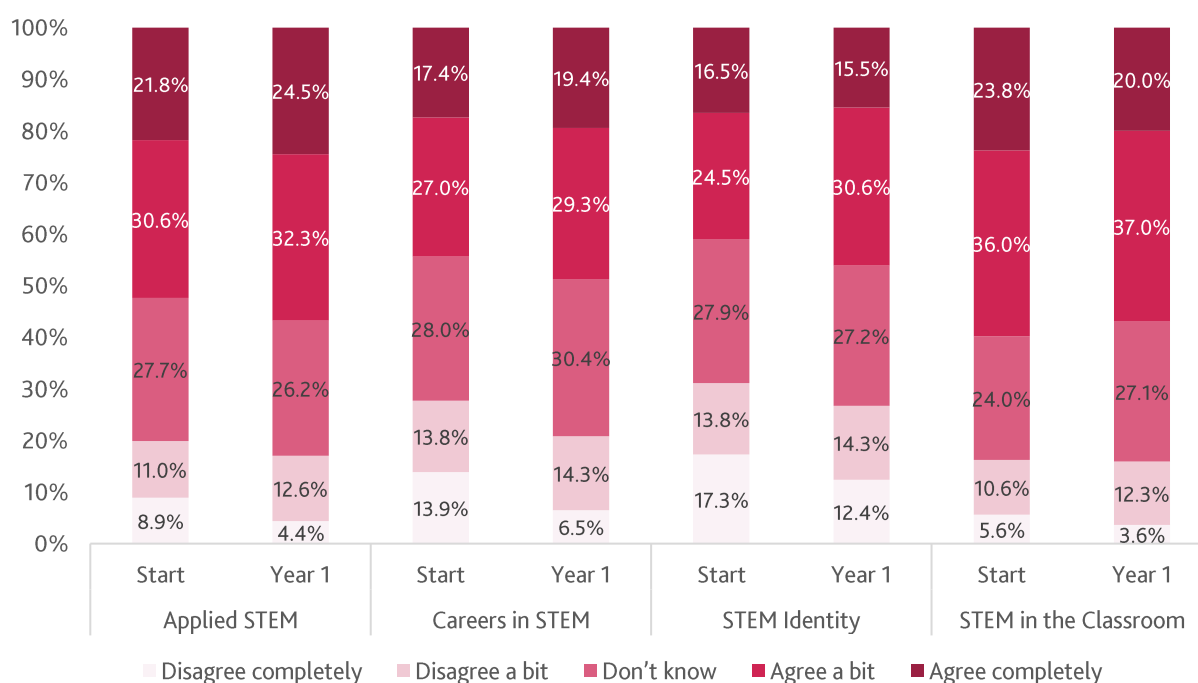
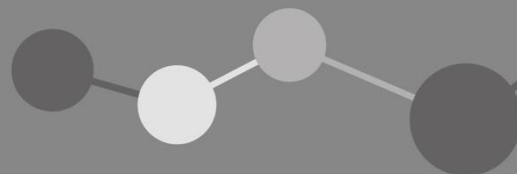


Figure 2: Comparison of responses from the student attitudes survey



The results show increases in general agreement to statements in three of the four categories, while the fourth category showed a small decrease in agreement. All four categories showed a fall in the proportion of students who disagreed with the statements examined. The responses in each category have been examined in greater detail and segmented by gender.

### 3.2.1 Applied STEM:

The category of Applied STEM explores students understanding of the importance of STEM in relation to real world concepts. After 1 year, 4% more students agreed with statements in this category, while 3% less students disagreed with statements.

When analysed further, the results show that there has been a larger shift in the responses provided by boys, while the results for girls have not changed substantially. 51% of girls were interested in learning more about working in a STEM industry, a rise of 8%, however less felt in the future society would need more STEM qualified people working for them than at the start of the partnership (56% falling to 50%). 64% of girls did agree that what they learn in STEM would help them do well in life, a rise of 4%. The response pattern among boys was consistently positive, with disagreement to all statements falling and agreement to all rising. 78% of boys agreed what they learned in STEM would help them do well in the future, rising from 67%. Additionally, 66% wanted to learn more about working in a STEM industry, an increase of 10%. Aggregated results for this category split by gender are shown in Figure 3.

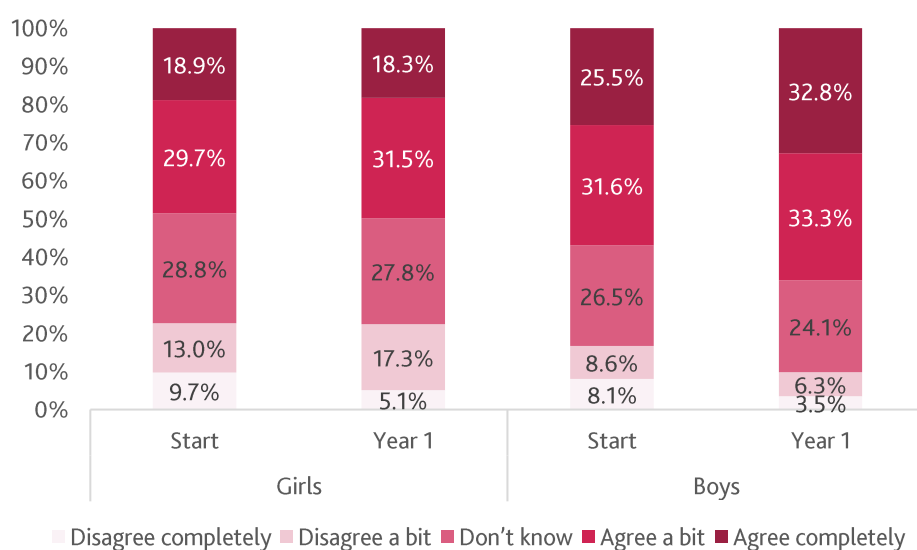
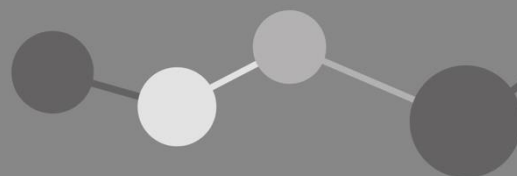


Figure 3: Aggregated responses split by gender for Applied STEM

### 3.2.2 Careers in STEM:

Careers in STEM asks several questions about students' knowledge of, and whether they are interested in learning more about STEM careers. This category showed the largest swing in responses, with 7% less students disagreeing and 4% more students showing agreement across all students surveyed compared to the start of the partnership.





Further analysis of the questions showed that for girls, after one year less disagreed and more agreed with the statements. Slightly more girls are aware of the qualifications needed for a STEM career (33%), with over a third (36%) now aware of the career opportunities available to them. Four in ten girls (43%) wanted to learn more about people who use STEM skills in their job. For boys, all statements saw similar, but more substantial shifts towards agreement. 62% of boys agreed they had a good knowledge of potential STEM career opportunities, up from 44%, while 55% agreed they knew what qualifications were needed for a STEM career. 73% of boys want to learn more about people who use STEM skills in their job, rising from 64% at the start of the partnership. Figure 4 shows the aggregated results for this category, split by gender.

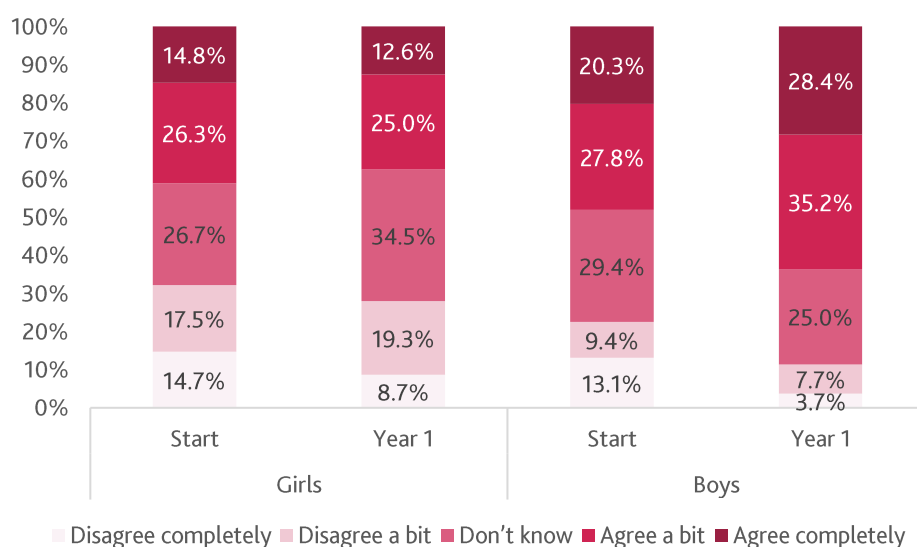


Figure 4: aggregated responses split by gender for the category of Careers in STEM

### 3.2.3 STEM identity:

STEM Identity explores whether a student views themselves as someone who would undertake further STEM study or a STEM career. The results show 4% less students disagreed with statements in this category after 1 year, with 5% more students agreeing with them.

Girls were 5% more likely to agree with a statement examining whether they believed they were the sort of person who could have a STEM career (32% rising to 37%). A similar proportional increase was seen to an explicit statement which asked if they would like a career in STEM when they are older (24% to 29% agreeing). For boys. Following the observed pattern, the responses were more positive. 67% said they were the sort of person who could have a career in STEM, a sharp rise of 15%. Additionally, over half agreed they would like a job in STEM when they are older, a rise of almost 10%. The aggregated results for this category are shown in Figure 5.



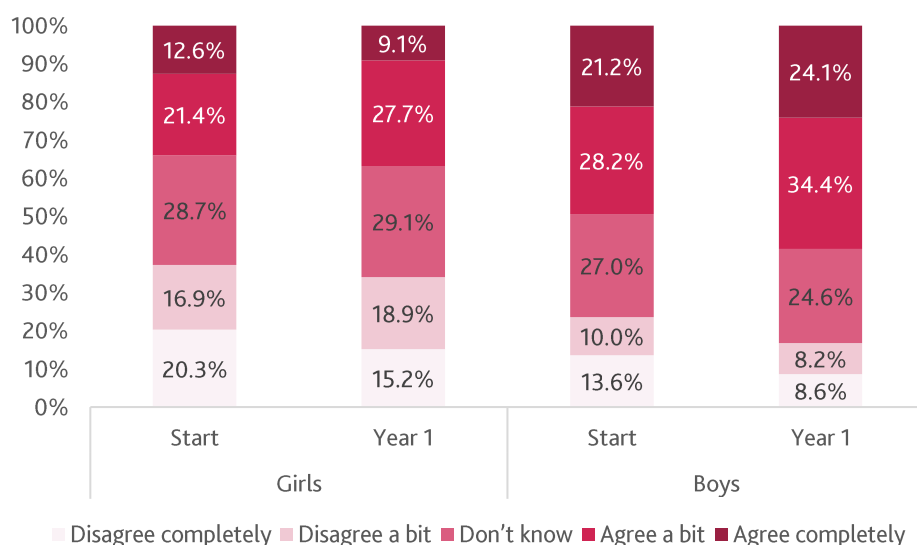
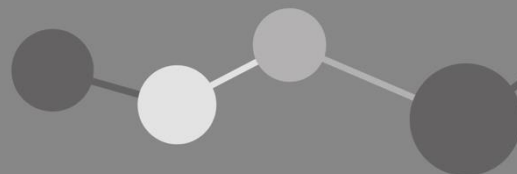


Figure 5: Aggregated responses split by gender for the category of STEM Identity

### 3.2.4 STEM in the Classroom:

This final category enquires about whether students enjoy STEM classes. Whilst disagreement decreased overall, there was also a slight decrease in agreement with statements in this category. The aggregated results are shown in Figure 6.

Closer analysis showed 57% of girls and 72% of boys wanted to learn more about STEM, a rise of 7% and 5% respectively, showing there is strong interest in studying STEM subjects. However, only 37% of girls agreed that it's easy for them to do well in STEM subjects, a fall of 6% compared to the start of the partnership. With 57% of boys agreeing, the response among boys to this statement was similar to the start of the partnership. Furthermore, whilst more boys said that their teachers make STEM subjects easy to understand (+2%), there was a reduction in the proportion of girls saying similar (-10%). A common pattern in girls' self-perception within STEM subjects, is that they tend to underestimate their own ability compared to boys (e.g. [Wellcome Science Education Tracker, 2019](#)). Indeed, while girls do seem to show decreased confidence, their *actual* attainment assessed by their teachers has significantly increased (see Section 3.4, below).

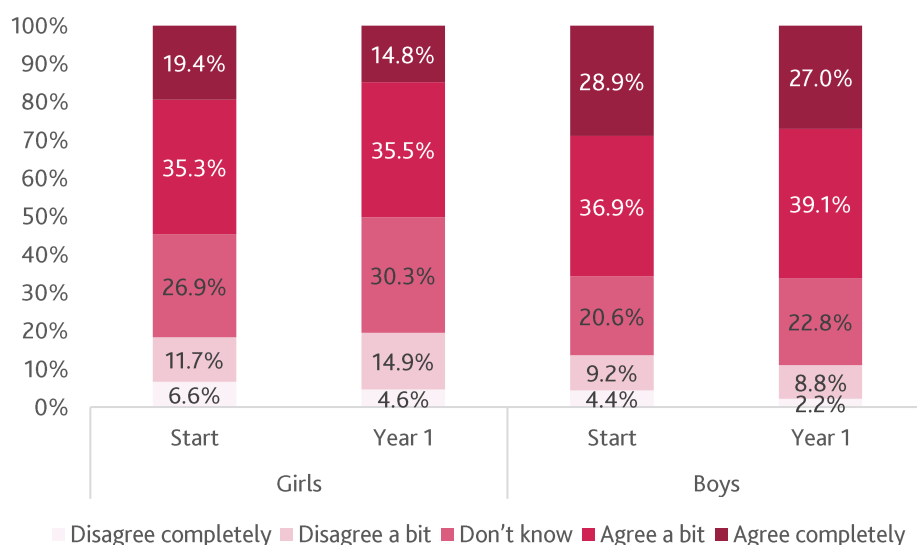
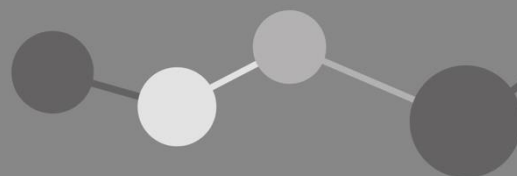


Figure 6: Aggregated responses split by gender for the category of STEM in the classroom

In summary, the results above show that after one year, ENTHUSE partnerships have had a strong impact on the attitudes of boys towards STEM. More work needs to be done to improve the attitudes of girls towards STEM and ensure they gain more substantial benefits from being involved in the programme.

### 3.3 In depth analysis – Teacher attitudes:

As with the student attitudes survey, teachers were asked to complete a short attitudinal survey at the start of the partnership and end of the first year. This survey asked the teachers to rate their agreement with a series of 20 statements across four categories on a scale of 1-10, with 1 being strongly disagree and 10 being strongly agree. This survey is repeated at the end of the first year and at the conclusion of the partnership. Results comparing the spread of responses from the start of the partnership to the end of the partnership are plotted in Figure 7 below.

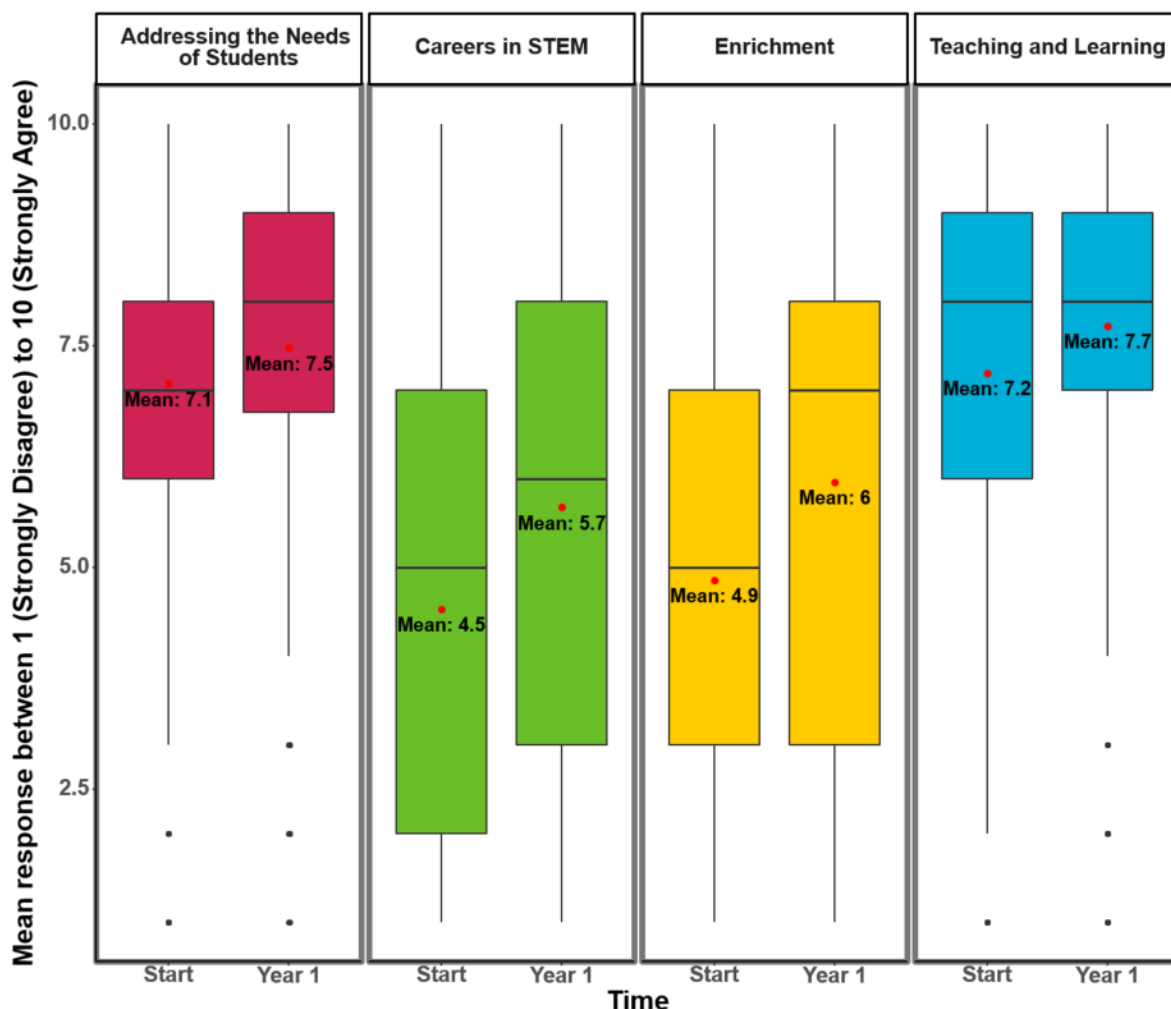
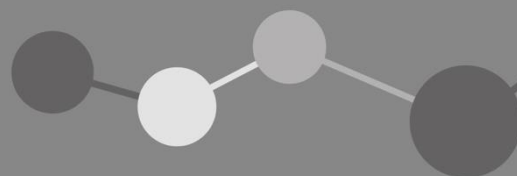


Figure 7: Boxplot showing the spread of responses to the teacher attitudes survey at the start of partnership compared to after 1 year

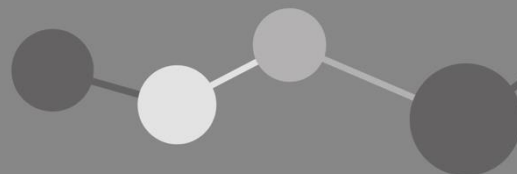
The results of this survey at the end of the first year show positive trends across all categories, with increased mean responses in each case. These positive trends are expected to continue in to the second year and be observed across partnerships which are in their first year.

### 3.3.1 Addressing the needs of students:

This category examines whether teachers are comfortable utilising different approaches in the classroom. The mean response to questions in this category at the start of the partnership was also high and one year in has risen slightly. The largest increase in this category showed on average teachers feel more confident identifying and challenging stereotypes, which rose from 6.3 to 6.8.

### 3.3.2 Careers in STEM:

Examines how confident teachers feel in their ability to embed STEM career knowledge. This category saw the largest average change, and all the statements answered saw a sharp rise on the responses given at the start of the



partnership. The largest of these indicated Teachers felt more confident using real life STEM contexts to improve their teaching, this statement rose from 4.7 to 6. Additionally, teachers report they are more regularly using cutting-edge STEM knowledge and context to support careers education, this rose from 4.1 to 5.3.

### **3.3.3 Enrichment:**

Measures how confident teachers are in their ability to promote or provide STEM enrichment opportunities. Agreement to statements in this category have risen a similar amount to the careers in STEM category. The largest increase seen showed teachers felt considerably more knowledgeable about the opportunities offered for enrichment provided by STEM employers and more able to work effectively with employers to support STEM education. Responses to these statements rose from 3.8 to 5.4 and from 4.1 to 5.3 respectively.

### **3.3.4 Teaching and learning:**

Statements on the theme of Teaching and Learning address how confident the teachers are in their own abilities. Responses to statements in this category started from a high base and showed a small positive overall change. The largest positive changes were seen to statements on the use of cross curricular STEM activities, which rose from an average of 5.8 to 6.8. Additionally, teachers feel more able to find high quality resources and are collaborating more. A statement examining the how easily resources can be found rose from an average of 6.8 to 7.8 and one asking about cross STEM subject collaboration rose from 5.7 to 6.5. In summary, these results show after one year that teachers are benefitting from being involved with the ENTHUSE Partnerships programme across all areas surveyed. It is expected that these improvements will continue in to the second year of the partnership and beyond.

### **3.4 In-depth analysis – Student attainment:**

The final part of the assessment toolkit is the student attainment tool. At the start of their ENTHUSE Partnership, schools are asked to collect attainment data along with some demographic information, such as gender. They provide a teacher assessed measure of pupil attainment at the start of their current school year. At the end of the first year of their ENTHUSE partnership, they provide a second assessment of attainment for the end of the year. Alongside this, assessments of whether the pupil has an increased or decreased capacity for further STEM study and an assessment of how likely a particular student is to pursue a STEM career is provided. These measures will be repeated at the end of the partnership. The results for Lloyds Register ENTHUSE partnerships are shown in Figure 8 below.

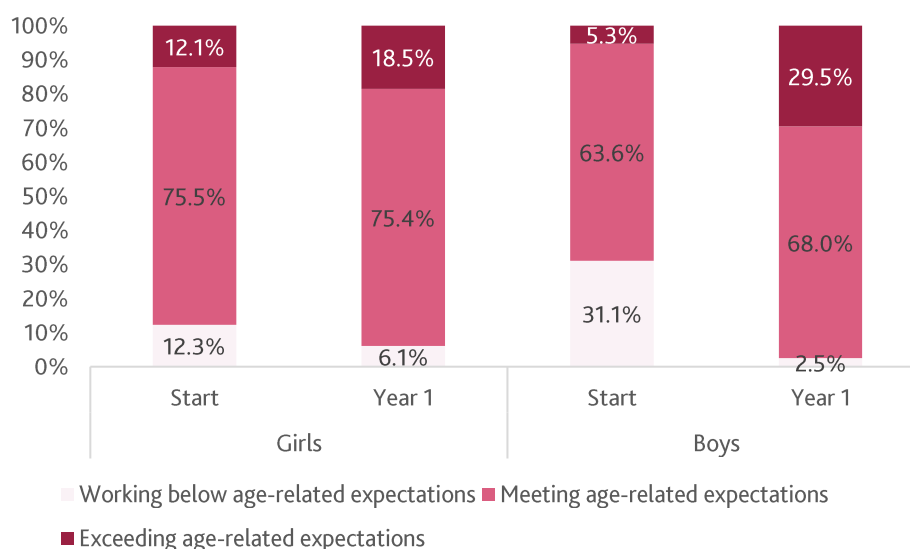
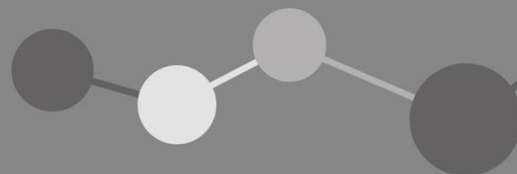
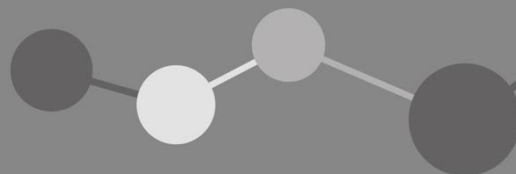


Figure 8: Changes in attainment after 1 year of involvement with the ENTHUSE Partnerships programme

Positive changes were seen in the teacher-assessed assessment of attainment at the end of the first year. At the start of the partnership, 12% of girls and 31% of boys were working below age-related expectations. At the end of the partnership, this had fallen to 6% and 2% respectively. Additionally, 12% of girls and 5% of boys were working above age-related expectations at the beginning of the partnership. This rose to 20% and 30% by the end of the first year.

Teacher assessments of the student's capacity to complete further STEM study showed positive signs. 20% of girls 52% of boys were reported to have an increased capacity for STEM study. In addition to this, teachers rated 16% of girls and 22% of boys as very likely to pursue a career in STEM at the end of the first year of the partnership. These measures will be collected again at the end of the partnerships.

In summary, positive trends can be seen in the attainment of both girls and boys one year into the partnership. The strong results seen regarding students' capacity for further STEM study and likelihood of a career in STEM are expected to be built on in partnerships that are not yet one year old and carried on by the partnerships which have passed this milestone



#### 4. Summary and recommendations:

Our analysis clearly shows successes in the first year of the Lloyds Register ENTHUSE Partnerships. The impact of the programme on boys has been especially noteworthy. Positive trends can also be seen across the board in the responses to the teacher attitudes survey, particularly in the categories of enrichment and careers.

Presently, Lloyds Register ENTHUSE Partnerships are making an impact in line with that of the STEM Flight Path. It is expected that the positive trends seen in the first-year data will continue in to the second year. In addition to this, further analysis of previous ENTHUSE Partnerships is taking place. Early indications from our other research show that students engaged with ENTHUSE Partnerships experience long term benefits from their involvement.

To widen and deepen the impact of the programme following these initial successes, three recommendations have been made:

1. We have clear evidence of positive impact on teachers and students. **Extending this support to a larger number of schools**, particularly in areas of disadvantage, will help to extend this impact to those schools, colleges and young people most in need.
2. **Increase the volume and quality of STEM career information** available to students. This needs to include providing information on the need for more STEM qualified people, examples of how the content that students are learning is applied in STEM careers and information on further study routes into STEM careers. Our data suggests that teachers are aware of how to find these resources, but the implementation needs to be developed and supported by further professional development and coaching.
3. Further to the gender differences highlighted above, we will work with those Partnerships that have a **female cohort with low self-confidence** in STEM to identify resources and direct support that will help to improve their students' attitudinal data over the next year, and beyond.
4. The current partnerships are now well established; however, support should continue to **develop the sustainability** of the partnerships to ensure long-term impacts beyond the initial 2-year period similar to those seen in previous ENTHUSE Partnerships.
5. Support in schools is clearly having positive impacts on students and teachers, however, **continued and increased engagement with wider communities** – especially in disadvantaged areas – will ensure that these positive impacts benefit the local community and future generations.

STEM Learning, April 2020.