Nesta/DCMS Centre for Social Action Innovation Fund Phase 2
Evaluation Report Summary Sheet

Grantee Name	In2ScienceUK
Programme Name	In2ScienceUK Expansion
Fund Name	Connected Communities Innovation Fund
Stage of Development	Scaling
Evaluation Partner	ZK Analytics
Date Completed	December 2019
Budget	£25,000

Project Overview

In2scienceUK aims to tackle two national problems: the lack of science, technology, engineering and maths (STEM) skilled workers in the UK and the fact that young people from the lowest income backgrounds are much less likely than their more affluent peers to progress to university, have a STEM career or become economically stable - even if they have the same grades. The programme works by leveraging the expertise and passion of local scientists, engineers, and technology and maths professionals to unlock the potential of young people from the poorest backgrounds by increasing their 'science capital'.

There are three core elements to the programme:

- Work placements and mentoring.
- Workshops on STEM careers and employability skills.
- Skills days on university access.

Volunteers currently provide work placements, role models, advice and guidance to young people to develop their confidence, knowledge of STEM degrees, careers and key employability skills essential for success.

Through the fund, In2Science aimed to scale its programme to other areas in the UK (which has to date mainly been in London) and to also expand its volunteer roles in supporting students in a workplace to also include running STEM workshops and skills days.

Headline Findings

- Participation in the in2scienceUK programme primarily **increased students' confidence in their abilities, improved their understanding of career routes into STEM and**

provided them with contacts that could offer them advice in the university application process.

- The program also increased students' STEM-related knowledge and exposed them to different forms of STEM learning and environments, most notably through work placements in which they met and worked alongside scientists or engineers. There was a large and significant increase in the proportion of participants who had participated in a scientific experiment outside the classroom from 27% at baseline to 57% at follow up, confirming that the project does meet one of its core aims – that of extending participants' practical experience.
- Students reported that the programme had strengthened their networks, but also altered their perceptions of what scientists are like – describing them as more approachable, relatable and 'like me' than they had expected.
- Through work placements and discussion with mentors, students felt that they had developed a more sophisticated understanding of a range of different types of STEM roles, a more realistic understanding of the demands of those jobs, and been able to translate ambiguous aspirations into more concrete and actionable career goals.
- Students' confidence and ability to engage with scientists also increased. Students were also better equipped to write high-quality personal statements and more confident about applying for the degree that they had named as their first choice. Although there was a decrease in a desire to attend a top university to study a STEM subject, students who were already interested in pursuing higher education at a high-ranking university now felt that this was a more realistic goal for them after participating in In2scienceUK.

Evaluation Approach & Methodology

ZK Analytics was commissioned by In2scienceUK to design and implement an impact evaluation of the programme. The evaluation strategy employed a mixed-methods approach. It included desk-research, quantitative analysis and qualitative research.

The quantitative element relied on the data collected through evaluation surveys that the project had asked participants to fill out since 2012. Every cohort was asked to fill in three surveys: at the beginning of their participation; after completing their participation; and one year on. The comparisons were performed independently for each cohort without pooling data across cohorts. ZK Analytics worked with In2scienceUK to implement a quasi-experimental design by surveying a comparison group that included individuals who were accepted to participate in the programme but did not take part, primarily due to the lack of sufficient placements.

The qualitative element consisted of 12 in-depth semi-structured interviews conducted over the phone by experienced qualitative researchers. This included six participants from the 2018 cohort and six participants who had just completed the program in 2019.

■ Quantitative	■ Qualitative	□ Other - Comparison Group
■ Impact Evaluation	□ Process Evaluation	□ Economic Evaluation
■ One-off evaluation	□ Developing internal evaluation capacity	

Evaluation Implementation Challenges and Limitations

There are outcomes specified in the programme Theory of Change that did not lend themselves to quantitative measurement and were not included in the report. They are:

- Increased technical skills.
- Knows a wider range of STEM careers.
- Improved confidence at interviews.
- Improved employability skills.

In addition there are three outcomes that while captured by the quantitative data, encountered technical issues in their estimation. They are:

- Greater knowledge of STEM degrees and training programmes.
- Knows a greater number of universities.
- Greater familiarity with the higher education environment.

There was a small sample size for the control group for the 2019 cohort which means that the findings from that element of the evaluation needed to be treated with caution. The evaluators suggest that this small sample size can potentially affect the findings in two ways:

- The low sample size leads to findings that are not statistically significant.
- The low sample size might affect the representativeness and the substantive meaningfulness of the comparison.

Key Recommendations and Next Steps

- To complete a second evaluation in 2020 with the new fully digitalised programme containing the same questions as the 2019 face to face programme to compare impact of the In2scienceUK digital and face to face programmes.
- Add questions to surveys to account for outcomes not currently measured.
- Complete a second evaluation with controls when the programme numbers reach 1000 students a year.
- Complete an external evaluation to measure the impact on the programme's volunteers.

in2scienceUK:

Impact evaluation

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Summary of impact

"in2scienceUK made me realise I don't have to worry about being a specific person… anyone can go into science." (Participant, 2019)

Participation in the in2scienceUK programme primarily increased students' ***confidence*** in their abilities, improved their understanding of ***career routes*** into STEM and provided them with contacts that can offer them ***advice*** in the university application process. Moreover, the program also increased students' STEM-related knowledge and exposed them to different forms of STEM learning and environments, most notably through work placements in which they met and worked alongside scientists or engineers. Students reported that this had strengthened their networks, but also altered their perceptions as to what scientists are like – describing them as more approachable, relatable and 'like me' than they had expected. Through work placements and discussion with mentors, students felt that they had developed a more sophisticated understanding of a range of different types of STEM roles, a more realistic understanding of the demands of those jobs, and been able to translate ambiguous aspirations into more concrete and actionable career goals. Students emphasised having learnt that there are multiple educational routes to achieving their career aims. For some, learning about alternative pathways had increased their commitment to pursuing their career goals and made these aspirations seem more attainable. Students highlighted that their confidence in relation to their capabilities in STEM, higher education and career plans had grown as a result of participating in in2scienceUK.

Increased engagement and confidence in STEM learning

There was a large and significant increase in the proportion of participants who had participated in a scientific experiment outside the classroom, confirming that the project does meet one of its core aims – that of extending participants' practical experience.

There also was a slight increase in the perceived level of students' STEM knowledge after participating in the programme. For example, the proportion of participants who agreed with the statement, 'I know quite a lot about science or engineering' increased by approximately 5% from the baseline to follow-up. Students were also more likely to want to read an academic research paper.

Knowing more scientists and engineers

There was a clear and significant increase in the proportion of participants who reported having met a scientist or engineer. Students who were interviewed felt that in2scienceUK had strengthened their networks by:

- Introducing them to scientists and engineers through the placement and/or workshops;
- Altering their perceptions of scientists – most often by finding them more approachable and/or relatable than expected; and/or
- Increasing their confidence in their ability to engage with people working in STEM fields.

Improved professional & networking skills

In 2018, 59% of students reported knowing someone who can give them good advice about career options in a STEM area at follow-up, compared to 47% at the baseline.

There were also increases in the number of students who reported feeling confident about introducing themselves to a STEM professional in person or via email.

Students who were interviewed attributed increased confidence in engaging with STEM professionals to, first, knowledge and learning acquired through in2scienceUK and, second, to the attitude of their mentor and/or having built a positive relationship with them.

They also felt that in2scienceUK had helped them to prepare for the workplace more generally by developing soft skills such as communication, networking and interview skills.

Better understanding of STEM career routes

At follow-up participants were slightly *less* likely to agree that they would like a job that uses science or engineering. However, participants did become more likely to think that they now knew a number of diverse careers that they could enter.

Students who were interviewed had developed a more sophisticated understanding of a range of different types of science and engineering jobs – including 'behind the scenes' roles – as well as of the non-technical skills involved in working in certain STEM careers.

As regards their own career goals, students who were interviewed felt that, as a result of undertaking work placements and discussion with mentors and their colleagues:

- They knew more about their desired career;
- They had a more realistic understanding of the demands of STEM jobs;
- Their STEM career aspirations had been clarified and reinforced – transforming ambiguous aspirations into more concrete and actionable career goals; and/or
- in2scienceUK had introduced them to new careers that they had previously been unaware of or dismissed.

Almost all students interviewed highlighted the diversity of experience amongst staff at their placement, and many were surprised to learn that there were a number of pathways to the same career outcomes.

Better equipped to write high-quality personal statements

The proportion of participants who reported knowing someone outside their school who would give feedback on their UCAS application personal statement increased from 36% to 54% (2018).

The proportion of participants from the 2018 cohort who had drafted their personal statement at the time of the survey increased by approximately 50 percentage points from 17% to 68%, suggesting that up to 50% of the participants drafted their statement while participating in the project. In 2019, this increase is of approximately 40 percentage points.

Participants were also more likely to be more confident about their ability to write a high-quality personal statement compared to the baseline.

Students who were interviewed reported that workshops had helped build their abilities and confidence in applying for both university courses and work, whilst placements provided knowledge and work experience which they could deploy in their university applications.

Higher motivation to attend a top university

There was a significant increase in levels of confidence amongst students about applying for the degree that they had named as their first choice. However, there were also decreases in, first, desire to attend a top university to study a STEM subject and, second, excitement at the prospect of doing a STEM degree.

Nevertheless, most students interviewed who were already interested in pursuing higher education at a high-ranking university maintained that interest – but now felt that this was a more realistic goal for them, and felt more comfortable about the prospect of 'fitting in' there, after participating in in2scienceUK.

Those students who were less interested in attending a high-ranking university tended to have more vocational career goals (most often medicine) and were understandably more concerned about securing the necessary degree than the institution where that degree would be obtained. Some participants came to the realisation that their existing grades might not be good enough to apply to top university and were planning to apply to mid-level schools.

Better understanding of university/apprenticeship application process

There was a significant increase in students' level of agreement with the statement, 'I know where to seek support and advice about the university application process'.

In addition, students who were interviewed repeatedly emphasised that through placements and, more specifically, discussion with their mentors they had learnt that there are multiple educational routes to achieving their career aims. For some, learning about alternative pathways had increased their commitment to pursuing their career goals – and had made these goals seem more attainable, even if setbacks (such as not getting into a top university) were encountered. Some commented that they were now more aware of the importance of

practical work experience and considering applying for degrees which included a 'year in industry'.

The findings suggest that although some students had become less motivated to pursue a degree at a top university, the in2scienceUK programme had nevertheless:

- Reinforced their career aspirations;
- Provided them with valuable information which enabled them to map out realistic plans for achieving their career goals; and
- Helped them to develop the necessary confidence to pursue those plans.

Increased confidence in their own abilities, and the attainability of a STEM degree or career

Students who were interviewed highlighted that their confidence had grown as a result of participating in in2scienceUK – in relation to their capabilities in STEM, higher education and their careers, and in general. Areas of increased confidence cited most often were:

- Their ability to read STEM texts at a higher level;
- Their capacity to communicate with others about STEM topics;
- Their ability to get into university;
- Their ability to work in a STEM job;
- Feeling that more opportunities were open to them; and
- Feeling more resilient and better equipped to handle setbacks.

Several students mentioned that they were reading more advanced materials following in2scienceUK, having been encouraged by their mentors, who had introduced them to new materials or ways of finding academic work (such as google scholar).

As mentioned above, many students changed their perceptions about 'scientists' after engaging with them on the placement. These shifts in understanding were also important for building their own confidence.

Students reported that they felt more comfortable with the idea of working in a lab knowing that there were people working there from a range of different backgrounds. This effect appeared to be most pronounced when students felt that they could relate to their mentor or someone else within their lab – with perceived socio-demographic commonalities including age, (for girls) gender and (for immigrants/children of immigrants) country of origin. This may have helped students understand that "*someone like me"* can achieve the career to which they aspire. Relatedly, students tended to gain more from placements with a more junior professional (e.g. PhD student rather than research fellow) – as they were more approachable and better able to provide relevant advice (about A level course selection, for instance).

Many students expressed increased confidence in themselves, their capabilities and resilience following their placement. For most students, it was their first exposure to the workplace and/or to a professional STEM setting, and while some struggled initially, most reported feeling comfortable at the end of the placement. Importantly, students felt that this was a more general lesson about their capacity to overcome initial failures and learn.

Section 1 Context and methodological overview

In 2018 ZK Analytics was commissioned by in2scienceUK to design and implement the quantitative impact evaluation of the program to meet the Level 3 NESTA standard of evidence. The research is funded by DCMS through the Connected Communities Innovation Fund.

The evaluation strategy employs a mixed-methods approach. In follows several stages and includes desk-research, quantitative analysis and qualitative research.

The project started with **desk-based research** in September 2018 with an assessment of the in2scienceUK Theory of Change and a review of the measurement strategies implemented since 2012. This was followed by a comprehensive listing and evaluation of the indicators used across time in an attempt to identify those that are common across time.

The **quantitative element** relies on the data collected through evaluation surveys the project asked participants to fill out since 2012. Every cohort was asked to fill in three surveys: at the beginning of their participation (baseline, usually in May); after completing their participation (follow-up, usually in September) and one year on. We use this data to make the pre-post comparisons and identify if change occurred. The comparisons are performed independently for each cohort without pooling data across cohorts and the appropriate tests of statistical significance are applied. This approach is consistent with the NESTA Level 2 standard. To reach the Level 3 standard we worked with in2scienceUK to implement a quasi-experimental design by surveying a comparison group that includes individuals who were accepted to participate but did not participate, primarily due to the lack of sufficient placements. Two different strategies were used. In 2018 we created an artificial comparison group relying on a single measurement in time and the data was analysed using Propensity Score Matching between participants and the members of the comparison group. In 2019 pro-post measurements were implemented concurrently with those of the participant group. The data was analysed using a Difference-in-Differences approach.

The **qualitative element** was implemented in September 2019 and consisted of 12 in-depth semi-structured interviews conducted over the phone by our experienced qualitative researchers. We included six participants from the 2018 cohort and six participants who have just completed the program in 2019. This choice was driven by the need to capture the immediate effects of the project, along with longer-term impacts. Within each cohort half of the interviewees were selected from participants who have shown counterintuitive patterns of responses. The interviews were summarized and a coding framework was used to analyse the responses.

Section 2 Review of Theory of Change & Outcome measures

The project commenced with a review of the Theory of Change and we carried out a mapping exercise between the outcomes specified by the Theory of Change to the measures (i.e. questions) included in the questionnaires over time. The resulting excel document (Appendix 1) contains the results and indicates the following:

- The Theory of Change is well developed and we did not suggest any change on a theoretical basis. However, as highlighted in Appendix 1, several short-term outcomes are not currently measured, (indeed we believe that they might not be easily measured using self-report quantitative items). We tentatively suggest removing such outcomes from the ToC. These are:
    - Increased technical skills
    - Improved confidence at interviews
    - Improved employability skills

- Most short-term outcomes included in the ToC are operationalized by the new survey template launched in 2018 survey.

- There have been many changes to question wordings and answer option patterns across time. As we discuss later, this presents significant issues for the implementation of a cohesive evaluation strategy. As such, we recommend that no further changes be made to the questionnaires. Currently used measures are broadly appropriate (valid) given the issues they are attempting to measure. Moreover, we strongly believe that obtaining comparable data over-time is significantly more beneficial to the project compared to the benefits in validity obtained by performing (minor) changes on the questions. Particularly problematic is the change of answer options that were implemented for the 2019 cohort. ZK Analytics was not consulted before this change was implemented.

- Not including the new questionnaire template launched in 2018, in general, the year one follow-on survey does not include measures that were collected in the pre or post surveys.

- Assessment of the types of information collected by the various questions allows us to group questions into their main categories:
    - Measures related to process
    - Attitudinal measures of impact
    - Behavioural measures of impact

- The questions in these different groups test different aspects of the project's impact and require different analytical frameworks. We discuss these below. This evaluation will focus on the process and attitudinal measures.

1. Measures related to process

Associated to most short-term outcomes are sets of indicators that measure the process: whether the activities of the project delivered on and/or supplied the participants with the resources the project aims to supply them with.

Such process measures do not and cannot be used to deduce actual *impact.* They should be seen as precursors of impact. They are enablers, resources the project provides to facilitate short-term impact.

For example, **q52b** (2018 questionnaire) asks pupils whether *they know someone outside of their school who would give them feedback on their UCAS application and personal statement?* The question is placed within the *"Better equipped to write high quality personal statements"* short-term outcome. Knowing someone to provide feedback enables a pupil to produce better statements but it does not itself achieve that. Moreover, by definition, the project might acquaint them with a person who could fulfil this role. As such, we see this as a measure of process: was the project successful in enabling the pupil?

Impact assessment: testing whether the project was successful in achieving its aims (as far as resources are concerned) should necessarily be done by comparing pre and post levels of these measures (ideally with a control group). The measurements taken after one year are not useful in this context.

2. Attitudinal measures of impact

This group of indicators can be used to measure attitudinal changes before and after the project. On selected measures a comparison with the measures taken one year on is also advisable. We recommend against comparisons to the values measured one year on in cases where their expected experience post-project would substantially confound the outcome one year on (e.g. receiving access to additional resources in the final year of school).

To follow the example detailed above, **q52a** (2018 questionnaire) asks pupils *how confident they are that they can write a high quality UCAS personal statement.* The question is in the same short-term outcomes group. We argue that this type of question measures attitudes that are instrumental in achieving the short-term outcome. As such, we believe that they are better suited to measure the 'impact' of the project.

3. Behavioural measures of impact

The final group of indicators is more closely linked to the longer term aims of the project and is focused on pupils' actual university application choices and eventual success. There are only a few questions that fall into this category and we believe that the most efficient way of assessing behavioural impact is comparing pre-data with actual choices using the services provided by UCAS.

Identifying impact

To generate insight that is both scientifically robust and useful we need to be careful and explicit about the 'locus of impact'. By this we mean that for each type of measure it is crucial to 'search' for the impact of the project at the place or time it is most likely to occur. For example, it would counterproductive to compare the levels of **q52d** (confidence about writing a UCAS proposal) pre-project with those recorded one year on as the results might be confounded by activities that take place over the course of the school year.

We carried out a review of all measures. Appendix 1 indicates which group of measures each question is assigned to. As we mentioned earlier, there are outcomes specified in the ToC that do not lend themselves to quantitative measurement. These are not included in the following sections of the report. We list them below:

- Increased technical skills
- Knows a wider range of STEM careers
- Improved confidence at interviews
- Improved employability skills

In addition there are three outcomes that while captured by the quantitative data, we encountered technical issues in their estimation. They are:

- Greater knowledge of STEM degrees and training programmes
- Knows a greater number of universities
- Greater familiarity with higher education environment

Section 3 Measuring change (NESTA Level 2)

Following the methodology set out in the previous section, using data from the 2018 and 2019 cohorts, along with historic data collected between 2014 and 2017, we conducted analysis to determine if project participants display changes when comparing readings taken before and after participation in the project. The following sections report the results and our findings. Measures are grouped by type (attitude or process) and by the outcome (defined in the ToC) they refer to.

In addition to illustrating the changes exhibited by the participants, for the 2019 cohort, we also include the baseline – follow-up differences we find in the comparison group.

We use appropriate statistical tests to assess the statistical difference of the findings. To test the difference between two (paired) proportions we used McNemar's test (used for process measures). To test differences in means we used paired sample tests (used for attitudinal questions).

1. Increased Science Capital

After participating in in2scienceUK most students felt that their STEM networks had grown – and reported knowing more scientists following their participation in the program. These findings partially reflect earlier survey data, which found that a majority of students were likely to have met a scientist or engineer. However, the survey also showed that, when asked "Do you know anyone, not including your doctor or dentist, who works as a scientist or engineer, or in a job that uses science or engineering?" the percentage of students who stated that they knew a scientist decreased *following* the program. However, this finding was not statistically significant. Moreover, despite these surprising survey results, none of the students interviewed reported a decrease in their STEM networks since participating in the in2scienceUK program.

The following sections combine the results of the qualitative and quantitative streams and summarise students' own perceptions of their STEM networks and the impact in2scienceUK has had on their science capital. In summary, most students felt that in2scienceUK strengthened their networks by:

- introducing them to scientists and engineers through the placement;
- introducing them to scientists and engineers through workshops;
- altering their perception / understanding of scientists as ‘humans’;
- broadening their understanding of what a scientist is;
- increasing their confidence in their ability to engage with people working in STEM fields.

A.1. Expanding networks

Of the twelve students interviewed, eight felt that they knew more scientists after in2scienceUK, while four reported no change. Those students who reported that their networks had grown emphasised their placements as a key opportunity to meet scientists. As one student mentioned:

> "*Our mentor was a researcher, and I got to work in the lab which meant I got to meet a lot of scientists, who I wouldn't have met otherwise*”.

Relatedly, those students who rotated throughout their placement, or whose mentor explicitly introduced them to their colleagues, were more likely to feel that their STEM networks had expanded. Students who reported their networks had expanded expressed a belief that this growth would not have occurred without in2scienceUK:

> "*I'd never actually personally met scientists before. After meeting the scientists and learning about their research, being part of what they're doing, helped me a lot.*"

Workshops were also important for expanding students’ scientific networks. Interviewees that mentioned attending science-based activities, such as a Google Deep Mind event and an artificial intelligence lecture, were *more likely* to feel like their networks had expanded. One student reported,

> *"I think it's definitely given me a lot more connections, for example there's always emails about having the opportunity to meet up with other in2scienceUK students or being able to meet other people of different career paths who give lectures about their career”.*

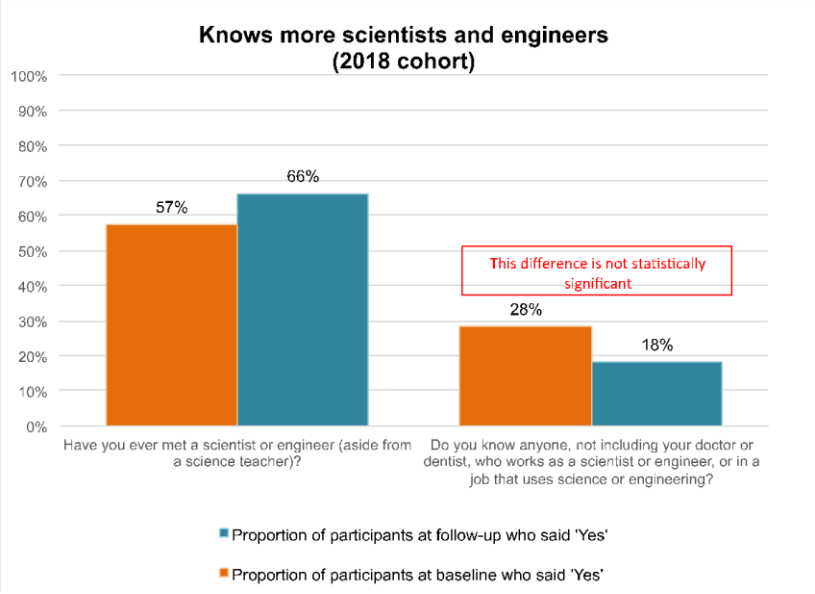
Relatedly, those students who believed that there had been *no change*s in their scientific networks were also *less* likely to report attending additional activities provided the program. One student articulated this link directly, saying:

> "*I think because I didn't go to many lectures or opportunities that the in2scienceUK organisation offered, I don't really know more scientists or engineers than before*".

Those students who did not feel their networks had grown did not appear to vary from those who did by showing any observable characteristics. Importantly, these students also felt confident communicating with scientists and shared the same perceptions of people working with STEM as the students who reported growth. Given that the majority of students interviewed felt that their networks had increased, and none reported a decrease, the survey results are likely a consequence of participants misunderstanding the question, responding incorrectly or by random variation in response patterns.

The quantitative data shows that there is a clear and significant increase of about 10 percentage points in the proportion of participants who say they met a scientist or engineer. The follow-up survey indicates that 66% of participants (who filled in both surveys) say they met a scientist.

Figure 1

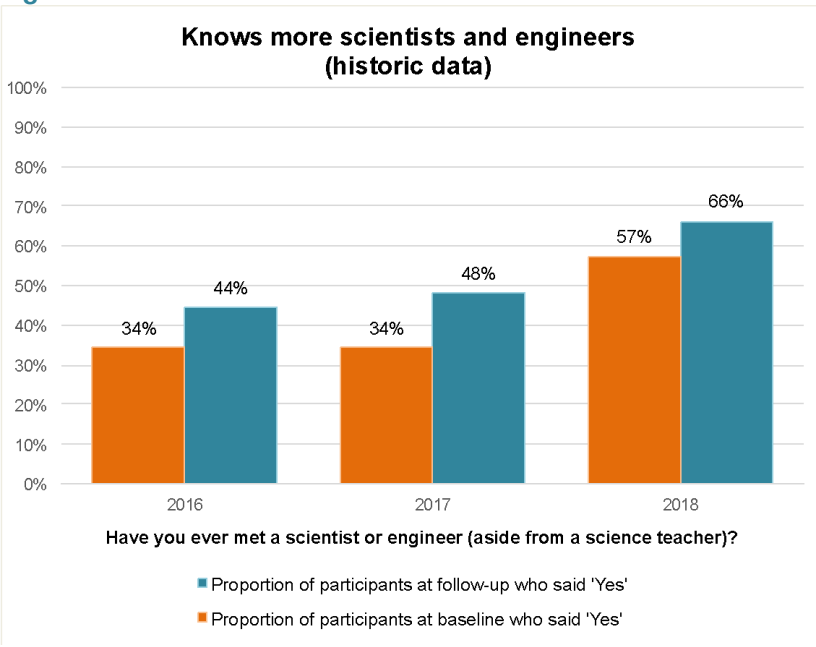


While this difference is encouraging, the absolute value of the proportion at follow-up might be thought of as somewhat surprising. One might expect this proportion to be higher, given that the project connects the participants with PhD students and

researchers in STEM subjects at leading universities. We believe the explanation could lie in how participants define 'a scientist'. Perhaps, PhD students who are at the beginning of their career and are closer in age to the participants might not be perceived by them as 'scientists'.

Similar findings are observed when looking at historic data (2016 and 2017 cohorts). No data was available for the 2019 cohort.

Figure 2



A.2. Perceptions of scientists

Students also reported that their perceptions of scientists changed following the in2scienceUK program. These changes related to their expectations of how scientists would behave, as well as the type of work they engaged in. For example, one student reflected:

> *"I thought they'd be really strict and not have a lot of time, but they communicate really well, I just realise that they're like all of us… they might not correct you if you're ignorant, they might help you to understand instead of saying you don't understand anything*".

Beliefs that scientists were approachable and good communicators was also important for increasing students' confidence communicating with their mentors and other scientists.

When asked to list the types of jobs performed by scientists, students felt that their understanding had both broadened and become more realistic since participating in the program. As one student noted:

> "*Before I just used to think about the more obvious jobs like being a doctor or a teacher or I don't know, an engineer, but now I think about the roles behind the scenes, like for example within a hospital you have someone who works as a consultant or someone who works as part of the IT department and other things like that*".

Students reported being aware of additional occupations, as well as a greater understanding of the day to day tasks performed by scientists – including things like administration and project management:

> "*Medicine, it's not just the stuff that's going to cure you, but you have the people... there are biomedics and biochemists who actually go to do all the social things and find ways of handling people*".

Expanding their definitions of scientists reflects the interviews' findings that students were likely to report knowing *more* scientists following the program.

A.3. Confidence engaging with scientists

In addition to knowing more scientists, the majority of students reported feeling more confident engaging with scientists after taking part in in2scienceUK. Some students believed that their increased confidence reflected their increased understanding of STEM subjects and careers. One student said:

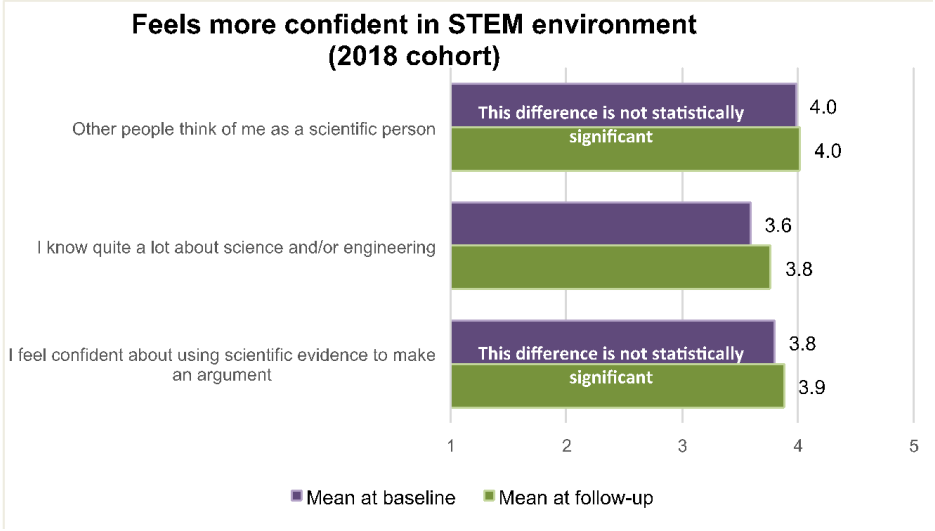
> "*I feel like I get more confident as I grow up anyway, I think I have more knowledge to talk about now than before, and in2scienceUK definitely gives me something to talk about".*

Others felt that this shift was an outcome of having positive interactions with their mentors on their placements, which made them less intimidated interacting with scientists. One student, who felt their confidence increased, had made an effort to maintain contact with their mentor,

> "*They kindly offered for me to go back to the lab in case I wanted to do some more experience or wanted to talk to them about everything. They were really nice and really helpful".*

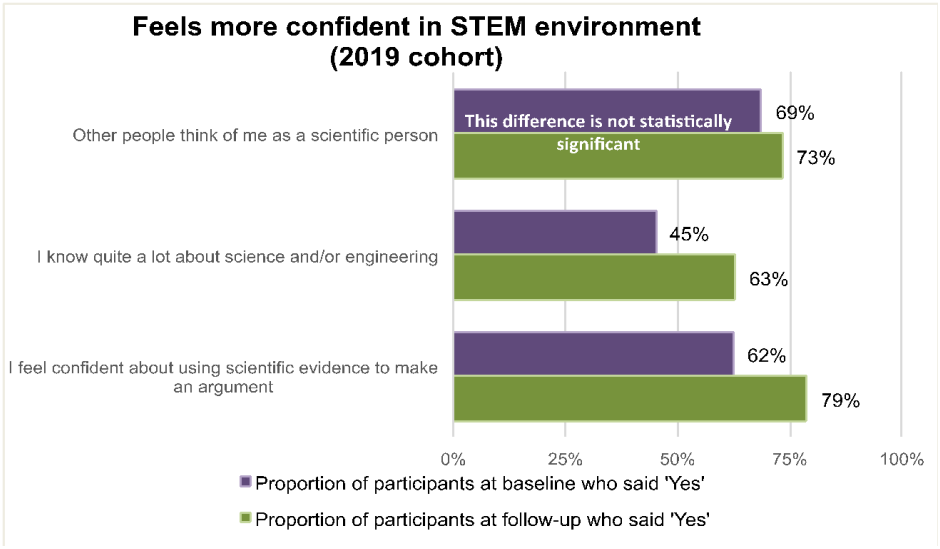
Looking at the quantitative data and comparing the baseline and follow-up data for the 2018 cohort, the levels of all three measures that capture feeling confident in the STEM environment appear elevated. However, only for a single question is the difference statistically significant: there appears to be a slight increase in the perceived STEM knowledge level of pupils.

Figure 3



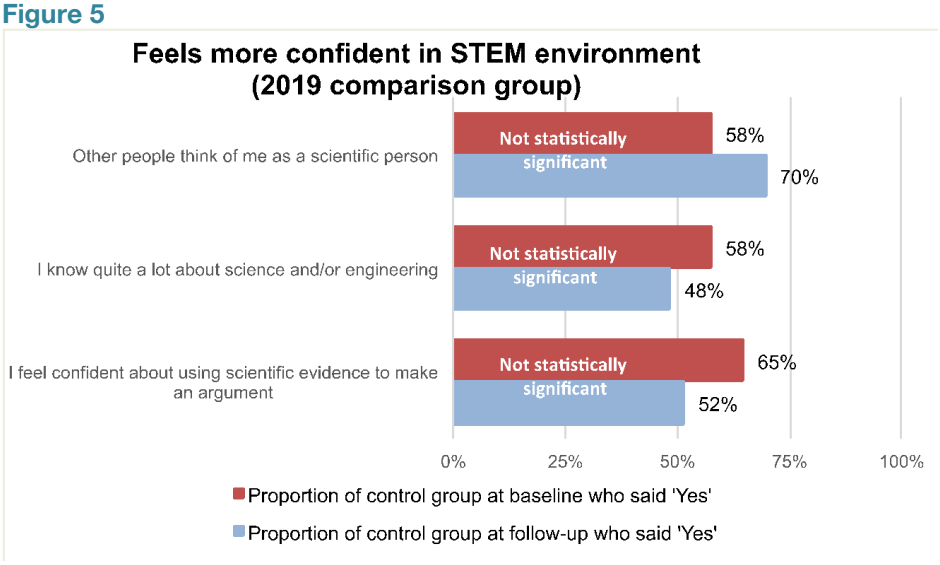
The results for the 2019 cohort display similar patterns. The positive difference observed for 'feeling confident about using scientific evidence' also attains statistical significance. As we discussed in the previous section, the measurement scales between the 2018 and 2019 cohorts were modified, which is why the analysis reports means for the 2018 cohort and percentages for the 2019 one.

Figure 4



In clear contrast to the in2scienceUK participants, the data collected on the 2019 comparison group suggests the lack of any meaningful change in this group.

Figure 5

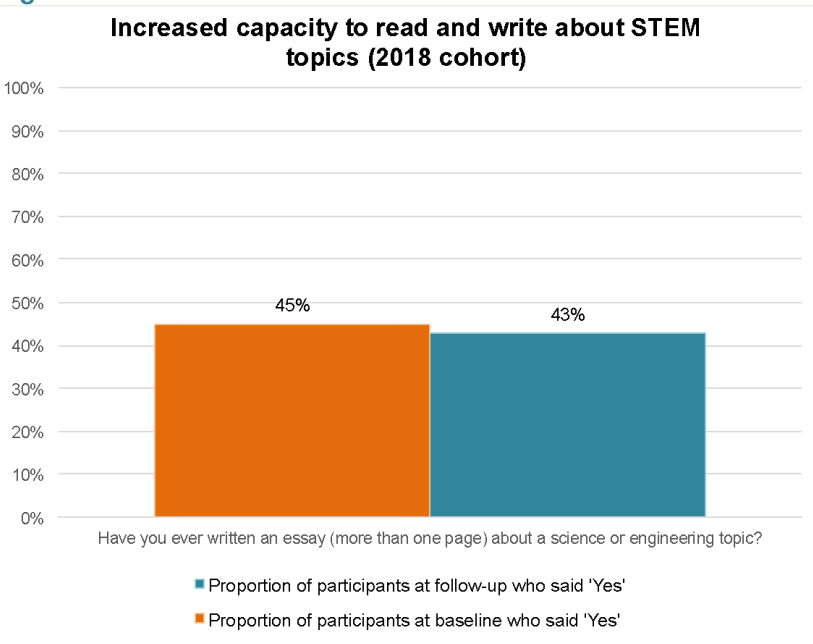


A.4. Capacity to read and write about STEM topics

We find that the proportions of participants who say they have written an essay is lower in the follow-up compared to the baseline of the 2018 cohort. This might not be surprising when considering that activities of the project do not include essay writing. Moreover, as mentioned earlier, a potential explanation could be that pupils exaggerate

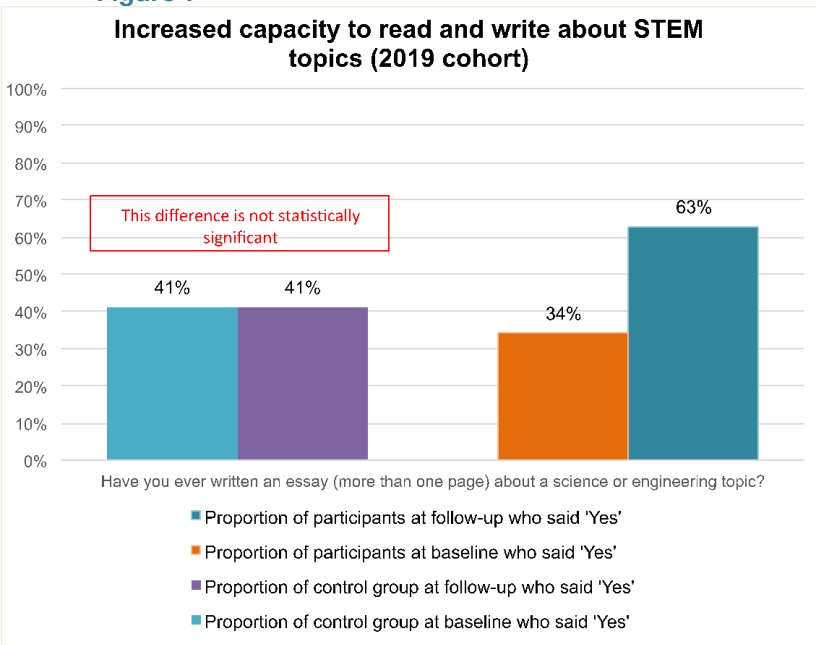
their credentials at the baseline and/or pay less attention when filling in the follow-up survey.

Figure 6



However, looking at the results pertaining to the 2019 cohort, there is a clear and statistically significant increase in the proportion of those who say that they have written an essay post-participation (when compared to the baseline). Moreover, the 2019 comparison group shows no differences between the baseline and follow-up.

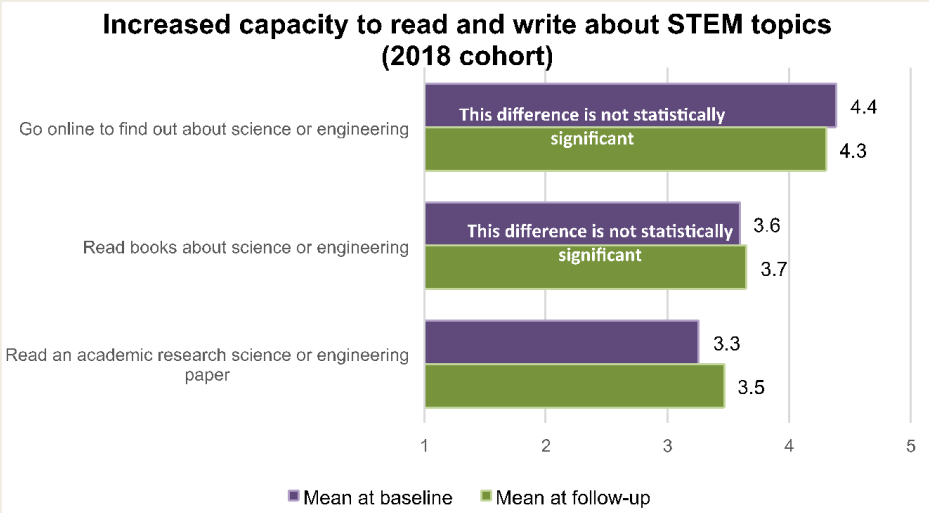
Figure 7



The attitudinal measures ask a participant to state how likely they are to:

- Go online to find out about science
- Read books about science
- Read academic research papers

Figure 8



In both 2018 and 2019, for the first two questions, the results display changes that are not statistically significant. However, the third question shows a clear significant increase. Compared to before their participation in the project, after the end of the project, pupils are significantly more likely to want to read an academic research paper. The analysis of the 2019 comparison group indicates that the difference is not statistically significant. However, this might simply be a function of the low sample size.

Figure 9

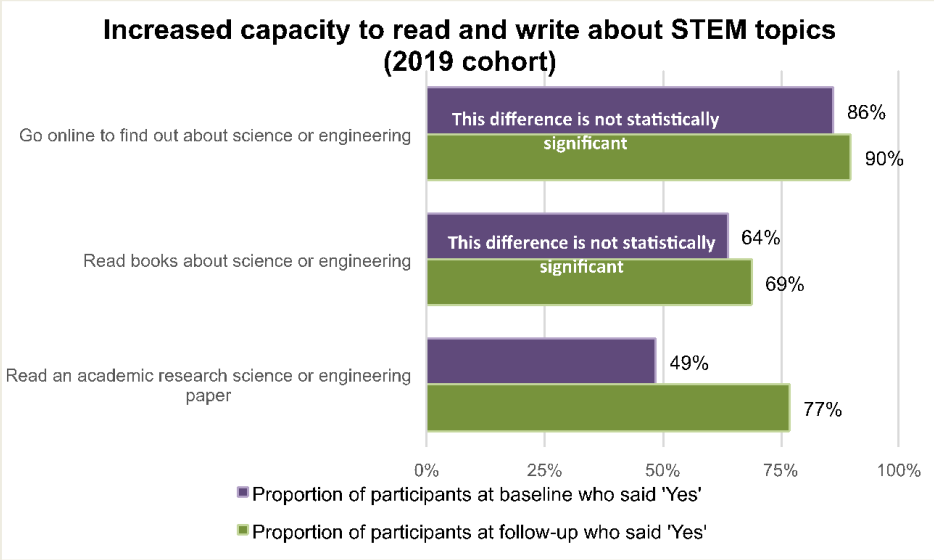
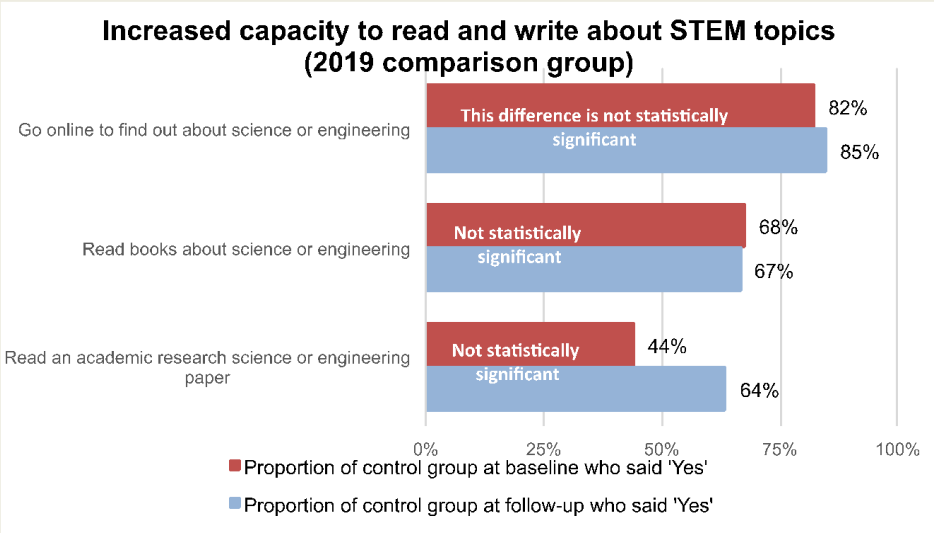


Figure 10

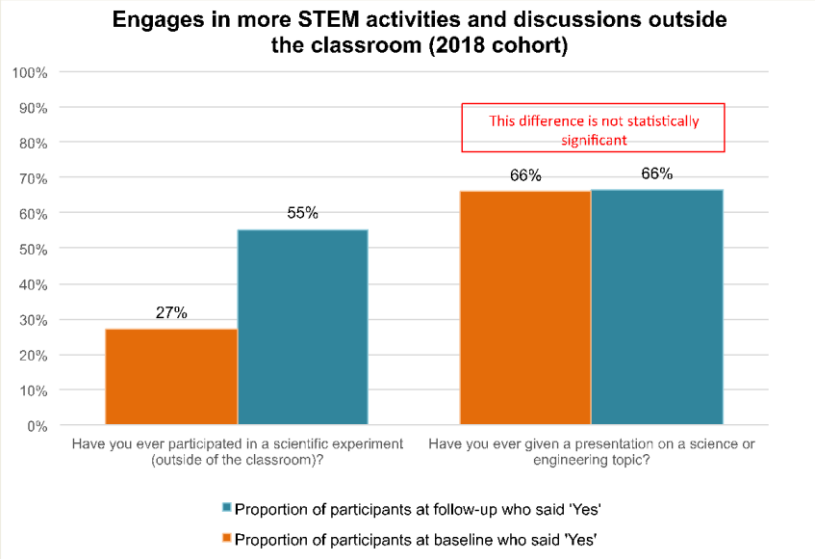


A.5. Engagement in more STEM activities outside the classroom

The results suggest that there is a large and significant increase in the proportion of participants who say they participated in a scientific experiment outside the classroom. This is encouraging and confirms that the project does meet one of its core aims of extending participants practical experience.

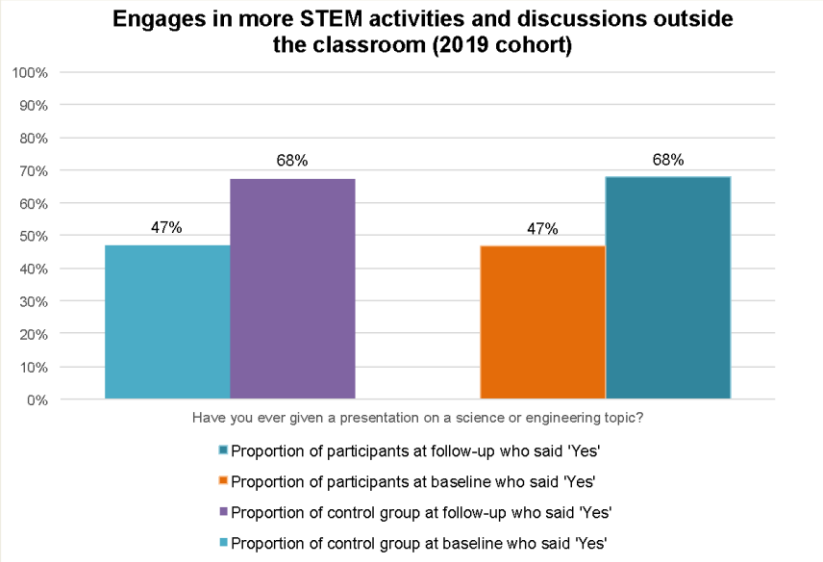
There was no difference when looking at whether pupils gave presentations.

Figure 11



The differences observed in 2018 are maintained for the 2019 cohort. However, similar differences are also observed for the 2019 comparison group.

Figure 12



The attitudinal questions ask a person to state how likely they are to:

- Talk about science (only 2018)
- Attend a lecture

We find a small significant, but negative effect: It appears that participants seem to talk less about the science of engineering with other people after the project, compared to the baseline. The reason for this is as yet unknown, but potential explanations could include carelessness in filling out the questionnaire at follow-up or a conscious effort to exaggerate at the baseline. However we cannot rule out that the effect is genuine.

We find no significant difference on attending a lecture in 2018 or 2019. Similarly there is no statistically significant difference when looking at the 2019 comparison group.

Figure 13

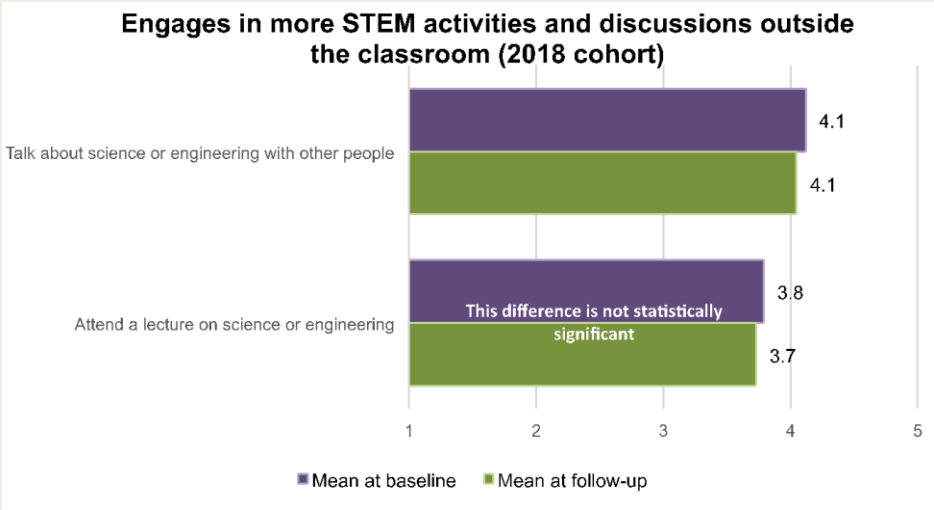


Figure 14

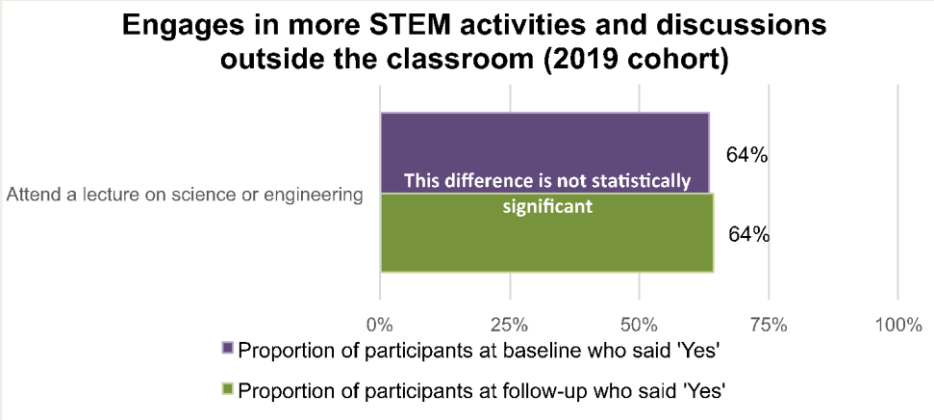
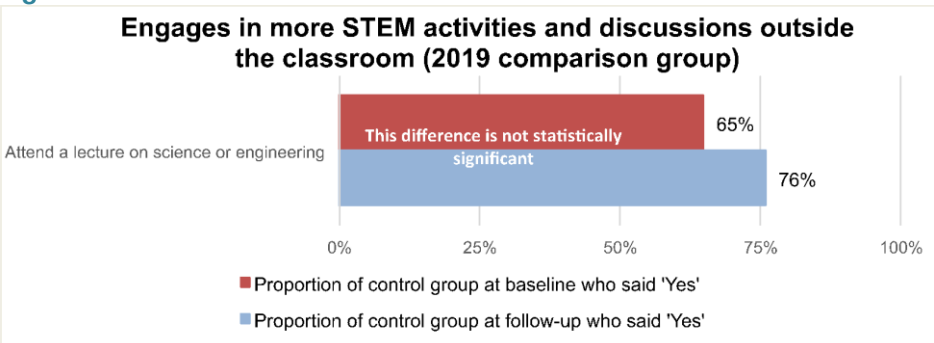


Figure 15



A.6. Visiting greater number of places of STEM interest

Visiting STEM places of interest is operationalized by asking participants how likely they are to go to science centres, museums or planetariums.

The results fail to offer a clear or compelling picture. The data collected in 2018 appears to suggest that there is no change between the baseline and follow-up. The data collected for the 2019 cohort suggests that this change is negative while no difference is detected for the comparison group.

Figure 16

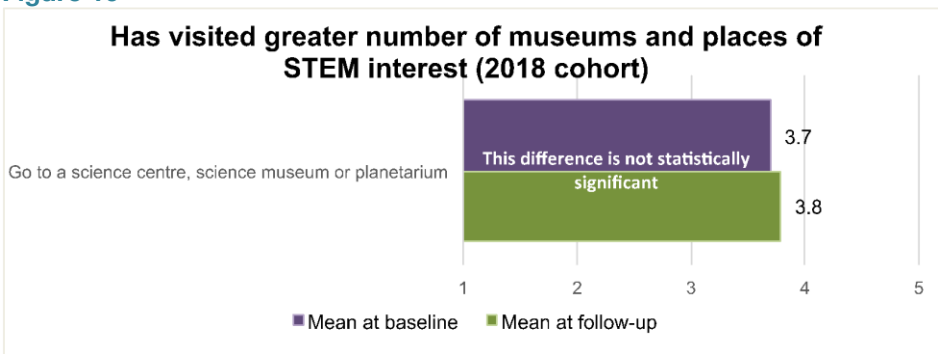


Figure 17

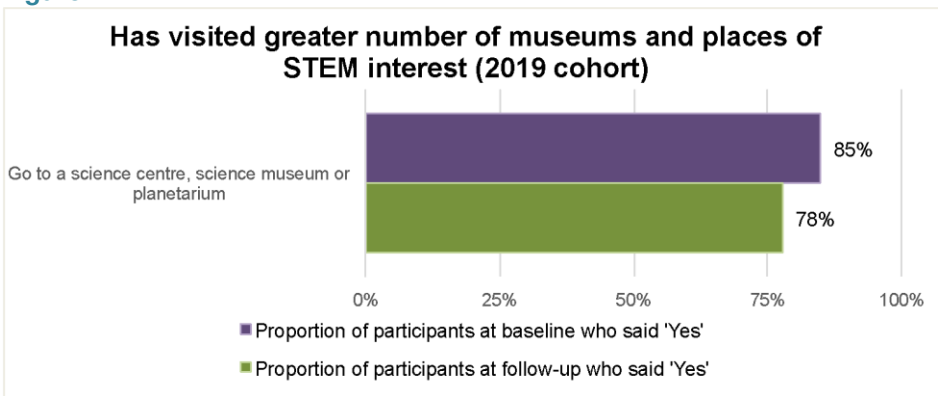
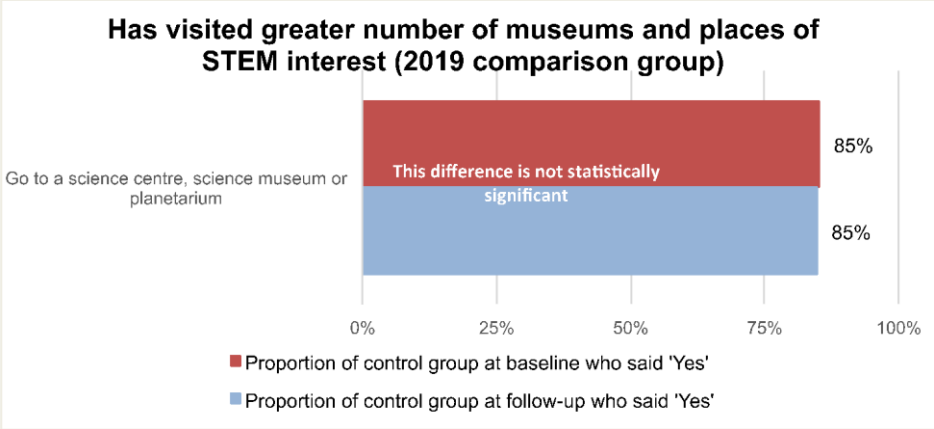


Figure 18



B. Increased STEM Career Capital

Students' STEM career capital, which relates to the clarity of their career aspirations and pathways, appeared to be strengthened by in2scienceUK. With the majority of students reporting that the work experience and/or conversations with their mentors had helped them develop clearer career goals. Relatedly, they felt that they knew more about their desired career and had a more realistic understanding of the demands of STEM jobs. Moreover, students felt that in2scienceUK had introduced them to new positions or to careers that they had previously dismissed.

Students repeatedly emphasised the importance of the work experience and mentors in promoting STEM career capital growth. As one student mentioned:

> "*I feel like in2scienceUK made it feel clearer what I wanted to do... if I hadn't had the placement I wouldn't have known precisely what I wanted to do or know what it's like to work in a university lab - In2scienceUK helped find it out. I probably could have still come to the same conclusion but it would have taken a lot more work... without that experience I wouldn't have known anything to be honest*"

Of the twelve participants interviewed in the qualitative research, nine intended to pursue a career in STEM, one was unsure and two wanted to follow a career outside of STEM. However, all students reflected on the program, and in particular the placement, as an important step within their career development. Nine students mentioned that the placement helped them in at least one of the following ways:

- Reinforce stem career aspirations;
- Expose new roles or areas of interest;
- Introduce new pathways to their career goals;
- Set expectations about the reality of work life.

B.1. Exposure to new STEM careers

Most students felt that the placement reinforced their previous interest in STEM while simultaneously clarifying their career goals and expectations. Many students felt that the work experience allowed them to transform their ambiguous career goals into more concrete and actionable ambitions. For example, one student had begun in2scienceUK with an interest in working in medicine – but following a hospital placement working with pregnant women – decided they wanted to become a doctor specialising in women's health. Other students felt that the work experience exposed them to roles that they had previously not considered or dismissed. Three students specifically mentioned developing a stronger interest in research roles, following a University based placement. As one student mentioned:

> *"I want to get into either research or something to do with medicinal chemistry… It's definitely a lot different because before [in2scienceUK] I wanted to become either a pharmacist or a teacher or something like that, I never thought about the other career paths I could have doing chemistry".*

Two students no longer wanted to pursue a career in STEM following in2scienceUK, however neither attributed this change to participation in the program. Both students expressed having doubts about a STEM career prior to in2scienceUK. Furthermore, both mentioned their grades as potential barriers to STEM careers, and felt that their skills and interests were better suited to other disciplines. As one student noted:

> *"I realised my grades probably weren't up to standard, and I needed Chemistry and I don't really do Biology either, I just felt like I wasn't equipped to go to university with it, and I didn't really enjoy A-level Chemistry as much as I enjoyed GCSE"* .

B.2. Exposure to new career routes

In addition to the hands-on work experience during the placement, almost all students mentioned discussions with their mentors and colleagues as important to exposing them to new career options and routes. All students felt that there was someone at their placement they could talk to about their career aspirations, and most had conversations with not only their direct mentors but also their mentors' colleagues and teams. As one student highlights:

> "*They know about what I want to know, and I was able to ask loads of questions from them about how they got to where they are. That helped me a lot... In terms of everything, talking to people who had more experience than us, the mentors, they're in the science sector and we learnt a lot about their lives"*.

Interestingly, almost all students highlighted the diversity of experience in the employees of their placement, and many were surprised that there were a number of pathways to the same career outcomes,

> "*I think the biggest impact was how people get to where they are at that point in their life... what career path people took and how it doesn't really matter like how you learn things, as long as you learn it*".

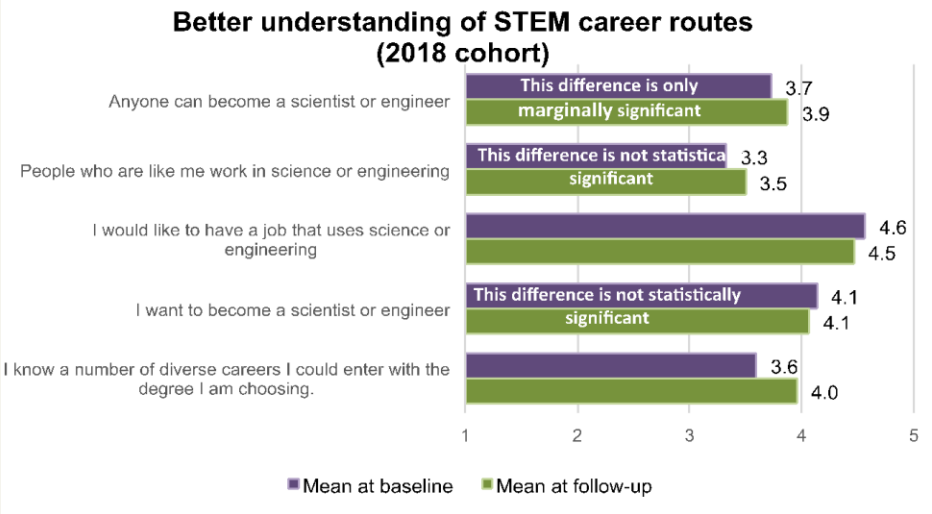
In addition to being important for STEM Career capital, these discussions about career pathways were critical in developing students' confidence and career resilience.

To quantitatively test participants' understanding of STEM career routes, they were asked how strongly they agreed or disagreed with a set of questions. These included:

- Anyone can become a scientist or engineer
- People who are like me work in science or engineering
- I would like to have a job that uses science or engineering
- I want to become a scientist or engineer
- I know a number of diverse careers I could enter with the degree I am choosing

The graph below displays the results for the 2018 cohort and indicates that only two of the five questions show statistically significant changes. On the one hand, it appears that at follow-up participants are less likely to agree that they would like a job that uses science or engineering. However, on the other hand, participants become more likely to think that they now know a number of diverse careers that they could enter.

Figure 19



The general pattern of the results is nearly identical for the 2019 cohort. The differences in the levels and patterns of statistical significance are likely caused by the changes in the way the variables were measured in 2019. Most interestingly, the results indicate that at the conclusion of their participation in the program, respondents were:

- Approximately 7 percentage points more likely to say “anyone can become a scientist or engineer”. A statistically significant change was also identified for the comparison group; however, this was limited to two percentage points.
- Approximately 20 percentage points more likely to think that people ‘like them work in science or engineering”. A statistically significant change was also identified for the comparison group; however, this indicated a two percentage points decrease.
- Approximately 22 percentage points more likely to say that they “know a number of diverse careers they could enter with the degree they chose”. No difference was observed in the comparison group.

Figure 20

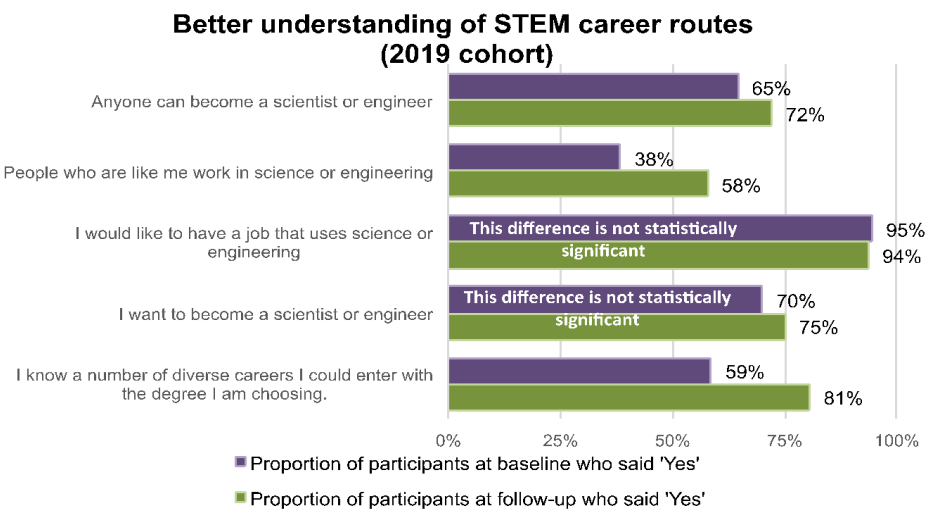
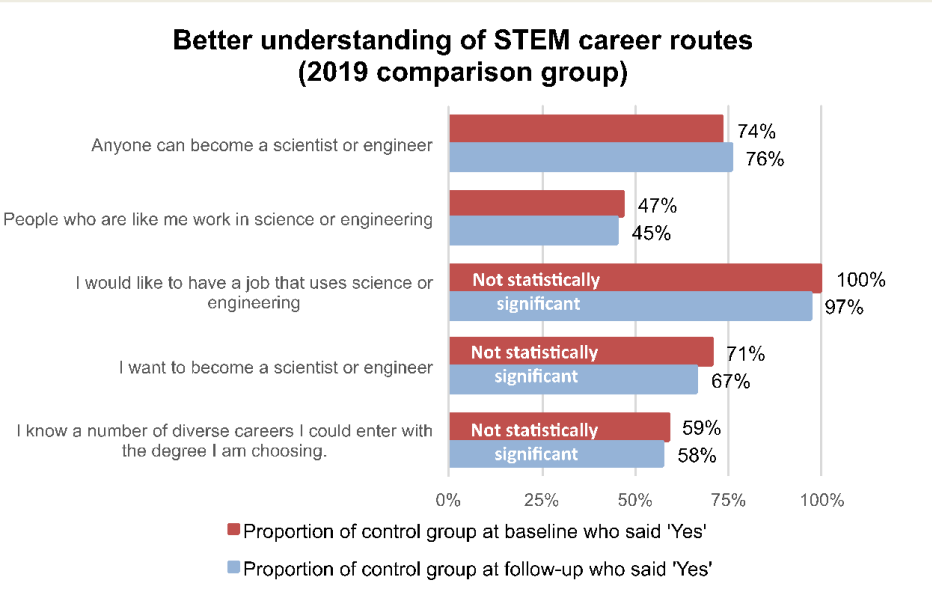


Figure 21



B.3. Generalist career skills

Students felt that the in2scienceUK program helped prepare them for the world of work more generally, particularly in relation to communication and networking. The placement was considered the most important element, however six students also felt that successfully interviewing for in2science had made them feel more confident with future interviews. Critically, even those students that no longer wanted to peruse a career in STEM reflected on the program as useful in helping them achieve their new career aspirations. Both students emphasised the generalist skills they gained from the placement, such as networking and communicating with professionals. As one student mentioned:

> *"I feel like whatever you're doing, having that [in2scienceUK] experience helps so much, working at a really good university in good labs, working with experienced people, you get to actually speak to them about their knowledge, you get to go out... networking events. In the job I'm doing now, networking is such an important thing, and I wouldn't have known how to do that."*

In the quantitative study pupils were asked both before and after the project whether they know anyone who can give them good advice about career options in a STEM

area. In the 2018 cohort 47% of pupils said they know such a person at the baseline compared to 59% at follow-up.

The results are somewhat clearer when looking at the 2019 cohort. 17% of pupils said they know such a person at the baseline compared to 73% at follow-up. This represents a 56 percentage point increase. This can be contrasted with the 35 percentage point increase in the comparison group.

Figure 21

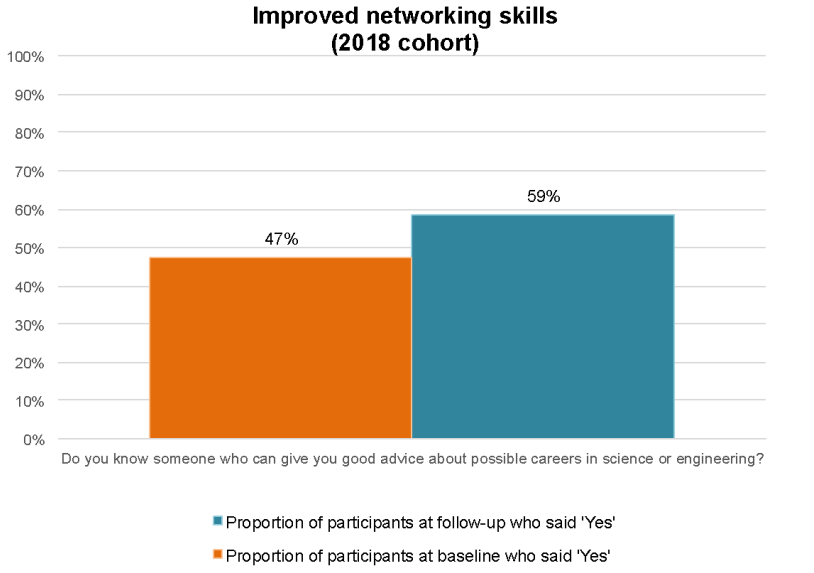
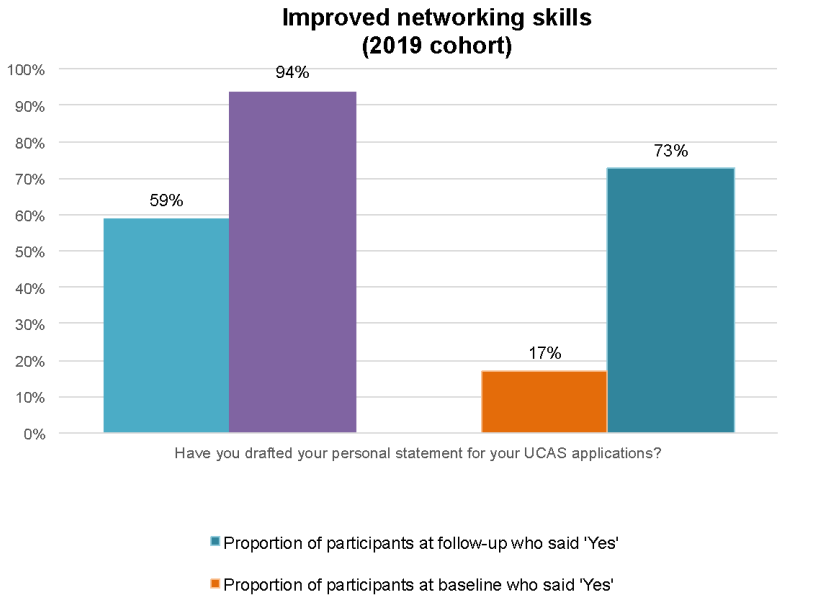


Figure 22



On an attitudinal level, two questions are used to measure networking and professional skills. Participants were asked how strongly they agree or disagree with:

- Feeling confident about introducing themselves to a STEM professional in person
- Feeling confident about introducing themselves to a STEM professional via email

As the graphs below indicate, there are statistically significant increases for both measures when comparing them pre and post project for both the 2018 and 2019 cohorts. The 2019 comparison group does indicate any statistically significant changes.

Figure 23

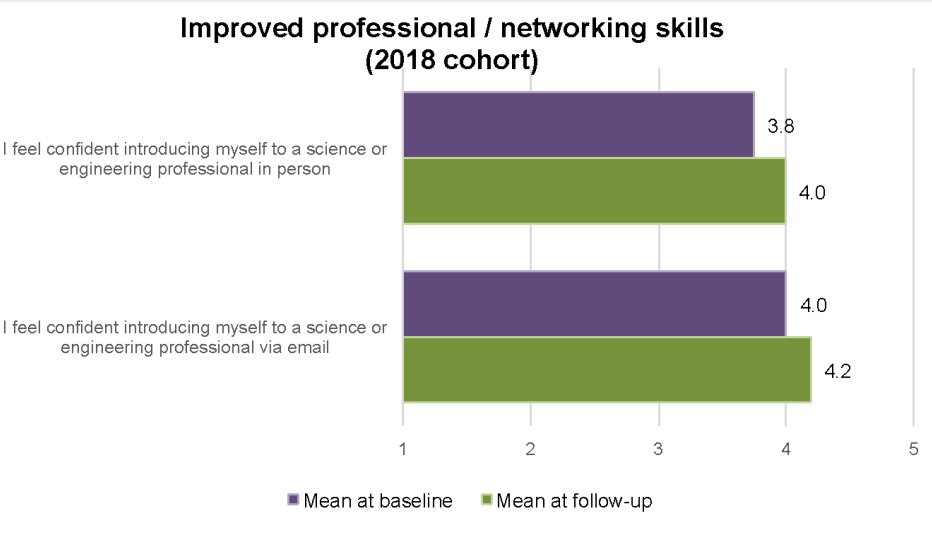


Figure 24

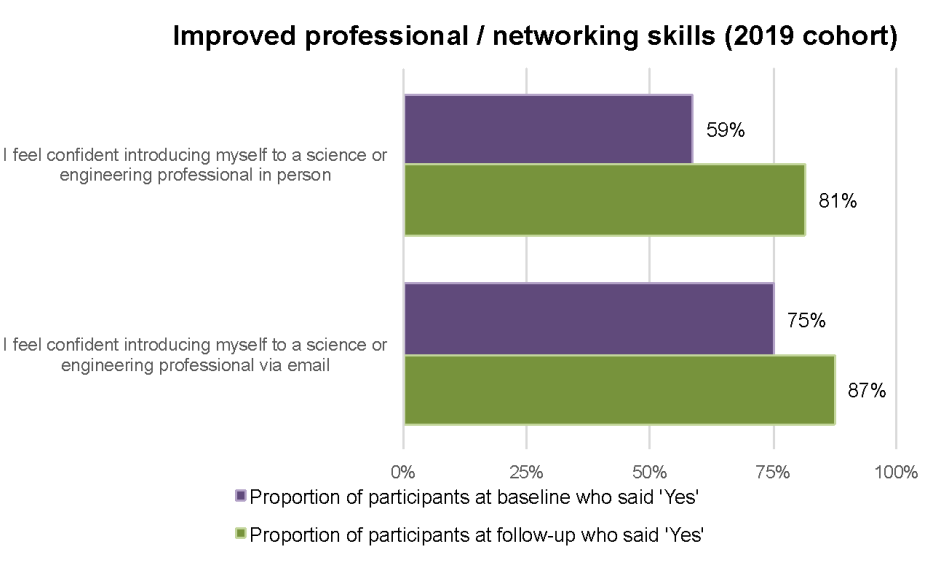
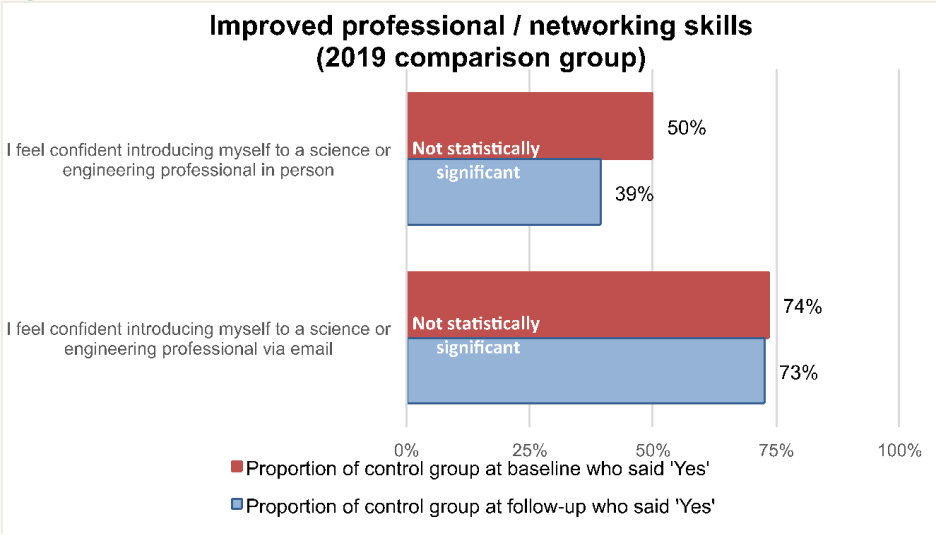


Figure 25



C. Increased Higher Education and Training Capital

Qualitative interviews with students revealed that most felt that their higher education and training capital, or their confidence and capabilities in pursing further studies, had increased following participation in in2scienceUK. Quantitative data suggests that the program had mixed effects on students' higher education and training capital, in that despite significant increases in University application confidence, there were decreases in reported motivation to attend a top university to study a STEM subject and decreased excitement at the prospect of a STEM degree. The interviews show that the program was able to increase students' capital by:

- Introducing them to different pathways to reach their career goals;
- Promoting career resilience;
- Highlighting the importance of work experience and other forms of training;
- Supporting them in University application process;
- Providing work experience and knowledge useful in university applications.

C.1. Beyond Top Universities: Multiple routes to career goals

Students repeatedly emphasised that the placements taught them that there are multiple routes to reach their career aims, and these learnings may explain the decreased commitment to attend a top University. Conversations with their mentors and others was the most common way students were introduced to these ideas:

> "*Some of the people I talked to had civil engineering degrees, mathematics degrees, so it shows that in that kind of work space you don't have to have one technical thing.*"

While these results may initially appear damaging to students' career motivation, in actual fact the opposite seems to be true. Many students reported that learning about alternate pathways *increased* their commitment to pursue their career goals and made them seem more attainable. In this sense, students felt that knowing about other pathways increased their confidence to pursue their career ambitions, even if they faced a setback, like not getting into a top university. These results are particularly important given the survey findings (below) show that, before in2scienceUK, almost half of students felt that they didn't know anyone working in STEM to provide advice regarding their careers or University.

Relatedly, a number of students shifted their focus from University exclusively to training and other forms of work experience. With three students mentioning wanting to take a 'year in industry' in addition to studying. As one student expressed:

> "*I think it [in2scienceUK] was really mind opening for me because I always thought you'd always have to get good A-levels and go to a good university and then you can do a PhD at a good university as well, but it showed me that you can do anything at the moment and you can still get into what you want to do in the future as long as you have an interest in that, there's always a way to get into that... like doing apprenticeships or interning at companies straight away or like just gaining experience is really useful. And I think that's more useful than just doing a degree.*"

These students emphasised the importance of the placement as an opportunity for learning and development outside of their standard lessons and classrooms.

While almost all students believed that in2scienceUK had exposed them to different career routes, most maintained their interests in pursuing higher education at a 'top' university. Seven students expressed an explicit interest in studying at a high-ranking

university, two were interested in studying at any university and three were unsure. Those students who wanted to attend a top university did not link this ambition to their participation in in2scienceUK, although many mentioned that it felt like a more realistic goal for them now. Following a placement at a University, a student who was already intending to apply to a Russell Group institution said they were more comfortable with that decision now,

> "*I guess the placement gave me the idea that I could actually apply to those good universities and the people there are really nice.*"

Those students who were less interested in attending a high ranking university tended to have more specific career goals, such as medicine, and felt a stronger commitment to their discipline than to high ranking institutions, "*at the end of the day it's the same degree, so I'm not really fussy where I go".*

In the quantitative study, to measure their motivation to attend a top university, participants were asked to state their level of agreement with the following statements:

- I am motivated to go to a top university to study a science or engineering subject
- I am excited at the prospect of doing a science or engineering degree
- I feel confident that I have the ability to study at a top 30 university in the UK
- I believe that I can complete a science or engineering degree
- I am confident that there are lots of science or engineering jobs available to me that once I have my science or engineering degree
- I aspire to do a PhD one day

Figure 26

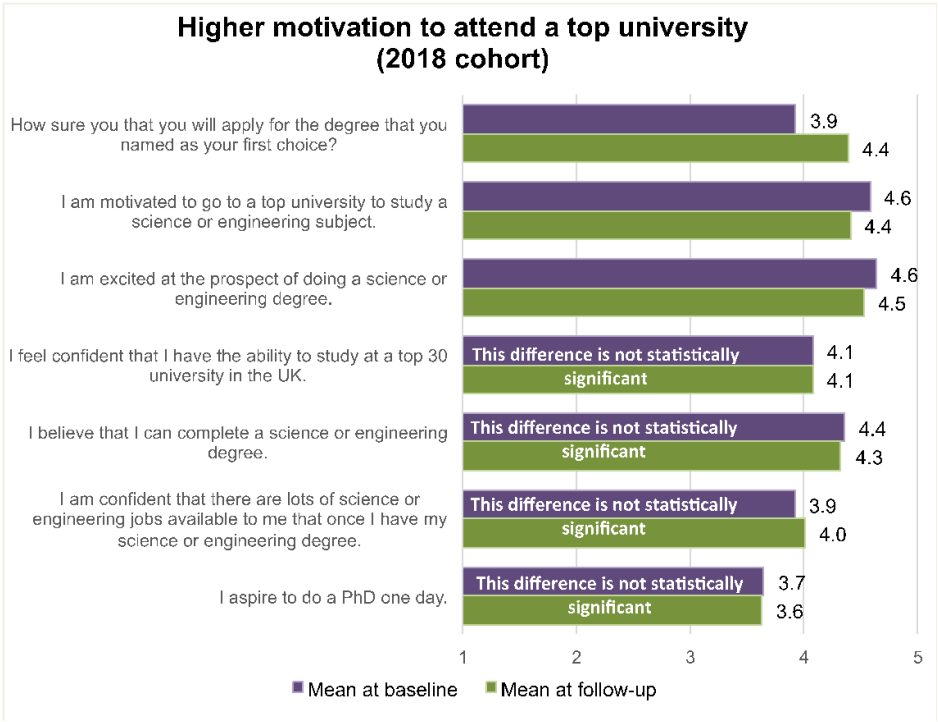

Higher motivation to attend a top university (2018 cohort)
How sure you that you will apply for the degree that you named as your first choice?
3.9
4.4
I am motivated to go to a top university to study a science or engineering subject.
4.6
4.4
I am excited at the prospect of doing a science or engineering degree.
4.6
4.5
I feel confident that I have the ability to study at a top 30 university in the UK.
This difference is not statistically significant
4.1
4.1
I believe that I can complete a science or engineering degree.
This difference is not statistically significant
4.4
4.3
I am confident that there are lots of science or engineering jobs available to me that once I have my science or engineering degree.
This difference is not statistically significant
3.9
4.0
I aspire to do a PhD one day.
This difference is not statistically significant
3.7
3.6
1
2
3
4
5
Mean at baseline
Mean at follow-up

Figure 27

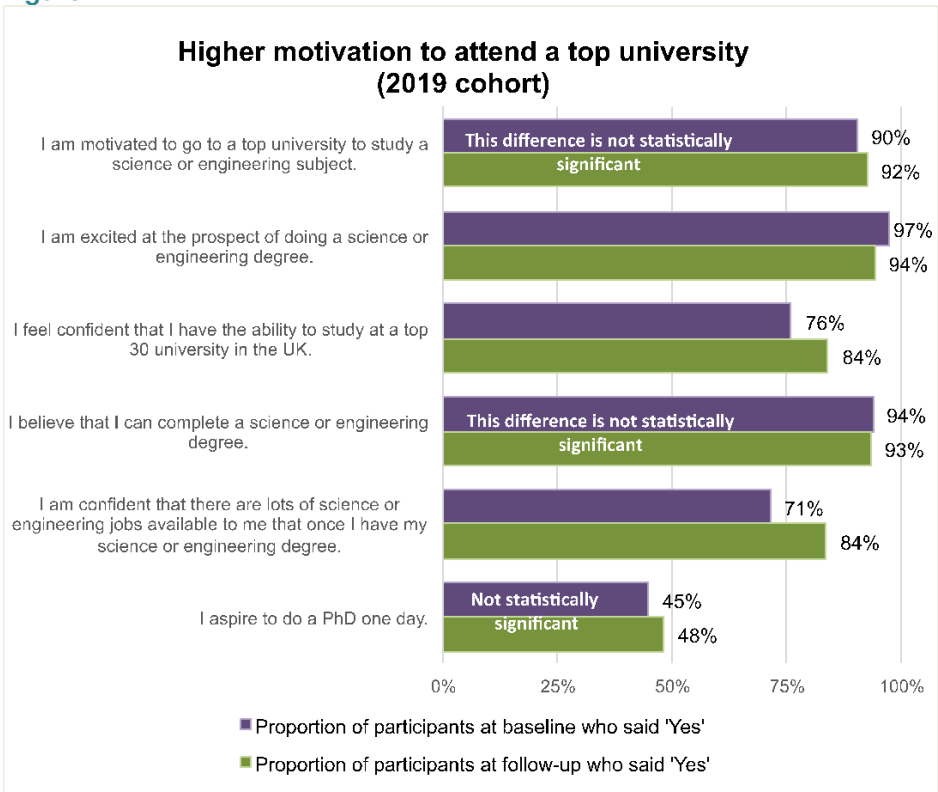

Higher motivation to attend a top university (2019 cohort)
I am motivated to go to a top university to study a science or engineering subject.
This difference is not statistically significant
90%
92%
I am excited at the prospect of doing a science or engineering degree.
97%
94%
I feel confident that I have the ability to study at a top 30 university in the UK.
76%
84%
I believe that I can complete a science or engineering degree.
This difference is not statistically significant
94%
93%
I am confident that there are lots of science or engineering jobs available to me that once I have my science or engineering degree.
71%
84%
I aspire to do a PhD one day.
Not statistically significant
45%
48%
0%
25%
50%
75%
100%
Proportion of participants at baseline who said 'Yes'
Proportion of participants at follow-up who said 'Yes'

Figure 28

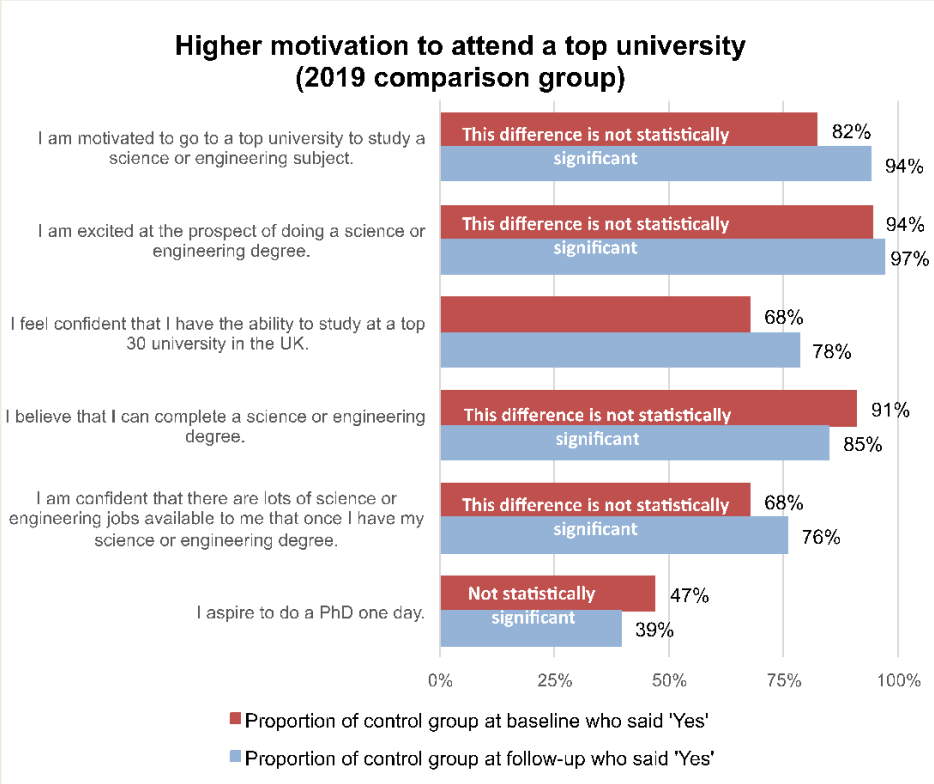


Figure 29

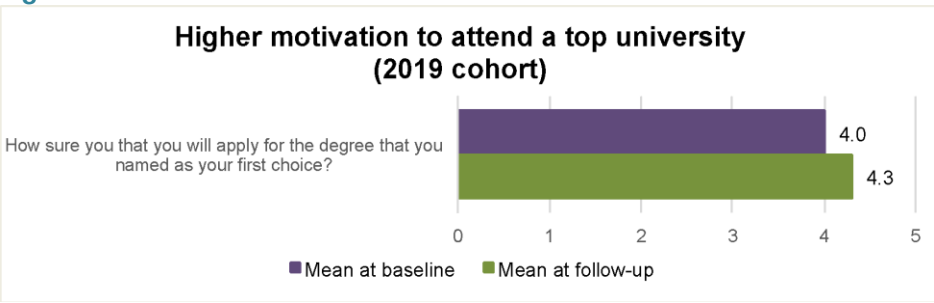
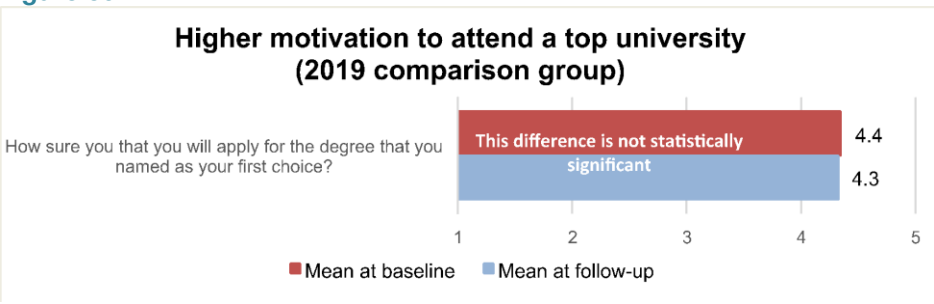


Figure 30



The results, displayed in the graphs above, show a mixed picture:

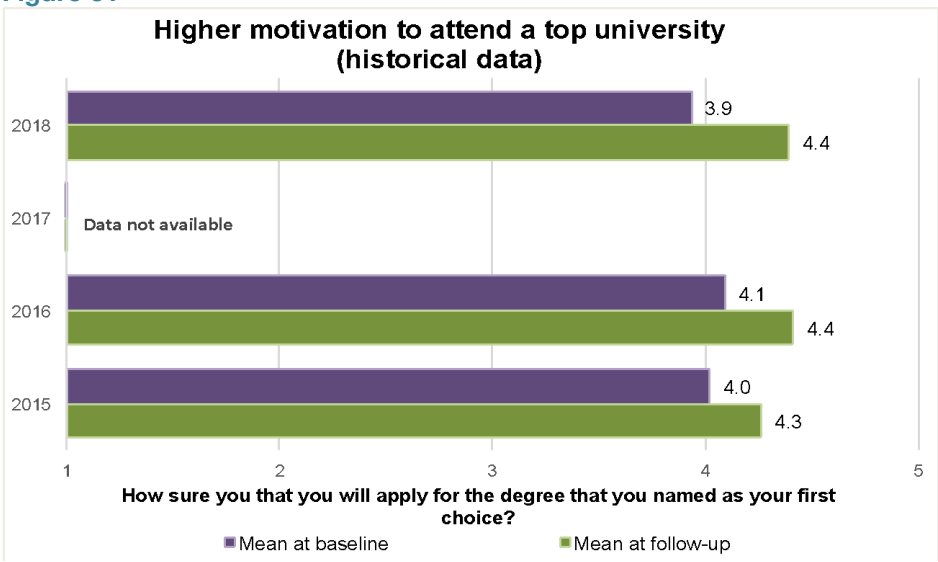
- There appears to be a significantly increased level of confidence about applying for the degree that was named as first choice.
- However, there also appear to be significant decreases in:
    - motivation to attend a top university to study a STEM subject (although in this case it is not clear whether the question measure a reaction to 'top university' or 'a science or engineering degree')
    - excitement at the prospect of doing a STEM degree

The two later findings are consistent with previous findings indicating a decrease in participants wanting a job that uses science or engineering.

Examining historic data on these variables (graphs displayed immediately below), the following conclusions can be drawn:

- The results observed for the 2015 and 2016 cohorts with regards to the **certainty of applying for the degree named as first choice** display strikingly similar patterns to our 2018 observations. Participants appear to be statistically significantly more likely to want to apply to their first choice degree compared to the baseline.

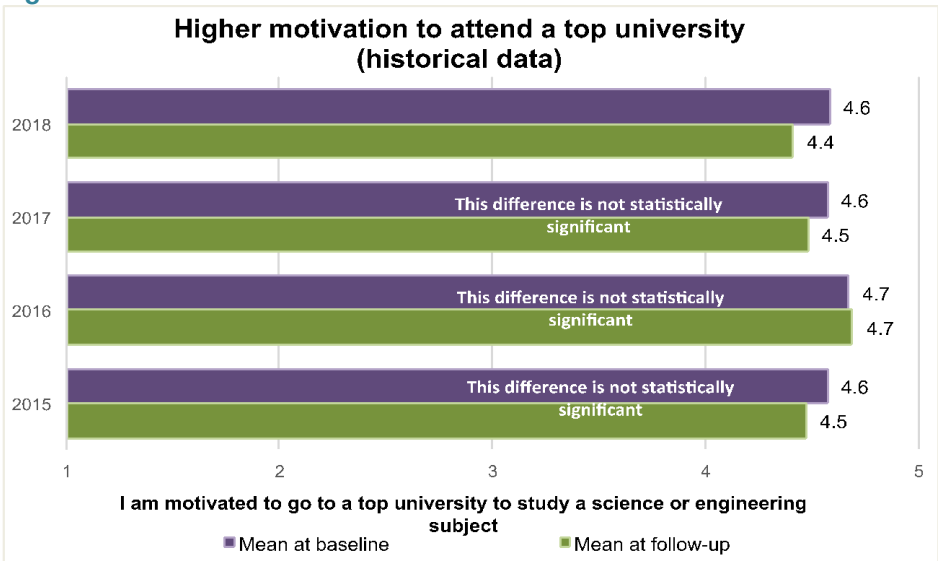
Figure 31



- Interestingly, when looking at the **motivation of attending a top university to study science or engineering,** the results, once again, are consistent with the 2018 cohort and suggest that motivation slightly decreases compared to the baseline. Technically the differences we find are not statistically significant.

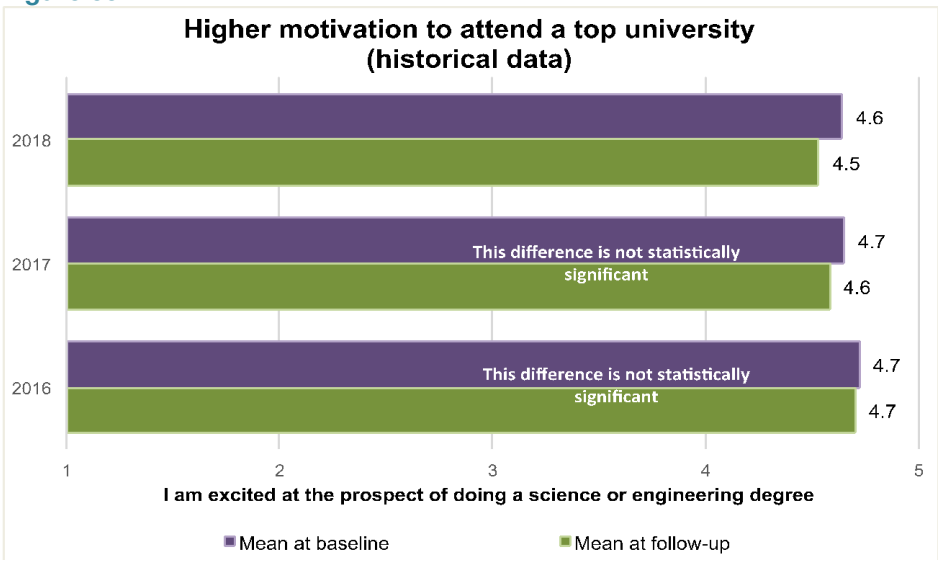
However, we believe this to be solely on account of the lower sample sizes. If we were to aggregate data across years, the results would be supported by appropriate statistical significance levels.

Figure 32



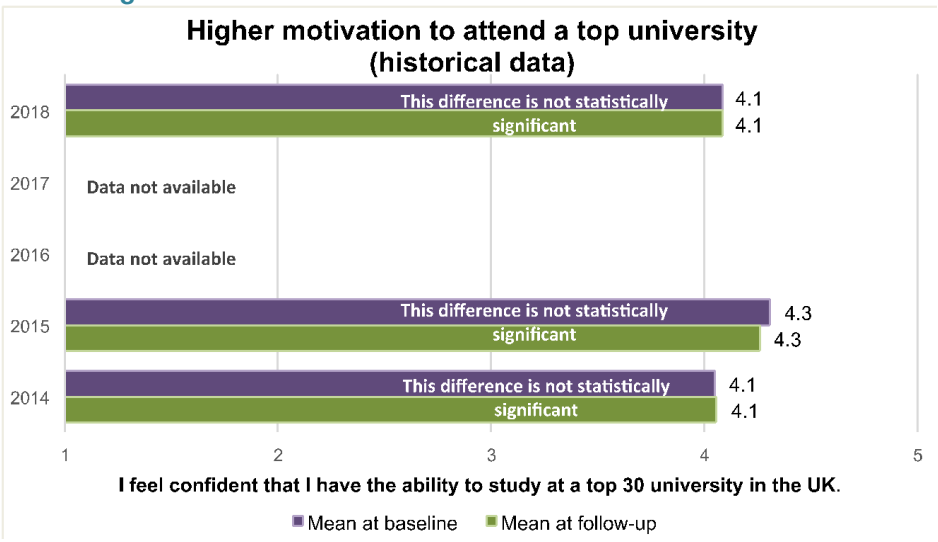
- Similar findings are obtained if testing participants' **excitement for pursuing a science or engineering degree**. The historical data is consistent with the 2018 findings and suggests a decrease in excitement compared to the baseline. Our comments about statistical significance presented in the previous point are also relevant here.

Figure 33



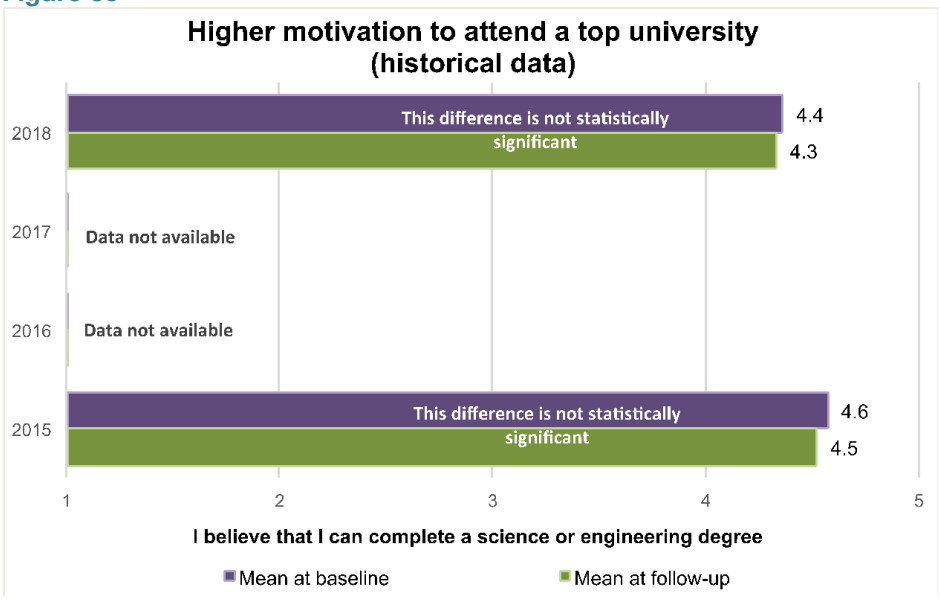
- Similar findings are also obtained when looking at **confidence in the ability of studying at the top 30 university**. There appears to be no difference between pre and post measures.

Figure 34



- Finally, there does not appear to be difference between the baseline and follow-up measure in the **strength of confidence in one's ability to complete a science or engineering degree** when looking at the 2015 cohort. This is consistent with the 2018 findings.

Figure 35



C.2. Fitting in at a top University

Only one of the students expressed concern about fitting in at a top university, which they felt would be less inclusive than lower ranked schools. As the student stated:

> "*I don't know if the top universities would be as diverse as the middle range universities, but I'm not sure because I've only visited middle range unis. I feel like there'll be a lot of pressure on those students*".

Although this student had a different view compared to other students interviewed, and the only one who reported this view, it appeared to be a significant factor in their decisions regarding higher education.

C.3. Applications and Access

Many students reported that in2scienceUK helped prepare them for university applications, through the workshops targeted at developing application skills and also through the experience and knowledge they developed at the placement. A resume workshop and personal statement workshop were most frequently cited by students as being useful for their university applications.

> *"I think they were useful because I didn't have enough knowledge beforehand, I didn't really know how to write CVs... in my colleges they'd just give you a brief summary... they wouldn't help you a lot. With in2scienceUK we sat down and talked about what I could improve and what I should write more... that helped me develop my CV and also my confidence".*

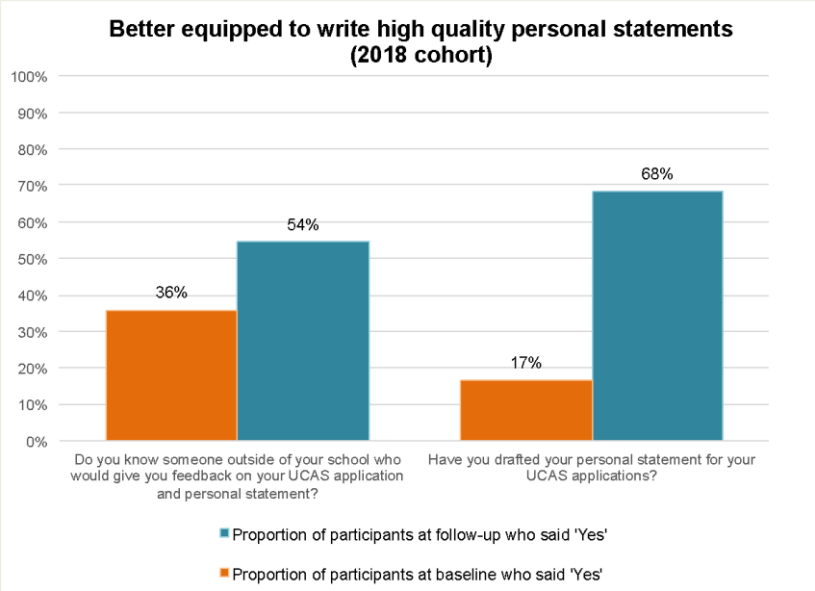
Furthermore, five participants explicitly mentioned they thought the placement would be useful for University applications:

> "*A lot of what I learnt at in2scienceUK I put in my personal statement... if I had an interview I think I'd have a lot of knowledge and I'd be able to answer their questions."*

In the quantitative study, participants were asked a set of two process questions to determine the impact on UCAS applications. The results (displayed in the graphs below) indicate that clear and large changes pre and post project in both the 2018 and

2019 cohorts. The results also indicate the lack of change in the 2019 comparison group.

Figure 36



The results of the analysis of the historical data show that:

- The proportion of participants who said they **know someone outside their school to give feedback on the UCAS application** personal statement increased from 36% to 54%. Historic data (graph below) further shows that a similar pattern of increase was observed when looking at the 2017 cohort. However, in the case of the earlier cohort (2016) the results indicate an inversed (significant) effect, where upon completion of the project participants appeared to be less likely to know such a person.
- The proportion of participants who have **drafted their personal statement** increased by approximately 50 percentage points from 17% to 68%, suggesting that up to 50% of the participants drafted their statement while participating in the project. Similar patterns of increases (if slightly lower in magnitude) are observed for both the 2016 and 2017 cohorts.

Figure 37

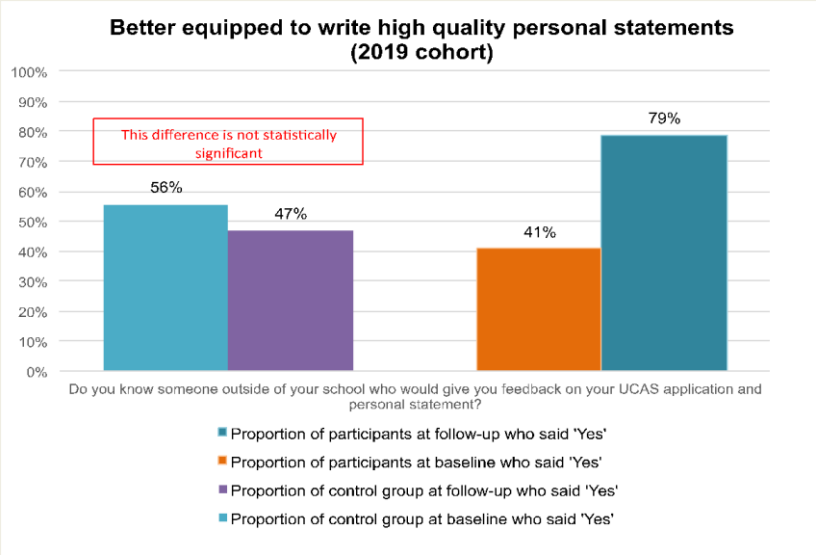
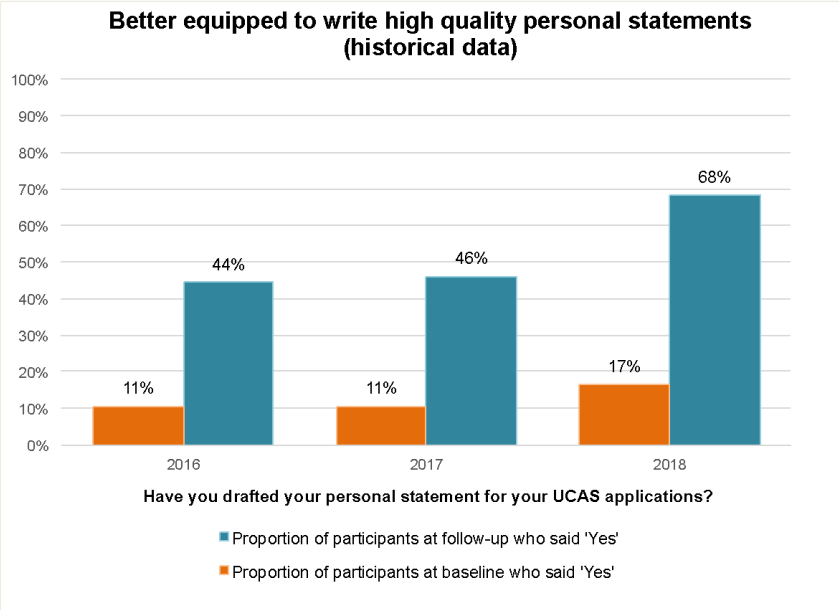


Figure 38



On an attitudinal level, participants were also asked how much they agree or disagree with feeling confident that they are able to write a **high quality UCAS personal statement.** Consistent with the points made above, the results show that participants are more likely to be more confident about their ability to write the personal statement compared to the baseline. This is confirmed by the patterns identified in both the 2018 and 2019 cohorts but also by the lack of any significant change in the comparison group.

Figure 39

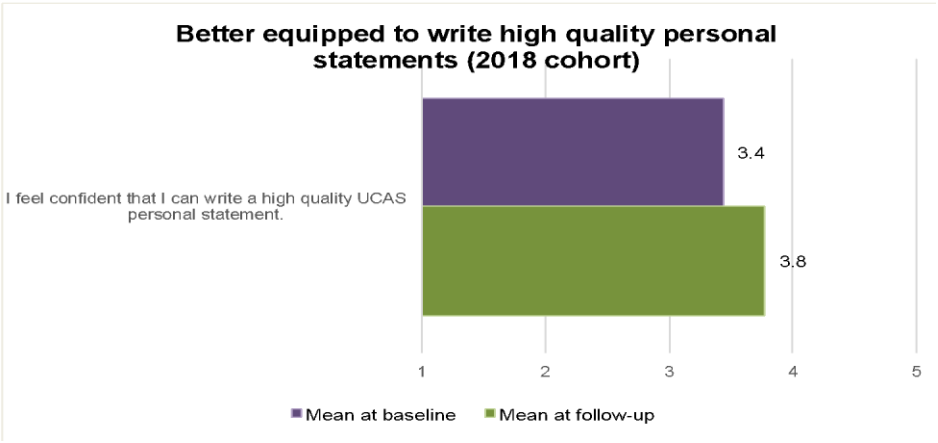


Figure 40

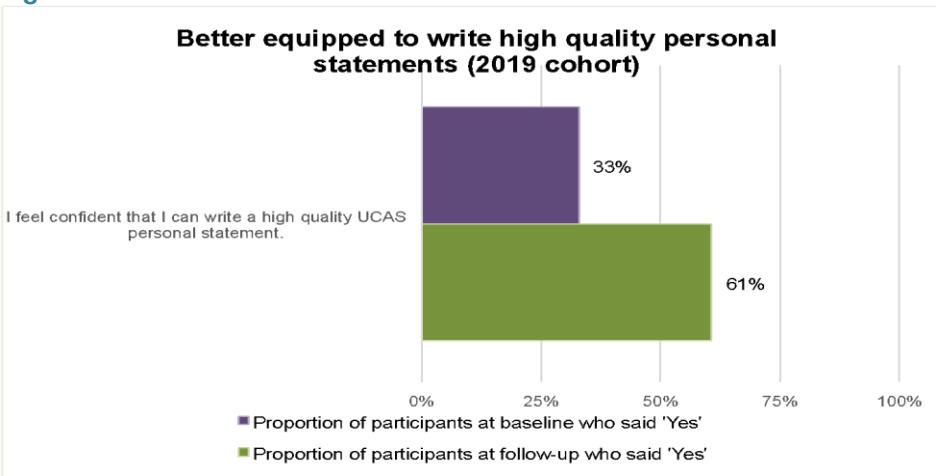
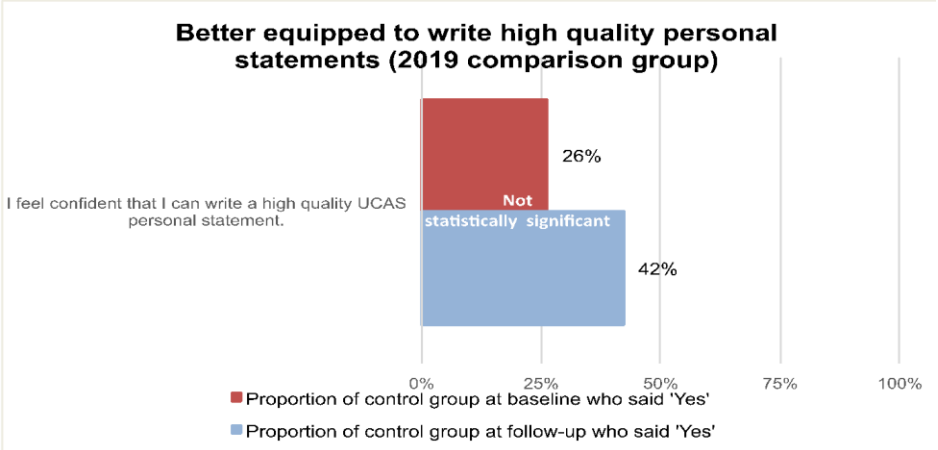
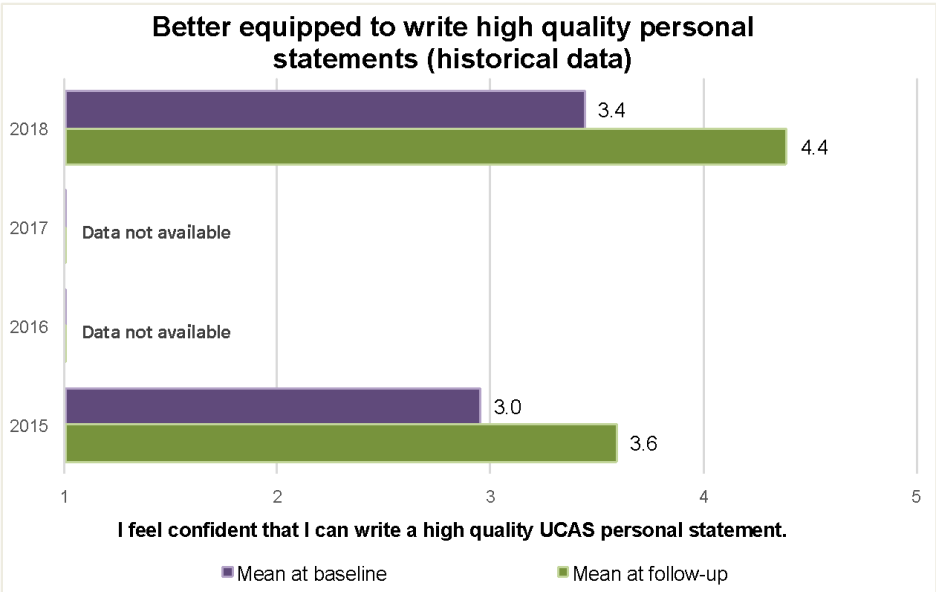


Figure 41



These findings are fully consistent with results obtained for the 2015 cohort (the only cohort for which this information is available).

Figure 42



C.4. Better understanding of application process

The results indicate that there is a significant increase in the level of agreement with knowing where to seek advice about university application processes in both the 2018 and 2019 cohorts. In addition there appears to be a lack of a significant difference in the 2019 comparison group.

Figure 43

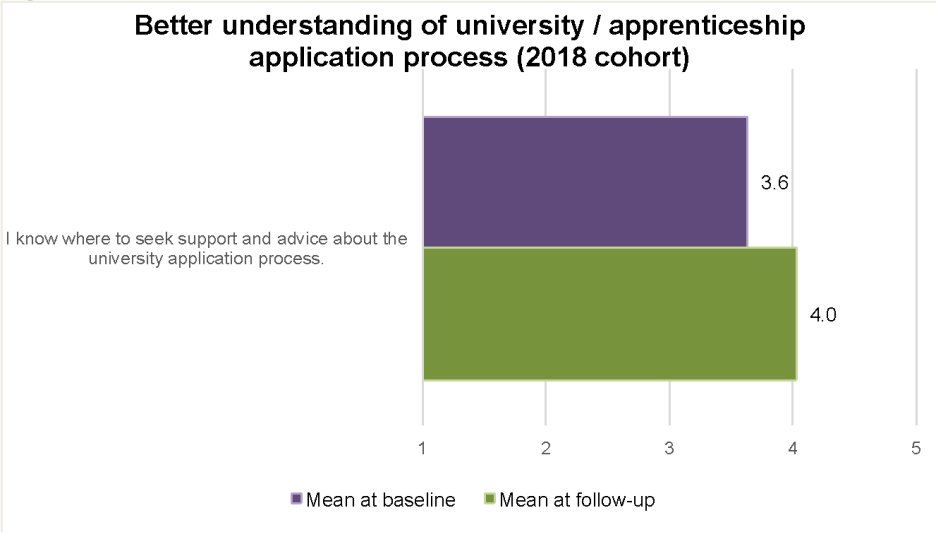


Figure 44

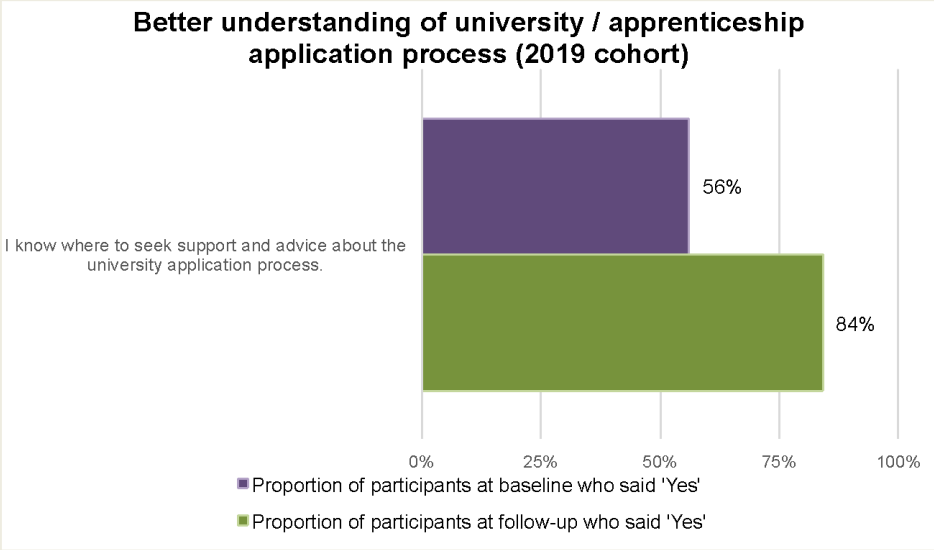
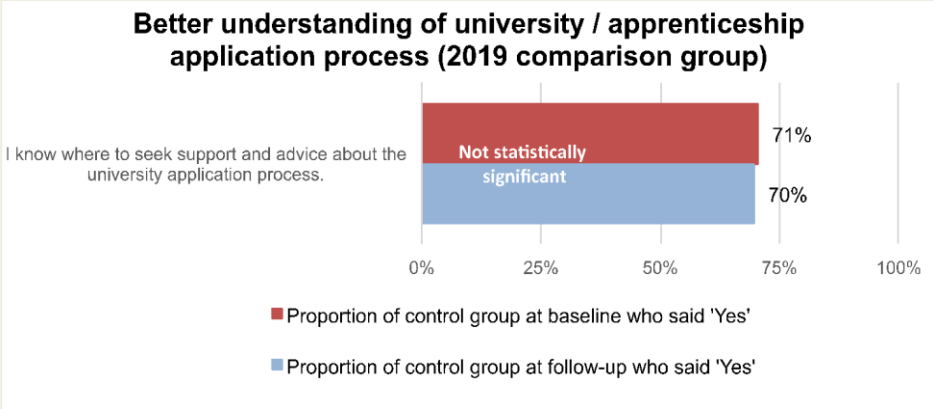


Figure 45



D. Confidence in the attainability of a STEM career, and their own abilities

The majority of students explicitly reported feeling more confident after in2science - in relation to their capabilities in STEM, as well as their careers and higher education. With ten out of the twelve students interviewed reporting higher levels of confidence in one of more of the following areas:

- Their ability to get into a university;
- Their ability to work in STEM;
- Their capacity to communicate with others about STEM topics.

Equally as important, most students implied that their confidence had grown. Examples of higher confidence related to:

- Reading STEM texts at a higher level;
- Feeling like more opportunities were open to them;
- Feeling more resilient and equipped to handle setbacks.

D.1. Confidence in STEM more generally

Four students mentioned that they were reading more advanced materials following in2science. All of these students felt encouraged by their mentors, who had introduced them to new materials or ways of finding academic work (such as Google Scholar). In addition to the placement, the workshops helped introduce students to new subject areas

> "*Beforehand, I wasn't actually reading anything because it wasn't a requirement for our 6th form or any of my subjects I was doing, but I think after the in2science competition I felt I was reading more and I was also encouraged to because people told me it's something to write about in the personal statement".*

Only one of the students interviewed felt that they were engaging in materials at a lower level than prior to in2science, but this was attributed to having to focus on specific texts due to exams. The remaining seven students felt that their reading had not changed since the program.

D.2. Confidence in opportunities

As previously discussed, many students changed their perceptions about scientists after engaging with them on the placement – and these shifts in understanding were also important for their own confidence. A number of students reported that they felt more comfortable with the idea of working in a lab knowing that there were people with a range of backgrounds:

> "*It made me realise I don't have to worry about being a specific person… anyone can go into science*".

This effect appeared to be most pronounced when students felt that they could relate to their mentor or someone within their lab:

> "*My mentor was a PhD student and he was around 30 maybe 40, and I was amazed how age didn't define if you want to be educated, how you are... and the fact that he was from the same country with me that really helped me connect with him."*

D.3. Increased resilience

Many students expressed increased confidence in themselves and their capabilities following the placements. For most students it was their first exposure to work and professional STEM settings, and while many struggled initially, most reported feeling comfortable at the end of the placement. As one student highlights:

> "*That [being in a lab] put my off biology a bit because there's a lot of lab work, but then I realised that I was new to it... and things I'm unfamiliar with I don't feel very excited and comfortable about, but once I got into the habit of using the equipment I really did like it*".

Importantly, students felt that this was a more general lesson, about their own resilience and capacity to learn. Two students made this link very explicitly, and felt that overcoming initial failures at placement taught them about their own abilities and increased their confidence:

> "*because you kind of never know if you'll be interested in something unless you try it, I felt from in2scienceUK I learnt that I should take more opportunities when I see it and not hesitate.*"

Section 5 Attributing change to the project (NESTA Level 3)

To attribute the changes we observe between the baseline and follow-up to the project, it is required that these results be compared to a counterfactual (i.e. a world in which the same pupils did not take part in the project). Of course, this is not possible. As such, we generate comparison groups composed of project applicants that did not end up taking part in the project due to the lack of a sufficient number of placements. This also includes pupils who could have taken part in other extracurricular initiatives.

Due to logistical constraints we implemented two different control methodologies for the 2018 and 2019 cohorts.

A. The 2018 cohort

In 2018 the project did not collect data from a comparison group at either the baseline or follow-up. As such, we proposed the creation of an artificial comparison group.

Methodology

Data was collected on non-participants in the 2018 cohort in December 2018. The aim was to test that the effects identified in the participant group were specific to the project. In the absence of a parallel control group (i.e. a group that was surveyed at the same time points as the treatment group) we recommended setting up a control group containing eligible pupils that did not participate solely due to the lack of a high enough number of placements. This group was surveyed in December 2018 using the pre-placement survey. In addition to the variables measured by the survey, we determined that we could make use of an additional organic variable: time. Given the educational stage and age of the target audience, we believed it is reasonable to assume that with the passage of time (since May 2018, the point of the baseline) both participants and non-participants are likely to be exposed to activities (including in school) that will act to positively affect the levels of the variables that measure impact. In other words, as pupils move closer to UCAS applications, on average, we assume them to be more likely to have been exposed to activities that prepare them. In this context, we hypothesize that the impact of the project can be ascertained if the measures taken in the control group in December 2018 are closer to those taken in the participant group in May 2018 (baseline) versus those taken in September 2018 (post-project follow-up).

We used Propensity Score Matching to match the artificial comparison group to the group of participants. Thereafter we estimated the coefficients of interest and determined the Average Treatment Effect on the Treated. This was done in accordance with the type of data:

- As process measures were based on dichotomous variables, we estimated the probabilities of having said 'Yes'
- For attitudinal measures we estimated means.

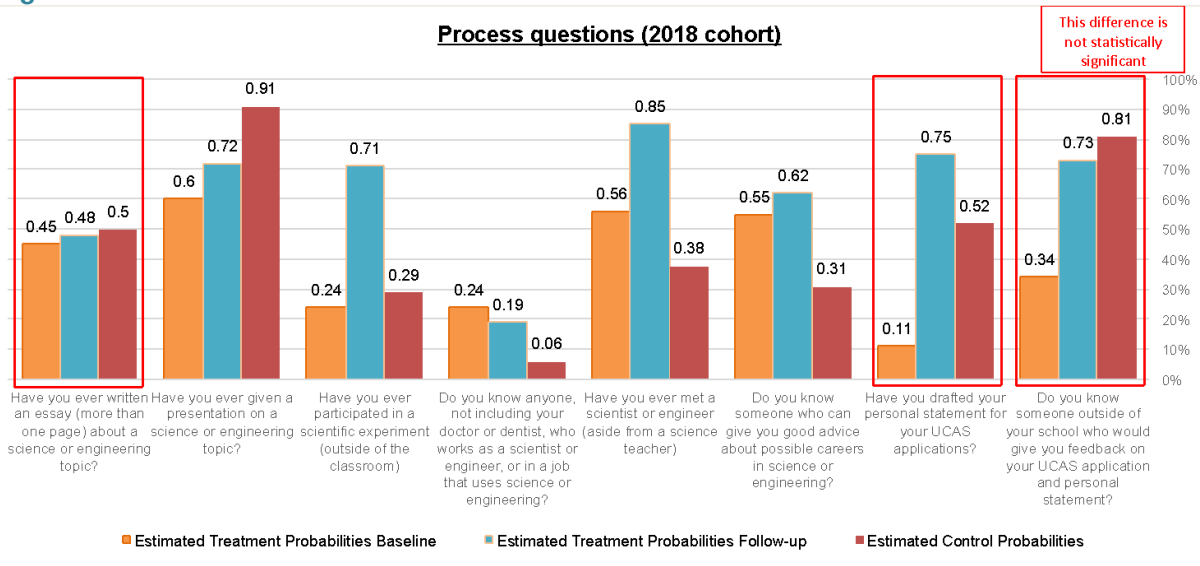
The group of participants consisted of 114 respondents that were captured at both the baseline and follow-up. The attrition rate was 45%, and 207 respondents were included at the baseline. The artificial comparison group contained 87 respondents.

Results

The results pertaining to the **process measures** are not conclusive but do exhibit encouraging findings. On a key set of questions, the participant baseline levels measured in May 2018 are comparable to the level of the comparison group measured in December 2018, while the follow-up level for participants (measured in September 2018) is significantly larger. We argue that this is an indication of the impact of the project. The pattern is observed on the following measures:

- Having participated in a scientific experiment outside the classroom
- Knowing or having met scientists
- Knowing someone to provide advice on careers in science or engineering

Figure 46



Looking at **attitudinal variables**, the results, not displayed here, generally show that the control group displays increased levels on most variables compared to both the participants baseline and follow-up when looking at attitudes.

As such, we cannot draw any conclusions as to the effect of the project or attribution. Nonetheless, given that the data was collected at a point in time by which the non-participants could have received significant additional support, the negative findings cannot be taken to mean that the project did not have an effect.

Nonetheless, there are two exceptions where the level of the control group is significantly lower than the levels in the treatment group:

- Confidence in introducing oneself to a scientist in person
- Confidence in introducing oneself to a scientist via email

These suggest that the project can be seen as responsible for increasing a participant's confidence in introducing themselves.

The results pertaining to process variables are somewhat more positive. There are several instances where the project appears to have had a clear contribution:

- Have you ever participated in a scientific experiment (outside of the classroom)?
- Have you ever participated in a scientific experiment (outside of the classroom)?
- Have you ever met a scientist or engineer (aside from a science teacher)?

Based on these findings, we suggest that in the 2019 cohort a comparison group be set up and surveyed at the same time as the participants.

B. The 2019 cohort

The evaluation strategy for the 2019 cohort included collecting data on a comparison group composed of project applicants who were interviewed but were not selected to participate due to a lack of sufficient placement or scheduling conflicts.
The members of the comparison group were asked to answer the same questions as the participants at both the baseline and follow-up.

The comparison group contained 116 respondents at the baseline (May 2019). However, the attrition rate between the baseline and follow-up was 72%, meaning that only 33 members of the comparison group. The treatment group contained an overall number of 237 participants who took the survey at both time points. The attrition rate was 36%, with 372 respondents having filled in the survey at the baseline.

Methodology

Due to the low sample size in the control group it was not possible to carry out Propensity Score Matching. Instead we implemented a difference-in-differences (DiD) approach. This approach compares the difference between the baseline and follow-up in the treatment group (i.e. participants) with the difference between the baseline and follow-up in the comparison group. Depending on the type of outcome variables (mean or proportion), it then assesses where the difference between the differences is statistically significant.

Technically, the DiD estimates are equivalent to the ATT (average treatment effects on the treated) and express the impact of the project.

However, it is important to note that the findings need to be treated with caution due to the low sample size in the comparison group. This can potentially affect the results in at least two ways:

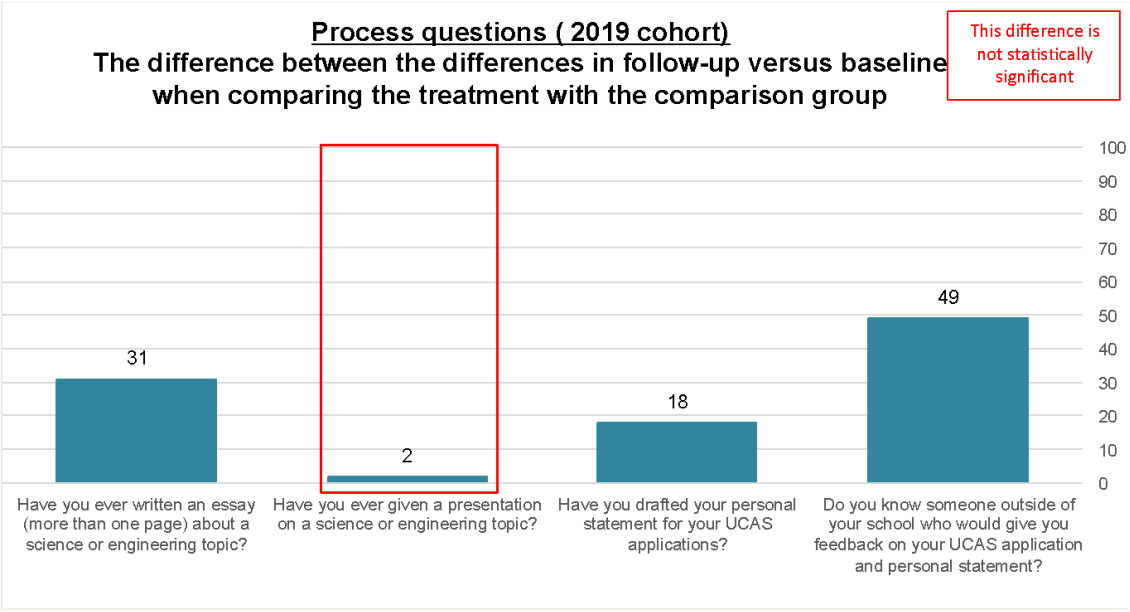
- The low sample size leads to findings that are not statistically significant
- The low sample size might affect the representativeness and the substantive meaningfulness of the comparison.

Results

Looking first at **process measures**, the results appear promising and show positive project impacts:

- On average the project increased the likelihood of having written an essay on a STEM topic by 31 percentage points;
- It also increased the likelihood of a student having drafted their UCAS application by 18 percentage points;
- By far the largest impact is observed when asking respondents whether they know anyone outside of school who can give them feedback on their UCAS application. The project appears to increase the change of this happening by 50 percentage points.

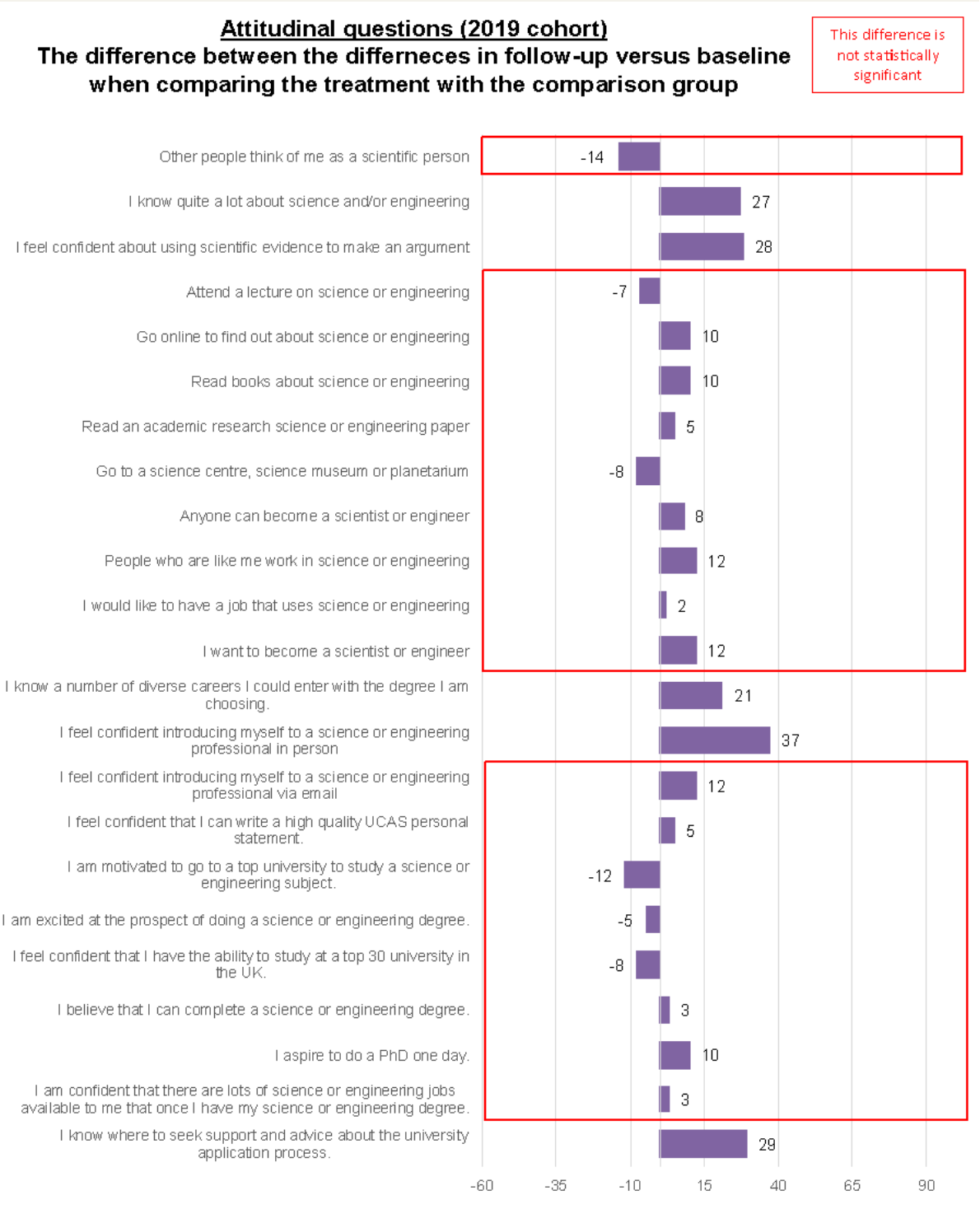
Figure 47



The **attitudinal measures** also show positive impacts, although due to the low sample sizes, very few analyses reach statistical significance. The project appears to have clearer positive impacts on:

- Increasing knowledge about science and/or engineering (27 percentage points)
- Increasing confidence in using scientific evidence to make an argument (28 percentage points)
- Increasing understanding of the variety of careers one could working given the chosen degree (21 percentage points)
- Increasing confidence in introducing oneself to a scientist (37 percentage points)
- Increasing the knowledge of where to seek support about the university application process (29 percentage points).

Figure 48


Attitudinal questions (2019 cohort)
The difference between the differneces in follow-up versus baseline when comparing the treatment with the comparison group
This difference is not statistically significant
Other people think of me as a scientific person
I know quite a lot about science and/or engineering
I feel confident about using scientific evidence to make an argument
Attend a lecture on science or engineering
Go online to find out about science or engineering
Read books about science or engineering
Read an academic research science or engineering paper
Go to a science centre, science museum or planetarium
Anyone can become a scientist or engineer
People who are like me work in science or engineering
I would like to have a job that uses science or engineering
I want to become a scientist or engineer
I know a number of diverse careers I could enter with the degree I am choosing.
I feel confident introducing myself to a science or engineering professional in person
I feel confident introducing myself to a science or engineering professional via email
I feel confident that I can write a high quality UCAS personal statement.
I am motivated to go to a top university to study a science or engineering subject.
I am excited at the prospect of doing a science or engineering degree.
I feel confident that I have the ability to study at a top 30 university in the UK.
I believe that I can complete a science or engineering degree.
I aspire to do a PhD one day.
I am confident that there are lots of science or engineering jobs available to me that once I have my science or engineering degree.
I know where to seek support and advice about the university application process.
-14
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-60
-35
-10
15
40
65
90

Section 5 Conclusions and final comments

The results of the analyses carried out lead to two overarching conclusions:

1. There is robust evidence that in2scienceUK has a clear and positive impact on increasing students' ***confidence*** in their abilities, improving their understanding of the ***career routes*** into STEM and providing them with contacts that can offer them ***advice*** in the university application process. This evidence meets NESTA's Level 3 standard.

2. However, as the analyses presented in the report suggest, there is also evidence of a much wider effect the project has on its participants. While this evidence does not meet the level 3 standard, it does meet level 2. Moreover, the clear patterns that we observe are oriented in the directions the ToC would suggest and are consistent across time. This offers further assurances as to the reliability of this insight.


ZK analytics