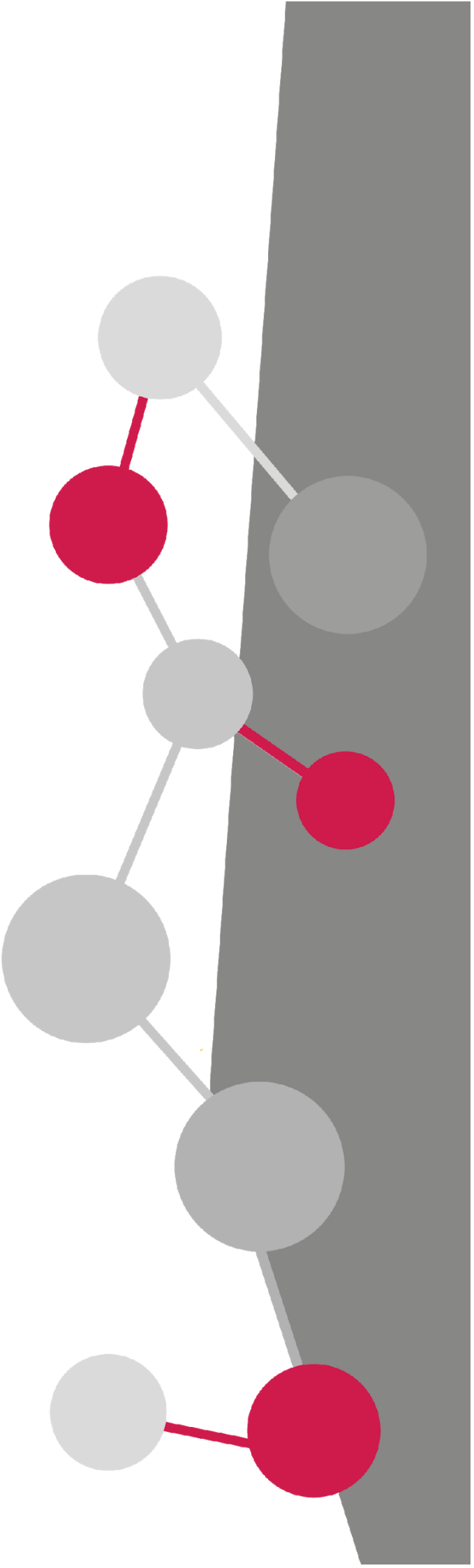
STEM LEARNING



Online CPD Evaluation and Impact: 2021

Executive Summary

STEM Learning Online CPD courses provide self-paced and facilitated professional development for teachers and others involved in the education of young people, primarily in STEM subjects. The programme offers development in broad teaching skills, such as behaviour management and assessment for learning, and subject-specific courses for practical science and subject knowledge. This report reviews the quality and impact of online courses provided by STEM Learning in the 2019/20 academic year.

Key Findings

This report shows the quality and impact of STEM Learning's Online CPD Programme. Overall, this feedback shows that:

- **Across the programme course quality is rated highly**: 98% of participants rated the overall quality of the course as "good" or "very good".
- **Participants rate the impact of the course on themselves highly**: 91% of participants rated the impact on themselves as "medium" or "high" immediately after the courses. These high levels of impact are sustained 6 months after the course, with 76% of participants rating the impact on themselves as "medium" or "high" in the 6 month follow-up survey.
- **Participant background affects the amount of impact on students and colleagues**: Whilst all participants showed impact on students and colleagues, those with more teaching experience rate the impact of the course on their colleagues and students more highly than participants with less teaching experience. Similarly, those with less academic science background rate the impact on students and colleagues as higher than those with more advanced science qualifications.
- **Teaching focus does not affect the impact participants gain from the CPD**: Regardless of phase taught, subject specialism or whether the participant was teaching within their specialism, all participants found the courses to be impactful on themselves (>95% medium or high), their students (>70%) and their colleagues (>70%).

80% of participants rate the impact on their students as medium or high

- **Impact on students increases in the six months post course**: 80% of participants rate the impact on their students as "medium" or "high" six months after the course, an 11% point increase on the 69% of participants who rated the impact on their students as "medium" or "high" immediately post course. This increase shows that six months after completing the course, participants have had an opportunity to embed their learning into their teaching practice and continue to see an impact on their students.

STEM Learning, March 2021

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Introduction

STEM Learning Online CPD Programme

STEM Learning Online CPD courses provide self-paced and facilitated professional development for teachers and others involved in the education of young people, primarily in STEM subjects. Our approach has a focus on reflective practice, with participants encouraged to complete courses alongside their teaching and supported to implement ideas from courses immediately in their classroom. Courses are designed to take 2-6 weeks, with flexibility for participants over pace and choice of activities. The programme offers development in broad teaching skills, such as behaviour management and assessment for learning, and subject-specific courses for practical science and subject knowledge. By delivering this programme on FutureLearn, we enable participants to engage in CPD at a low cost, with flexibility of when and where they learn. The courses also bring together participants from a range of teaching backgrounds, cultures and countries to learn from each other through sharing practice, ideas and resources.

Report Focus

STEM Learning has enabled teachers, technicians and others involved in the education of young people to continue with their professional development throughout the Covid-19 pandemic. Drawing upon our established online learning programme and experience supporting professional development, both in-person and at a distance, STEM Learning has led the sector with provision of both remote synchronous continuing professional development (Remote CPD), and instant-access, online CPD courses hosted on FutureLearn (Online CPD). This report focuses on our Online CPD programme, which first launched in 2016.

This report presents participant feedback on the FutureLearn online courses provided by STEM Learning in the 2019/20 academic year. Participant data from self-audit surveys completed at the start of courses, immediately after course completion, and six months after the courses took place has been examined. Participants' ratings of course impact and level of course satisfaction have been examined at a programme level, to give an overview of the quality of the courses. There are also three case studies which look at participants' experiences at a course level, including their aims before the course and how the course helped them achieve those aims. Overall, this report shows the benefits of the STEM Learning approach to online learning, and how these courses have been successful in improving teacher's professional development.

Programme Quality and Satisfaction

Overall, course quality and course satisfaction is consistently high across the board. Around **98% of participants rated the overall quality of the online CPD they had received as "good" or "very good"**, with 70% rating the quality as "very good".

Satisfaction remains high regardless of participant background, such as how many years teaching experience they have, and what phase or subject they teach. Around **94% or more of participants agreed that**:

- They would recommend the course.
- Their understanding of the course subject has improved.
- The course was well organised.
- The course was relevant.
- The course was a good use of time.

The majority of **participants agreed that their practice had improved** as a result of their engagement with the online CPD. Approximately 13% of participants responded "don't know" to this question suggesting that they haven't had the opportunity to put what they have learnt into practice and therefore observe improvements in practice before completing the post-course survey. This explanation is supported by data in the follow-up survey collected 6 months after completing the course; the majority of participants said that the area which had most improved for themselves across this period was their "professional practice".

> *"I feel I now naturally look for the links for careers learning and it seems to just happen within the lessons. The tasks I plan are incorporated better than being a stand alone part of a lesson"*
>
> - *Linking curriculum Learning to STEM Careers participant*

Programme Level Impact

Although each course has a number of different intended outcomes, all courses provide a similar experience. STEM Learning's online CPD courses aim to improve participants' teaching practice by:

- Expanding subject knowledge.
- Providing opportunities to share and reflect on teaching practice.
- Developing a range of teaching skills specific to STEM subjects.

For all courses, both the post-course and 6 month follow-up surveys ask participants to rate the impact of the course on four areas: their colleagues, their students, themselves and overall. In order to investigate how a participant's background affects the impact of the course, the data has been cut to show the impact ratings from specific groups of participants.

Programme Level Impact: Participant teaching experience

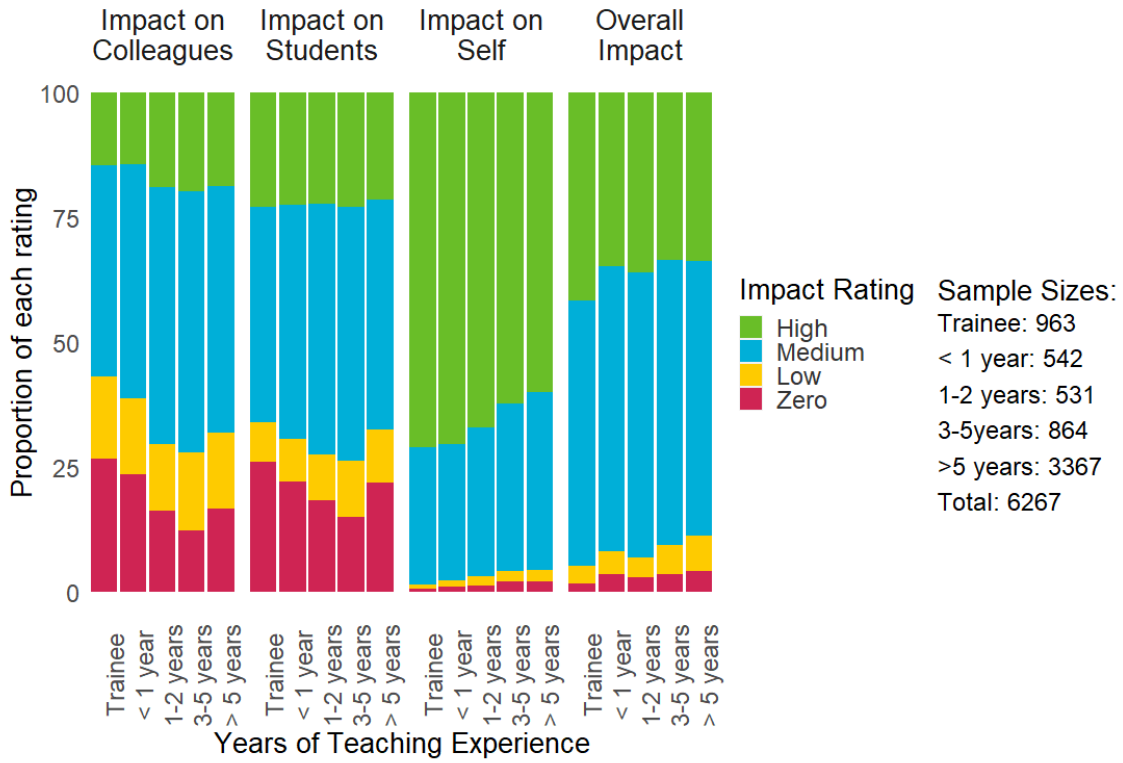


Figure 1: the level of programme impact, dependent on participant's years of teaching experience.

Participants with less teaching experience are more likely to rate the impact of the course on colleagues or students as zero or low, than participants with more teaching experience. For instance, 27% of trainees rated the impact of the course on colleagues as zero, whilst only 12% of participants with three to five years teaching experience gave a zero rating. This difference makes sense, as a newly qualified teacher, or a trainee, may have less opportunity to lead CPD with their colleagues, share learning more broadly or disseminate their teaching resources widely. In contrast, a teacher with more experience, who might be the head of a department or a subject lead, would be expected to mentor and support colleagues, perhaps leading CPD in their school or college, or wider. For example, when asked about impact on colleagues, a participant with five or more years teaching experience stated:

> *"Colleagues also have access to resources I have prepared and are using them with classes. Material can be shared with ease with substitute/cover staff so they can deliver full lessons."*
>
> - *Teaching for Home Learning: Secondary Science participant*

With regards to impact on students, trainee teachers might not currently be working in a school, or only be teaching over short periods of time, therefore won't be able to assess the impact on students.

Although by far the majority of participants rated the impact on themselves and overall as medium or high, there is a trend for the proportion of low and zero ratings to increase as participants' teaching experience increases. This is likely due to these participants having greater subject knowledge and better developed teaching practices, therefore gaining less from the specific type of courses which form the Online CPD programme.

Programme Level Impact: Participant Phase

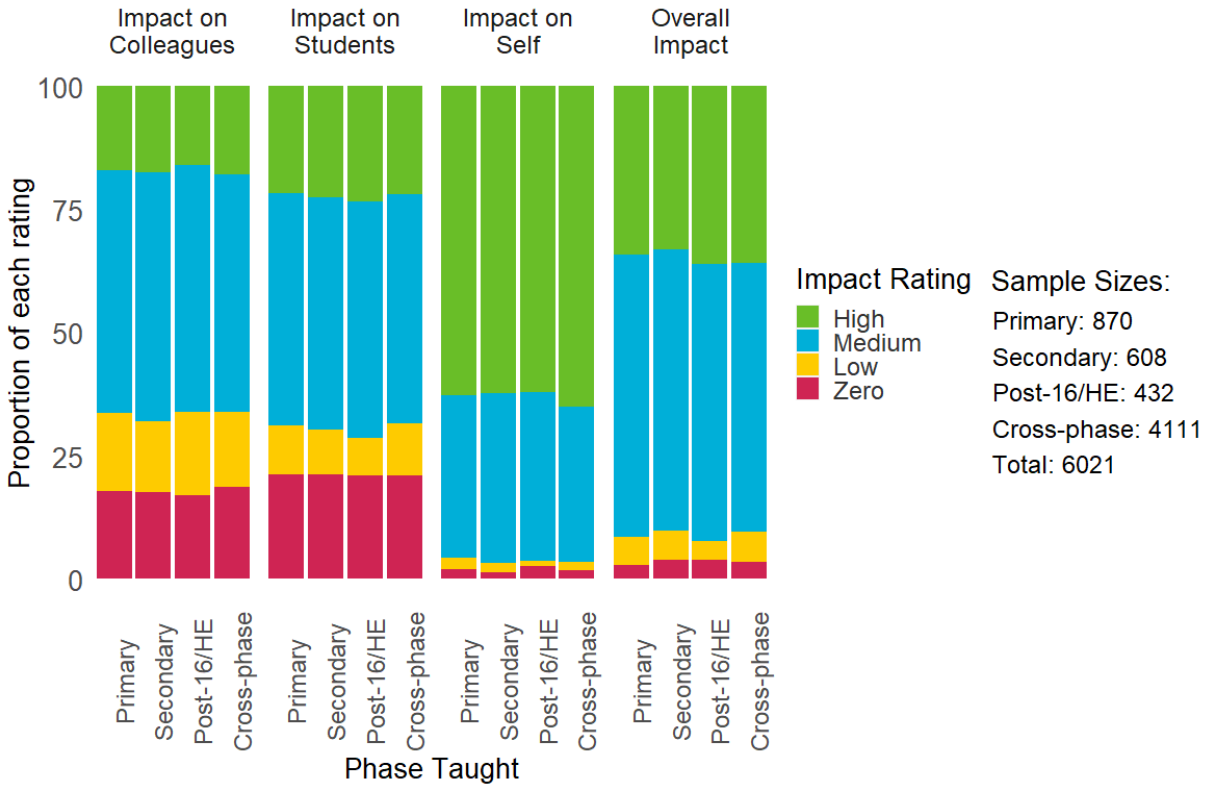


Figure 2: the level of programme impact, dependent on participant phase.

Within each of the four areas of impact, the impact ratings remain similar across the phases taught. As participants are likely to be completing courses which are targeted towards the phase they teach, these results suggest that all courses are at a similar standard, with each phase benefiting from impactful courses.

Participants rating the impact on self showed the largest proportion of medium and high responses, with an average of **96% of participants rating the impact of the course on themselves as medium or high**. An

average of **67% of participants rated the impact on colleagues as medium or high**; similarly, an average of **70% of participants rated the impact on students as medium or high**.

Programme Level Impact: Participant qualifications in science

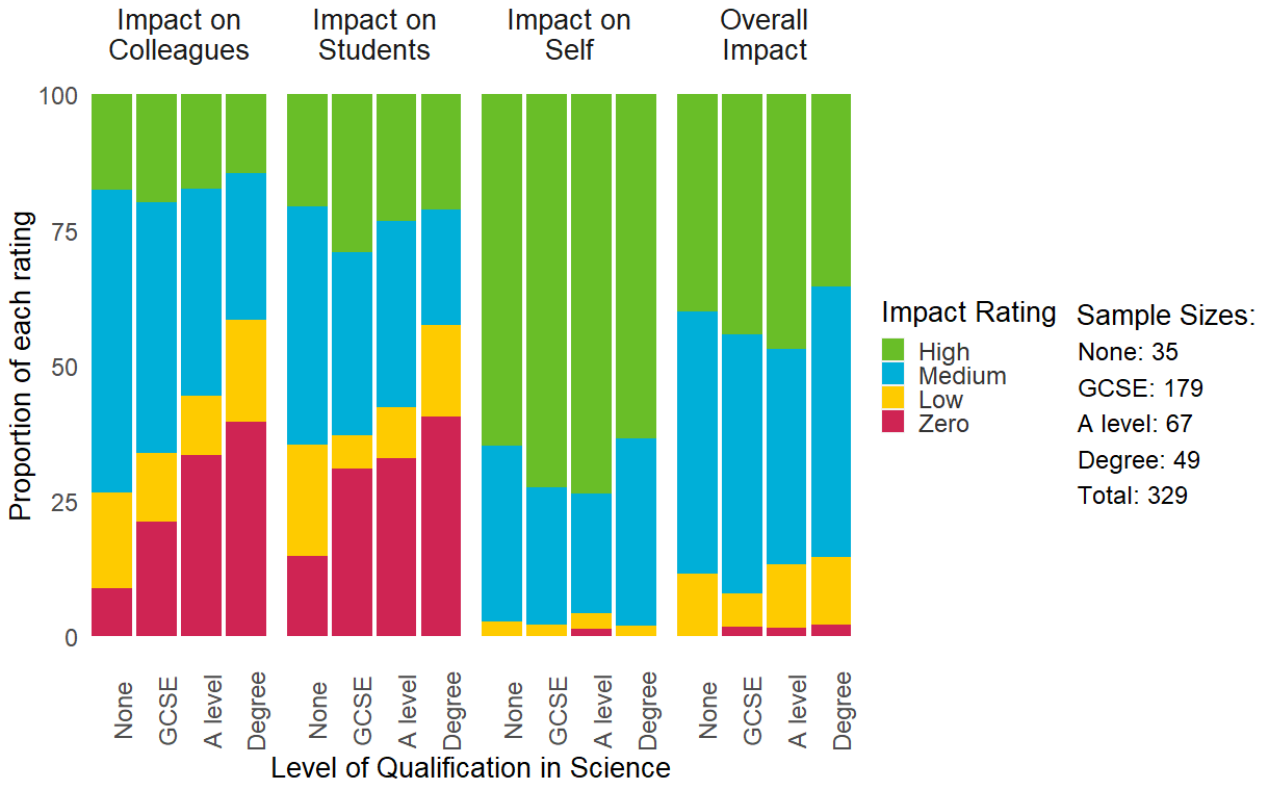


Figure 3: the level of programme impact, dependent on participant level of science qualification.

Participants with the lowest level of previous academic science qualification gain the most from the Online CPD courses, with **74% of participants with no science qualifications rating the impact on their colleagues as medium or high**, and **65% rating the impact on their students as medium or high**. This shows how the Online CPD programme meets an immediate need in developing both subject knowledge and the confidence of teachers who are teaching without a science/STEM background.

Overall, more than 65% of participants, regardless of qualifications in science, rated the **impact of the course on themselves as high**. Overall impact was also rated highly, with **over 90% of participants rating the overall impact as medium or high.**

When reflecting on how their practice has changed in the six months following CPD, one participant wrote:

> *"I have become more happy to divert away from the "normal" style of teaching science that was common in our school, and branch out, teaching subjects in a more exciting and inspiring way"*
>
> - *Teaching Primary Science: Exploring Space participant*

Due to the open access of our Online CPD programme, participants may opt to take courses that require subject knowledge that is either significantly higher, or lower, than their qualifications in the subject. This may lead to the slight trend in impact being greater for those who have qualification levels of GCSE or A level in STEM subjects.

Programme Level Impact: Participants teaching within or outside their specialism

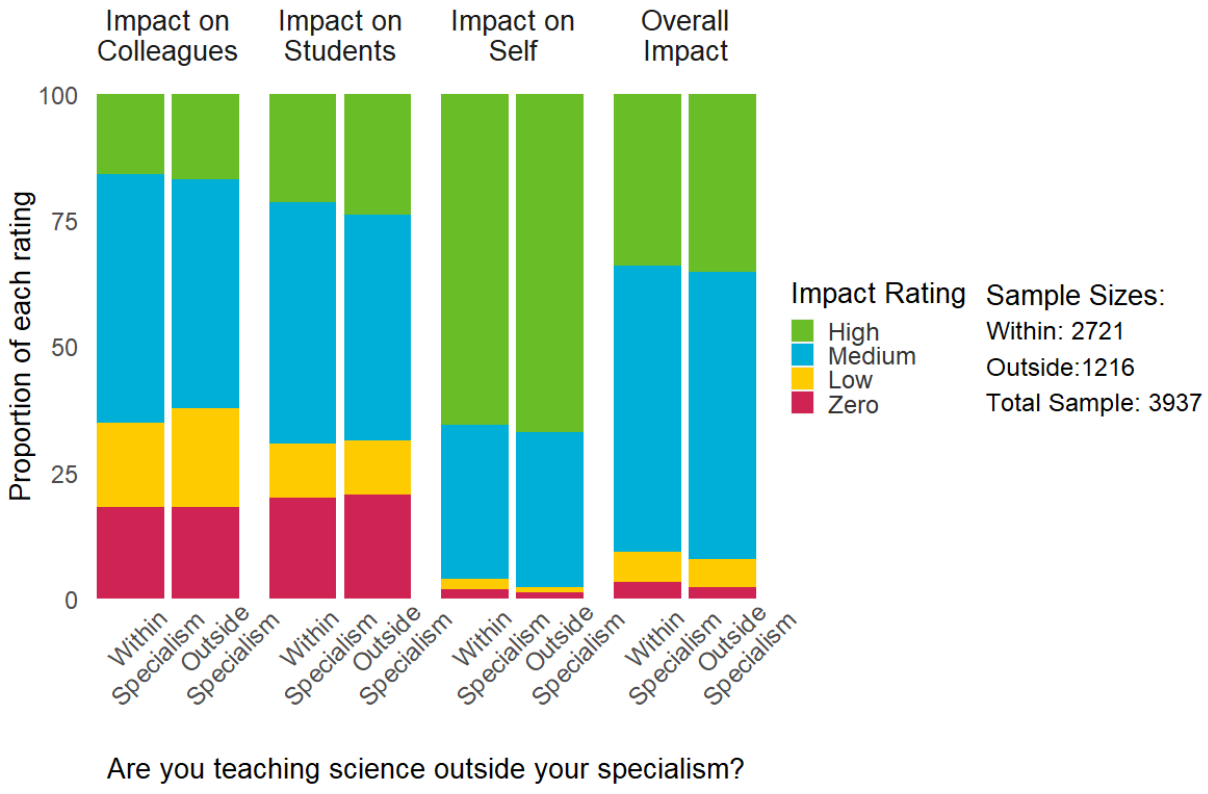


Figure 4: the level of programme impact, dependent on whether participant teaches within or outside their specialism.

One of the distinctive approaches for STEM Learning Online CPD is the flexibility for participants to engage with parts of the courses that meet their needs best. Also, the opportunity to communicate with other teachers from a range of backgrounds means that those who are specialists are able to pick up new ideas and are challenged in their approaches, as much as those who are non-specialists.

Within each of the four areas of impact, the proportions of each impact rating are similar regardless of whether or not the participant teaches within or outside their specialism. Whilst it might be expected that participants teaching outside their specialism would gain more from the courses as they are more in need of support; it could also be expected that those teaching within their specialism would be in a better position to understand the course material, and so gain more impact from the course. The similarity in impact ratings implies that the needs of the participant are always met, whether they teach within or outside their specialism.

It is worth noting that some courses are mainly aimed at teachers teaching outside their specialism, or teachers who lack science qualifications. For instance, it would be expected that courses which purely cover subject knowledge would mainly be engaged with by participants teaching outside their specialism, or who have received limited science education. Therefore, the similarity between the two groups could be as a result of participants successfully selecting courses aimed at them.

Programme Level Impact: Participants teaching science or non-science subjects

N.B. Non-science teachers comprises of participants who said that they taught any subject other than science, including maths, design & technology, and engineering.

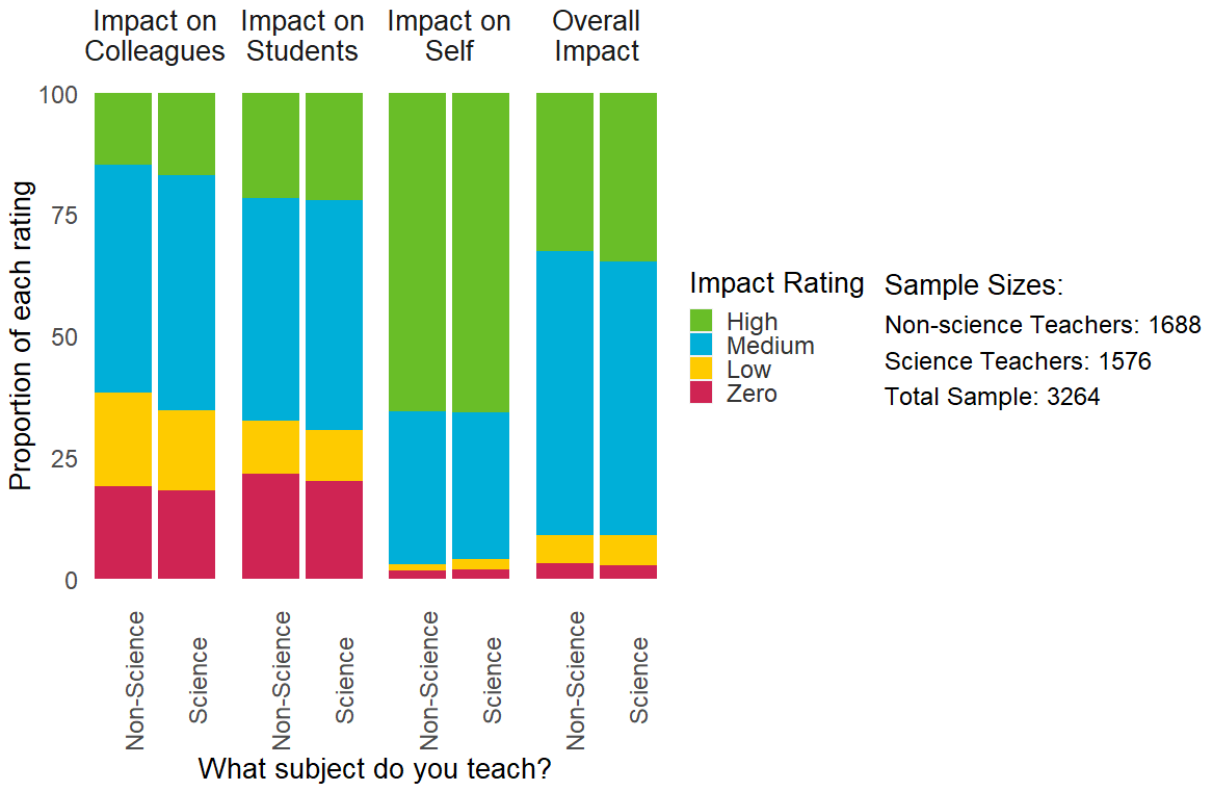


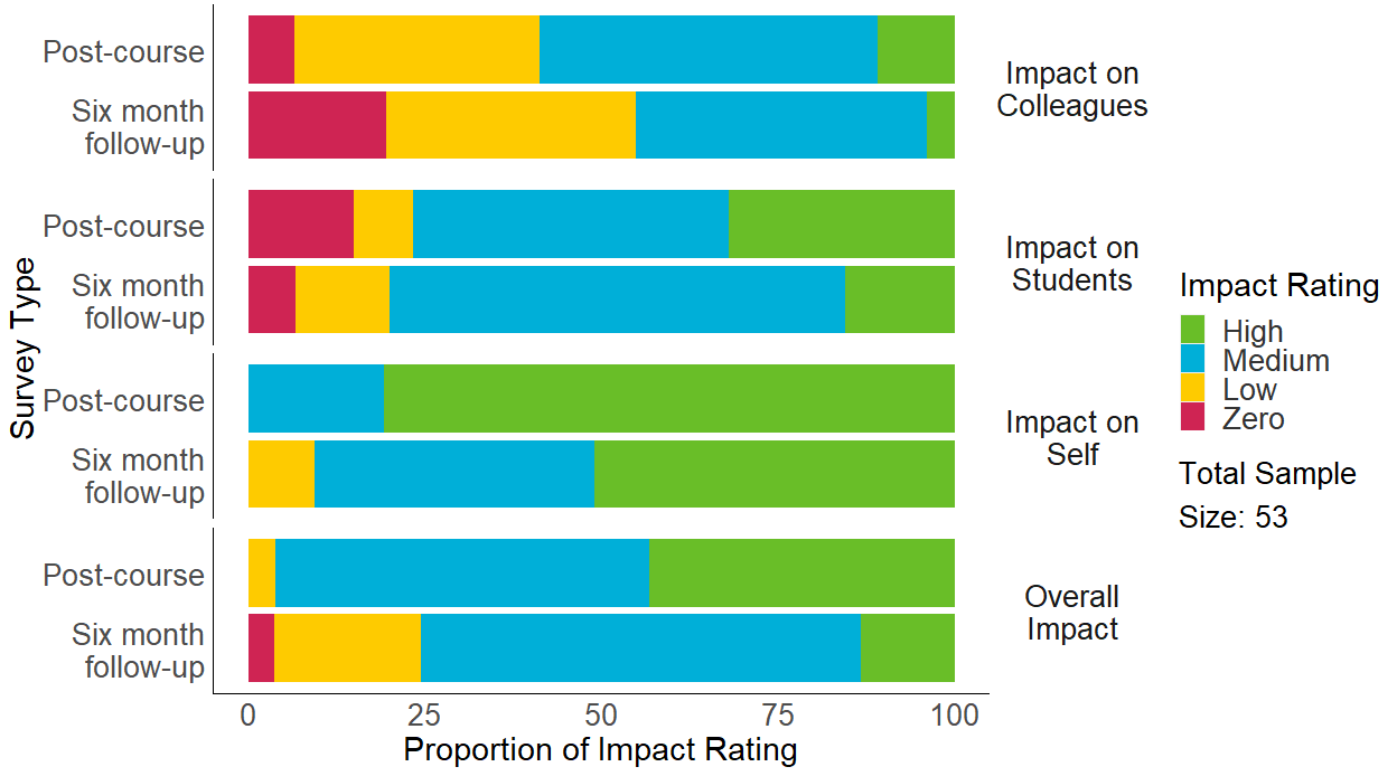
Figure 5: the level of programme impact, dependent on whether a participant teaches a non-science or a science subject.

Within each of the four areas of impact, the proportions of each impact rating are largely similar regardless of whether the participant teaches a non-science or a science subject. There is a slight trend for participants who teach science to give the courses higher impact ratings than those who do not. This overall similarity implies that the programme is able to support teachers from a range of STEM subjects and have an impact for participants in their own context. It's worth noting that some courses are suitable for both teachers of science and non-science subjects, while others are aimed specifically at science teachers. So, the similarity between the two groups could be because participants are successfully selecting the courses which are best suited to their needs.

Both groups of participants rated the impact on themselves highest, with **97% rating the impact on themselves as medium or high**, and 66% rating the impact on themselves as high. The majority of participants (69%) also rated the **impact on their students as medium or high**.

Programme Level Impact: immediately after the course and six months later

The impact ratings from the post-course survey and six month follow-up survey have been compared to give an insight into the immediate versus longer term impact of the courses. Responses from the post-course survey and six month follow-up survey have been matched ensuring we are only looking at responses from participants who completed both surveys.



N.B. The sample size is proportionally very small in comparison to the total number of online CPD participants

Figure 6: Comparing impact at a programme level between the post-course and six month follow-up surveys.

Across three areas, the impact of an Online CPD course is greatest immediately after the course. This is to be expected as participants have had the opportunity to embed new ideas and reflect on practice throughout the course.

For "impact on colleagues", the proportion of high and medium ratings decreased from 59% in the post-course survey to 45% in the six month follow-up survey. This shows that a significant proportion (45%) of participants have been able to sustain their impact on colleagues. However, whilst the impact on colleagues may have dropped in the six months following the course, this is likely due to participants being

unable to engage their colleagues throughout the Covid-19 pandemic, rather than being unable to engage them ever. For example:

> *"I hope to deliver a staff meeting to pass on information I have gathered through training - I have materials ready but this hasn't happened yet, partly due to covid restrictions and a shift in the school's focus as a result of the pandemic"*
>
> - *Teaching Primary Science: Getting Started participant.*

Between the post-course and six month follow-up surveys, "impact on students" saw an increase in the proportion of medium ratings, with **over three quarters of participants rating the impact on students as medium or high**. In the six month follow-up survey, participants were asked what had improved for their students as a result of the course; over 70% of participants said that the "motivation and engagement" of their students was what had improved most as a result of the Online CPD course.

Course Level Evaluation

Course level analysis showed that all Online CPD courses were rated highly in course satisfaction and overall quality, with an average of **98% of participants rating the overall quality as "good" or "very good"**. To get a deeper understanding of impact at a course level, three courses, each of which were aimed at teachers of a different phase, were explored further. Free text questions were analysed to highlight key words, which were then presented in the form of word clouds.

N.B. Word clouds display the most frequently used words in responses, the more common a word is, the larger the font it is displayed in. Responses were filtered to remove high frequency words such as 'and', 'the', 'of', 'a'.

Course Spotlight - Teaching Primary Science: Getting Started

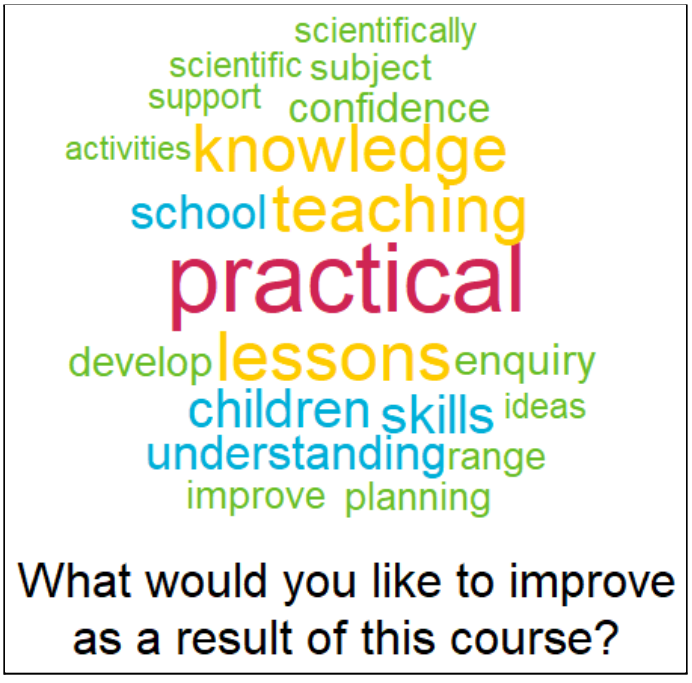
The “Teaching Primary Science: Getting Started” course is targeted at teachers of 5 to 11 year old pupils. It aims to improve participants’ confidence in teaching practical science within the confines of the primary classroom, by exploring engaging activities, showing them how to resource practical science lessons, and how to embed these lessons into their planning. The course also covers a range of related topics, including methods for developing pupils’ thinking and reasoning skills, as well as their ability to identify types of enquiry.

Nearly 800 participants completed the post-course self-audit, of which:

- 56% had five or more years teaching experience.
- 65% had GCSEs (or equivalent) in science.
- 41% teach key stage 2.
- 19% teach key stage 1.
- 33% teach both key stages.
- 8% teaching EYFS (Early Years Foundation Stage).

Prior to the course, participants are asked to identify areas they wish to improve as a result of their engagement. Word cloud 1 shows response to this question. The word “practical” was commonly used in participants’ answers, suggesting that **participants aimed to improve their confidence in delivering practical lessons**.

> *“[I want to] make the science lessons more practical and engaging, develop my understanding of how to resource a practical science lesson, develop children’s thinking skills, feel confident in teaching science”*

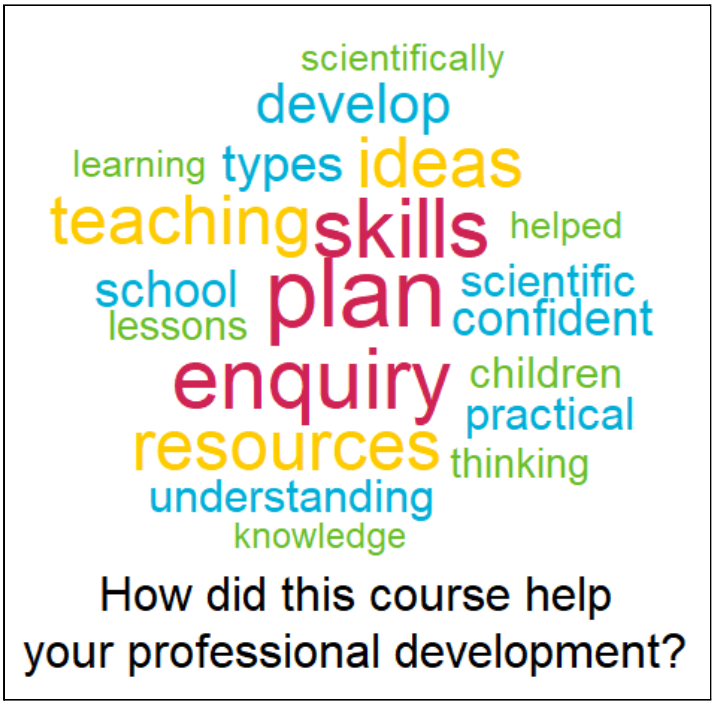


The next most frequently used word is “knowledge”, this implies that **participants wanted to improve their science subject and pedagogical knowledge** as a result of taking this course. The other most commonly used words were, “lessons,” and “teaching”; this is unsurprising as aims to improve lesson quality or develop teaching practice would likely underpin other aims participants have.

After the course, participants showed increases in their knowledge and skills. Word cloud 2 shows that one of the most frequently used words was “plan”, likely referring to **planning of future science lessons**

and promoting the planning of practical investigations by students and teachers together. The word "enquiry" is also commonly used, showing that **many participants felt that the course had well prepared them to teach pupils about different types of enquiry**, another one of the course's aims.

"I feel better equipped to plan for different types of enquiry"



The word "resources" is also among the most frequently used words; many **participants praise the high quality resources** they have been provided with during this course.

"The course has given me so many ideas and resources to really focus on the scientific skills the children need to experience and to develop"

"[I now have] useful resources for a broad range of practical science skills and opportunities"

Participant Journey

As part of this analysis, the journey one participant followed was examined. This participant has taught at key stage 2 for more than three years, and **before the course they did not feel that they were engaging the class in practical science regularly enough, and they did not feel confident in managing pupils' behaviour during practical lessons**. When asked before starting the course, what they would like to improve as a result of it, they said:

"[I would like to improve] my confidence in knowing how to resource science lessons and how to build in different types of enquiry. I would also like to know how to quickly plan for science, as I find it hard to make science [lessons] practical every week".

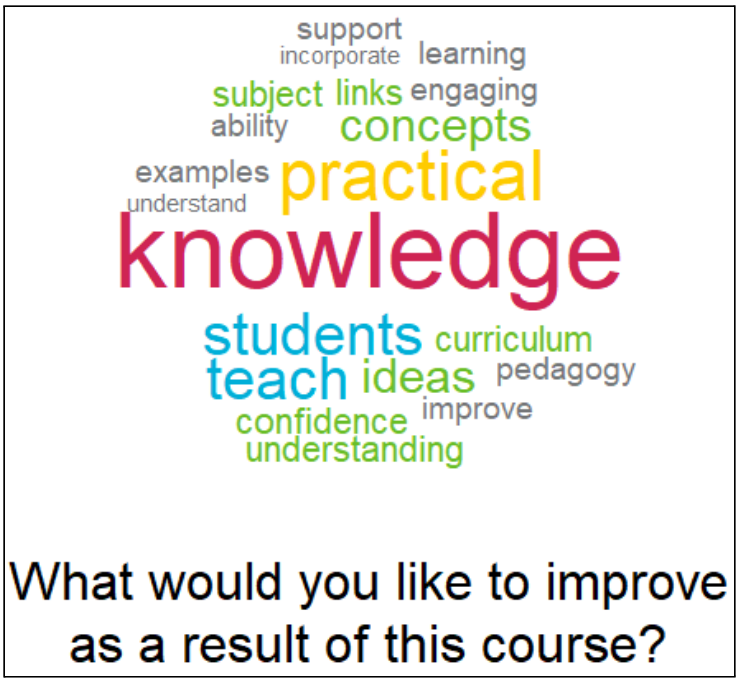
After the course, the participant felt **they had made great improvements in their practice**, as the course has "addressed the gaps … in [their] pedagogical knowledge". In addition, their **confidence in teaching science lessons will have improved** due to their "much better understanding of how to teach scientific skills and how to make the learning child-led". Having a "much better bank of resources" and learning about "post-it planning" investigations with pupils has helped them develop their ability to quickly plan science lessons.

Course Spotlight - Teaching Biology: Inspiring Students with Plant Science

The "Teaching Biology: Inspiring Students with Plant Science" course is aimed at Biology teachers of 11 to 16 year old pupils. The course was developed as a collaboration between STEM Learning and Science and Plants for Schools (SAPS). It specifically aims to improve the participant's knowledge of plant science so that they can address student's misconceptions and use plants to teach a variety of biological principles across a range of contexts. Participants should also be able to deliver more engaging practical Biology lessons after taking this course.

Over 200 participants completed the post-course self-audit, of which:

- 47% had five or more years teaching experience
- 86% worked across both key stages 3 and 4



Before taking the course, participants were asked what they wanted to improve upon; as one of the key course outcomes is to **improve subject knowledge surrounding plant science**, it's unsurprising that the most common word used in answers was "knowledge", as is shown in word cloud 3.

"[I want to improve my] knowledge of plant biology and [learn] how it can be used to support key concepts"

Another prevalent word in answers was "practical", implying that **participants wanted to gain ideas on how to plan and deliver practical sessions** which cover concepts within plant biology.

Following on from the course, participants had a range of positive comments on how the course had helped them improve their professional development. Word cloud 4 shows that one of the most frequently used words was "ideas", which suggests that **many participants gained new ideas for teaching plant biology as well as how to incorporate it into other biological contexts**, two key aims of the course.

"[The course gave me] great ideas and confidence to lead a topic using plant examples as opposed to animal examples. Great ready to use resources too."

The word "practical" is also commonly used in answers, suggesting that **many participants felt that the course had provided them with suggestions of practicals to engage students in plant biology**.

Participant Journey

As part of this analysis, the journey one participant followed through the course was examined. This participant is a trainee teacher and has had some experience teaching across key stages 3, 4 and 5. Whilst this participant felt confident in their own knowledge of plant science before taking the course, they did not feel confident in using plants to teach other biological principles. They said that the main development objectives for their engagement in the course were, "[improved] confidence in plant biology and … some new practical ideas to incorporate into [their] lessons"

After the course, the participant felt they had been provided with "lots of practical ideas … which can easily be added to [their] classroom practice". They said **they now felt comfortable in using plants to teach other biological principles**, supported by them being "introduced to the great wealth of resources available on [the] SAPs website and stem.org.uk". They also felt that **they better understood "common misconceptions that students face"** and that **the course had improved their ability to "plan activities and questions to interest students [in plant biology"]**.

Course Spotlight - Planning for Learning: Formative Assessment

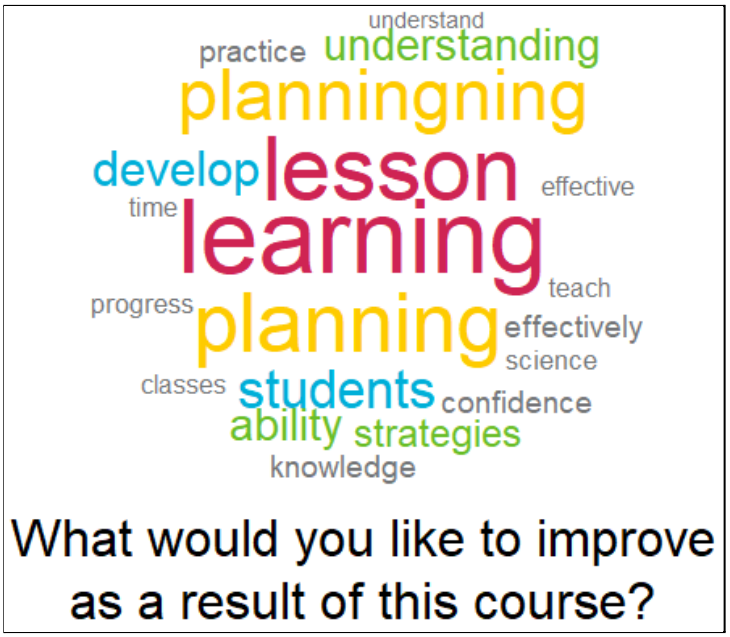
The “Planning for Learning: Formative Assessment” course is suitable for educators working in primary, secondary or further education. The course aims to develop participants teaching practices so that they can clarify pupils’ learning goals so that ultimately their pupils’ understanding is progressed both in and between lessons. The course also aims to improve participants’ medium-term planning skills, and help them factor in the capability levels of different pupils.

Over 500 participants completed the post-course self-audit, of which:

- 38% had five or more years of teaching experience
- 37% were trainee teachers
- 65% teach across multiple phases
- 11% teach only at secondary
- 15% teach only at primary

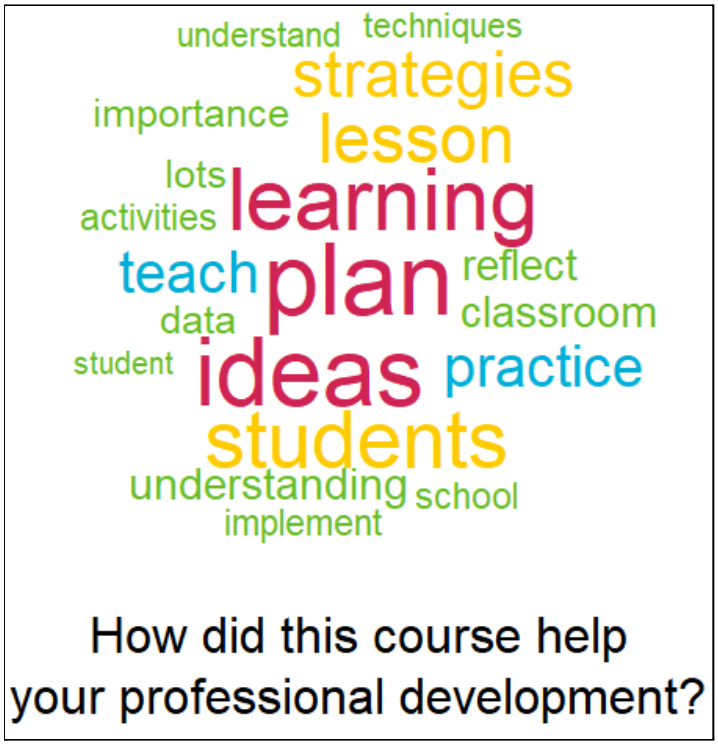
In the pre-course survey, participants were asked what they wanted to improve upon as a result of taking the course; word cloud 5 shows some of the most frequently used words in answers. As developing planning skills is one of the course’s key aims, it’s unsurprising that “planning” was the most common word in answers. The words “learning” and “lessons” were also among the most prevalent words in answers, implying that **participants want to enhance pupils’ learning, and deliver more engaging lessons**.

> *“I would like to develop a toolkit of strategies for planning for learning and assessing learning in lessons. I would like to develop an understanding of how to apply … my assessment of students’ learning to future lessons in order to ensure they are always building upon their knowledge and skills”*



After the course, participants were asked how the course had helped them improve their professional development; word cloud 6 shows some of the words used most frequently in responses. The word “ideas” was one of the most common words in responses, suggesting that **participants gained new ideas for carrying out assessment.** “Learning” was another frequently used word, implying **participants better understood how to assess learning, as well as enhance it during lessons**.

"[The course] gave me some great practical ideas in how to assess learning is taking place. I also gained further elements of how collaborative learning can be further incorporated within the classroom"



The word "plan" was used frequently in responses as well, suggesting that **the course has been successful in helping participants improve their planning skills, both in planning for assessment as well as lesson planning based on students' needs**.

"My confidence in planning for lessons to meet the needs of my students has improved"

Participant Journey

As part of this analysis, the journey of one participant through the course has been followed. This participant is a trainee teacher and has been teaching at a primary level across both key stages 1 and 2. When asked what they wanted to improve as a result of the course they said, "I would like to develop my understanding of what strategies for formative assessment are good to use, and how best to integrate them into my lessons so that I can more effectively help the children learn".

After the course, **the participant had been provided with a variety of "practical ideas and tips as to how to plan strategies for formative assessment into lessons"**. Whilst the participant said they already knew "the importance of using formative assessment" before the course, they agreed that **their "understanding of how the theory links to practice" had been deepened as a result of the course**. The participant felt hopeful that the new strategies they had learnt would help "develop students' understanding", and they were "keen to try out some of these [new] ideas in the classroom".

Summary

This report shows the quality and impact of STEM Learning's Online CPD Programme. Overall, this feedback shows that:

- **Across the programme course quality is rated highly**: 98% of participants rated the overall quality of the course as "good" or "very good".
- **Participants rate the impact of the course on themselves highly**: 91% of participants rated the impact on themselves as "medium" or "high" immediately after the courses. These high levels of impact are sustained 6 months after the course, with 76% of participants rating the impact on themselves as "medium" or "high" in the 6 month follow-up survey.
- **Participant background affects the amount of impact on students and colleagues**: Whilst all participants showed impact on students and colleagues, those with more teaching experience rate the impact of the course on their colleagues and students more highly than participants with less teaching experience. Similarly, those with less academic science background rate the impact on students and colleagues as higher than those with more advanced science qualifications.
- **Teaching focus does not affect the impact participants gain from the CPD**: Regardless of phase taught, subject specialism or whether the participant was teaching within their specialism, all participants found the courses to be impactful on themselves (>95% medium or high), their students (>70%) and their colleagues (>70%).
- **Impact on students increases in the six months post course**: 80% of participants rate the impact on their students as "medium" or "high" six months after the course, an 11% point increase on the 69% of participants who rated the impact on their students as "medium" or "high" immediately post course. This increase shows that six months after completing the course, participants have had an opportunity to embed their learning into their teaching practice and continue to see an impact on their students.