

Research into the Institute of Physics' Early Career Professional Learning Programme

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January 2023

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Acknowledgements

We are grateful to the Gatsby Charitable Foundation for funding this study, to Jenni French at Gatsby and colleagues at the IOP for their support, and to the participants and mentors of the Early Career Professional Learning Programme who gave up their time to participate.

Introduction

An important element of the Institute of Physics' (IOP) education strategy is to support teachers of physics through continuing professional development. As part of this offer, the Early Career Professional Learning Programme was established in 2019, funded by Gatsby, to support teachers of physics in the early years of their careers in secondary schools in England.

The IOP's Early Career Professional Learning Programme included the following opportunities:

- videos, webinars and other information-sharing and guidance sessions, designed and led by experts in physics education from universities, schools and other contexts;
- discussion groups with peers, led by experienced IOP mentors;
- Individualised coaching and mentoring from experienced IOP mentors.

Sheffield Hallam University was commissioned by the Gatsby Foundation to carry out a small-scale research study into the IOP's Early Career Professional Learning Programme. The aim was to gather evidence of the programme's impact, exploring factors including:

- how teachers choose and benefit from different levels of support within the programme;
- the nature and outcomes of subject-focussed mentoring and coaching conversations;
- the value of learning as a network of peers;
- the ways in which this subject-specific professional development complements the Department for Education's Early Career Framework programme (Department for Education, 2022).

The IOP's programme is set in the context of two key influences on teachers' practice and professional development. Firstly, the Department for Education's Early Career Framework (Department for Education 2022) was piloted in selected regions of England in 2020-2021 and rolled out nationally the following year. The Early Career Framework includes a professional development programme with the support of an in-school mentor for teachers in the first two years of their careers. Meanwhile, the COVID-19 pandemic brought about a period of unprecedented challenges period for teachers, especially those at the start of their careers, with restrictions in social contact leading to rapid shifts to online teaching and learning and, for many teachers, increases in workload, stress and anxiety (Kim and Asbury, 2020; Achtaidou et al., 2022). As a result of the pandemic, teachers joining the IOP's Early Career Professional Learning Programme were unlikely to have experienced 'normal' classroom teaching during their initial teacher education courses and may have lacked opportunities to develop their use of pedagogies such as practical work (la Velle et al., 2020; Chadwick and McLoughlin, 2021).

This study took place over two years (2020-2022), involving surveys and interviews with programme participants and IOP mentors (Annexes A and B). Twenty-four participants completed a survey in the first year of the programme and eleven were interviewed. In the second year of the programme, twenty-six participants completed a survey and eight were interviewed. Of these, some had been involved with the programme in year 1; others had joined the programme in year 2. Six programme mentors were interviewed in the first year and four in the second year.

In this report we summarise the findings of the study, then offer recommendations arising from the findings for policy makers, school leaders and professional development providers. Annexes A and B contain details of the first and second years of the study, including methods of data collection and analysis, findings, conclusions and recommendations.

Findings

The IOP's Early Career Professional Learning Programme provided valuable support for participants' professional learning at the beginning of their careers. The programme offered opportunities for teachers to learn about and develop their practice in a subject-specific context, through a variety of modes of support including videos, group discussions and individual mentoring. Each mode of support was experienced positively, although levels of engagement varied between participants.

The programme's areas of strength included:

- a focus on subject as the context for learning;
- the provision of video content which could be engaged with flexibly;
- the opportunity to gain support from and share experiences with peers;
- the provision of support external to the school environment;
- the expertise, flexibility and experience of the mentors.

Annexes A and B provide further details of these areas of strength. Here, we highlight some aspects of the programme which appeared to be particularly important.

Firstly, the subject-specific nature of the programme was an essential driver of engagement for all participants, and the programme offered valuable content to support teachers in learning about physics and how to teach it. The programme's subject focus complemented other professional development activities, especially for those participants who were lacking opportunities for subject-specific support in their schools.

Secondly, IOP's mentors played a vital role in the programme. Their experience and expertise were essential to participants' positive experiences. They provided flexible, responsive opportunities for learning, giving practical advice in relation to the teaching of physics, classroom practice more generally and, as we discuss next, wider professional issues such as career development. The provision of support outside school, separated from line management and appraisal processes, was important in enabling participants to share concerns about their practice.

Additionally, the programme provided support for participants in more general aspects of their careers. The opportunities to share concerns with peers and, particularly, with the IOP mentors, enabled participants identify ways to pursue their careers that went beyond the teaching of physics. For some, this provided a 'lifeline' which may have kept them in teaching. The importance of this non-subject specific role may not have been fully anticipated by the IOP, the mentors or indeed the participants, but the value which was placed on it demonstrates the strength of the mentors' expertise in being able to adapt to provide this support. Importantly, it indicates that there is a gap, for some teachers, in the availability of this kind of mentoring support in their schools. This reinforces findings from other studies identifying the value of external mentoring (for example, Hobson et al., 2012).

Naturally, there were areas of the programme which could have been improved. The flexibility inherent in the IOP mentors' approaches meant that participants' experiences of mentor support varied across the programme, with some being offered more opportunities for individualised support, flexible participation and subject content than others. In response to the COVID-19 pandemic, the IOP moved the programme to a fully online mode of delivery. From the participants' perspective, this did not appear to hinder engagement. However, the mentors more mixed views about this, identifying the lack of opportunities

for building local peer-support networks among the participants, and for hands-on learning about practical work.

For some participants, ongoing, long-term engagement in the programme was challenging, especially as they moved into their second year of teaching. This was caused by a need to prioritise other aspects of practice, to balance professional and personal commitments, and by the requirements of other in-school activity such as participation in the Early Career Framework professional development programme. Although it was not possible in this study to determine the direct impact of COVID-19 on engagement in the IOP's programme, our findings support others in suggesting that some participants may have felt the impact of increases in workload, stress and anxiety (Kim and Asbury, 2020; Acharidou et al., 2022) which limited their ability to participate.

Overall, the IOP's Early Career Professional Learning Programme offered flexible opportunities for teachers to address their professional learning needs, building on positive relationships with mentors and other participants. For all the teachers in this study, the programme enabled them to develop their knowledge and understanding of physics pedagogies and helped them to learn about other aspects of the IOP's support, which will be useful in their continuing careers. For many teachers, the programme provided, through their relationships with mentors and peers, essential emotional and career support, situated outside their schools. For a few teachers, the combination of subject and generic support played what appeared to be a vital role in keeping them in their careers.

Recommendations

To end, we offer some recommendations for school leaders, professional development providers and policy makers involved in the design and delivery of professional learning for teachers in the early stages of their careers:

- Opportunities for subject-specific professional learning should be offered to all teachers in the early stages of their careers, particularly focussing on subject knowledge and pedagogies.
- Online activities, such as short videos, can be engaged with flexibly, providing routes to independent professional learning which can work particularly well in the context of subject-specific support. Professional development providers should consider whether non-subject specific professional learning activities can be complemented by subject-focussed activities, such as videos.
- Mentoring and opportunities for discussion with peers, outside the immediate school context, provide valuable sources of support for early career teachers. Policy makers and school leaders should consider how to offer this support, which is external to in-school processes of line management and appraisal.

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Annex A. Year 1 Report

1. Introduction

A key element of the Institute of Physics' (IOP) education strategy is to support teachers of physics through professional development. As part of this, the Early Career Professional Learning Programme is intended to support teachers of physics in the early years of their careers, complementing the Department for Education's Early Career Framework. The programme includes:

- videos, webinars and other information-sharing and guidance sessions, designed and led by experts in physics education from universities, schools and other contexts;
- discussion groups with peers, led by experienced IOP coaches;
- individualised coaching and mentoring from experienced IOP coaches.

In 2020, Sheffield Hallam University was commissioned by the Gatsby Foundation to carry out a small-scale study into the IOP's Early Career Professional Learning Programme over two years. The aim of the study is to gather evidence of the programme's impact, exploring factors relating to the impact of the programme such as:

- how teachers choose and benefit from different levels of support within the programme;
- the value of learning as a network of peers;
- the nature and outcomes of subject-focussed mentoring and coaching conversations;
- the ways in which this subject-specific professional development complements the Early Career Framework.

In this report we summarise findings from the first year of the study. This report includes a description of our approach to data collection and analysis, key findings, a plan for the second year of the study and recommendations for to the IOP's Early Career Professional Learning Programme.

2. Approach

2.1 Data collection and analysis

Data was collected through the following methods:

- a survey of teachers participating in the Early Career Professional Learning Programme;
- individual interviews with teachers participating in the Early Career Professional Learning Programme;
- individual interviews with IOP mentors responsible for the delivery of the Early Career Professional Learning Programme.

Teachers were recruited through an email invitation sent from the IOP to all participants in the programme, which invited them to complete the survey and volunteer for a follow-up interview. Mentors were recruited via an email invitation from the IOP. We used opportunistic sampling to interview a sample of 11 teachers and six mentors (Table 1). Since participants volunteered to take part in data collection, they may not represent the full range of perceptions of the programme; those with more negative views may have chosen to not volunteer.

Data collection	Survey completion	Volunteers for interview	Interviews carried out
Teachers	24	13	11
Mentors	n/a	8	6

Table 1. Data collection participants

Survey questions (Appendix 1) focussed on participants’ experiences of and engagement with the programme. Interviews, conducted by a researcher from Sheffield Hallam University, followed a semi-structured set of interview questions, allowing for probes and further investigation where appropriate. Interviews were carried out through telephone calls and online meetings. With permission, they were recorded, and then transcribed.

In this report, we offer an overview of the data, aiming to give a ‘flavour’ of responses and to draw out how the programme has worked for those involved, perceptions of any areas of success and where improvement might be needed moving forward. Depending on findings from the second year of the study, and via discussion with Gatsby and IOP, we may return to this data for further analysis.

2.2 Ethics and data protection

The study followed Sheffield Hallam University’s ethical research¹ and data protection² protocols, ensuring data was handled securely and sensitively with appropriate consent procedures, including anonymity in reporting. A project-specific participant information sheet and privacy notice (Appendix 1 and 2) and online consent forms³ were used for all data collection. In line with ethical and consent procedures, data has been anonymised for reporting.

3. Findings

In this section we give an overview of the findings from analysis of the data, starting with the survey and then moving on to interviews with teachers and mentors. As mentioned above, at this stage our intention is to offer an overview of emerging themes from the data, which form the basis of the recommendations provided in the next section and our proposed plans for the second year of the study.

3.1 Survey responses

A full set of survey responses can be found in Appendix 3.

A total of 24 teachers completed the survey, with respondents having followed different routes into teaching and differing levels of qualifications in physics. Ten had been part of a SCITT route into teaching, with eight on university-based PGCE courses, three on schools-based PGCEs and three on other routes.

In terms of physics qualifications three had postgraduate degrees, 11 undergraduate degrees, three had taken a physics SKE course and another three teachers had A levels in physics. Three respondents were the only physics teachers in their school. Seventeen teachers had between one and three other physics

¹ [Sheffield Hallam University Ethics and integrity](#)

² [Sheffield Hallam University Privacy Notice for Research Participants](#)

³ [Participant consent form](#)

colleagues, three teachers had between four and six, with one respondent having more than six fellow physics teachers in their school. All were teaching Key Stage 4 physics, with nine teaching at A level. Many teachers noted that they were teaching chemistry and biology at Key Stage 3 or 4.

Respondents were asked a series of questions around confidence in relation to their physics teaching. While high levels of confidence (i.e. responding with very confident or quite confident) were felt in the areas of their own subject knowledge, assessing physics knowledge, using models and analogies, using ICT/digital technologies, adapting teaching/the curriculum/assessment as a result of Covid-19 and teaching mathematics in physics, teachers were less confident in areas involving identifying and addressing misconceptions, curriculum design e.g. sequencing lessons appropriately, developing pupils' literacy and setting up/demonstrating experiments. Teachers were least confident in supporting pupils with special educational needs or disabilities, those whose first language is not English, managing students' practical work and managing pupil behaviour.

A significant number of participants have been or still are part of other support programmes. Nine survey respondents were IOP scholars, and most respondents (18) reported that they were taking part in the Early Career Framework.

Moving on to the activities provided by the IOP's programme, all respondents had attended the group mentoring sessions, with 12 also taking part in one-to-one sessions, although the number of sessions varied across the group of respondents

A majority (22) had watched the online videos, which were perceived as being very useful, with all 22 teachers saying that they would continue to watch these. Group mentoring sessions were perceived as being either extremely or very useful by 21 respondents with physics-specific pedagogical information/discussion and peer support and discussions seen as the most useful elements. All respondents stated that they intended to keep attending these sessions.

The majority (11 out of 12) of those who had taken part in one-to-one mentoring sessions found to be either or very useful, with examples of learning including how to give instructions and explanations, how to address pupil difficulties in understanding physics and how to carry out practical activities. Several respondents said that they intend to continue attending these sessions; where teachers stated that going to future one-to-ones was a "maybe" (5 out of 12) this was likely to be due to a lack of time.

The final parts of the survey asked participants to suggest areas of practice which could be covered in future learning activities. A full set of responses is provided in Appendix 3; summarising here the suggestions include a mixture of physics-specific concerns (practical work and assessment practicals, subject knowledge), more general pedagogical approaches (assessment for learning, using ICT, curriculum design, questioning, differentiation) and wider issues relating to teachers' careers (organisation).

3.2 Teacher interviews

Eleven teachers, sampled from survey respondents, were interviewed about their involvement in the IOP's Early Career Professional Learning Programme. The interviewees were at differing stages of the programme, with some having engaged in several sessions and also participating in one-to-one sessions, while others had not yet started on the one-to-one stage. Just one of the teachers interviewed had not trained as a physics teacher.

Participants had learned about the IOP programme via their school or peers, with some being members of the IOP or attending events and hearing about it more directly; all had voluntarily engaged with the programme.

Very few teachers identified any significant barriers to taking part. While the main barrier identified by participants being time, it was noted that twilight sessions were easier to attend, but sometimes getting home from school to take part in online sessions could be a challenge.

'[it] ...can still be really tricky if we're making sure that we've got all of the lessons planned for the days and weeks and stuff... if you can't find the time to do it then it becomes a bit of a struggle to try and meet it and then it becomes an extra stress on top of everything else.'

'I think the main thing is obviously the NQT year is quite busy ... more recently they seem to organise them on evenings that I am able to attend it was just initially it took a little bit of time to get my evening sorted out.'

For a few of the teachers, taking part in the programme had a huge impact on their life and career. As will be discussed later the level of support provided by the mentors in some cases went far beyond what was perhaps intended and had a very positive outcome.

'I think without this programme, the IOP programme, I would have left the profession months ago and they helped me find another school and go on and believe in this. I have to prove this out. It's important for me. Without them I wouldn't be able to survive in this profession I'm quite sure about it.'

Resources and content

As mentioned in the previous section, feedback on the programme's video content was very positive, with teachers saying that they were the right length and covered useful issues and areas and were of immediate use. The direct links to practice were explicitly picked out as a useful part of the programme.

'I found them really useful I think they're quite good at giving an example of how they can be used like the techniques and things they're suggesting.'

'I like them because they're kind of like although I've watched 9 they're only about 10/15 minutes long each and that's actually really good because you can kind of watch them in your coffee break.'

'They usually cover the very problematic grey areas. I just realised I cannot answer into a Year 11 class assuming they know how to rearrange an equation. However tragic this sounds. Then there is a description I tried at least 3 times to explain that and I watched the video and realised how I should explain it.'

The way in which the videos were focussed was also well received, with common issues related directly to the teaching of physics. The specific linking of maths and physics was mentioned several times, as well as topics such as language, cognitive load and inclusion.

'They're all valuable they're really good and they're not too long and they're on YouTube so you can go back to them as well, if you watch one and you think oh what was that they said you can just go back to it, they're really good... The ones that I particularly liked were when we were looking at using maths in physics and using language in physics and that was something I immediately put into effect.'

'They've made it really targeted towards physics and science education ... the latest one was on cognitive load and obviously you do that continuously throughout teacher training now but they helped you really be able to relate it to the physics side of it.'

'They're normally quite specific about things that you can then take away and put into your lesson so for example the one about the science capital one a lot of kids don't realise that a lot of things they do in their daily life involves a lot of science so if you pick examples specific to things that they are genuinely interested in then it can improve engagement ... So I can just pick that up and directly put that into our lessons.'

'The maths and physics ones I thought were really good and there were things that I just hadn't really thought of before.'

'The recent one we did on the inclusion in science isn't something I've particularly given a great deal of thought about but they had some really good suggestions of maybe scientists that we don't normally include when we give examples of famous scientists, so it's definitely fed into my teaching.'

One teacher noted that the session on maths and physics had inspired them to talk to the maths department in their school:

'It caused us to go away and have those conversations within our own maths departments which is probably a useful thing.'

Fit with other available support

We learned from the survey that a majority of participants were engaged in other supportive activity, including the Early Career Framework. Interviewees were therefore asked how the IOP's programme fitted with other support available to them. Several mentioned that their in-school mentor was not a physicist and that, as a result, the additional support from the IOP programme was very helpful. Others noted that the programme fitted well with the ongoing support from within their school, and was seen as complementary, flexible and very responsive to needs.

'[The IOP programme] fits in quite nicely. Also the IOP support is pretty flexible so if you say I dropped in and asked a question about convex lens practicals and actually doing it in the classroom focussing on objects forming images and people are able to give me some practical, this is how I did it, and this is what I did.'

'I think it complements in the sense that they will deal with anything you ask them to deal with.'

'I much prefer the IOP thing to that [the Early Career Framework]. I just feel like it's more personable and specific and I just prefer it a lot more than that to be honest.'

Teachers also noted that getting support and advice from outside the immediate school environment was very useful.

'I think it's been nice to get some support from outside of school because sometimes it's good to just be able to ask questions within maybe a neutral environment, sometimes I have questions and I don't want to criticise that's not what I want to do but I just genuinely have a question sometimes I think within the school environment sometimes that can be interpreted as a criticism when it's not its just quite good to have something outside of school and be able to ask experienced teachers their advice.'

It was noted that much of the support available in or out of school can be quite general because it is intended for teachers from across a range of subject disciplines. For this programme, therefore, the physics focus was thought to be very valuable.

'IOP is the one where you can really focus down on your subject so that's where it really compliments everything else... it's not just subject knowledge it's doing the teaching and learning but with that focus on physics so it's the classroom techniques but with the physics focus which is absolutely brilliant.'

'Absolutely fantastic I think IOP is very dedicated to helping early career teachers and I think that is brilliant because physics in some ways is a bit of a Cinderella subject and people shy away from it.'

It was mentioned that it was useful to bring the in-school and IOP programmes together, as is encouraged by IOP mentors, so that the two do not stand apart from each other.

'I like just bring it into our meetings [with in-school mentor] rather than it being like a separate thing for school to support me with.'

The mentors and programme sessions

Teachers' views of the IOP mentors were overwhelmingly positive, with them being praised for their supportiveness, expertise, and flexible approach.

'We have a coach who is the most open-minded teacher and coach I met or one of them and I met a lot of very good people and professionals in my life. I don't know which part is covered by the programme and which is covered by professional knowledge and empathy.'

'One of the things they've doing one of the sessions we've got is just like a drop in, [mentor] going to be online for an hour if you want to drop in and bring an issue bring your problem it's going to be almost like a physics teacher clinic.'

'Absolutely fantastic because [name] and [name] who run them are experienced physics teachers themselves and again hearing things from experienced people who've been there seen it seen the mistakes being done, probably made the mistakes themselves and just passing on their experience is absolutely invaluable.'

One teacher shared a strategy that their mentor employed at the end of a session which had been very useful. This offers a good example of how mentors have taken a flexible approach to adapting their sessions to participants' needs.

'At the end of his session was just to share a super quick demo that he loves to do ... he literally just tagged it on the end he was like "here I've got something useful ... so I'll share it with you" and it took 2 minutes and I really liked that just like super quick ... It was like a magnet demo that he literally just basically put a magnet on some water and showed how it shows the magnet field lines of another magnet and it was super easy. I don't know how easy that would be to do every session but it was great that time.'

Two teachers experienced a change in mentors a few sessions into the programme, which, it was reported, felt a little uncomfortable.

'We had a couple of sessions to get to know our first mentor and also we're kind of all of the people in my group happen to be young women and it was a young woman mentor and now we've gone to an older man which sort of feels a little bit awkward and I know he's doing his

best and I feel a bit bad for him, but kind of because we were just used to it kind of felt like bit more of like a group of similar staged people having a bit of a chat. Now I'ts a little bit like kind of he's in charge and he knows what's going on a little bit more.'

The mentors' role in signposting other professional development and sources of support was noted as important. For example, the IOP's programme of professional development, and specific relevant courses: *"she highlighted a session on waves for the IOP early career teachers and things like that"*

The response to one-to-one sessions were also very positive, with teachers deriving a variety of benefits and types of support.

'When I was having the 1 to 1 with [mentor] I said one of the things I struggled with a little bit or I would struggle because we're not allowed to do too many practicals now but now they're coming back and this is like setting out electrical circuits and she said well if you can draw on the table or put big sheets of paper on get them to draw the circuit on the paper or on the table and then set the circuit up on top of that, it's just like brilliant why didn't I think of that?'

'I had a 1 to 1 with [mentor] and that was very good because we talked about what else might be available because there's mountains of stuff that the IOP do and it's just like so where do you feel you would need some others. There was one on electricity there was a session on electricity so I went booked myself on.'

As noted earlier, some teachers needed a higher level of support, and this was often provided by the mentor.

'I know I'm getting much more than that [the standard one to one mentoring]. I know my mentor on the programme is especially for me ... She realises when somebody needs some more and discusses with the programme and then we get more.'

Peer support

Teachers felt that the peer support offered by the group sessions was very valuable, not least because it let them know that they were not alone in struggling with various issues in school. These sessions enabled them to hear other people's experiences in different contexts, and allowed them to share ideas and resources, such as apps, to help support their teaching.

'It's been really good sort of during the lock down to realise its not just my school kids that are disengaged it's everybody's school who are having trouble with engaging the students and it's been good to get hints and tips from other people of what their school is doing and sort of things like that.'

'That's really good for my confidence point of view that everybody's coming across similar problems to yourself it's not just you individually so it's not you're not at fault it's just a general problem.'

'We were able to talk to each other and share experiences I found that really helpful ... I think it was more just ... hearing other people's perspectives around certain things was good.'

'There is a very young person in this group who is engaged in some radio programme and blogs. So we share a lot. She shared about some apps where the children can do the equations. When I shared those apps with my students it was so brilliant.'

'We just kind of like get into a conversation and then we'll be like "oh well we do this and we do that" and it just gives everyone ideas and we all share our own experiences of what our school does and how it might be different at other schools and stuff.'

Working in groups, therefore, enabled teachers to build supportive peer networks.

'It's so extraordinary that three of us have problems with our schools, very serious problems. This is not small problems that we have. We formed a smaller group where we have each other and our coach separately.'

Building on the programme

The teachers interviewed were asked about how they thought the programme could be improved. As we saw in the survey, and perhaps unsurprisingly, given the interruptions to their training and NQT years resulting from Covid-19, several teachers said that a focus on practical work would be useful. This is clearly an area about which teachers are apprehensive.

'I suppose maybe a little bit of stuff about experiments I think it's just the fact that it's been so long I haven't done anything this year so I'm a little bit nervous about that whereas I know what they're talking about now it's really relevant for what we're doing now but maybe next year when I start getting a bit freaked out about bringing experiments back in.'

'Obviously because Covid affected both training and the induction year it's more just about how to teach those practical skills without just relying upon videos all the time where I don't have access to a lab. So trying to think like getting those demo's integrated into lessons.'

'I think how to troubleshoot practicals would be a good thing ... for non-specialist teachers its generally the non-specialists teachers start teaching the physics topics lower down the school, but then if the practicals aren't working there then it's really hard to relate to it and then be able to carry on the teaching at a higher level without going back to the basics properly.'

'There's always room for experimental techniques and tips ... It really helps when you can share other's experiences.'

Other areas mentioned as a possible focus were misconceptions with physics, going through GCSE questions with students and assessment for learning. One teacher noted that content for A level would be useful as well as on medical physics applications as part of a BTEC.

In terms of other areas for improvement, a couple of interviewees noted that communications had not been as good as they might have been, with a lack of reminders about sessions.

'There was the first one and then the next one I logged into but they hadn't really sent out any reminders about it, nobody else, so that didn't happen.'

'There's been a couple of issues around organisation. Meetings I've logged in for that don't seem to have taken place and some of them have been poorly attended.'

3.3 Mentor interviews

The six mentors interviewed were a mix of a retired and experienced teachers, working across the country in terms of geographies. Geographical groupings varied in terms of teachers' links with their mentors, with some mentors working with more than one group of teachers. For example, while the teachers in a particular group may have been located within the same geographical area, the mentor was not necessarily in this area. In the case of a late starting group the teachers covered a wide geographical

spread. In another group, teachers and their mentor were more local to one another, meaning that some of the teachers already knew each other from their training. For this group, the mentor felt that their similar location was useful as they were more aware of the context in which the teachers were working.

Online delivery was seen as essential to programme delivery. Mentors appeared to be happy with the online approach, and did not see it as a barrier, although groups may take time to settle in to working together online, discuss topics easily, and form a peer network. However, it was noted by one mentor that it would be difficult to mentor teachers on topics such as practical lessons in a remote context, and that it could be better to have blended model with some face-to-face sessions.

Feedback on sessions

Overall, mentors were positive about the programme, its aims and their role.

'It's giving the teachers the opportunity to have another form of support which they can access and I think that other mentors have had trainees in a similar position to some of mine and have also been giving them one to one support.'

Mentors spoke about the videos and how they would set tasks for teachers and then discuss the outcomes of strategies at the following meeting and think about next steps. However, it was also noted by one mentor that she had tried very hard not to burden the teachers with extra work or tasks as part of the programme, feeling that they had enough to do with their teaching, and were very busy and under pressure.

One mentor noted that a teacher had said that it was nice to have a "listening ear" from someone not directly involved in their career or at their school; a contrast to many in-school mentors who also hold line management roles. It was also felt that having a physicist to speak to was useful, particularly given how busy the last year had been for teachers.

'They've appreciated having another physicist to bounce ideas off. Some have said that even though there are other physicists in the department, obviously teaching is a very busy profession and especially this year and so they've found that there haven't naturally been those kind of spaces to have those conversations as often as they would like at school.'

As might be expected there were varying levels of attendance at group sessions across the programme, however mentors reported that teachers were engaged in the sessions when they attended. Varying levels of take-up were experienced for the one-to-one sessions, with all of one mentor's group taking up the offer, nearly all of another mentor's group (five out of six), but fewer than half (four out of nine) for another mentor.

It was stated that the networking element of the group sessions had been very beneficial, and that it seemed likely some groups would remain in touch.

'Networking for sure, so they are all in contact with each other and had because they haven't looked at the videos before the last meeting they'd agreed that they were going to watch them over the summer holidays ... And contact each other to discuss them which I thought was great actually.'

Varying the programme

Mentors varied the ways in which they ran sessions, for example showing videos in the first session to highlight their usefulness and signposting to resources which could be used instead of practicals, which were largely not available to teachers during Covid-19.

'So in each session we tend to spend about half an hour dealing with the video content, if that makes sense. So that's the kind of mainly the pedagogy session, the pedagogy part so kind of half of it is dealing with the pedagogy part and then probably the rest is split between the subject knowledge and the kind of mentoring aspect in those initial and those group sessions.'

Indeed, all the mentors noted that there had been some degree of variation from the programme, with one-to-one sessions in particular being much more varied in terms of the topics that teachers wanted to discuss. These varied from master's level qualifications, to dealing with other members of staff, to general advice about teaching. Group sessions too were sometimes re-focussed on day-to-day issues such as those arising from the Covid-19 pandemic, particularly remote learning, evidencing progress in the NQT year, and career progress more widely. Other issues that were discussed in sessions included behaviour management, planning of lessons and time management. The mentors were happy to accommodate and adapt to teachers' needs in these ways.

'This year quite a lot of what we've spoken about has been to do with the COVID situation, the struggles that the NQTs have had surrounding that. Quite a lot of what I've done has just been providing reassurance that it's really stressful for everyone but they are absolutely doing the best that they can and that that is absolutely okay at this time. Which is a common theme in teaching anyway to be fair but particularly at the moment.'

'What became apparent fairly early on to me was actually the opportunity just to talk about what was going in school was really very valuable for the mentees and particularly the ones that for whatever reason don't feel as well supported in school.'

A few of the teachers needed a much higher level of support from their mentor. For example where a teacher had really been struggling in school.

'In terms of the one-to-one sessions there were a couple where there were clearly issues with their mentors in school and one of them in particular I don't know how many hours I've done with her, but it is literally multiple half hour phone calls ... she says I have saved her career.'

Two mentors also noted that they had looked at application forms for teachers looking for new jobs and helped them prepare for interviews.

'So we've ... spoken about applications, interviews and then how to prepare for your new job next year. So within the kind of confines of the CPD that I've been delivering there's also been so many other conversations that have come out of that.'

There was also the sense that teachers had found it difficult to engage with the stimulus material in term time, so discussions shifted to allow them to view the content over the holidays. One mentor noted that one of her teachers, who already had high level of support from the IOP as a scholar and in school, and therefore was not wishing to engage with the project to a high degree, choosing instead to just receive the videos. The mentor noted that the teachers that had continued to engage were generally career changers, i.e. they had entered teaching after having pursued another line of work.

Overall, the mentors felt that the programme had been successful and had enough flexibility to support teachers and meet their needs, even where this had meant that the programme had had to change. This was illustrated by teachers wanting to continue with the sessions in the 2021/22 school year.

'Most recently obviously we've been discussing with the NQTs are you likely to want to continue with the support into the second year. But actually even before I'd offered it out, three of mine had already asked like "oh you are going to be doing this next year aren't you?" I think they found it really useful, they seemed to have really positive things to say.'

Finally, it was noted that the IOP was supportive of the mentors and the support they were giving teachers particularly in one-to-one sessions, even if this varied from the programme.

'There have been days when I came out and I thought honestly what am I going to do next because I don't know what to do to help this person. But there's someone always for me to go and have a chat with. [IOP have] been great, so that back up has been there as well, so. But I have got a lot out of it personally.'

Building on the programme

While the videos had been used as starting point for the sessions, one mentor felt that they were too long, and not as engaging nor as focussed on pedagogy as they could have been. They felt that the IOP had thought of the videos as a programme, rather than "online content", where videos tend to be short and focussed. Another mentor felt like the delivery of the programme related to the videos needed some development, noting that *'I think the material is good, but I think we haven't quite got the delivery right and the way in which it needs to be used'*, and that, while the videos were useful for those who did not attend sessions at all, more was needed in order to stimulate group sessions. It was noted that the videos could be sent out centrally to those who were not engaging in sessions, as the mentor felt they were *'sending information into a big dark void'*.

Further, mentors said that they had also prepared additional materials for sessions, for example around cognitive science and had taken longer to introduce and discuss areas that teachers needed more support on. It was also noted that it could be difficult for teachers to engage with video content and that the group and one-to-one sessions could be more effective for the communication of communicating ideas and strategies. It was noted that it would be useful for mentors to store and share resources centrally.

'[It] didn't need eight or nine of us or however many there are to be producing those [resources] separately, what we really needed was one person to do it and share it ... Or it's the coming out from the centre and I know I'd probably have tweaked it as well, but it just, because with, I get paid overtime for this so it's extra to my one day a week role, so if they're paying nine people to produce this PowerPoint, that doesn't really make a lot of sense to me.'

The videos provided by the IOP were not always sufficient for mentors to feel confident in their knowledge and so some training or overview might be provided in areas where mentors might be less familiar with the content. This applied to programme content such as science capital, inclusion and improving gender balance, where additional support for mentors could perhaps be delivered within the mentor team.

It was also noted that two sessions were offered to mentors for their half termly meeting and, for those mentors who were therefore unable to attend, it would have been useful to have had a summary of the discussions held at the session.

Mentors felt that the topics of sessions were likely to change in the next school year, as it becomes possible to deliver practical lessons again, following lifting of restrictions relating to Covid-19. This is particularly true for teachers who have experienced limited delivery of these kinds of lessons. However, it was noted that this type of content might be more challenging online.

'Most recently obviously we've been discussing with the NQTs are you likely to want to continue with the support into the second year. But actually even before I'd offered it out, three of mine had already asked like "oh you are going to be doing this next year aren't you?" I think they found it really useful, they seemed to have really positive things to say.'

Finally, one mentor noted that all four of the more engaged teachers in their group had moved schools, with the main reason being they were trying to avoid teaching biology and chemistry.

'They want to be physics teachers, they have struggled some of them to get to grips with some of the physics content let's say key stage three and know exactly what they need to teach and then someone's saying "oh, well now you need to teach biology".'

4. Conclusions, recommendations and next steps

4.1 Conclusions and recommendations

Overall, it appears that participants have found the IOP's Early Career Professional Learning Programme useful in supporting their learning and progress during a particularly challenging year for new teachers.

The feedback from teachers in both interviews and surveys was very positive in terms of all of the opportunities offered as part of the programme. The online nature of sessions was not generally felt to be an issue which limited participation. Interestingly, participants and mentors reported focussing their activities around issues relating to physics teaching, to teaching more generally and to wider career issues.

Particular areas of strength include: the provision of video content, a focus on subject, a system of support external to the school environment, the expertise and experience of the mentors, and the opportunity to gain support from peers. Looking at each of these in turn, for teachers, the video content produced was perceived as being very helpful, with a range of topics covered, all of which were linked directly to teaching physics. However, it should be noted that the videos appear to be used in different ways by different mentors, some mentors were not clear about the relationships between the video content and the mentor-led group and one-to-one sessions.

The focus on teaching physics has been very useful for teachers and is much appreciated. The programme complements other professional development activities particularly due to its subject focus, which is not necessarily provided through school-based support, and to the provision of support outside of the immediate school context and therefore separated from line and performance management systems.

The expertise and experience of the mentors are a particular strength of the programme. Their practical advice and support, including signposting to other materials and courses, were valued. The group sessions were thought to be useful, and the peer support of the group sessions has, for some, meant that they have felt less alone and has clearly been of help after both difficult training and first years for teachers. Indeed, for some teachers, it appears that the one-to-one sessions have been a lifeline, supporting them to move schools. In one case this support has been credited with keeping someone in teaching. The mentors' flexibility in approach and the ways in which the mentors have been able to work to support the

teachers should be seen a strength of the programme. By teachers, a small number of issues were raised around the organisation of sessions and around mentors changing part way through, which was seen as unsettling.

Mentors enjoyed the experience of working on the programme and found it positive. The sharing of experience, tips and ideas by mentors was clearly seen as valuable. Adaptations to the proposed approaches within the programme were made by some mentors, for example discussing the day-to-day issues encountered by teachers (e.g. other staff in schools, further qualifications, lesson planning, behaviour management). In terms of improvements, suggestions from mentors included: an online repository where additional materials developed for the programme are deposited; shorter, more 'bite-size' video content; ongoing support for mentors in areas where they lack confidence and experience such as equality, diversity and inclusion.

Drawing on these conclusions, we end this section by offering some recommendations to the IOP for the ongoing development of the Early Career Professional Learning Programme.

Firstly, there is variation in how mentors deliver sessions, the ways in which they use the videos and even the content they cover. It is not clear whether or not this influences participants' engagement with or experience of the programme. However, the IOP may wish to consider whether or how to ensure consistency across mentors so that all participants are offered equal access to support without losing the highly valued 'personal touch' of individualised support from mentors.

Secondly, participants are clearly gaining significantly more from the programme than physics subject and pedagogical knowledge, with content covering more generic aspects of teaching and some mentors even offering support on career progression. While this is clearly beneficial for participants, some participants may not be offered this support or know that it is available. Again, therefore, consideration of equal access to support could be beneficial. Related to the content of sessions, some mentors feel that further support for them in developing their knowledge of some aspects of content may be useful. The IOP might look at how it provides this support, including ensuring that all mentors are able to participate in these activities, or gain follow-up support if they are unable to attend.

As planned, teachers have engaged with the programme in different ways, from only watching the videos, to group sessions, to one-to-one sessions with mentors. In this first year, it appears that teachers have largely made their own choices around their levels of engagement. While this is valuable in some ways, particularly in terms of supporting teacher autonomy, mentors might be supported to consider how to identify those teachers who would most benefit from one-to-one support and target this support at those participants. One solution might be to design learning pathways for teachers so that they can see how each aspect of the support helps them in their practice and their careers, and then their engagement can be more targeted towards learning needs.

Finally, in terms of further developing and building on the programme content, the subject of support around practical activities emerged through both the interviews and the survey. For this to be a successful a more blended programme with some face-to-face activities may be necessary. How this might be done should be carefully considered given the geographical spread of some groups.

4.2 Year 2 research plans

Our original proposal gave suggestions for the second year of the programme; a smaller scale follow up with continuing participants; or smaller scale repeat of Year 1 with new participants to identify impact of

any changes to the support programme. Given the issues experienced by schools and teachers in the 2020/21 school year and the shifts that had to be made to the programme as a result i.e. adaptation by mentors, focus on more general issues experienced by teachers, we are open to discussions with the IOP and Gatsby as to the best route to take.

Other areas to investigate might include:

- in-depth investigation of what participants are learning and how (i.e. from which aspect of the programme)
- further consideration of alignment and complementarity with ECF
- identification of models of/approaches to mentoring and coaching being used in the and effective practices for this context

5. Appendices

Appendix 1. Participant information sheet

Research into the IOP's Early Career Professional Learning project

About the project

The Sheffield Institute of Education (SloE) at Sheffield Hallam University is carrying out research in the Gatsby Foundation and the Institute of Physics (IOP) programme for Early Career Teachers, in order to investigate the efficacy of the programme and its individual elements.

The IOP programme aims complement the Department for Education's Early Roll Out of the Early Career Framework (ECF), by offering a range of activities and support. These includes webinars and equivalent information-sharing and guidance sessions, led by experts in physics education from universities, schools and other contexts, discussion groups with peers, led by experienced IOP coaches, and individualised coaching and mentoring from experienced IOP coaches.

To do this the SloE will be carrying out a survey with teachers and also interviews with both teachers and IOP coaches. We may also carry out observations of sessions.

Do I have to take part in the research?

Participation in surveys, interviews or observations of sessions is voluntary. By completing the survey you will be agreeing to your data being used in an anonymous form in reporting. At the beginning of the survey you will be asked to confirm that you have read this project information sheet and our privacy notice, and consent to participating and your data being collected and processed as outlined in the information documents. If you are asked to take part in an interview that is recorded, we will ask you to complete a consent form.

Other data we may use in the research (this includes observation of sessions) derives from project activities. If you prefer that we do not use this data, please notify any of the SloE team.

You can withdraw your data, from any of the data collection methods, at any point until it has become fully anonymised and aggregated into the analysis at which point we would be unable to identify it. If you wish to withdraw your data please notify the SloE Project Director, Professor Emily Perry (contact details below).

Will I be identifiable?

All project reports, and any academic research publications and presentations, will anonymise organisations and individuals so no individual participant or their organisation will be identified or identifiable. The names of organisations and individuals involved in this project may be given in reports, publications and any associated presentations.

Data collection

To carry out the evaluation, Sheffield Institute of Education (SIOE) staff will collect data. All data collection and analysis will be carried out by experienced researchers from SIOE.

Data to be collected	Teachers	IOP coaches	
Teacher survey An online survey will collect data on the experiences of teachers on the programme	x		The survey will be straightforward to answer, containing click-box responses and open comment sections. Your responses will be collated and analysed by the research team at SIOE and reported anonymously. Surveys will take no more than 10 minutes to complete
Interviews We may ask teachers and IOP coaches to take part in interviews (by telephone or online) to gather information regarding perceptions of the programme	x	x	Interviews will be carried out by an experienced researcher from SIOE. With permission, these will be recorded using an audio recorder and may be transcribed. Anonymised interview transcripts will be shared between the SIOE team. Anonymised data will be thematically analysed to explore perceptions of the programme. Interviews should take no more than 45 minutes
Silver and gold level sessions We may observe online sessions and take notes.	x	x	We will take notes to help us to understand the sessions and their content. No participants will be named in any notes. Your consent for us to take notes relating to your contributions to the meetings will be clarified verbally at each session. If you do not give consent, your data will not be used.

How will my data be protected?

All digital data will be stored in secure, password-protected computers in Sheffield Hallam University. Paper-based data will be stored in locked cupboards within secure offices. Any transfer of data will use secure portals.

SHU undertakes research as part of its function for the community under its legal status. Data protection allows us to use personal data for our work with appropriate safeguards in place under the legal basis of **public tasks that are in the public interest** (GDPR clause 6 (1) f). A full statement of your rights can be found at <https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notice-for-research>.

If you have any queries about the information provided here please contact the project team: Professor Emily Perry or Dr Josephine Booth (details below).

All University work of this nature is reviewed to ensure that participants are treated appropriately and their rights respected. This work was approved by the University Ethics Committee. Further information can be found here: <https://www.shu.ac.uk/research/ethics-integrity-and-practice>.

For any concerns about Sheffield Hallam University:

You should contact the SHU Data Protection Officer if:

- you have a query about how your data is used by the University
- you would like to report a data security breach (e.g. if you think your personal data has been lost or disclosed inappropriately)
- you would like to complain about how the University has used your personal data

Postal address: Sheffield Hallam University, Howard Street, Sheffield S1 1WB Telephone: 0114 225 5555;

Email: DPO@shu.ac.uk

You should contact the SHU Head of Research Ethics (Professor Ann Macaskill - a.macaskill@shu.ac.uk) if:

- you have concerns with how the research was undertaken or how you were treated

Project contacts

If you have any further questions about this project, please contact:

Dr Josephine Booth (Co-investigator)

Senior Research Fellow

Sheffield Institute of Education

Sheffield Hallam University, S1 1WB

josephine.booth@shu.ac.uk

(Working days Tuesday-Friday)

Professor Emily Perry (SHU Principal Investigator)

Sheffield Institute of Education

Sheffield Hallam University, S1 1WB

e.perry@shu.ac.uk

Appendix 2. Project privacy notice

Research into the IOP's Early Career Professional Learning project

Privacy Notice – March 2021

Introduction

This document outlines the responsibilities of Sheffield Hallam University (SHU) in handling personal data collected from participants as part of the research into the Institute of Physics' (IOP) Early Career Professional Learning project.

From 25 May 2018 the General Data Protection Regulation (GDPR) replaces the Data Protection Act and governs the way that organisations use personal data. Personal data is information relating to an identifiable living individual.

Transparency is a key element of the GDPR and this Data Protection Statement is designed to inform participants about:

- how and why SHU will use personal data collected in this evaluation
- what participants' rights are under GDPR, and
- how to contact us to exercise those rights

Participants' Rights

One of the aims of the General Data Protection Regulation (GDPR) is to empower individuals and give them control over their personal data. The GDPR gives participants the following rights:

- the right to be **informed**
- the right of **access**
- the right to **rectification**
- the right to **erase**
- the right to **restrict** processing
- the right to **data portability**
- the right to **object**
- rights in relation to **automated decision making and profiling**

For more information about these rights please see: <https://ico.org.uk/for-organisations/guide-to-data-protection/principle-6-rights/> and: <https://www.shu.ac.uk/about-this-website/privacy-policy/data-subject-rights/subject-access-request>

Participants can contact SHU at any time to:

- withdraw from the research and have their individual data deleted
- request copies of their own personal data held by SHU (**a subject access request**)
- exercise **other rights** (e.g. to have inaccurate data rectified, to restrict or object to processing)
- **query** how data is used by SHU
- report a **data security breach** (e.g. if there are concerns that personal data has been lost or disclosed inappropriately)
- **complain** about how SHU have used personal data.

Details of who to contact are provided at the end of this statement.

Why are we processing participants’ personal data?

It is necessary for SHU to process some personal data, in order to carry out research on the IOP’s Early Career Professional Learning project.

Retention

After the research is complete, SHU will retain participants’ data for research and knowledge exchange purposes, including presentations at professional or academic conferences, or publications in professional or academic journals, for a period of five years after the publication of the final report. SHU will remain as a data controller for this period.

Respecting confidentiality

In the production of professional or academic publications or presentations, all data will be fully anonymised and no individual or school will be identified or identifiable.

What is the legal basis for processing activities?

SHU are Data Controllers for the research. The processing of personal data is defined under GDPR as a specific task in the public interest. As data is being processed for the purpose of academic research, the main aim of which is to improve the IOP’s understanding of the Early Career Professional Learning project. The legal basis for processing your personal data is as a ‘Public Task’ (Article 6 (1) (e)).

<https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/lawful-basis-for-processing/public-task/>

Which Personal Data will we collect and use?

In order to provide our services we need to collect and use some personal data. Below is a list of what this will include for the research:

Type of personal data	Teachers	Institute of Physics coaches
Names	X	X
Contact details (work email address)	X	X
Personal characteristics: Name, school, school role, gender	X	X
Interview responses	X	X
Teacher survey responses	X	X
Silver and Gold session observations	X	X

Who will we share personal data with?

The privacy of personal data is paramount and will not be disclosed unless there is a justified purpose for doing so. Data may be shared between SHU and the following parties:

- **Transcribers**, who we may ask to produce transcripts of audio recordings of interviews.

SHU NEVER sells personal data to third parties.

Security

SHU take a robust approach to protecting the information they hold. This includes the installation and use of technical measures including encryption of data, firewalls and intrusion detection and prevention tools on networks and segregation of different types of device; the use of tools on University computers to detect and remove malicious software and regular assessment of the technical security of SHU systems. SHU staff monitor systems and respond to suspicious activity. SHU also has Cyber Essentials certification.

Alongside these technical measures, comprehensive and effective policies and processes are in place to ensure that SHU users and administrators of information are aware of their obligations and responsibilities for the data they have access to. Access to project data is restricted to the research teams and administrators associated with the project. Sharing of the data with other researchers would require approval by the Sheffield Institute of Education ethics committee who will ensure that all data protection requirements are met. Training is provided to new staff joining SHU. Existing staff have training and expert advice available if needed.

All personal data will be stored in directory locations that are only visible to specified members of the project team.

Further Information and Support

For further information about how SHU use personal data see:

<https://www.shu.ac.uk/about-this-website/privacy-policy/privacy-notice-for-research>

<https://www.shu.ac.uk/about-this-website/privacy-policy/information-governance-policy>

The Information Commissioner is the regulator for GDPR. The Information Commissioner's Office (ICO) has a website with information and guidance for members of the public:

<https://ico.org.uk/for-the-public/>

If there are any concerns about the way this project processes personal data, please raise these with the project teams.

Contact details

Principal Investigator

Prof Emily Perry

e.perry@shu.ac.uk

OR

SHU Data Protection Officer

DPO@shu.ac.uk

0114 225 3361

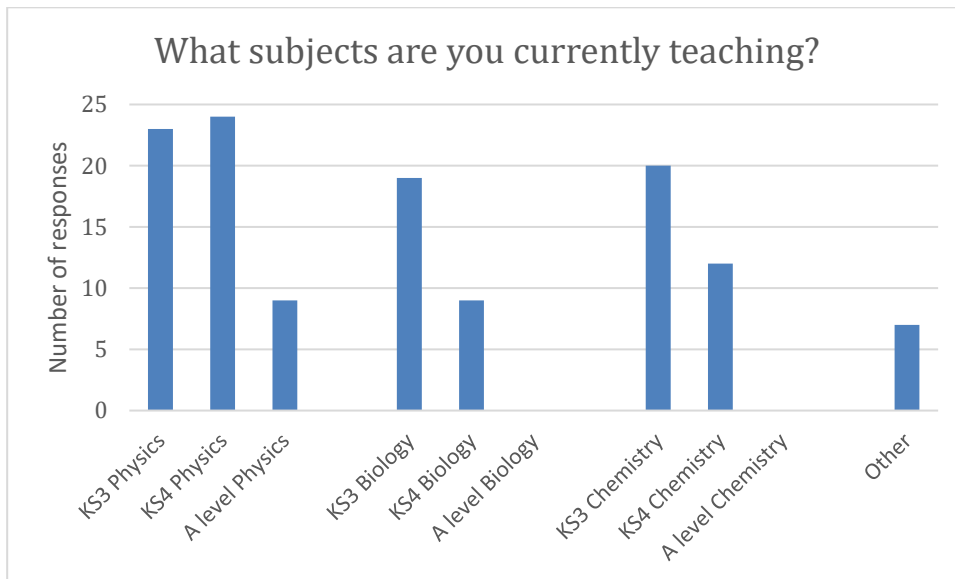
If you have an ongoing concern, you can contact the Information Commissioner's Office, the body responsible for enforcing data protection legislation in the UK, at <https://ico.org.uk/concerns/>

Appendix 3. Teacher survey responses

Participants

Route into teaching	PGCE – school based	PGCE – university based	SCITT	Other	Other: details	Total respondents	
Number of responses	3	8	10	3	Future teaching schools Researchers in school School direct	24	
IOP scholar							
	Yes			No			
Number of responses	9			15		24	
Highest level of physics qualification							
	A level	Undergraduate degree	Postgraduate degree	Physics SKE course	Other	Other: details	Total respondents
Number of responses	3	11	3	3	4	Engineering degree Masters/Bachelors in mechanical and biomedical engineering Undergrad masters Undergraduate degree in mechanical and optical engineering	24
Other physics teachers in school							
	None	1-3	4-6	6+			
Number of responses	3	17	3	1		24	

What subjects are you currently teaching?



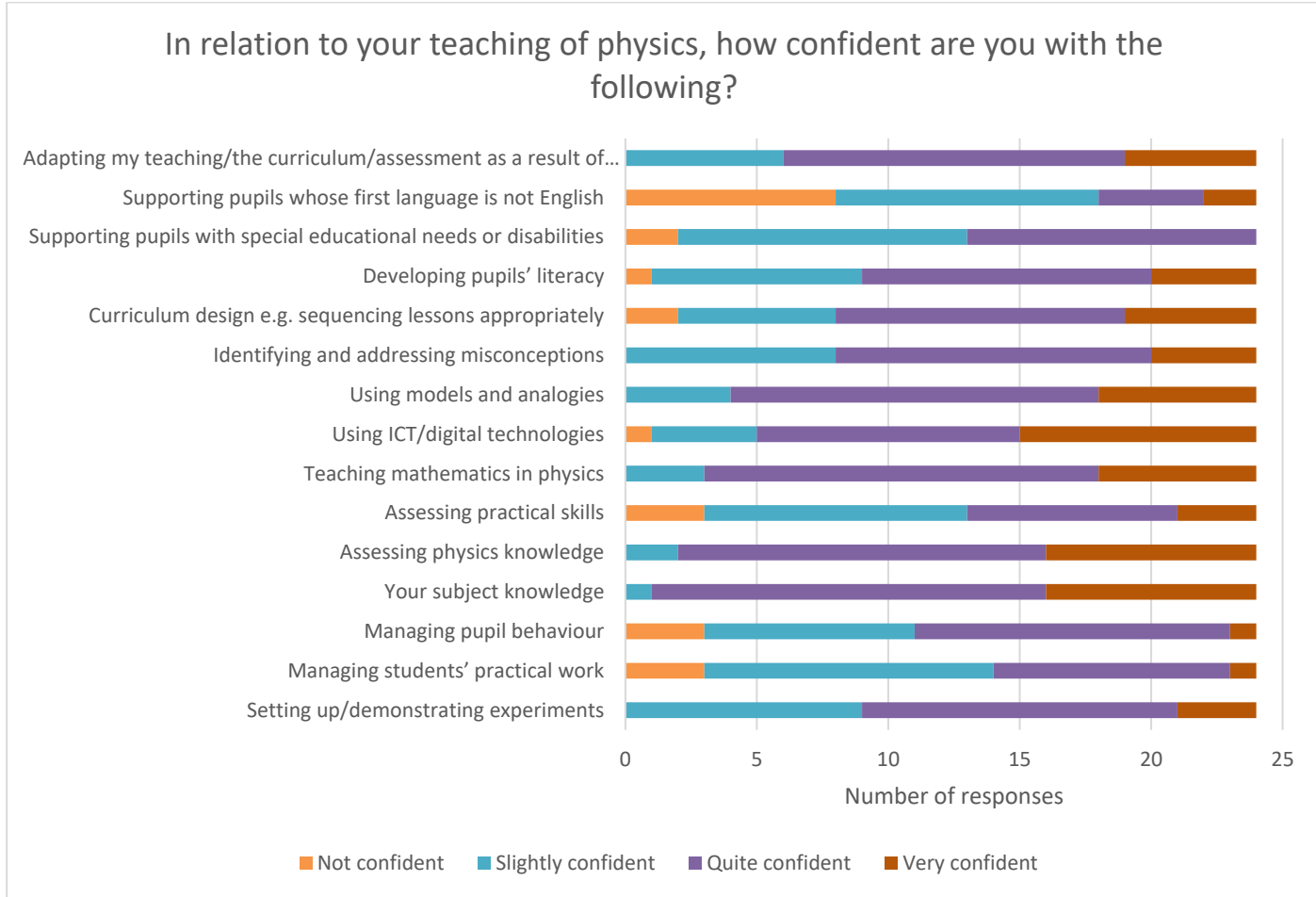
Professional development

Participating in Early Career Framework	Yes	No	Not sure	
Number of responses	18	5	1	24

Other professional development (not including IOP)

- I have independently sort out CPD through the Open University and other similar providers.
- NQT training done within school during the autumn term
- IOP CPD sessions, school based NQT train sessions, online CPD
- IStip NQT program, IOP Domains, ASE webinars and Creative education online courses
- Internal support through school and IOP mentoring
- School based observations and feedback. And my own SKE.
- Professional coaching through school as part of NQT support and also 1:1 support from mentor and Physics team lead.
- NQT support provided by my school and the partnership we are part of.
- General school CPD sessions once a week
- In-school training

Confidence



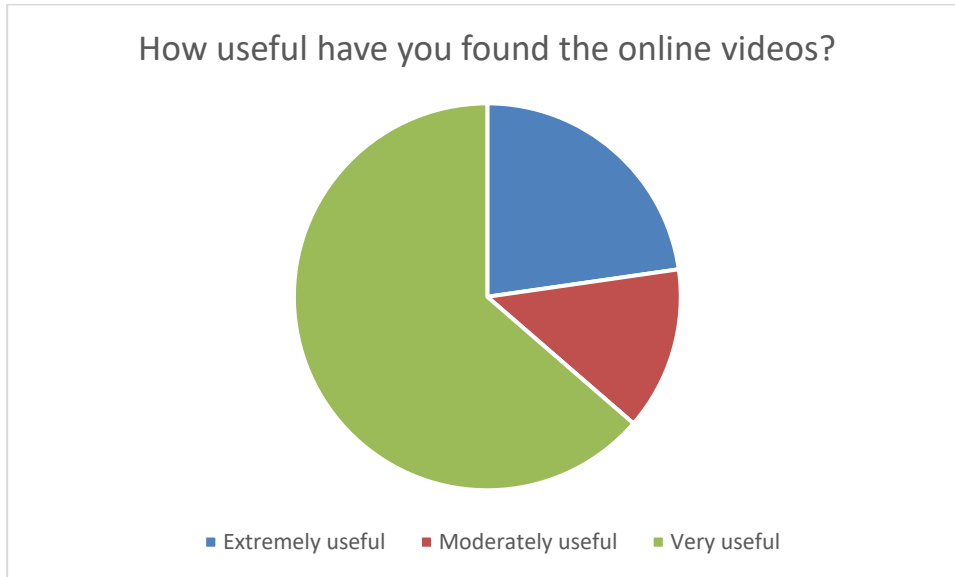
Early Career Professional Learning programme

Which activities have participants accessed?



Online videos

How useful have you found the online videos?



Do you intend to continue looking at the videos?

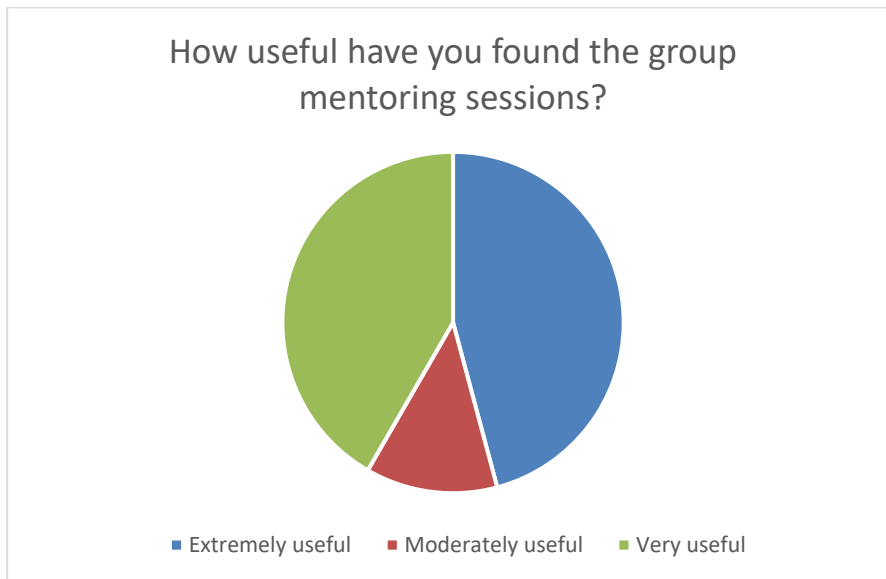
Yes	22
Maybe	0
No	0

Group mentoring

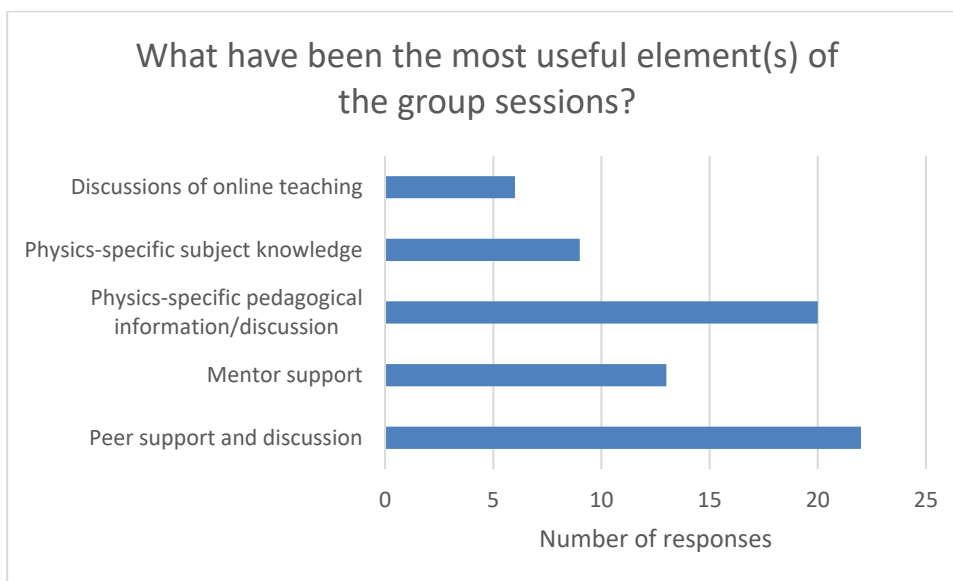
How many group mentoring sessions have you attended?

1-3	4-9	10 or more	other
13	6	2	1 (all)

How useful have you found the group mentoring sessions?



What have been the most useful element(s) of the group sessions?



If possible give an example of something you have learned from these sessions

- I found the use of KS1/2 mathematical language a great way to bridge the gap and remove the fear of calculations in Physics, as well as the 'power of per' as an example to give full exposition on terms used to ensure a deeper level of understanding in students
- Ways to improve numeracy and literacy in lessons
- Its nice to hear other NQT's experiences and feelings. Useful GCSE physics teaching sessions
- Use of alternative methods that replace practicals. How to liaise with Maths teachers and have an insight into the school's SoW to help students use Maths skills in Physics.
- Suggestions of how to support year 11 students in the COVID environment
- Use of language in physics teaching
- Very helpful to talk to an experienced AQA examiner

- Examples of good practice. I remember one very useful session about required practicals given the current situation (how to use a phone to record data, e.g.).g.)
- That all teachers were struggling with online learning. Also there's always support available
- tackling misconceptions and literacy in physics
- Science Capital approach
- How to demonstrate the use of lenses to form an image and teaching formulae and their rearrangement

Do you intend to continue attending group sessions?

Yes	24
Maybe	0
No	0

What areas of practice would you like to be covered in future group sessions?

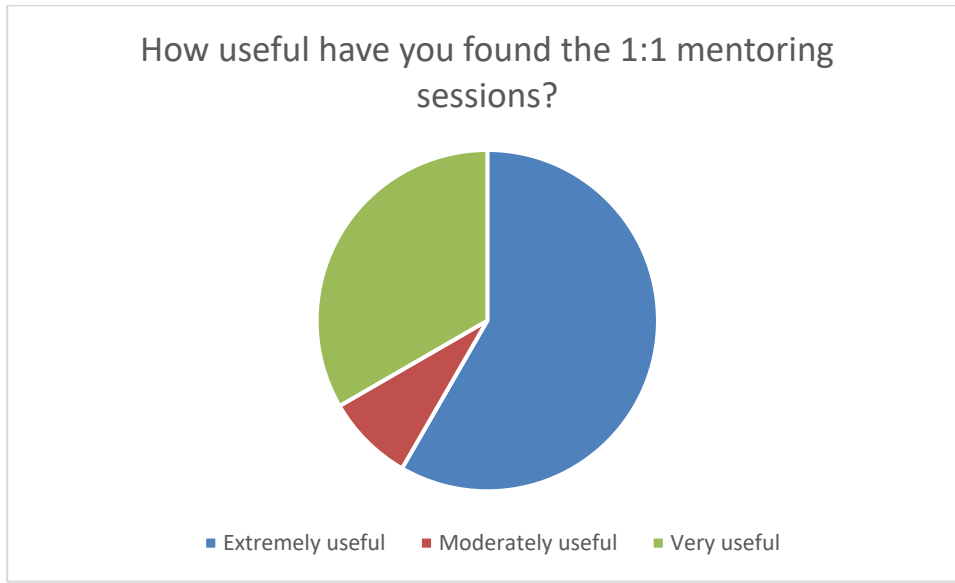
- CPACs
- creating a vocational teaching programme or adapting teaching for those who cannot read/write
- Behaviour management, teaching pupils with send considerations
- A level subject knowledge and practicals
- Assessment for learning, differentiation, assessments.
- Practical skills
- IT basics
- SEN
- Differentiation for students with different abilities and interests, including SEND students.
- curriculum design
- practical work - preparation and management - and ensuring that practicals are useful for learning
- Radioactivity

1:1 mentoring

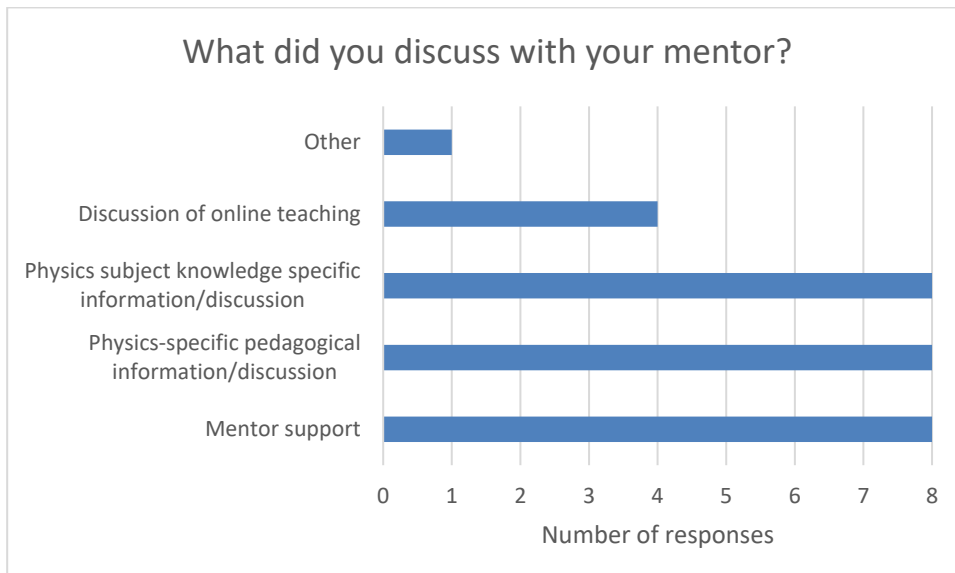
How many 1:1 mentoring sessions have you had?

1	2-4	5 or more	other
5	4	1	One ad-hoc response to a question that week

How useful have you found the 1:1 mentoring sessions?



What did you discuss with your mentor?



If possible give an example of something you have learned from these sessions

- The importance of clear dialogic instruction and explanations that overcome literacy and mathematical barriers
- Physics teaching related MA courses

- My biggest gap is understanding the UK education system, and my mentor meetings were comprehensive in this sense: I learnt how to carry out real-life experiments (e.g. speed of sound and light on a football pitch), how to cater for unprivileged students (and that is possible to coach them for the best universities in the country), how to keep students engaged during online learning. Most importantly, my mentor is a humanistic, understanding and open-minded person, which should be a core quality for every teacher. Her attitude models resilience, integrity and professionalism.
- How pupils struggle with similar topics in other schools, and how to address

Do you intend to continue attending 1:1 sessions?

Yes	7
Maybe	5
No	0

If you have answered no or maybe – why is this?

- Only if I have specific issues to discuss
- Depending on time and availability
- I don't usually have much free time, and can be quite tired after long days at work
- Lack of time

What areas of practice would you like to be covered in future one to one sessions?

- CPACs at A level
- A level subject knowledge questions
- Classroom behaviour and physics practicals/ differentiation/ teaching-coaching for assessments.
- Practical sessions
- Not sure. Perhaps set up of practicals, or hinge/diagnostic questions.
- Keeping organised. Just support to keep this career going too!!

Annex B. Year 2 Report

1. Introduction

A key element of the Institute of Physics' (IOP) education strategy is to support teachers of physics through professional development. As part of this, the Early Career Professional Learning Programme is intended to support teachers of physics in the early years of their careers, complementing the Department for Education's Early Career Framework. The programme includes:

- videos, webinars and other information-sharing and guidance sessions, designed and led by experts in physics education from universities, schools and other contexts;
- discussion groups with peers, led by experienced IOP coaches;
- Individualised coaching and mentoring from experienced IOP coaches.

In 2020, Sheffield Hallam University was commissioned by the Gatsby Foundation to carry out a small-scale study into the IOP's Early Career Professional Learning Programme over two years. The aim of the study is to gather evidence of the programme's impact, exploring factors relating to the impact of the programme such as:

- how teachers choose and benefit from different levels of support within the programme;
- the value of learning as a network of peers;
- the nature and outcomes of subject-focussed mentoring and coaching conversations;
- the ways in which this subject-specific professional development complements the Early Career Framework.

In this report we summarise findings from the second year of the study, intended to complement, rather than replicate, findings detailed in the Year 1 report. This report includes a description of our approach to data collection and analysis, key findings and recommendations for to the IOP's Early Career Professional Learning Programme.

2. Approach

2.1 Data collection and analysis

Data was collected through the following methods:

- a brief survey of teachers, intended to gather the views of those who have not engaged in the Early Career Professional Learning Programme;
- individual interviews with teachers participating in the Early Career Professional Learning Programme;
- individual interviews with IOP mentors responsible for the delivery of the Early Career Professional Learning Programme.

Teachers were recruited through an email invitation sent from the IOP to participants in the programme, which invited them to complete the survey and volunteer for a follow-up interview. Mentors were recruited from those who had participated volunteered, via an email invitation from the IOP, for interviews in Year 1.

We used opportunistic sampling to interview eight teachers and five mentors (Table 1). Since all participants volunteered to take part in data collection, they may not represent the full range of perceptions of the programme, and those with more negative views may have chosen to not volunteer.

Data collection	Survey completion	Interviews carried out
Teachers	26	8
Mentors	n/a	5

Table 1. Data collection participants

Survey questions focussed on gaining information from less engaged participants (see below). Interviews, conducted by a researcher from Sheffield Hallam University, followed a semi-structured set of interview questions, allowing for probes and further investigation where appropriate. Interviews were carried out through telephone calls and online meetings. With permission, they were recorded, and then transcribed.

In this report, we offer an overview of the data from Year 2, complementing that provided from Year 1, including identifying areas of success and where improvement might be needed moving forward.

2.2 Ethics and data protection

The study followed Sheffield Hallam University’s ethical research⁴ and data protection⁵ protocols, ensuring data was handled securely and sensitively with appropriate consent procedures, including anonymity in reporting. A project-specific participant information sheet⁶ and privacy notice⁷ and online consent forms were used for all data collection. In line with ethical and consent procedures, data has been anonymised for reporting.

3. Findings

In this section we give an overview of the findings from analysis of the data, starting with the survey and then moving on to interviews with teachers and mentors. As mentioned above, at this stage our intention is to offer an overview of emerging themes from the data, which form the basis of the recommendations provided in the next section and our proposed plans for the second year of the study.

3.1 Survey responses

A total of 26 teachers completed the survey (Table 2). Only those five participants who said they were not engaged in the Early Career Teachers programme were asked to complete the full survey. A full set of their responses can be found in the Appendix. Teachers who said they were fully or partially engaged in the programme moved directly to a final question asking for interview consent.

⁴ [Sheffield Hallam University Ethics and integrity](#)

⁵ [Sheffield Hallam University Privacy Notice for Research Participants](#)

⁶ [Participant information sheet](#)

⁷ [Project privacy notice](#)

What is your level of engagement with the IOP's Early Career Professional Learning Programme?	Number of responses
I am fully engaged in the programme	6
I am partially engaged in the programme	15
I am not engaged in the programme	5

Table 2. Year 2 survey participants engagement with the programme

Looking at the responses of the five non-engaged participants, all had some awareness of the programme, having seen information about it from the Institute of Physics. Only one had accessed any of the programme activities, specifically the group mentoring and online videos.

The participants' reasons for not participating were varied (Figure 1), with four of the five saying that they were too busy or didn't have the time to participate. One participant (participant A in Figure 1) chose, alongside a lack of time, all the responses relating to gaining support from other sources, and said that they didn't feel the programme would benefit them. This participant was also the one who reported engaging with some programme activities. They suggested that the IOP could support participation in the programme by offering 'more bespoke advice through lesson observations'.

Participant E, who chose 'other', felt that they 'really wanted to engage with the online seminars', but the only sessions offered to them were in the evening, which were 'not compatible with having a family at home'. They compared this programme to the IOP Domain sessions, which had been a positive experience ('I did the IOP Domains sessions previously and got a lot from them, so I was keen to join'), where alternative session timings were offered. From our interviews with participants and mentors (see below), some mentors did offer alternative session timings, but it seems that this participant was not given this option.

One participant (participant C in Figure 1) reported that they have now left teaching.

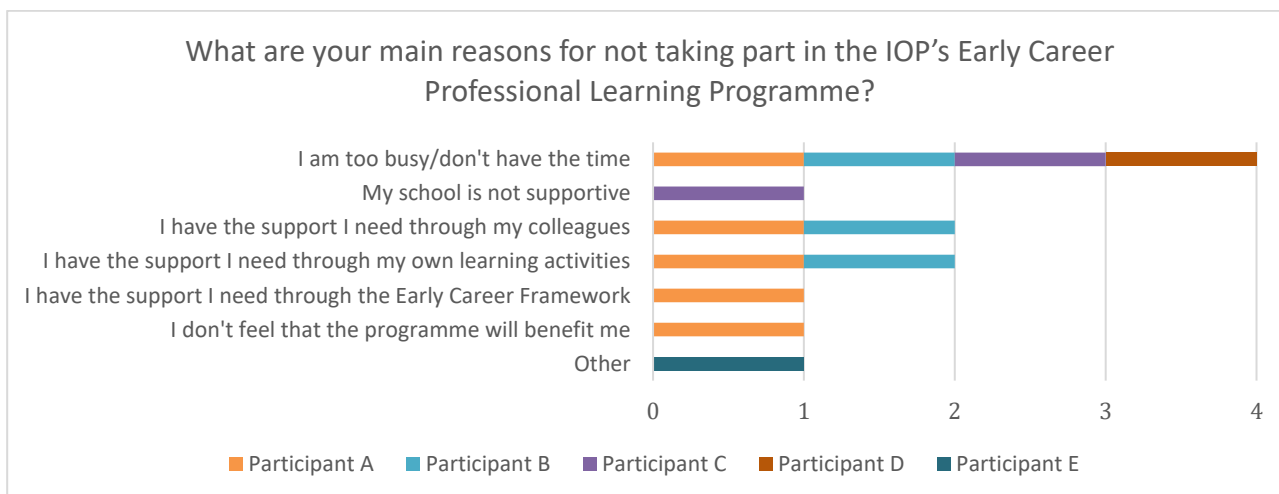


Figure 1. Survey participants' reasons for not participating in the programme

3.2 Teacher interviews

Eight teachers, sampled from Year 1 and 2 survey respondents, were interviewed about their involvement in the IOP's Early Career Professional Learning Programme. Half were in the first year of their engagement

with the programme, and half were continuing from Year 1 (Table 3). Most had completed their first year as a teacher.

	Number of interview participants
Engagement with IOP Programme	
First year of engagement with the programme	4
Second year of engagement with the programme	4
Teaching experience	
In first year of teaching	2
In second year of teaching	6

Table 3. Interview participants' engagement and experience

Engagement with the programme

All the teachers interviewed had attended some group sessions and engaged with the IOP's online videos to some extent. Two of those in their second year of the programme stated that they attended fewer group sessions than in Year 1. Around half had also attended at least one 1:1 mentoring session, with two others saying that they had not accessed this support but were glad to know it was available if needed. Overall, participants' experiences of the programme were positive, as were their attitudes to the IOP and its other support and resources. However, as we describe below, participants' experiences of and engagement with the programme were quite varied.

'I think having the IOP there is the main thing. I don't know where else I would get support from for physics. The IOP seems the obvious place to go to for that and having someone like the mentor there that I can turn to if needed I think is really important and pretty vital to be honest.'

The participants appreciated the physics-specific nature of the programme, with 'expert input' from mentors. The videos were mostly considered to be helpful (although one participant described them as a 'work-in-progress'), especially where mentors followed them with discussion, recaps and examples of practical classroom applications. Opportunities to talk to other teachers were particularly well-received.

'I really like talking to other early career teachers at different schools and getting their perspectives on things. And the support offered. It's nice to have an external physics person that I can go to if I've just got a question about how to do this.'

Programme sessions in Year 2 continued to run through online environments. The teachers we interviewed expressed mixed views about this, recognising that online sessions were a compromise. Overall, they felt that online sessions facilitated greater participation, even if they reduced opportunities for some types of learning.

'The group sessions in a virtual form are not as productive as a group session in an in-person form. However, getting people meeting up in person is not practical or feasible all of the time and so actually it's a perfectly feasible middle ground. I think that the conversation flows a lot better in person and it doesn't necessarily flow all the time in a virtual scenario, and some contribute more than others. That is just the reality of it.'

'If it was in person, like discussing things together in the lab and asking lots of questions and like practicing things, but because it's all been on Zoom, it has lost that. And I kind of think that

although the sessions are quite good, I could have just gone on the IOP website and Googled it if I had really wanted to know it ... it feels like certain practicals, or demonstrations that we have not tried before, if they have gone into the school and shown us how to do it, we had all got to have a go and we would be thinking about how we would do it in the classroom and set it up and stuff, then that would have been really useful.'

The role of the mentors

The expertise and support of the mentors were appreciated by participants, with various comments on their experience, ability to adapt sessions to emerging needs and supportiveness.

'It starts off normally by the mentor asking how we're all doing and if there is anything in particular that we want to bring up or any issues that we have, so she normally asks each of us individually and then that might prompt a conversation on the back of it, and then there will be a theme for the meeting, which will be a particular topic agreed in advance and she would have sent some video links or something to read or study beforehand and then the meeting will then be looking at that particular part of physics, whatever it is, and then having a discussion around that.'

'They will usually say are there any topics, is there anything particular you want us to go through, topic-wise. They usually talk about it and they usually bring up the practical ideas because when you're doing the practicals you are also talking about the theory anyway and they will run through ideas to use and I think that is what everyone really wants. Practical ideas ... And that is how it's run and I've been very happy with that.'

However, participants' experiences of the programme appeared to be quite dependent on the individual mentor leading their sessions. For example, some variation was reported in how mentors choose to run their sessions, with some mentors giving participants flexibility in when to attend and others offering a single timeslot. As mentioned previously, this made participation a challenge for some teachers, particularly those with professional and family commitments.

'They were very helpful and very lovely, but I quickly realised because of my family situation that I wasn't going to be able to make many of the events.'

Mentors also appeared to take varying approaches to facilitating group sessions. Some mentors delivered sessions in pairs, while others worked alone. Some used a more pre-determined structure to the session, while others appeared to give greater opportunities to participants drive the session.

'It is much more "this week we're going to talk about this" and then they give us ideas about a particular topic and then we chip in with questions. We don't choose what we do as such ... I think that the presenter dominates the conversation and we just listen. That is often how it goes.'

One participant experienced a change of mentor from Year 1 to Year 2 and the change in approach, alongside other time commitments, limited their engagement.

'I thought it had been really, really good ... the lady who ran it in my first year ... she was brilliant, and it was actually really helpful ... I have barely done anything this year. I've watched the online videos but either the group meetings have been when I have had parents' evening, or they've been really unengaging, or I have just completely missed them because work has been so busy ... Last year I was actively looking forward to it ... This year it was a bit more of a

chore just to go to the meetings because after a couple I knew I would just be sat there and I wouldn't really do anything.'

Perhaps related to this variability in how mentors presented the programme, some participants appeared to have differing views of the intended purpose of the programme and its relationship with other IOP activities.

'Sometimes I think that she could just lecture us about some physics teaching, which is good. She has done that from time to time ... but I am not sure that's the purpose of this, is it. Because IOP do all of that anyway on their Domain series and the CPD Mondays and stuff, whatever, so that is not the purpose of this. I think the purpose of this is for more relaxed chats about how things are in school.'

Participants' learning

Participants reported gaining knowledge of a range of physics-specific pedagogical approaches, including misconceptions and practical work. Some also improved their physics subject knowledge, although others suggested that this was available through other support activities.

'I've learnt quite a lot of the theory involved in physics teaching, and by that I mean about the theories that underpin practical work in physics.'

'It's been specific physics aspects with regards to forces or something like that, how we are teaching a particular topic. We've done quite a few discussions on running practicals and examples of practical activities in the classroom. So examples of how we can do that, which we've done. We've more recently looked at assessment within physics and how we can assess and it's been a bit of maths skills as well.'

Through the mentor sessions, participants also gained understanding of how to apply the knowledge presented in the IOP's videos.

'I think sometimes the videos can be a little bit academic and like the theory behind what physics teaching should be. And then the mentor meeting allows you to be like "Okay, well you've just given me this entire video on maths skills and now I'm about to go and teach electricity. How can I incorporate it in to my lessons?", and the mentors support you with actually incorporating it in to your lessons.'

As mentioned above, participants also felt that they benefited from opportunities, in small group sessions, to share experiences and solve problems with other teachers, and for some this provided emotional support as well as support for physics teaching.

'I have learnt that the problems that we have here are shared elsewhere, which is nice.'

'Being able to share experiences as to what's going on with people in similar positions to me, because in the school that I'm working at, I'm the only [Early Career Teacher] in the school, so no one else in the school is at the same position as me, so again it's useful to have those school discussions.'

'It was very encouraging ... it was enough positivity just to keep me hanging in there really.'

For some teachers, the timing and choice of content was not always aligned with their curricula and teaching activities. This limited some participants' perceptions of their learning.

'The material can be good but it might not be that relevant to me teaching right now, so I might get advice on something that I taught three months ago and I won't have to teach again until next year, so it's about the timing of what gets delivered when.'

Several participants mentioned how they had applied their learning in their practice and/or shared their learning with colleagues in school, and reported that this had been well-received.

'I used some IOP resources and adapted them again to use as a starter when I was being observed at the place where I currently work ... my line manager who observed me was really impressed and she was really positive about it and she said she would like me to gather together a bit of a suite for everyone to use of starting materials and plenary materials. So, you know, it went down really well.'

Complementing other support

For one or two teachers, as the only physics teacher in their school, this programme offered vital support which was not available elsewhere. For others, the programme provided 'a different view' from their school's curricula, opening up wider possibilities for their teaching of physics.

'They've just got a lot of good ideas about how to teach things, which I like ... when I started the programme there was no physics specialist in my department, so there was no one else I could turn to for physics specific teaching advice. So I would turn to this programme instead.'

'Well, I think that it has just been nice to have a different view on things. That is the main thing about it. So everything is not focused on our scheme of work and our way of teaching things and our syllabus and our specifications, so it's complementary in respect that it's much more bigger ideas about physics teaching and how could you do these things in your specific situation. So it's been nice to have both, I have to say.'

Some participants felt that the subject-specific nature of the programme complemented other support such as the Early Career Framework.

'I think that a lot of the video topics are on things that are aligned with the Early Career Framework that we've been working through, so they've not always matched up at the same time, but they are saying the same things. For example, like the working memory stuff, that video is exactly the same content as what the Early Career Framework says that we should be considering and so I think that they've gone well together like that, but obviously physics based, which is helpful.'

'I think the other support, it's very generic. Not specific to my subject, whereas this is. So I get the general teaching advice for my ECT and then I get the physics specific stuff from this programme. So yeah, they complement each other well.'

Participants' experiences of support in their schools appear quite mixed, from those who feel fully supported by their colleagues to others who have no other physics teachers and are left to source their own professional development, or are unsupported to participate in professional development activities.

'I don't think that our leadership supports the teachers very well and that is why people keep leaving. We lose about a third of our staff each year... they feel that the senior leadership team doesn't really do anything about it. Doesn't support them, and the systems that we have in place are not very good and not well maintained, and it demoralises a lot of people basically.'

Improvements to the programme

The teachers interviewed were asked about how they thought the programme could be improved. The responses were diverse, including:

- More content focussing on specific approaches and topics, including misconceptions, electricity, inclusion and teaching children with special educational needs and disabilities
- In-person sessions for practical activities
- Sessions on career progression, leadership and management

Three participants felt that they would appreciate more content focussing on behaviour management, especially in the context of learning after COVID-19.

'I've had one particularly difficult class this year and I think that there always is one, but I have really struggled with behaviour management for them and they've made me cry sometimes afterwards. And I have had support with them, but yeah, it continued to be a trial, so I suppose it's a behaviour management thing ... learning how to teach that kind of group has been quite tough.'

One participant mentioned that they would appreciate support more tailored to teachers' individual needs, while by contrast, another suggested that the IOP offers more online 'masterclass' style activities.

'If we were asked a little bit more what do you want us to go through with you instead of "We are going to go through this" then that could be better. At least being offered to give our ideas to the session before it happens, so that they can just make it as relevant to what we want right now as possible.'

'I went to like an electricity – I think that they called it like a master class or something like that. It was like an entire day in a half term that was just online with people discussing about how you should best teach electricity to different year groups and I found that really useful and I took away a lot from that. So that sort of thing I really like. I really like that it was online because travelling is really difficult. Yeah, that was sort of the best, online is good.'

3.3 Mentor interviews

The four mentors interviewed had all been involved in the Year 1 of the programme and were continuing with their existing groups of participants and/or supporting a new group of participants in their first year of engagement in the programme.

As with the participants, while in general, individual mentors' experiences of the programme were quite mixed, but taken together, the mentors' opinions were very positive.

Participants' engagement with the programme

Overall, mentors felt that teachers' attendance and participation were disappointing. Some teachers consistently engaged in sessions, with others attending less frequently.

'Out of the year twos we've got about five out of fifteen who are fairly regular attenders and the year ones, it's probably three out of thirteen, but then in between that there are people who drop in for an odd session.'

Participants in year 2 of the programme were often less engaged than those in their first year. Some mentors suggested that some teachers, especially those in the second year of participation in the programme, may have gained access to support in school, and that this was either limiting their time for

participation, or providing learning so that the IOP programme was not needed. Other participants were felt to be simply too busy with work or family commitments to feel able to attend consistently.

'There are three or four who have consistently come to everything in some way, or if they haven't then they've gone out of their way to tell me why not and what they're doing. From what I gathered, speaking to some of the others, like informally, that was mainly because they were engaged in their own ECT programme at the school, which was very, very, onerous in terms of time.'

'We've got the ones who are in their first year of teaching and then the ones in their second year of teaching. So the second years, those are the ones that we're seeing less and less of over time ... as time went on and they returned to school and they got back into the regular environment, I think that there were things, a natural progression, things that were working towards a natural end and there was much less need for the online meetings.'

'There are often school meetings, parents' evenings and things like that which meant that they can't attend but we know from those who do attend that they're struggling, you know, they've come home from school after a very busy day and ... they let us know that after this meeting they've got several hours of marking or planning or whatever to go through and it just seems to be very sad in a way that they're being offered support and they feel so much under siege that they don't feel they can actually engage with the support because engaging with the support takes a certain amount of time and they haven't got that.'

One mentor felt that year 2 participants, a year further on in their teaching careers, had more diverse learning needs, and this was harder to respond to within the IOP's programme.

'In the first year, their needs were much more common between them and as they've gone through ... their needs have kind of diversified and that has made it harder... I think that they need different kinds of sessions in a way I think. So rather than it being focused on this is how you might teach electricity, which is a perfectly sensible thing to do, does it need a different kind of shift in emphasis to what are the problems with, or you know, a lot of making it work in practice now you've got over the first hurdle, kind of thing. I think that is certainly something to think about.'

Programme delivery and content

All mentors offered group and 1:1 sessions to participants, and only one found that no participants took up the offer of 1:1 support. Mentors used a variety of models, some more flexible than others, to support engagement and participant learning, which included:

- A balance of group and 1:1 sessions
- Optional drop-in sessions
- Mixing year 1 and year 2 groups, or keeping them separate
- Offering options around timings of sessions
- Running sessions outside school time
- Working individually, or working with another mentor

The IOP's videos were used by mentors to stimulate discussion and highlight points of pedagogical knowledge. However, mentors, like teachers, had somewhat mixed views of their effectiveness within the programme, particularly given some participants' inability to find time to watch them before sessions.

'I very definitely have used the videos that were supplied that were tailored to the programme. I thought that they were great conversation starters really. So as I mentioned, I watched them, I took notes on them, and then typically in a session we would have a kind of "How's it going with everybody?" bit and then when there was a lull in the conversation I could then bring in those ideas and sort of like ask people how they were addressing those particular points.'

'The topics and video content I don't think worked in the way it was intended. At the beginning it was sort of intended that the participants would go and watch the videos, and then come back and discuss them having watched them. The reality is that they found it very, very difficult to ring-fence the times to do that ... but I found the video content very useful because I would watch it and then I could lead a discussion based on the things that I had seen.'

The timing of sessions was of particular importance, usually taking place after school. A few mentors reported their frustrations at low attendance, even while offering flexible timeslots and sending out reminders to participants.

'We would have a couple of time slots, we would go for a 4.30 so that they could probably still be in school and online, and then at 6.30-7pm we would try and alternate it around those times. At times we offered two opportunities per group, per monthly session.'

'It would be nice if people replied to say yes, I will definitely be there, definitely can't make it ... Arranging a session, having equipment set up ready for it, and then having two or three people turn up.'

Even though sessions were delivered online, mentors were mostly grouped geographically with participants. This was seen as advantageous in supporting local knowledge of schools, contexts and other sources of support.

'I could direct local resources if they came up with problems, which we thought was very helpful ... I know many of the schools in the area, and so that local knowledge was very helpful in terms of "Oh there's a school there you can talk to," or "Yes, your school has a bit of a problem with this, so you might need to think about that" sort of thing.'

In common with the participants, mentors felt that online delivery enabled participation in terms of accessibility, but limited some forms of engagement such as getting to know fellow participants.

'The thing about being online is that it's a lot easier to get to, isn't it, so I am not against online. We have found this throughout all our CPD that it's so much easier for teachers to get to it, so it's a lot more accessible, and that there is quite a bit that we can do. I guess it's just the networking really that's a bit hard. And networking between mentees, so they've got access to us but they've not got quite so ready access to each other.'

'We have tried. There have been WhatsApp groups tried and with different degrees of success but I guess if you could meet at least a few times, two or three times in the year, at least you get to know faces and you get to talk to each other and perhaps you build links with the person who is geographically closest to you and share ideas about the area and so on, so perhaps a mixture of some face-to-face and online would have really been good.'

Participants' learning

As in Year 1, mentors focussed their sessions around a blend of physics pedagogies, including dealing with pupil misconceptions and practical work, subject knowledge and more generic support. There were some mixed opinions about supporting teachers' subject knowledge within the sessions, with some mentors

feeling that this was central to the content of the programme and others signposting other IOP activities to support this.

'I guess on the face of it they are asking about generic class management skills, but it's obviously going to be in the context of the physics and the teaching. I mean we certainly are not teaching them the physics. The assumption is that they know the physics but the pedagogy and how they actually go about teaching it.'

'So in some ways it is direct physics teaching knowledge. So we have passed on top tips, things about scheduling topics, things about how to do practicals, how to approach teaching different aspects, so sometimes it's been very specific and physics based ideas, and sometimes it's been more a moral support sort of thing, so when people have been struggling just to be able to offload on somebody who is not a part of the school.'

This emotional support from mentors, and from other participants, appeared to be important. All the mentors we interviewed mentioned the value of offering a 'safe space' outside their immediate school environment for teachers to talk about their experiences and discuss wider issues beyond physics teaching, including career development, classroom management and their colleagues.

'We didn't want to stop them having the chance to get things off their chest and moan about their head of department or that particular kid, or the timetabling.'

'The fact that they could validate their experience with other people's experience and realise actually it's the same or similar everywhere. I think that they have valued the opportunity to network.'

This support was sometimes offered through 1:1 sessions, working with individuals, and, as we heard from the participants, sometimes came about through the group of teachers talking together.

'The opportunities for them to network with each other and also to get support in a very low stakes way, because they haven't got to go and ask somebody else. They can just access us and so that's been I think really valuable.'

Complementing other support

As mentioned earlier, the IOP's programme was seen as, and intended to be, complementary to other, less subject-focussed support offered in schools, such as the Early Career Framework.

'The IOP support is really valuable because it's subject focused and because it's a little bit more impartial whereas yeah, some of the early career programmes can be a little bit over-prescriptive.'

This 'impartial' nature of the programme, as we have discussed, was felt to enable greater honesty, openness and reflection on practice.

'It gave them the point of contact for somebody they just didn't have ... the IOP said 'Here it is, we're going to set this up, it's for you, there is no judgement involved, it's totally divorced from your school, someone you can talk to about anything and it will never get fed back''. And that was a very valuable resource for them.'

However, as mentioned above, for some participants, the wide-ranging nature of programmes such as the Early Career Framework meant that they were unable to also commit to participating in the IOP programme.

'The material provided was very comprehensive for them ... they've done everything, which has meant it's an overburden in terms of workload for both the person working as the tutor in the school, and the early career teacher receiving the training.'

Improvements to the programme

The mentors interviewed were asked about how they thought the programme could be improved. Their responses can be grouped into the following themes:

- Supporting participant engagement
- Programme delivery, including resources, in person delivery and network-building
- Opportunities for mentors to share practice and collaborate
- Complementing other support

Looking at each of these in turn, two mentors suggested that the IOP could provide greater support in maintaining contact with participants, thereby reducing the time needed for mentors to confirm session timings and send reminders. Some mentors considered that more resources would be useful alongside the videos or suggested alternative models of programme content, such as greater individualisation for teachers, or a greater focus on issues such as behaviour management in physics.

'They are still nervous about practical work and I think that that is a consequence of the pandemic and the restrictions that were placed during their training years and NQT year and also anecdotally, behaviour in class ... behaviour has meant that they are even more nervous about practical work than they might have been otherwise.'

'There is an argument for going more towards focusing on particular physics topics, because even if people aren't teaching maths at the moment they know that they will eventually, and so potentially I think that having the more broad teaching pedagogy topics was great, because it was relevant to everybody all the time, but you sometimes had to work to make it relevant, if you know what I mean, whereas the thing with NQTs is that they panic that they don't know what they need to plan for next lesson and so actually starting off with a physics topic focus may have been a better plan and weaving the broader teaching pedagogy in there, as it was relevant, might have been a better way to go.'

A few felt that, now the necessity of online delivery due to COVID-19 had passed, some in-person delivery would better facilitate learning about topics like practical activities and support participants to build networks with their peers. Similarly, one mentor suggested that providing opportunities for mentors to share practice through in-person activity would also be beneficial, and another proposed that collaboration, such as through the delivery of larger online 'masterclass' type event, might make effective use of the mentors' expertise.

'Now that we are the other side of COVID, I think putting in some elements of face-to-face meetings, even if they're very sporadic, even if it's just a meet-up to start with, or an annual meet-up or something like that, I think some sort of face-to-face meeting would be very helpful. I think also possibly a closer liaison between the different mentors in the different regions would be useful, so we didn't really meet up very often and I think that maybe after talking more about what we were about to do, so having a planning session before the term would be useful.'

'Here is a lot of superb practitioners with really excellent knowledge who could do the online workshop saying "listen, I'm setting up a demonstration of how to do radioactivity practicals or a friendly way of building circuits so the students gain the confidence". And I think that is

where the IOP really could provide that online guidance to large numbers of teachers in one go, at one-time sessions.'

Two mentors felt that the IOP's programme could be aligned more closely with other professional development activities, including, but not limited to, the Early Career Framework.

'The first thing is that it needs to be much more joined up to whatever the early career programme is within the institution the person's in, so that there is a window in their [Early Career Teacher] ... rather than it being squeezed between it. The second thing is that I think it needs to be a lot more joined up to other support programmes that are out there, for example the Support Physics Network ... if that could be joined up, or to the other STEM centres, that would actually be quite a powerful thing, because it could deliver support beyond the narrow confines of what we've been asked to do.'

Finally, one mentor called on the IOP to continue to advocate with policy makers for a greater focus on subject-specific professional development.

'I think having subject specific stuff could be really powerful, but somebody at a high level in the Institute of Physics needs to lobby people in government, basically, to make sure that it is joined up to what's going on, rather than being an add on that can be chopped off ... One of the weaknesses of the [Early Career Teacher] programmes is that they don't allow enough autonomy for the person involved in it to choose what would be a good thing for them to do, and all of the research says that subject specific professional development is a really important thing so to have that separate from what they're doing in terms of their teacher development seems a bit of a missed opportunity.'

4. Conclusions

In its second year of delivery, the IOP's Early Career Professional Learning Programme has continued to provide valuable support for teachers. The combination of activities within the programme offered flexible opportunities for teachers to address their professional learning needs and build constructive relationships with mentors and other participants. For all the teachers we spoke to, the programme enabled them to develop their understanding and knowledge of physics pedagogies and to learn about wider aspects of the IOP's support, which will be useful in their continuing careers. For many teachers, the programme also provided emotional and career support, through their relationships with mentors and other teachers. This combination of subject and generic support has arguably played a vital role in keeping some teachers in their careers.

In terms of participation and engagement, Year 2 of the programme has been more challenging than Year 1. All those who said to us they were not engaged in the programme felt that they did not have time for participation on top of other professional and personal commitments. The difficulties of participation appear to be particularly pertinent for teachers in the second year of the programme, and the reasons for this are complex. Teachers in the second year of the programme are a year further on in their careers, and so may have more diverse professional learning needs, which are not addressed through the existing IOP programme. They may have begun to engage more in professional learning in their schools, which either limits the time available to participate in professional learning activities outside school, or, more positively, provides the support they need. Finally, these teachers may also have more demands on their time through their professional roles.

Teachers' experiences of the programme, while positive overall, were also mixed in terms of how the mentors chose to schedule and deliver the sessions. Some teachers were given more choice over session timings and content. Others felt these were both pre-determined by mentors. This flexibility of approach can be positive in enabling adaptation to particular groups, individuals and mentors, but also means that, as we have seen in this study, some participants did not feel they were getting the best experience. The mentors suggested that they wanted more opportunities to work together, and so this balance of consistency against adaptability, which may apply in other IOP professional development activities, is something which might be discussed as a mentor team.

In Year 2, the programme delivery continued online. Again, this had advantages in terms of ease and flexibility of access, but also raised some questions in terms of participants' ability to build sustained networks with their peers. Mentors and participants wondered whether a move, now, to a blended model of online and in-person activity would be an improvement.

Finally, it is clear that the IOP's programme has offered to participants learning which is not available through other, in-school, support. Participation in in-school activity such as the Early Career Framework professional development programme has limited some teachers' ability to engage fully with the IOP's programme, but, for those that have engaged, the IOP's programme provided significant opportunities for learning in two areas which were not available to the same degree elsewhere: knowledge and understanding of subject-focussed pedagogical approaches, and emotional support from an expert mentor, and peers, outside their immediate school environment. Knowing this, the IOP, and other organisations with similar roles in the system, should continue to advocate with policy makers for the ongoing importance of supporting these professional needs of early career teachers.

5. Appendix: Survey for non-engaged participants

Sheffield Hallam University (SHU) have been asked by the Institute of Physics and the Gatsby Foundation to carry out an independent evaluation of the Early Career Professional Learning programme. As part of this we are interested to learn from those who have chosen not to participate in the programme. You can find the information sheet for the study [here](#) and the privacy notice [here](#). Please read these before you start the survey.

The answers you give to this survey will be anonymous in all reporting.

At the end of the survey, we will ask you to provide contact details if you are happy to engaged in follow-up from this survey. Any further data collection will also be anonymised.

Please tick the box below to indicate that you consent to taking part in the survey and agree to the terms of the privacy notice. If you do not tick this box you will not be able to complete the survey.

I have read the project information sheet and I consent to taking part in this survey and to the terms of the privacy notice

1. What is your level of engagement with the IOP's Early Career Professional Learning Programme?

- I am not engaged in the programme
- I am partially engaged in the programme
- I am fully engaged in the programme

The following questions were only asked to those who responded "I am not engaged in the programme" to question 1. Those who responded with partially or fully engaged were directed to a final question asking for consent to potentially participate in interviews.

2. How aware are you of the IOP's Early Career Professional Learning Programme? Choose as many responses as you wish.

- I have seen some information about it from the IOP
- I have heard of it from other teachers and colleagues
- One or more colleagues in my school is participating
- I am not aware of it
- Other _____

3. Did you access any of these programme activities before deciding not to take part?

- Online videos
- Group mentoring sessions
- One to one mentoring sessions
- None of these
- Other _____

4. What are your main reasons for not taking part in the IOP's Early Career Professional Learning Programme?

Choose as many responses as you wish.

- I am too busy/don't have the time
- My school is not supportive
- I don't feel that the programme will benefit me
- I had a look at the programme and didn't think it was right for me
- I don't need specialist physics support at this time
- I have the support I need through the Early Career Framework
- I have the support I need through my colleague
- I have the support I need through my own learning activities
- Other _____

5. If you wish, tell us a little more about your reasons for not participating.
6. What could the IOP do to support your participation in the programme?
7. We may wish to contact people who haven't engaged with the IOP's Early Career Professional Learning Programme to learn more about their professional development. If you are happy to be contacted by Sheffield Hallam University researchers, please provide an email address that you can be contacted on below.

Sheffield Hallam University

Research into the Institute of Physics' early career professional learning programme

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