IOP Institute of Physics

Future Physics Leaders

Theory of Change

Future Physics Leaders (FPL) is a programme that has been designed to develop leaders, coaches and teachers of physics in the identified priority areas.

The three-year intervention will provide a sustained programme of professional development that will leave a legacy of increased capability and capacity for physics teaching, leadership and coaching in the regions and an increase in the number, quality and stability[1] of physics teachers. Consequently, students' experiences of physics will be improved in a lasting way, leading to an improvement in attainment and progression to physics beyond 16[2].

Issues

A shortage of high quality physics teachers has a detrimental effect on students' physics attainment and progression[3]. This shortage is more acute in schools that have been rated inadequate or requiring improvement by Ofsted[4]. This specific shortage has arisen from a lack of high quality newly qualified teachers (NQTs) and the difficulty in recruiting them to these regions, the higher than average attrition rates of physics teachers, and the fact that physics teachers are more likely to move to improve their working conditions. Consequently, children in these schools are more likely to be taught physics by a non-specialist teacher than those in less deprived areas[5], with detrimental effects on their chances in physics.

Inputs

To address these issues, the FPL programme will work with [redacted] hubs in each of the three regional Lots. Each hub will comprise a Lead School and [redacted] Partner Schools – a total of [redacted] schools. Through these Hubs, a team of external Development Coaches will provide a coherent and interconnected package to:

1. Attract and retain high quality NQTs to the priority areas through a marketing campaign to IOP scholars; and provide a sympathetic timetable and mentoring for those NQTs in their new schools;
2. Provide a coherent programme of support for a group of identified Lead Teachers to develop them as future School-Based Development Coaches capable of continuing to provide CPD support in the hubs;
3. Provide a programme of sustained and regular professional development for all physics teachers[6];

[1] Teacher retention and development are essential: moving a child from an average to top teacher allows them to learn in 6 months what would otherwise have taken 12

[2] Retention is important because persistent high turnover can be detrimental to pupil attainment.

[3] The quality of teaching is the most important school-based determinant of educational success.

[4] Pupils in schools serving areas of higher deprivation are 22% more likely to have teachers without an academic degree in a relevant subject.

[5] At least 80% of physics lessons are taught by non-specialist teachers nationally.

[6] Focused, sustained teacher CPD is the most effective mechanism for improving pupils' classroom experience.

4. Provide CPD for non-specialist teachers.

Outputs

The outputs of the four strands are interconnected and progressive:

- Schools will be encouraged to offer desirable jobs with sympathetic timetables to NQTs. Such a timetable comprises mainly physics with repeated classes[7]. Whilst it reduces the workload on the teacher, it is not a reduced timetable – the same number of lessons are taught.
- The IOP will encourage high quality trainees from its scholarship programme to consider and apply for these (and other) jobs in the areas.
- Development Coaches will mentor[8] the NQTs[9]. They will be assisted by Lead Teachers as part of their own professional development.
- Lead Teachers will also work with Development Coaches to provide regular[9], bespoke CPD to both specialist and non-specialist teachers in the hubs. In this way, and through a dedicated development programme, Lead Teachers develop their own coaching skills and become the next generation of Development Coaches.
- The existing and new physics teachers in the region will participate in physicsspecific professional development led by Development Coaches; they will develop their teaching practice and mature quickly into the next generation of Lead Teachers.
- Development Coaches (and, eventually School-Based Development Coaches) will lead CPD for non-specialist teachers – improving their practice and giving them more confidence and enjoyment from teaching physics.

Outcomes

There will be an increase in the quality of physics teaching, the capacity for leadership and the capability for coaching within the regions. Specifically:

- Specialist physics teachers, including NQTs, and non-specialists will feel more confident in their teaching through increased pedagogical and subject knowledge, leading to an improved quality and effectiveness of teaching;
- They will also feel more valued as professionals, encouraging them to remain in the profession[10][11];
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[7] Assignment of new teachers to their preferred subject and giving them repeat classes (sympathetic timetables) improves retention and progression.

[8] Non-judgemental support from external mentors enhances beginner teachers' professional learning and identity [9]

Mentoring support reduced attrition to 1.88% compared to 4.5% for teachers in comparable schools

[9] Effective CPD is sustained and has a rhythm.

[10]

[11] out of 10 schools whose teachers engaged in CPD reported improved retention of teachers.

The strengthened professional identity[12], along with the improved culture and sense of community will increase the chances of teachers staying in their schools, the region and the profession and becoming leaders - improving the capacity for, and quality of, leadership[13];

- There will be an increase in the number of physics specialist teachers and leaders in the region –through the influx of NQTs and through better retention;
- All teachers will have more opportunities to progress and to become Lead Teachers and School-Based Development Coaches. Those opportunities will further increase the retention of physics teachers and leaders;
- There will be a sustained and lasting CPD capability through the training of SchoolBased Development Coaches;
- All physics teachers will feel more connected to the discipline and there will be an increased culture and community of physics in the schools and region;
- As a result of the improved teaching and pedagogy in physics developed through the above interventions, pupil outcomes and progression in physics will also improve in targeted schools and areas.

The community of physics teachers will be encouraged to become a part of the wider community of physicists in the regions through the IOP's branches and outreach activities. The IOP believes that teaching physics is doing physics and being a part of the wider physics community will add to the teachers' sense of value and belonging - providing further encouragement to remain.

Impact

As well as the direct impact during the funded phase, the programme will leave a legacy of increased capacity within the regions for providing CPD and a lasting culture of professional development within a community of physics teachers and improved teaching quality. The IOP will continue to provide support and accreditation for teachers and coaches through a series of regional seminars to support and develop coaching practice.

Above all, students' attainment will increase[14] because of the improved teaching quality, the greater stability of staff and, through better retention, the increased number of experienced teachers and leaders in the region.

References

Below are the references for the evidence that is stated in the footnotes.

1. Some simple analytics of school quality, Hanushek (2003) conference paper.
2. How teacher turnover harms student achievement, Ronfeldt et al (2012) American Education Research Journal.

[12] Focusing on professional qualifications and teacher value are important factors affecting teacher retention
[13] Good leaders are important. Teachers' perceptions of the school administration has by far the greatest influence on teacher retention decisions
[14] IOP's Stimulating Physics Network increased attainment at GCSE with the number of students achieving A*–C grades in physics increasing by 25.5% in partner compared to 19.5% in non-SPN schools.

3. Human Capital and Education: The State of the Art in the Economics of Education, Burgess (2015) IZA.
4. Social inequalities in access to teachers, Allen, Mian and Sims (2015) SMF.
5. Specialist and non-specialist teaching in England: Extent and impact on pupil outcomes (2015) DfE.
6. Reviewing the evidence on how teacher professional development affects student achievement. Yoon, K. et al. (2007) Washington, DC: US Department of Education, Institute of Education Sciences.
7. The Price of Misalignment, Donaldson and Johnson (2010) EEPA.
8. Supporting beginner teacher identity development: external mentors and the third space, Hobson et al (2015) University of Nottingham.
9. Retired Teachers as Consultants to New Teachers: Inservice Teacher Training Model, Gold (1987) ERIC.
10. Developing Great Teaching, Cordingley et al (2014) TDT.
11. Evaluation of impact of National Science Learning Network CPD on schools, Bryant et al (2016) Isos.
12. Engaging Teachers: NFER Analysis of Teacher Retention, Lynch et al (2016) NFER.
13. The influence of school administrator decisions on teacher retention decisions (2010) Boyd et al.
14. The evaluation of the Stimulating Physics Network (SPN) Programme, Smith et al (2016) Alpha Plus.