Learning to Teach Physics

A guide to support from the Institute of Physics

FOR STUDENT TEACHERS
We value and support all teachers of physics, whatever your background.

At the Institute of Physics (IOP), our aim is to secure a flourishing future for physics. We promote physics education at all levels but we know that passion for science is born in school and it is here that it must be most carefully nurtured. Whether you are a physics graduate or have another background, your role as a teacher of physics is crucial to the next generation of scientists.

This booklet gives you some idea of the ways that we can support you during your Initial Teacher Education (ITE).

We have materials to help you to develop your own understanding of physics, resources that will help you teach it at all levels, advice on practical demonstrations and suggestions on how to keep your physics teaching engaging for everyone. We invite you to become part of our community of teachers of physics, a place where you can ask questions and share ideas.

But it doesn’t end there. Our resources and support are available during your NQT induction, in the early years of your teaching and throughout your career. We know that confident, knowledgeable teachers not only stay in the classroom for longer but they will pass on that passion to their students.

Dr Frances Saunders CB FREng FInstP
President of IOP

Whatever your specialism, you will probably teach physics at Key Stage 3 if not beyond. To help support your physics teaching, the Institute offers FREE resources to all student science teachers at all secondary levels through our Student Teacher Affiliation Scheme.

To qualify for Student Teacher Affiliation you need to be:

- a student teacher in the UK or Ireland
- working towards Qualified Teacher Status (QTS) or equivalent at secondary level
- expecting to teach physics in the future whatever your specialism
- following a recognised ITE route e.g. PGCE, PGDE, SCITT, School Direct, Teach First, Physics SKE, undergraduate degree with QTS

You can register for Student Teacher Affiliation by:

- completing the online form at www.iop.org/student-teacher
- filling in your details on the tear-off form at the back of this booklet. To comply with our data-security procedures, please fold and secure the form before returning using the prepaid postage (or add a stamp if you’d prefer to reduce our costs).

STIMULATING PHYSICS SUPPORT
Keeping Early Career Teachers

Mentoring and events
If you’re a physics specialist in England, look up your local Stimulating Physics Support (SPS) Mentor. They offer light-touch personalised mentoring in your first years in the classroom and run local meetings for early career physics teachers. Tick the box on the Student Teacher Affiliation form at the back of this brochure to apply.

For more information, visit www.iop.org/sps.
Meet our mentors

We have drawn together some of the best and most experienced practitioners to create support networks for all teachers of physics.

Our Physics Network Co-ordinators (PNCs) cover the entire UK and Ireland. They run free events and workshops open to local teachers, plus they offer advice and support.

Additionally, in England, the Stimulating Physics Support programme works exclusively with early career teachers of physics. This team of Teaching and Learning Coaches (TLCs) offer mentoring and workshops.

Here, a couple of mentors introduce themselves. To find your local PNC or TLC, visit www.iop.org/ltp/who.

Brendan Ickringill
Teaching and Learning Coach/Mentor in Manchester

My first teaching post was in an inner-city school in Leeds. I had a fantastic mentor and worked with some very disadvantaged pupils, which really helped me to develop as a teacher. Working with new teachers now is refreshing and I always learn something new – I enjoy helping people to achieve their goals. During my free time, if it’s dark and clear, I can be found looking through the eyepiece of my telescope or screaming at its camera controls on my computer.

Ruth Wiltsher
Teaching and Learning Coach/Mentor and Physics Network Co-ordinator in Durham

I have taught physics in almost every type of school and have also been a teacher trainer. I find introducing teachers to the vast array of IOP supporting materials very rewarding. One of my best experiences was going into a school and seeing two PGCE students using their new “jelly-baby wave machine”, which I’d just introduced them to. Outside work, you’ll find me walking in the wonderful countryside of the North East.

Our bloggers

During the past few years, we’ve been fortunate to have PGCE students blogging during their training year. We asked them to be honest – and they were. Here are some excerpts from their early postings. Read them in full at www.iop.org/ltpblogs.

“I am a few weeks into my science PGCE and it has been brilliant. The best thing so far is that it has reinvigorated my interest in science. I’m noticing science in action everywhere I go, giving me ideas for potential lessons and examples of science in the real world.”

“In our very first week, we were set loose on a class of 16- and 17-year-olds. I still can’t believe that we survived the lesson, really enjoyed it, and most importantly, that some students actually learned something. That is probably the most important lesson I’ve learned in the first few weeks: it is not about you but all about the students and their learning.”

“My one piece of advice for starting at your first school is to get stuck in straight away. I have helped in transition days for new year 7 pupils and open evenings at two different schools, attended child protection courses and various CPD events. The first few weeks are the time to do all this because when the teaching starts, I don’t think I will have as much free time.”

“I’d say the first few weeks of the PGCE have been quite overwhelming but it has really helped to be with a group of people who are in the same boat.”

“One piece of advice that I got was to make friends with the technicians at the school. This has proved to be invaluable. The technicians have been extremely supportive so far of my ideas for experiments, dusting off old equipment and helping me rehearse experiments in advance.”

“My most comedy moment so far? Being told by my year 8 pupils that I look like Miley Cyrus. Not sure if this was a compliment or not?!?”
IOP resources for teachers of physics

Finding your own materials can be a minefield. But the Institute of Physics has all the resources you will need to teach physics at secondary level.

**Supporting Physics Teaching (SPT)**

Whether you have a degree in it or not, teaching physics at school can present unexpected challenges. The Supporting Physics Teaching (SPT) materials are designed to help you to be confident with what you have to teach and to show you how you could teach it. SPT covers the entire physics curriculum for the 11–14 age group and a proportion of the 14–16 curriculum. Explore SPT at [www.supportingphysicsteaching.net](http://www.supportingphysicsteaching.net).

*Student Teacher Affiliates* receive a free USB stick pre-loaded with SPT and TAP.*

---

**Teaching Advanced Physics (TAP)**

TAP offers a comprehensive set of detailed resources to help you to plan lessons for 16–19 year olds. The resources are aimed at those who are new to teaching this age group and don’t assume that you have lots of equipment or advice from experienced colleagues. Adapt the resources to work for you. Download TAP at [www.tap.iop.org](http://www.tap.iop.org).

---

**Practical Physics**

Physics practicals are a vital part of your students’ experiences at school. The *Practical Physics* website describes proven experiments in sufficient detail that they will work in any school laboratory. It also provides notes about teaching and learning, as well as health and safety issues. The site is ideal for teachers who wish to develop their practical craft in physics. Visit [www.practicalphysics.org](http://www.practicalphysics.org).

---

**@TakeOnPhysics**

Our Twitter feed is ideal for new teachers of physics. We use it to share ideas, events and resources: from the best physics apps to the first Vine from space, great demos, puzzles and blogs. Follow @TakeOnPhysics to build your own teacher network and connect with the wider physics community.

---

**Classroom Physics**

Look out for *Classroom Physics* the Institute’s termly magazine for teachers of physics in the schools that you visit. It will keep you informed about the meetings, INSET courses, resources and support that the Institute and other organisations offer to all teachers of physics. It also includes some starter ideas, teaching tips and worksheets, particularly for 11–16-year-old students. You can find it online by searching the IOP website at [www.iop.org](http://www.iop.org).

---

**Physics Education**

*Physics Education* is the Institute’s journal on research into physics pedagogy. It is worth looking at for your ITE coursework and it’s also essential reading throughout your career – keeping up with the latest education research is a powerful way to keep your teaching fresh. View the latest journal online at [www.iopscience.org](http://www.iopscience.org) or check for the journal at your ITE centre.
Help! I’m not a physicist

Never really liked or understood physics when you were at school? Dread the thought of having to teach it?

It’s OK. We know that there are plenty of science graduates starting their teacher-training courses who worry about physics. But don’t be afraid of teaching physics, even if it is not your main science specialism.

You can’t escape the fact that, whatever the subject, you need a good understanding to teach it effectively. But you’re a bright graduate who is teaching teenagers. With a little preparation, you will manage to keep a few pages in front of your class. Many trainees discover that they begin to enjoy physics when they start to get to terms with it and can see how all of the pieces of the jigsaw fit together.

In fact, your lack of specialist knowledge can give you an advantage. When you are new to a topic, you may be able to see the difficulties that students are likely to encounter much more clearly than the physics specialist, to whom the ideas have become second nature. To use the jargon, you may find it easier to “scaffold” the students’ learning or identify the steps needed to gain understanding. There is a real satisfaction to be gained from taking a conceptually demanding idea and teaching it well, especially if the idea was new to you a few days earlier.

Some trainee teachers are nervous about physics practical work and this makes them reluctant to use it in their teaching. Most students enjoy doing hands-on work and you need a variety of activities within a lesson to keep it interesting – any experienced teacher will tell you that visual aids are a vital part of their tool kit. Find out what other people do and try their ideas for yourself. The golden rule is to try out everything before the lesson to make sure that it works. Use www.practicalphysics.org for ideas and advice.

Don’t forget, it does your job prospects no harm at all if you can state on your CV that you are keen and able to teach physics.

Surviving Teaching Practice

As a student teacher, whatever your training route, you will spend the majority of your time in the classroom. Whether you are at the front leading a lesson or at the back observing, this is where you will really learn how to teach.

Make the most of opportunities to observe experienced teachers. It may seem strange advice, but ignore the science because you can learn a lot just from watching. How does he/she:
- engage the class?
- keep them interested?
- modulate his/her voice?
- control behaviour?
- handle transitions?
- emphasise important points?
- use body language?
- assess progress?
- manage materials?
- create a positive learning environment?

You should have the opportunity to observe all of the classes that you will eventually teach, so learn the students’ names and become familiar with their classroom routines. At first, your timetable will be less than 50% of the workload of an NQT. As you gain experience and grow in confidence you will gradually increase the number of classes that you teach until you will be teaching about 75% of the NQT workload. You should be teaching across the ability range, at both Key Stages 3 and Key Stage 4 and teach all three sciences at some level.

You’ll have plenty of support. In the schools you will have a subject mentor and a professional mentor. You will probably work closely with the class teachers as well. Your tutor will pop in a couple of times to give you feedback and advice. Don’t forget to make time to get to know your coursemates or fellow trainees – remember that they’re going through the same experiences as you.

As the weeks in school progress you will find that you experience a rollercoaster of emotions. Sometimes you will feel that you are “probably the best teacher in the world”. At other times you will wonder why you bother. The secret is not to get carried away with your successes and to take your failings on the chin, and bounce up smiling.
Why it’s good to TalkPhysics

As a student teacher there will be many demands on your time. Why add to this by searching through another website?

Teaching physics can be a challenge. But using our community website TalkPhysics can save you time and make your life easier. TalkPhysics brings together teachers, resources, ideas, knowledge and mentoring under one virtual roof.

• SEARCH the existing posts and see what other teachers have said about teaching a topic and what resources they might have uploaded.

• If you don’t find what you need, you can ASK the question and see what comes back. With more than 7500 users, someone will be there to help.

• You can JOIN specific groups that you are interested in. If there isn’t a group for your specific requirements, why not create one?

• We even use TalkPhysics to provide online TRAINING at a time to suit you. This is done in closed groups where we encourage you to join the discussion in a friendly, supportive environment.

So, sign up and have a browse. We guarantee that you’ll never have a blank sheet in front of you when planning a physics lesson.

See how new teachers have been using TalkPhysics. >>

Tom soon discovered he was the only A-level physics teacher at the school where he was doing his employment-based training.

In addition, he found lots of equipment that he didn’t recognise and no usable scheme of work. TalkPhysics members rallied around, asking him to post photos so they could identify kit, sharing their SoWs and telling him how they’d survived similar experiences.

Claire was being observed teaching a lesson on conductors and insulators to a mixed-ability class.

She was looking for activities that would get the class moving around. Her request prompted 21 comments, many the same day, with suggestions for games, some video clips and practical ideas. It also stimulated a discussion on the pros and cons of different models and approaches.

Allwyd had a job interview and had been asked to prepare an hour-long lesson on Newton’s first law and teach the first 20 minutes.

As well as suggestions for activities and clips to use, TalkPhysics users gave him: advice on how to structure a lesson; a warning that some schools block video-hosting sites; and an insight into what the interviewer would be looking for.

See how new teachers have been using TalkPhysics. >>

www.talkphysics.org
To become an IOP Student Teacher Affiliate, simply fill in this form, tear it off, fold and secure, then put it in the post.

<table>
<thead>
<tr>
<th>First name</th>
<th>Surname</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>E-mail address</th>
<th>(please give an e-mail address that will be active beyond your training period)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Telephone number</th>
<th>(please give a telephone number that will be active beyond your training period)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Postal address</th>
<th>(please give an address that will be active for at least one year)</th>
</tr>
</thead>
</table>

**Teacher Training Centre**

<table>
<thead>
<tr>
<th>Route</th>
<th>PGCE</th>
<th>PGDE</th>
<th>School Direct</th>
<th>SCITT</th>
<th>Teach First</th>
<th>SKE</th>
<th>BEd</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Specialism</th>
<th>Physics</th>
<th>Chemistry</th>
<th>Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Physics with Maths</td>
<td>Other (please state)</td>
<td></td>
</tr>
</tbody>
</table>

*England only: If you are specialising in Physics or Physics with Maths, we may be able to match you with a mentor as part of our Stimulating Physics Support scheme. Would you be interested in this?*

<table>
<thead>
<tr>
<th>Start of training</th>
<th>(mm/yy)</th>
</tr>
</thead>
</table>

**Optional**

We are committed to promoting diversity in physics. If you’re happy to help, we’d like to know a bit more about you.

**Gender:** Male ☐ Female ☐ Prefer not to say ☐

**Are you a career changer?** Yes ☐ No ☐ If yes, please specify year of first graduation:

**Ethnic origin:** This question is about the cultural group to which you perceive you belong. The categories are based on those used in the 2011 UK Census.

White British ☐ White Irish ☐ White other ☐ Mixed/Multiple ethnic backgrounds ☐

Asian/Asian British ☐ Black/Black British ☐ Other ethnic group ☐

Prefer not to say ☐

**Do you consider yourself to have a disability?** ☐Yes ☐ No ☐ Prefer not to say ☐

When we receive your application, we will send you a USB stick preloaded with physics-teaching resources. If you have already downloaded the SPT and TAP materials from our website, please tick here ☐ to help reduce our costs.

By completing the details on this registration form, you shall be assumed to give your consent to the Institute of Physics (and other companies in its group, including IOP Publishing Limited) sending you information about its products and services, including, but not limited to, teaching resources, webinar invitations and training courses. We will never sell or rent your e-mail address to third parties.
FREE support for all student science teachers who are Learning to Teach Physics

Application form for Student Teacher Affiliation

Institute of Physics

76 Portland Place
London W1E 4EL

Please secure along this edge

Please fold along this line

BUSINESS REPLY SERVICE

Licence No. S.W.2949

learning to teach physics
Joining the Institute

Membership of the Institute is for everyone who has an interest in physics and its future

• All student science teachers can apply to become a Student Teacher Affiliate. See page 3 and the tear-off form on page 13 for more details.

• If you have a degree in the physical sciences or engineering, you can apply to become an Associate Member of the Institute or, if you have an interest in, but no formal background in, physics, you can become an Affiliate Member. Both will give you access to IOP member benefits, such as publications (e.g. our journal Physics Education (see page 7) and our international physics magazine Physics World), career advice, regional networks and discounted rates at meetings.

• If you are interested in subscribing to Physics World, join up as an IOPimember.

For more details about joining the Institute, visit www.iop.org/membership.

The Institute of Physics is a leading scientific society. We are a charitable organisation with a worldwide membership of more than 50,000, working together to advance physics education, research and application.

We engage with policymakers and the general public to develop awareness and understanding of the value of physics and, through IOP Publishing, we are world leaders in professional scientific communications.

September 2014