

Chartered Science Teacher Register Exemplar Material – Secondary School Teacher

Applications for the Chartered Science Teacher register are completed through the online registration system. Eligibility for the register results from; being a Member or Fellow, holding significant professional experience and responsibility as a teacher, and a minimum of Level 7 qualification in Education or Pedagogy (or demonstrated equivalent expertise).

The CSciTeach application itself predominately focuses on the submission of evidence against the competencies of Chartered Science Teacher. We ask for detailed examples of how you meet the competencies, giving an example from within the past two years of your professional experience.

Although applicants may be eligible for CSciTeach, without a satisfactory application, they are not added to the register at that time, examples of what the competencies require and the expectations for professional background can be seen below:

In **red** are answers which would not be sufficient and in **green** are answers that would be sufficient.

It is important that the examples given show the **impact** that is had on **yourself**, your **students**, your **colleagues** and the **wider science teaching community**. Using exam data, levels of progress made, students feedback and colleagues comments can all contribute to evidence to demonstrate the impact that you have made.

Competencies

A1: Demonstrate a broad and up to date knowledge and understanding of science and wider science curricula related to your teaching.

- I read books and journal articles to keep my subject knowledge up to date. I also watch TV shows on science subjects.
- I have attended courses on the new A level specifications with the examining body.
- In order to ensure that my subject knowledge is up to date I have attended talks hosted by the Royal Society of Biology at events such as the big biology giveaway, which showcases new and emerging research areas within the biosciences. I am then able to give current examples to my students helping to engage them in lessons. This has resulted in greater student involvement and more university applications in this field.
- In November I attended the meeting of the Biology Education Research Group at the Wellcome Trust Sanger Institute, where the day was devoted to addressing genomics and genetics in the national curriculum as when key ideas are introduced and the depth of understanding required in the topic has changed under reforms. Collaboratively we addressed what the main misconceptions were within genomics and genetics alongside potential ways for teaching aspects of the subject. The experience made me reconsider the order in which I would teach genetics topics, and that teaching it from the perspective of how things were discovered in a historical order would not necessarily be the best way of explaining concepts. It was also interesting to consider how the topics are often linked to diseases, and their treatments which is intrinsically of human interest, and it does provide a hook in terms of its importance but it would be good to be able to engage students with wider applications beyond human health. The results my students now achieve in tests on genetics have improved significantly.

A2: Demonstrate a broad and up to date knowledge and understanding of teaching, learning and assessment specifically related to science education.

- I have maintained an up to date knowledge of pedagogical techniques and assessment strategies through in service training within schools which included behaviour management, lesson planning, differentiation, using assessment systems and data analysis.
- Whilst completing the module foundations in science teaching and learning from my Masters in Science Education I took part in seminar sessions where we address different theories of learning along with the impacts of different teaching techniques. I chose to focus my work on the impact of practical work within the classroom, researching the variety of techniques that are used to facilitate practical science. The effectiveness of the different techniques was varied and it made me aware that there can be different purposes for practical work. I had a tendency to use practical work as a tool to demonstrate concepts and ideas within science however did not provide enough opportunities for my students to take part in more open investigations. As the coordinator of key stage 3 I was then able to implement changes in the schemes of work which allowed greater flexibility and time dedicated to investigations, this increased my students' confidence whilst doing practical work and they were better able to understand the steps they had to take when planning, implementing, gathering results and interpreting them. This better understanding of 'scientific method' has enabled more of my students to achieve A* and A grades at GCSE than previously; 2014, 52% compared with 2013, 41%.
- As a science faculty we meet regularly to discuss how we intend to approach certain parts of the curriculum. This is a two-way process where younger staff with fresh ideas, are sharing good practice with more experienced colleagues and vice versa. I attend optional monthly 'Teaching and Learning' meetings at school which allow staff to share good ideas and discuss solutions to problems across all subjects. I frequently employ 'Assessment for Learning' in my lessons and it is embedded in the Science Faculty Handbook which I have produced every year. This has resulted in a much more equal level of performance across the sciences at GCSE and A-level compared with previously.

A3: Demonstrate a knowledge of students and an understanding of the influences on them including developmental, cultural, gender and other contextual factors that might impact on their learning

- I work with students from a range of backgrounds and have taught in boys schools and mixed schools, the situation in a mixed school is different to that of a single sex school.
- Students spend a fair amount of time in school but also the greatest proportion of their time is spent outside it, their home life, cultural background and socio-economic status inevitably can impact on the way in which they learn and attitude towards learning. I worked in areas of London where there was a high level of poverty and needed to be aware that students often did not have time or space to do work at home, so we offered time at lunch times and after school where they can access staff for support and IT facilities to be able to complete work. Several students commented that without this, they would probably not have achieved pass grades at GCSE.
- My school has a strong belief in stretching the most able while supporting the weaker students. At GCSE, I pioneered a 'Core Science' set for the weakest students in Science. They are taught all 3 sciences by a single teacher at a slow pace and their results for the past 5 years have borne out my belief in this route as the pass rate has increased from 78% to 100% over the past three years.
- It was important within certain aspects of biology such as when we were looking at organ systems to be aware that for cultural reasons certain students may not want to participate and alternative activities were devised to try and engage them with the topic. Their parents later told me that they were delighted I had been able to do this and that their children felt more valued.

B1: Demonstrate ability to analyse, evaluate and refine teaching to improve student learning.

- I have been observed and have received a number of outstanding observations, and have developed new book marking strategies which students like and have helped them to progress.
- At my school there is a 'Learning and teaching group' which meets once a month and enables staff to share good practice and new ideas with others. I now use different strategies with certain classes which have resulted in much more consistent levels of involvement within a class.
- Whilst teaching I have been observed by senior colleagues who have given feedback and areas to target for development. I found that being able to establish the progress of all members of the class throughout the lesson could be difficult, so through discussions with my colleagues I decided to use mini plenary activities throughout the lesson which provided indicators of how the class was doing at different points. By more frequently trying to establish the understanding of the class, I was able to adapt my teaching, so that if the students were not understanding the concept we could cover them again, but if they did understand we could progress more quickly. I tried to encourage the students to be independent and identify for themselves the level of understanding that they had, with the ultimate test being that they were to explain concepts to their peers. I used a range of activities including: traffic lighting, students writing their own questions, quick quiz, describing images, students writing a review etc to assess student understanding. By making assessment an integral part of my lessons and not just a summative output I was able to increase the progress of the class and support individuals learning. The KS3 class I initially tried this with all made over 1 level of progress in the year that I taught them, a significant improvement over the previous year (+0.3).

B2: Demonstrate ability to engage students in generating, constructing and testing scientific knowledge by collecting, analysing and evaluating appropriate evidence.

- I use practical work in many lessons, this gives students opportunities to generate their own data and analyse it.
- I believe virtually every science lesson should involve some degree of practical work and have always insisted that every member of my faculty follows this principle. Once young pupils have mastered the basics of a practical class, they can then start to produce hypotheses and devise ways of testing them. I also believe the use of outside speakers and relevant trips outside school help them to appreciate the 'bigger picture' of science. Some years ago I pioneered a special course in 'Statistics for Biologists' at my school which was well received and prepared them for some of the analytical skills needed to successfully negotiate the demand of some A-level practical work. Their overall marks in tests were significantly better as a result of this innovation. It also proved to be good preparation for undergraduate science courses where statistics become an essential tool. Past students have told me that they feel competent with statistics in their undergraduate classes, and discussions with an undergraduate tutor have confirmed that this focus on statistics is exactly what universities need.
- I have always favoured practical work that generates large amounts of data that needs extensive analysis and evaluation so that students appreciate how 'real science' is done. This approach has allowed more of my students to access top grades as shown by the last 4 years' A-level results at my school; every year, more A* grades were achieved in Biology than in any other subject.
- Working with the science museum on a project that looked at means to promote scientific literacy helped me to find ways to ensure that students understood the principles behind how science worked. I found that by encouraging more talk in the classroom, regarding what they were doing, or trying to find out, that in explaining the situation to others, students were better able to explain it to themselves. Students were then able to think through things in a logical order and record their

thoughts. This process enabled the students to write better responses to questions and in exam year groups improve their answers to extended questions.

B3: Demonstrate ability to develop students' confidence and their use of scientific knowledge and processes to understand the world around them.

- Students have gain in confidence over the course of the year. As they progress, they need less scaffolding in the work that they do.
- *The Science Faculty run a weekly science club at lunchtime where topics of interest are discussed and experiments outside the usual curriculum are carried out. This club particularly benefits the 'quiet' children who prefer small group work. One parent told me that her son's attendance at the science club has really brought him 'out of his shell'. I arrange trips for students of various ages to such places as university labs, hospitals, the Royal Society, field trips, zoos and safari parks to enhance their understanding of science in the wider world. We have also had overseas trips to CERN and Cuba. Again, I have received feedback from parents saying how these activities have shown visible positive impact on their children. I believe there is no substitute for hands-on experience (see my Schools Trips article in the appendix) I have arranged for outside speakers to come into school to talk to students about their careers and specialist knowledge. This has also sometimes had a surprising impact on students' enthusiasm and career choices. For example, one student decided to follow a radiotherapy degree course after I invited a hospital technician to give a talk.*
- The level of scaffolding supporting students is reduced throughout the year as their confidence grows. Students learn how to support each other in lessons, playing to their strengths and helping others in their weaker areas, they are also able to identify who they can go to for support, making them more independent overall. I have noticed that there is more discussion in class and that as the students increase in confidence that they use more scientific terminology to explain concepts. The value of this emphasis on allowing students more time for discussion and reflection has been recognized and has now been adopted by the rest of our department.
- I have used examples of science that is happening in the media during my lessons, we took articles and evaluated if the evidence was compelling and tried to decide what it could have been based on, if it was reliable. By debating issues in class students were able to develop critical thinking skills. One of my students recently took part in the regional inter-college debating competition and she told me that her involvement was sparked off by my class debates about biological issues.

B4: Demonstrate ability to implement ways of extending students' understanding of major ideas of science.

- I encourage students to ask questions in lessons which they then have to research as part of their homework to find the answers. By taking students on trips they get to see other areas of science in context.
- As frequently as possible (and as long as the budget allows) I have brought in outside agencies and devoted an entire day for one Year group to conduct a series of exercises devoted to one area of science. Recent examples have included a day on impacts of global warming (Year 8) and one on alternative energies (Year 9). Trips to places as diverse as sand dunes, sewage works and Jodrell Bank have also helped our younger (KS3) pupils to get a feel for real 'science in action'. I believe every student should be exposed to such days as the interest shown is palpable and by carefully creating small groups of mixed ability, all benefit from the experience. The value of the science department's provision of trips was acknowledged in a recent Ofsted report.

C1: Demonstrate ability to contribute to, and take responsibility for leadership, management and development of science teaching.

- I am Head of Biology and have been working in this role for 6 years, prior to this I was the second in charge of the Biology department and a year 8 tutor. I line manage several members of staff.
- As a Head of Science Faculty, I have taken the lead of a team consisting of 4 departments (Biology, Chemistry, Physics and Psychology), 12 teachers and 3 technicians. We meet regularly as departments or faculty to discuss and evaluate progress. I believe it to be essential that all members of the faculty work together and that common policies and targets are strictly followed. Every member contributes to the evolution of policies and teaching/learning. The Head of Science is also responsible for appraisal of the technicians which I found particularly valuable and illuminating. Two technicians became among the first in the country to achieve their RSciTech status and in 2014 one became an MSB and won a runner-up prize in the 'National Science Technician of the Year' competition.
- In my role as key stage 3 co-ordinator I developed new schemes of work and methods for assessing the students in year 7, 8 and 9. As part of this I also produced 'how to' guides for staff and the technicians on the suggested practical activities that could be used during teaching. I presented this approach at a local science teachers' meeting and it has now been taken up by teachers in two other local schools. I ran training with my colleagues to encourage a range of practical work to be incorporated into lessons and looked at how we could make the practical work more open ended. I have been a mentor for both teach first students and PGCE students offering support with lesson planning and resourcing as well as feedback on lessons giving suggestions on how they can develop further. In recognition of the progress our trainee teachers make, our PGCE university partner has asked me to give a talk to new science mentors across the partnership.

C2: Demonstrate ability to work collegially with colleagues and the wider professional community to improve the quality and effectiveness of science education.

- I have collaborated with colleagues to produce our new schemes of work. We host regular training days which other schools attend.
- As Head of Science, I work with colleagues to develop new schemes of work at KS3, GCSE and A-level to constantly improve delivery of all the sciences including the addition of new assessment strategies and suggestions for practical activities to use. I have attended many meetings and conferences over the years and have always believed it vital to feedback new information to colleagues and discuss how we can implement strategies into our regular teaching. For instance, it was apparent that the increasing use of molecular techniques in biology leaves some staff uncomfortable with addressing the wider issues in the class room. I attended a Frontiers Science session on the medical applications of stem cell research an ASE meeting. I was able to bring back the lecture resources which I presented to staff in a lunch time meeting. This stimulated a discussion amongst the science teachers on the relevance of the subject to their area of responsibility.
- I am organising a conference for A-level Biology teachers for June 2015 which will address the genetics content of the new A-level specifications, it will hopefully have 70 teachers in attendance. As part of the conference we have invited staff from the local university to host a Café Scientifique on the Human Genome Project
- I share resources that I have developed on sites such as TES, where they have been downloaded hundreds of times by other teachers. I also use other social media such as you tube to record support for my students but have found that the resources are being used more widely, currently there are over 100 comments on the site. I have contributed and encourage online discussion of the material on the You Tube discussion site and am modifying the material to make it more widely applicable in the light of the comments

D1: Demonstrate ability to enable students to make informed decisions through using a wide variety of strategies, coherent with learning goals, to monitor and assess students' learning and provide effective feedback.

- In line with school policy I marked all my classes books on a two week cycle. I provided feedback which students were then able to ask me about in the following lesson when they received their books back.
- I use a system where, at the end of most pieces of work a student submits, a mark or grade is given along with an indication as to whether that student is on, above or below target. If on or below then a suggestion is written as to what that student must do to improve. This can then be reviewed when the next piece is submitted. The student then produces his/her own chart which displays the progress being made. Once a term, each student then has a mentoring session with the teacher to monitor this progress. When mock exams are taken, a personal comprehensive list is provided for each student to highlight those areas that must be targeted for improvement. The system appears to work as my GCSE students typically have a value-added score of +0.6 grade while my A-level students average +0.5 of a grade.
- When writing feedback in students books I used a pro-forma where they were required to respond to any issues raised or highlighted in their work. I highlighted the generic skill being developed and indicated the next time this would form part of the teaching and learning. This meant that the students re-engaged with the work that they had completed and looked at how they could improve. It was important that they responded to the comments, only 10% of students did not engage with this summative process. I was pleased to see that students are discussing the issues on the online discussion groups with over 30 posts in the week following the activity.
- As key stage 3 coordinator it was my responsibility to track and interpret all of the data for years 7, 8 and 9. Students who were identified as not making the expected progress were targeted for intervention measures such as extra support at lunch times and after school. These students were monitored by their teachers and given specific tasks to help support them and prepare them for their next summative assessment. Of the 24 students identified, 18 are now on track for expected progress.

D2: Demonstrate ability to plan coherent programmes of teaching and learning in science that are intellectually challenging, emotionally supportive and physically safe.

- Every year we review our schemes of work and add in new content. We look at what new changes have been implemented in the syllabus of our exam boards and see if any amendments need to be made.
- Whilst in my role as second in charge of the science department and coordinating the key stage 3 science curriculum I developed new schemes of work for year 9 as a transition from the key stage 3 content towards GCSE. The schemes contained practical work guides that ran alongside it, which I had developed with instructions on how to best do associated practical work, the equipment required and any risks involved. The schemes of work contained a variety of suggestions so that the teachers using them as a guide could select the activities that would be most appropriate for their classes and ways in which outcomes can be differentiated to support all learners. Following this two teachers have developed and implemented a new field work component of the biology teaching, they indicated this was facilitated by the practical component of the schemes of work I had provided.

E1: Demonstrate your commitment to continually maintaining and updating your professional expertise and competence.

- I have attended training in the last year on behaviour management, assessment strategies, child protection and a leadership course. I also have hosted a workshop on practical work in biology where I lead a session.
- I have regularly attended meetings and conferences concerning both advances in Biology and initiatives in teaching. I always cascade the results of such meetings on to colleagues. I believe that keeping myself in touch with advances allows me to inspire my students as evidenced by the large take-up of Biology at A-level (more than any other subject in most years) and the excellent results (nearly always 100% pass and value-added approx. +0.5).
- Over the past 4 years I have been completing my masters in science education and in the past year I finished my research based thesis on how enrichment activities can have an affective impact on students' attitudes towards science. I conducted the research at the school which I used to work at and interviewed groups of students and members of staff about extra-curricular activities that the students took part in if they felt it influenced students' attitudes and engagement with science. The results of the sample of students and teachers that were interviewed and surveyed suggested that there was a positive relationship and that the use of certain enrichment activities may influence student attitudes. Results from the research and the interviews and surveys were fed back to the school, this included information about which enrichment activities students wanted to do more of and that they found the most engaging and interesting. In particular students mentioned placement visits, so we have taken advantage of masterclasses at the local university where the year 12 Biology students attended a session on research addressing antimicrobial resistance. The feedback should help the school to ensure that it targets its extra-curricular enrichment provision appropriately covering areas which both teachers and students feel are beneficial.

Career Overview / professional background

To be awarded CSciTeach you need to have a minimum of four years' experience of teaching science following QTS (or equivalent) of which two should involve an appropriate level of responsibility. This can include leadership through coordinating a course, developing new schemes of work, resources for new courses, mentoring colleagues or coordinating training and professional development of others.

For those teachers who do not have QTS (e.g teachers in HE, teachers in the independent sector or those working in other settings) you will normally need six years relevant and demonstrable experience. If you do not have a Masters degree in education or pedagogy you can demonstrate skills and experience that have been gained through professional practice.

Important! For each entry, you should include sufficient details to allow assessors to validate your professional background with regard to your application. It is particularly important that you describe carefully the scope of your role and your responsibilities. Make sure to also include your current position in the list.