

THE LEARNED SOCIETIES' GROUP ON STEM EDUCATION

c/o 22–26 George Street, EDINBURGH, EH2 2PQ • t: +44 (0)131 240 5006

e: dtuhtar@these.org.uk

Ms Clare Adamson MSP
Convener
Education and Skills Committee
M4.10
The Scottish Parliament
EDINBURGH
EH99 1SP

27 January 2020

Dear Ms Adamson MSP

Scottish Parliament Education and Skills Committee inquiry on recruiting and training new teachers

I write to you as Chair of the Learned Societies' Group on Scottish STEM (Science, Technology, Engineering, and Mathematics) Education (the LSG). The LSG brings together the learned societies and professional associations to identify and promote priorities for STEM education in Scotland. The LSG comprises the: Association for Science Education; British Computer Society, The Chartered Institute for IT; Edinburgh Mathematical Society; Institute of Physics; Royal Society of Biology; Royal Society of Chemistry; Royal Society of Edinburgh; and the Scottish Mathematical Council. While all of these organisations are individually active in their own right, the LSG provides a forum for them to come together to discuss and take action on shared interests and concerns.

The LSG commented on the importance of teacher recruitment and training in building STEM capacity across the education sector in its response to the Education and Skills Committee's inquiry into Teacher Workforce Planning in 2017.¹ We would be pleased to discuss further our response with members of the Education and Skills Committee.

The available evidence suggests that specialist teachers in several of the STEM subjects are becoming increasingly scarce and that student teacher intake figures for the STEM subjects regularly fall short of the annual targets. For example, the number of dedicated Computing teachers in secondary schools fell

¹ Teacher Workforce Planning for Scotland's Schools: A Response from the Learned Societies' Group on STEM Education to the Scottish Parliament's Education and Skills Committee. (2017, April). Retrieved from Learned Societies' Group website: <https://www.rse.org.uk/policy/standing-committees/learned-societies-group/>

by over 22% between 2008 (766) and 2018 (595) and the number of specialist Chemistry, Physics, and Mathematics teachers have also declined over this period.² It has also been reported that these same subjects are among the subjects with the lowest teacher replenishment rates.³ This scarcity can be compounded by factors such as rurality, remoteness, and deprivation. Similar concerns exist regarding the extent to which new teachers enter the classroom prepared to teach the STEM subjects, with primary school teachers in particular reporting low confidence in their ability to teach engineering, science, and technology.

While we understand the present inquiry is concerned with gauging progress made in implementing the recommendations arising from the last inquiry, our response largely seeks to reaffirm our previous positions which we believe remain relevant. We have organised these according to themes for ease of reading.

Recruitment

1. In recent years around 18 **alternative routes** into teaching have been introduced across Scotland, many of which are seeking to expedite the recruitment of specialist teachers in the STEM subjects. The Scottish Government has recently undertaken an initial evaluation of the new routes into teaching. This shows an overall retention rate of 83% although this varies from route to route and some of the routes have small intakes.⁴ The routes should be **regularly evaluated** to assess the extent to which individually and collectively they are addressing teacher shortages and offering value for investment. On the basis of evaluation, some routes may need to be modified or discontinued. We welcome the fact that the evaluation of the alternative routes has taken account of both the intake and completion figures. The LSG has consistently commented on the need for teacher workforce planning to be underpinned by accurate data, especially the collection of data on the number of ITE entrants that complete their courses and enter the teaching profession, and not only the ITE intake figures.
2. In recent years, Scotland's **education landscape has been characterised by significant and continuing change** which has at times generated unfavourable press and political coverage as well as concern among teachers who do not believe they were adequately consulted in this process of reform. This has perhaps given the impression that teaching as a profession is in a state of flux and so may be a less stable and rewarding career option than it once was. In addition, some graduates in the STEM subjects may be hesitant to choose teaching over other careers due to **concerns about salary**, particularly compared to the technology sector. In reality, the pay gap between teaching and roles within the technology industry is less than might be perceived as salaries for the latter can vary significantly. Another issue affecting recruitment is the fact that graduates in the STEM subjects may not even be aware that teaching could be a viable career option for them. This is supported by research undertaken by Judy Robertson from

² Scottish Government. (2018). Teacher Census 2018. Retrieved from:

<https://www2.gov.scot/Topics/Statistics/Browse/School-Education/teachcensuppdata/teasup2018>

³ Teacher Workforce Planning Advisory Group. (2013). Report of the Teacher Workforce Planning Working Group. Retrieved from: <http://www.gtcs.org.uk/web/files/about-gtcs/dual-reg-consultation-report-of-the-twpwg.pdf>

⁴ Scottish Government. (2019). Evaluation of Alternative Routes into Teaching. Prepared for the Strategic Board for Teacher Education. Retrieved from: <https://www.gov.scot/publications/strategic-board-for-teacher-education-minutes-september-2019/>

the University of Edinburgh⁵, which found that while 44% of students interviewed had positive feelings towards a career in teaching computer science, this option was not promoted when the students were making choices about their future careers. It therefore becomes important to **champion teaching as a career** at the undergraduate level and earlier, as well as dispel misconceptions about salary disparities between teaching and other STEM careers. Fundamentally, prospective teachers need assurances that their work will be valued and fairly rewarded.

3. While **bursaries** or ‘golden hellos’ may succeed in attracting more applicants, the long-term impact of these measures on teacher retention is less clear. Bursaries and similar financial incentives need to be coupled with longer-term interventions to ensure those who take advantage of them enter and are retained in the teaching profession.
4. Indeed, in the context of teacher workforce planning, **retention** is a crucial but often overlooked aspect. It is also an area where more data needs to be systematically collected on the number of teachers leaving the profession in Scotland and their reasons for doing so. While some candidates may need little to no encouragement to enrol in teacher education, this enthusiasm may start to wane when they find themselves faced with the more challenging realities of the profession, including workload issues and limited opportunities for both career and salary progression as well as for subject-specific professional development. These factors, among others, may regrettably result in teachers leaving the profession.
5. If the issue of low retention is to be remedied, the above factors must be satisfactorily addressed, such as by ensuring that school structures are compatible with career mobility and by ensuring that teachers are able to access subject-specific career-long professional learning. In 2019, the Independent Panel on Career Pathways for Teachers published its final report.⁶ This makes important recommendations for developing new career progression pathways with a view to retaining excellent teachers. The panel recommended that its recommendations be implemented by August 2021.

Teacher Education and Professional Learning

1. The LSG has previously called for more stringent minimum entry requirements (i.e. at least one SCQF level 5 qualification in science) to be instated across ITE to provide a more solid foundation from which teacher candidates can develop their STEM knowledge, particularly in a primary setting.
2. A 36-week Post Graduate Diploma in Education (PGDE) offers too limited a period of time in which to cover the basics of pedagogical knowledge, subject matter knowledge, pedagogical content knowledge, and contextual knowledge. This is particularly the case for primary school teachers who may possess very little subject-specific knowledge in the STEM subjects and so are less likely to be able to teach these subjects confidently. Equally, newly qualified teachers should have a firm grasp of the pedagogical concepts required to teach their subject effectively. To that end, we would wish to see an increased emphasis on students gaining good subject matter and pedagogical content knowledge in both primary and secondary ITE courses in the

⁵ Robertson, J. (2019). Towards a Sustainable Solution to the Shortage of Computing Teachers in Scotland. Retrieved from:

https://www.research.ed.ac.uk/portal/files/118843218/CS_Teachers_Research_Executive_Summary.pdf

⁶ Independent Panel on Career Pathways for Teachers. (2019). Final report. Retrieved from: <https://www.gov.scot/publications/independent-panel-career-pathways-teachers-final-report/>

STEM subjects, with an understanding that the acquisition of such knowledge is a continuous process that should regularly be revisited throughout a teacher's career.

3. Subject-specific mentoring arrangements fulfil the dual function of enabling both the mentor and the mentee to engage in professional development. In this respect, mentoring is an efficient way of broadening the reach of career long professional learning (CLPL) opportunities, allowing teachers across different career stages to learn from one another. The literature also shows that mentoring and coaching satisfies many of the elements of effective professional learning, namely:
 - a. a structured, collaborative approach based on problem-solving and enquiry;
 - b. an explicit focus on a specific subject area;
 - c. being embedded in the context of the mentee/coachee;
 - d. a focus on improving the teaching of the mentee/coachee and the learning of their pupils
 - e. sustained over time with opportunities for reflection and experimentation in the classroom.^{7,8,9,10,11}

Teachers themselves have confirmed they value collaborative, job-embedded, subject-specific professional learning.¹² To that end, the LSG is strongly in favour of a greater emphasis being placed on subject-specific mentoring and coaching.

4. Although ITE represents an integral stage in a teacher's journey towards becoming a skilled and confident educator, it is far from the only teacher education a teacher should undertake. Research indicates that it takes a teacher an average of seven years to reach the proficient stage with some never progressing past this stage to become experts. However, effective subject-specific CLPL can help to make this progression through to expert more likely.¹³
5. Adequate and frequent professional learning can have a positive impact on retention.¹⁴ The more opportunities for subject-specific CLPL a teacher is given, the better equipped they will be to exercise their judgement and overcome professional challenges. In short, subject-specific CLPL enables teachers to become more resourceful, resilient, and empowered, all of which have a positive impact on career longevity.

⁷ Cordingley, P., Higgins, S., Greany, T., Buckler, N., Coles-Jordan, D., Crisp, B., Saunders, L., Coe, R. (2015). *Developing Great Teaching: Lessons from the international reviews into effective professional development*. London: Teacher Development Trust.

⁸ CUREE. (2018). *Developing Great Subject Teaching: Rapid Evidence Review of Subject-Specific CPD in the UK*. London: Wellcome Trust.

⁹ Kennedy, M.M. (2016). How Does Professional Development Improve Teaching?, *86*(4), 945-980. <https://doi.org/10.3102/0034654315626800>

¹⁰ Timperley, H. (2008). *Teacher Professional Learning and Development*. Brussels: IBE.

¹¹ Weston, D., & Bethan, H. (2019). Professional development: Evidence of what works. In C. Scutt & S. Harrison (Eds.), *Teacher CPD: International trends, opportunities and challenges* (pp.60-67). London: Chartered College of Teachers: Chartered College of Teachers.

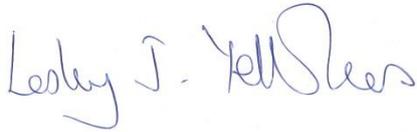
¹² Allen, R., & Sims, S. (2017). *Improving Science Teacher Retention: do National STEM Learning Network professional development courses keep science teachers in the classroom?* London: Wellcome Trust.

¹³ Berliner, D.C. (2004). Expert Teachers: Their Characteristics, Development and Accomplishments. Retrieved from: https://www.researchgate.net/publication/255666969_Expert_Teachers_Their_Characteristics_Development_and_Accomplishments

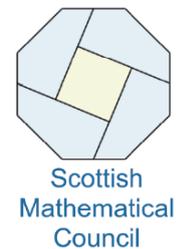
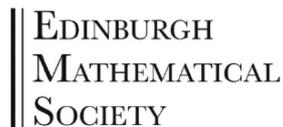
¹⁴ Allen, R., & Sims, S. (2017). *Improving Science Teacher Retention: do National STEM Learning Network professional development courses keep science teachers in the classroom?* London: Wellcome Trust.

I hope you have found our contribution to the inquiry useful. We would be pleased to discuss our response further should you consider that productive. To that end, we would be grateful if you could follow up with the LSG's secretary, Daria Tuhtar, dtuhtar@therse.org.uk, 0131 240 5006

Yours sincerely,



Professor Lesley Yellowlees CBE FRSE
Chair of the Learned Societies Group



The Association for Science Education is Registered Charity No. 313123
British Computer Society is Registered Charity No. 292786
The Edinburgh Mathematical Society is Registered Charity No. SC000241 (Scotland)
The Institute of Physics is Registered Charity No. 293851 (England & Wales) and SC040092 (Scotland)
The Royal Society of Biology is Registered Charity No. 277981
The Royal Society of Chemistry is Registered Charity No. 207890
The Royal Society of Edinburgh is Registered Charity No. SC000470 (Scotland)