

# LSG



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## The Learned Societies' Group on STEM Education

Professor Louise Hayward  
Chair of the Independent Assessment Commission

13 January 2023

Dear Professor Hayward

### **Learned Societies' Group on Scottish STEM Education response to the independent review of qualifications and assessment phase two consultation (preferred options)**

1. I write to you as Chair of the Learned Societies' Group on Scottish STEM (Science, Technology, Engineering, and Mathematics) Education (the LSG). Formed in 2012, the LSG identifies and promotes priorities for STEM teaching and learning in Scotland. Its constituent societies include: the Association for Science Education (ASE); BCS, The Chartered Institute for IT; Edinburgh Mathematical Society (EMS); Institution for Engineering and Technology (IET); Institute of Physics (IOP); Royal Society of Biology (RSB); Royal Society of Chemistry (RSC); Royal Society of Edinburgh (RSE; secretariat); and Scottish Mathematical Council (SMC).<sup>1</sup>
2. The LSG welcomed the announcement of an independent review into qualifications and assessment to complement and inform the other strands of education reform currently taking place, including the national discussion on education. It is important that the qualifications and assessment system keeps pace with these simultaneous reforms to ensure that changes are being implemented holistically and in an integrated fashion. **Irrespective of the form it takes, the qualifications and**

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<sup>1</sup> *Learned Societies' Group on Scottish STEM Education*. Royal Society of Edinburgh. (2022, September 7). Retrieved January 11, 2023, from <https://rse.org.uk/about-us/governance/standing-committees/learned-societies-group/>

**assessment system should be fit-for-purpose and reflective of the modern context to ensure learners can fairly demonstrate their attainment and readily apply this achievement to a variety of progression pathways and destinations.**

3. Recognising that the preferred assessment and qualification model may vary by subject, our response instead provides high-level and shared views – as they pertain to STEM teaching and learning – on the qualifications and assessment system as a whole. However, **we would stress the value of engaging with the individual subject-specific societies in order to inform delivery** (specifically during the third phase of the review, which will cover the practical implications of the preferred option). The learned societies have access to extensive membership and teaching networks and can feed in subject-specific concerns and advice to shape the development of assessment and qualifications as well as the curriculum, helping to ensure that approaches are realistic and workable from a STEM teaching and learning perspective. **The LSG is happy to offer assistance to the review in this respect and looks forward to further engagement with the Independent Review Group (IRG) as the review enters phase three.**
4. We were fortunate to participate in a virtual evidence-gathering session with Dr Edward Sosu of the Independent Review Group (IRG)<sup>2</sup> and Kirsty Anderson, Secretariat to the review, in early November 2022. The majority of our comments draw from this discussion and from previous responses to the OECD review of Curriculum for Excellence (CfE)<sup>3</sup>, the Muir review<sup>4</sup>, and other relevant consultations. We present all of our points in response to question 9 ('Is there anything else in relation to the reform of qualifications and assessment which is not covered in this consultation that you would like to raise?'), for the reasons described in the preceding paragraph.

**Question 9: Is there anything else in relation to the reform of qualifications and assessment which is not covered in this consultation which you would like to raise?**

#### **Articulating and realising the purpose of assessment and qualifications**

5. Teachers' time and efforts have been drawn away from improving formative assessment and diagnostic questioning towards summative assessment of National Qualifications and assessment for accountability purposes. While some may say there is currently too much assessment taking place in Scottish schools, the issue is arguably not so much the quantity of assessment but the purpose of that assessment, with insufficient focus being placed on assessments which will inform

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<sup>2</sup> *Independent Review of qualifications and assessment*. Scottish Government. (n.d.). Retrieved January 11, 2023, from <https://www.gov.scot/groups/independent-review-of-qualifications-and-assessment/>

<sup>3</sup> *Learned Societies' Group response to the OECD Review of Curriculum for Excellence*. Royal Society of Edinburgh. (2022, April 5). Retrieved January 11, 2023, from <https://rse.org.uk/expert-advice/learned-societies-group-response-to-the-oecd-review-of-curriculum-for-excellence/>

<sup>4</sup> *Learned Societies' Group response to Professor Ken Muir's education reform consultation*. Royal Society of Edinburgh. (2022, April 5). Retrieved January 11, 2023, from <https://rse.org.uk/expert-advice/learned-societies-group-response-to-professor-ken-muir-education-reform-consultation/>

teaching and learning. **Qualifications developed should therefore support teachers in planning for good learning.** We consider that this includes:

- planning a good progression in learning, ensuring that conceptual understanding and skills such as in practical work are built up over time;
- ensuring that learners are able to make links between the various conceptual areas of the subject; and
- ensuring that learners are able to make links between conceptual areas of a subject and real-world phenomena and applications

### **Curriculum, assessment, and qualifications as an integrated whole**

6. It is necessary to develop the curriculum with a clear initial view of the outcomes and assessments to which it leads in order to ensure coherence across the system. **A continued focus on, and ongoing changes to, the assessment of National Qualifications diverts secondary teachers' attention, time, and resources towards reverse engineering the curriculum to align with the assessment.** As we stated in our response to the OECD review, it is very unfortunate that assessment developments drove CfE reforms when the original intentions of CfE were focused on transforming learning and teaching through strengthening teacher agency in curriculum development, rather than on reforming qualifications.

### **Practical laboratory work**

7. As a collection of scientific societies, we are inherently interested in the role of **practical laboratory work** in assessments and qualifications. **It is critical that any assessment of practical skills is fit-for-purpose and provides a genuine measure of a learner's competency in practical techniques, rather than focusing too heavily on written outputs.** The introduction of assignments in N5 gave learners a chance to demonstrate initiative and learn practical skills, and thus were initially welcomed. However, in practice, the majority are centred on desk-based study followed by the production of a written report. Assignments across different National Qualification courses also follow a similar design and can therefore be repetitive rather than adding value to a pupil's learning. Therefore, the time requirement might be more usefully directed to other learning and teaching activities, including alternative opportunities for practical work.
8. **The fact that learners cannot be presented for National Qualification courses in the absence of these assignments (which by design must be undertaken in a classroom or college setting) could also present challenges to career changers and others wishing to independently work towards these qualifications through self-directed study.**

### **Building teacher capacity**

9. **If the preferred option includes a greater emphasis on teacher-led assessment, there will be a need for corresponding capacity building in this regard.** As the LSG noted in its response to the Muir review, some teachers are more confident than others in their assessment capabilities, and it will be important to ensure that all

teachers are supported in developing this skill, particularly if assessment moves further into the classroom and a wider range of assessment options is introduced. This will also give rise to good quality debate about more fundamental aspects of teaching and learning. Our response to the Muir review also reflected on the OECD's recommendation of a strengthened 'middle' (through networks and collaboratives among schools, and in and across local authorities) to facilitate the implementation of national directives at the local level, and we noted the need to invest in professional learning and capacity building that would bolster this middle level to improve the capability of the system overall.

### **The perceived relative difficulty of the STEM subjects**

10. Concerns have been raised about assessments in their present form, including assessment burdens on pupils and teachers, and impacts on student uptake of certain courses. Recent 'simplifications' to National Qualifications removed the assessment of units but resulted in the lengthening of examinations in many subjects, including in STEM – in some cases surpassing the length of university exams for these same subjects – and the introduction of examinations in subjects which previously did not have them (e.g. Practical Electronics). This has perhaps affected the perceived relative difficulty of different subjects, often impacting negatively on the STEM subjects in particular. **There is scope to consider how the current system may prejudice against the pursuit of certain subjects, and what can be done to facilitate learners' participation in these subjects without compromising the integrity or quality of assessments and qualifications.** This reiterates the importance of a fit-for-purpose system that makes space for different approaches tailored to the nature and needs of the corresponding subject as well as the learner.

### **The need for improved data**

11. Scotland's commitment to sweeping educational reform will be hamstrung unless it is founded on comprehensive, current, and accessible data to give an adequate picture of the current baseline and to diagnose areas for improvement. This is particularly important in light of the Scottish Government's initiative to close the poverty-related attainment gap and broader equity considerations. For example, data from the APPG on Diversity and Inclusion in STEM shows that 65% of the UK's STEM workforce continues to be comprised of white men while women, certain ethnic minorities, people with disabilities, and those from disadvantaged backgrounds continue to be underrepresented, implying they are either not making it into (or are lost from) the STEM 'pipeline' at an earlier stage.<sup>5</sup> However, as the LSG remarked in its response to the Scottish Government's consultation on enhanced data collection for educational improvement, there is little data on how different groups are engaging

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<sup>5</sup> *Diversity and inclusion in STEM*. UK Parliament. (n.d.). Retrieved January 11, 2023, from <https://committees.parliament.uk/work/1639/diversity-in-stem/>

with the STEM subjects at the school level.<sup>6</sup> **Until this data becomes readily and publicly available, it is impossible to gauge the uptake of qualifications across different groups and their respective attainment levels, which in turn makes it difficult to design the most appropriate policy responses to address these challenges and improve outcomes for these groups.** The learned societies have different campaigns aimed at eliminating biases in STEM and increasing uptake of the STEM subjects across markers of gender, socioeconomic status, ethnicity, and other factors.

12. We hope the preceding sections have been informative. If you would find it useful, the LSG would be pleased to meet with you to discuss our positions in more detail and the part we can play in both the independent review and in the education reform agenda more generally. To this end, if you wish to follow up, please contact LSG Secretariat, Daria Tuhtar, at [dtuhtar@these.org.uk](mailto:dtuhtar@these.org.uk).

Yours sincerely,

A handwritten signature in black ink that reads "Martin Hendry". The signature is written in a cursive style with a large, sweeping flourish at the end of the name.

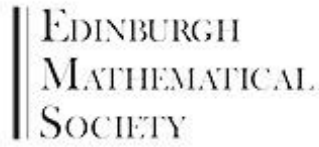
Professor Martin Hendry MBE FRSE  
Chair of the Learned Societies' Group on Scottish STEM Education

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<sup>6</sup> LSG: *Enhanced data collection for educational improvement*. Royal Society of Edinburgh. (2022, October 6). Retrieved January 11, 2023, from <https://rse.org.uk/expert-advice/lsg-enhanced-data-collection-for-educational-improvement/>



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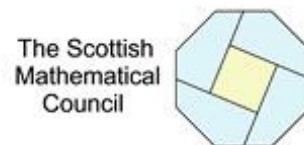
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