

Response ID ANON-H53J-UCYG-J

Submitted to **A STEM Education and Training Strategy for Scotland**

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About You

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Are you responding as an individual or an organisation?

Organisation

What is your organisation?

Organisation:

Wellcome Trust

The Scottish Government would like your permission to publish your consultation response. Please indicate your publishing preference:

Publish response with name

We will share your response internally with other Scottish Government policy teams who may be addressing the issues you discuss. They may wish to contact you again in the future, but we require your permission to do so. Are you content for Scottish Government to contact you again in relation to this consultation exercise?

Yes

Questions

1 Do you agree with the definition provided of STEM for the purposes of this Strategy?

Yes

Do you agree with the definition provided of STEM for the purposes of this Strategy?:

2 Do you think the aims of this Strategy and the four priority themes are the right ones to address the challenges identified?

Yes

Do you think the aims of this Strategy and the four priority themes are the right ones to address the challenges identified?:

- We agree with the two stated aims of the Strategy. The first aim could better emphasise the importance of equipping young people and adults with STEM knowledge and skills for their everyday lives as science-literate, informed citizens (which is broader than a focus on attainment and aspiration).
- We agree with the four priorities listed. The 'Connection' priority could be widened beyond linking education and training with the labour market to emphasise the relevance of STEM to everyday lives. Young people and adults should be made aware of STEM's role in the world around them. Success under this priority shouldn't be evaluated solely on whether they subsequently pursue STEM-related careers.
- Considering this Strategy in a wider context, we note that the Education Scotland National Improvement Framework – and the advice on its implementation (Education Scotland, Driving Excellence and Equity: Advice on School Improvement Planning 2017/18) – has a strong focus on raising attainment in literacy and numeracy. Our concern is that this focus can force schools into a narrow curriculum, at the expense of the sciences. There have been reports of this happening in England and it should be avoided in Scotland.

3 Are these success criteria right?

No

If not, tell us what criteria we should use instead.:

- It is difficult to assess how these success criteria will be accurately measured due to the lack of detail provided, in particular the first two.
- Bullet 3 (improved gender balance) and bullet 4 (wide range of STEM pathways) could potentially be in conflict. Some evidence suggests that the availability of

a wider range of courses can exacerbate inequalities (e.g. Henderson et al, Social Class, Gender and Ethnic Differences in Subjects Taken at Age 14 (Institute of Education, UCL, London, Working Paper 2016). There is a danger that bullet 4 could influence activity, rather than function as a measure of evaluation, and this should be guarded against.

4 Do you think the scope of the Strategy is right? Tell us if you think it should exclude something or include anything else. For example, should it include training and development that employers provide for their workforce?

Do you think the scope of the Strategy is right? Tell us if you think it should exclude something or include anything else. For example, should it include training and development that employers provide for their workforce?:

- We agree with the importance placed on focusing on early years, primary and families. Evidence indicates that in addition to the development of key skills and knowledge, stereotypes, perceptions and aspirations about jobs and science are already forming at this early age. See for example, Archer et al, *Aspires: science and career aspirations: age 10-14* (KCL, London, 2013)

- At primary school level, we recommend a benchmark of two hours per week dedicated to learning science (as distinct from studying mathematics)

5 Give us your views on whether you think the actions already underway across the sectors on STEM fit well with the Strategy and will contribute positively to it.

Give us your views on whether you think the actions already underway across the sectors on STEM fit well with the Strategy and will contribute positively to it.:

- Wellcome contributes funding to STEM ambassadors in Scotland and to the STEM insight programme, based in Glasgow, which offers staff in schools and colleges a unique chance to experience STEM-related work in industrial or university settings. These initiatives will fit well with the proposed Strategy and its objectives of linking education with careers, and inspiring young people in Scotland to see the value of STEM education and potentially pursue a career in a related field.

- Wellcome is launching a UK-wide Primary science campaign, Explorify (<https://explorify.wellcome.ac.uk/>), which aims to transform primary science. We recognise the importance of high quality science education at this stage of a young person's life, and this programme of work fits well with the Strategy's emphasis on early years and primary level.

- Wellcome contributes funding to SSERC (Scottish, Schools, Education, Research, Centre) through the UK-wide Project ENTHUSE. The proposed Strategy should make more of exploiting their expertise, existing networks and good quality CPD provision.

6 Tell us about activity currently ongoing – either included in this document or not – that you think could be adapted or stopped and why.

Tell us about activity currently ongoing – either included in this document or not – that you think could be adapted or stopped and why.:

7 Do you agree with the principles set out for implementation?

Not Answered

Do you agree with the principles set out for implementation?:

- An important principle that should be included in the Strategy is the use of evidence wherever possible. There is a growing evidence base of what works in education and policies and interventions should draw on it. Interventions and programmes that aim to meet the objectives of the Strategy should be tested and piloted on a small-scale before being rolled out nationally. For example, some of the findings from the Education Endowment Foundation's extensive work in England could be piloted in Scotland and adapted to local needs if it proves to be effective.

- The first principle is of vital importance. Reference to 'a shortage of STEM skills' lacks specificity. There are some fields of work which fall under STEM that are not experiencing a shortage of candidates. There needs to be a clearer picture of where and in what sectors Scotland's specific shortages are. This information would be useful for young people, teachers, careers advisors, training providers, employers and others.

- The second principle assumes that simplification and streamlining will automatically result in greater efficiency and value for money. While we agree with those aims, evidence should be used on a case-by-case basis to assess whether any simplification and/or streamlining is indeed likely to result in greater efficiency and value for money.

- We agree with the third principle.

8 What else should Government do to ensure a more coherent approach and maximise impact?

What else should Government do to ensure a more coherent approach and maximise impact?:

- Government should ensure effective coordination wherever possible by having an accurate overview of all activity in this area, both inside and outside publicly-funded programmes.

- We note that SSERC are mentioned only once in this consultation (and are not included in the list of 'partners' on page 19) but they are an important part of Scotland's STEM education infrastructure. They are the major provider of STEM CPD in Scotland. Independent evaluations have found strong evidence of the effectiveness and impact of their programmes (see for example, SSERC's Support for Science Education in Scotland through CPD. External Evaluation Final Report (Scottish Centre for Research in Education (SCRE), University of Glasgow, 2011). We would anticipate that they would be a key delivery agent of the new STEM strategy.

- Having a comprehensive overview of STEM education support from government, industry, charitable foundations and professional bodies would help avoid counter-productive activity, unnecessary duplication, and confusion amongst users and supporters. It would also assist in the identification of potential areas for

simplification and/or streamlining.

9 Overall, do you think this Strategy is clear and action focused? Do you think that the actions that we propose to take nationally will achieve the aims and intended outcomes?

Overall, do you think this Strategy is clear and action focused? Do you think that the actions that we propose to take nationally will achieve the aims and intended outcomes?:

- The consultation asks whether the proposed actions, taken nationally, will achieve the aims and intended outcomes stated. This should be assessed and then monitored using evidence (of successful pilots at a local level, similar initiatives in Scotland or internationally, and educational research literature). Similar pilots and initiatives, especially international ones, will need to be tailored to the needs of specific groups. The gathering and use of evidence to understand what works best in education is vitally important. We reiterate that this should be a guiding principle of the Strategy (see answer to Q7).
- Under the 'Excellence' heading: initial teacher education programmes – especially at primary level – should focus on STEM knowledge and skills and, crucially, transforming these into effective teaching.
- Practical work is an essential component of science education. It provides context to the theory and equips young people with the key scientific skills they need to thrive in a fast-changing world. Extended research projects can be highly motivating and provide students with a deeper learning experience about practical science, and also develop many transferable skills such as time management and communication (Bennett et al, Young Researchers: A rapid evidence review of practical independent research projects in science (Wellcome, London, 2016)). The proposed Strategy should be more explicit about the quality and quantity of practical work that young people in Scotland can expect to experience and opportunities for project work.
- Recent research has suggested that there may be a need to ensure that sufficient resources are available for practical work. More heads of science in Scotland were dissatisfied with the sufficiency of equipment and consumables in their school and reported that it impacted on their choice of practical work compared with their counterparts in England (initial data from an as yet unpublished three-year longitudinal study by the University of Durham commissioned by Gatsby with funding from Wellcome).
- We anticipate that the 'expected benchmarks' (in STEM subjects) for each level of the Curriculum for Excellence will have considerable influence on the quality of science education in schools. We note these expected benchmarks for STEM subjects (except mathematics) have not yet been published.
- Under the 'Inspiration' heading: a higher quality STEM education may indeed inspire more young people and adults to continue their studies to obtain higher order skills. However, an additional – and equally important – aim is to equip Scotland's young people and adults with crucial science knowledge and skills for their everyday lives. Not everyone will want to pursue a career in a STEM-related field, and it should be clear to young people that studying a STEM subject keeps their options open, develops highly sought after transferable skills, and does not commit them to pursuing a career in science.

10 Will this Strategy improve equity of outcomes? If not, tell us what else it should include, in particular for women and girls and other groups of people – disabled people, care leavers and minority ethnic communities.

Not Answered

Will this Strategy improve equity of outcomes? If not, tell us what else it should include, in particular for women and girls and other groups of people – disabled people, care leavers and minority ethnic communities.:

- Evidence suggests that gender biases occur early in a young person's life (see for example, Archer et al, Aspires: science and career aspirations: age 10-14 (KCL/ESRC/TISME, London, 2013); Institute of Physics, Opening Doors: A guide to good practice in countering gender stereotyping in schools (IoP, London, 2015) Addressing these should start as early as possible and target all parties who might influence a young person, including parents, families and teachers.
- There should be a strong emphasis on raising awareness of and combatting the role of unconscious bias amongst all those who work with young people.
- The term 'STEM' comprises multiple subjects. Each of these subjects will have its own challenges in terms of how different people [including young people and teachers] view it and how it is presented. Any interventions must reflect this.
- The Strategy proposes to focus on gender and deprivation in particular. Reference to the evidence and rationale for this decision would help stakeholders and other actors who might wish to contribute to the Strategy's goals assess where best they might focus their work. Wellcome, in partnership with Department for Education, the Department for Business, Energy and Industrial Strategy and the Royal Society, will be publishing a survey of science education in England which uncovers a nuanced picture of drivers and barriers around equity. We imagine that many of these factors (or variations of them) will exist in Scotland. Different groups and communities will require different actions, including but not limited to raising awareness of STEM careers, educational and career expectations, self-confidence, work experience opportunities and attainment.

11 What could schools, colleges, universities, community learning and development, the voluntary sector, science engagement providers and museums do to support the areas for action?

What could schools, colleges, universities, community learning and development, the voluntary sector, science engagement providers and museums do to support the areas for action?:

- Every organisation will have its own priorities and programmes of work and activities. It is important for the Scottish Government to have a comprehensive overview of STEM education support from government, industry, charitable foundations and professional bodies and ensure effective coordination of activities wherever possible. This would avoid confusion amongst users and unnecessary duplication of activity amongst stakeholders.
- The Strategy could propose how this coordination and oversight will work. This coordinating role would also be in a position to disseminate evidence on what works and local needs to inform the work of non-governmental actors.

12 What could professional organisations and bodies and third sector organisations do to support the areas for action? This includes, in particular, the General Teaching Council for Scotland, the CLD Standards Council, the teaching unions and representatives and the Learned Societies.

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- The Scottish Government should ensure effective coordination wherever possible by having an accurate overview of all activity in this area, both inside and outside publicly-funded programmes.
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13 What more could science centres and festivals do to complement and enhance STEM formal education, to inspire scientists of the future, and to ensure their activities support those of the Scottish Government and its agencies?

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14 Should this Strategy identify more actions for particular sectors, for example in relation to workplace and work-based training and development? Please make suggestions on what these actions could be.

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- The Scottish Government should ensure effective coordination wherever possible by having an accurate overview of all activity in this area, both inside and outside publicly-funded programmes. We would suggest convening a group of stakeholders to discuss how their work could complement the Strategy and help drive it forward.

15 Tell us what you think about this Improvement Framework. How can we best ensure uptake of this Framework in early years learning settings, schools and clusters?

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16 Tell us what you think of our proposal for developing a model of collaboration between schools, colleges, universities and employers. How should we now take this forward?

Tell us what you think of our proposal for developing a model of collaboration between schools, colleges, universities and employers. How should we now take this forward?:

- We support the fostering of mutually beneficial relationships between schools, colleges, universities and employers. We believe models of collaboration should be developed based on evidence of what works, and remain sufficiently flexible to be tailored to the distinctive members of the cluster and local need. However, existing networks should be utilised first, to avoid needlessly creating relatively similar ones, which could lead to duplication and confusion.
- SSERC, which Wellcome funds through the Enthuse partnership, have extensive experience in bringing together clusters of schools for more effective CPD (see for example, Lowden et al, Evaluation of the SSERC Primary Cluster Programme in Science and Technology (University of Glasgow, Glasgow, 2015). They also have experience in linking schools with universities and colleges, and should be a key partner in taking forward this area of activity.

17 Tell us what you think of our proposals for a Scottish STEM ambassador network. How should we now take that forward?

Tell us what you think of our proposals for a Scottish STEM ambassador network. How should we now take that forward?:

- We support the stated aim of improving links between schools and the private, public and third sectors. However, introducing a new 'Scottish STEM ambassador network' alongside the existing STEM ambassador network presents a serious risk of unnecessary duplication and confusion.
- The existing STEM ambassadors are proven to raise engagement and aspirations amongst young people (see for example, STEM Learning, STEM ambassadors: making an impact <https://www.stem.org.uk/sites/default/files/pages/downloads/STEM-Ambassadors-impact-report.pdf>). The report also highlights the importance of ensuring that young people can relate to the STEM ambassadors they engage with (by recruiting female ambassadors for example).

- SSERC currently manages three STEM ambassador Hubs in Scotland, on behalf of the National STEM Learning Centre.

- Far more detail must be presented on the differences between the proposed 'Scottish STEM ambassador network' and the existing UK-wide STEM ambassador programme before creating what currently appears to be a very similar if not identical scheme.

18 What other groups, organisations or people need to be involved in delivery of this strategy?

What other groups, organisations or people need to be involved in delivery of this strategy?:

- As noted above, SSERC is the major provider of high quality STEM CPD in Scotland, in partnership with universities, professional bodies, employers and education organisations. It also has extensive experience in connecting schools with colleges and universities. Its experience, national reach (as a shared service of all 32 Scottish Local Authorities), and the links that it already has with other stakeholders, should be harnessed to ensure the strategy is delivered as effectively as possible.

19 Tell us about what you are doing in your organisation, establishment or community that supports the aims and priorities of this Strategy.

Tell us about what you are doing in your organisation, establishment or community that supports the aims and priorities of this Strategy.:

- Wellcome is a funder of SSERC, the major provider of high quality STEM CPD in Scotland. They are also responsible for the management of three STEM ambassador Hubs in Scotland.

- We are launching Explorify, a UK-wide campaign to transform the quality of science education in primary schools.

- We are partnering with the Gatsby Foundation on a project conducted by the University of Durham to survey the provision of practical science in Scotland (and across the UK). This is part of our wider evidence-building work.

20 What could employers do to attract and retain more diverse STEM talent?

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Evaluation

Please help us improve our consultations by answering the questions below. (Responses to the evaluation will not be published.)

Matrix 1 - How satisfied were you with this consultation?:

Very satisfied

Please enter comments here.:

We assume this evaluation refers to the process of consultation and not the content of the Strategy itself. The consultation and supporting documents were easy to find on the website, the consultation questions were clear, and there was sufficient time provided (between publication and deadline).

Matrix 1 - How would you rate your satisfaction with using this platform (Citizen Space) to respond to this consultation?:

Very satisfied

Please enter comments here.: