A STEM Education and Training Strategy for Scotland

The Open University in Scotland response to the Scottish Government consultation

Background

The Scottish Government consulted on its approach to the delivery of STEM education in Scotland. What follows is The OU response to those questions to which we thought we could usefully contribute, as submitted via https://consult.scotland.gov.uk.

1. Do you agree with the definition of STEM for the purposes of this strategy?

- For the sake of consistency and with the comparability and portability of evaluation and measurement in mind, it may be useful to note the definitions of STEM used by the Scottish Funding Council and the Higher Education Statistics Authority and the implications these have on how Scottish Higher Education Institutions report on the uptake of STEM subjects.
- Reference to ‘computing science’ could be broadened to simply ‘computing’, which would be a more inclusive approach. Although we acknowledge the critical importance of digital skills, we are not clear why these are singled out in this context.
- Acknowledging the link between engineering and design may be beneficial.

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

- We welcome and support these aims, both of which seem appropriate.
- In terms of the four themes, we wonder if ‘connection’ could be more usefully presented as ‘relevance’, and believe that ‘equity’ should specifically reference access.

3. Are these success criteria right? If not, tell us what criteria we should use instead.

- We would advocate the use of measurable outcomes, alongside baseline data for comparison.

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?

- The strategy should include employer-led training and development, and we welcome the suggestion that work-based learning is in scope.
  It may be possible to make a link between this activity and the flexible skills fund announced towards the end of 2016.
- Care should be taken to ensure that support is available to young people aged 11-14 as this is a critical time in terms of subject choice, and also to all learners who are transitioning between different episodes of learning.

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.
• There are many examples of good practice going on across STEM education, including activity undertaken by The OU. For example, two of the five most popular modules taken by students via our Young Applicants in Schools Scheme (which allows S6 pupils to study at degree level, building their study skills and confidence) are STEM subjects: ‘Molecules, medicines and drugs: a chemical story’ and ‘Galaxies, stars and planets’.

• We undertake knowledge exchange activity to make our research and knowledge and understanding more accessible to the public. For example, late last year, some of our space science academics teamed up with Dynamic Earth in Edinburgh to give family-friendly talks, demonstrations, and show examples of their work to visitors to the venue over the course of a weekend.

• The Open Science laboratory is an online laboratory which allows authentic and rigorous investigations to be conducted using real data. Accessible by students at other institutions and by the general public alike, the laboratory seeks to make practical science learning and teaching available globally.

• ‘Returning to STEM’, a free online course, has been produced by The OU to help people who wish to return to work in the field of STEM after having taken a break for any reason, including caring for family or redundancy.

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

• We do not have any specific examples of activity that could be adapted or stopped but we would encourage the principle of collaboration and partnership to be a critical element of STEM educational activity.

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

• It is not immediately apparent how the principles, outcomes and priorities link together. Could these flow more clearly into one another?

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

• There may be value in developing an evaluation and measurement framework which goes beyond Key Performance Indicators and includes qualitative measures. It is also important to be clear about what purpose the data is to be collected for. How will learners’ progress be tracked?

• We must think about barriers to STEM education in the broadest sense in order to be able to develop solutions which will overcome them. For example, how do we ensure equitable access for, and take-up by, people in the context of different needs relating to gender, disability, care experience and rurality?

9. Overall, do you think this strategy is clear and action-focused? Do you think the actions that we propose to take nationally will achieve the aims and intended outcomes?
Many of the actions identified in the strategy seem to be positive steps, but it may be that, as noted above, clearer linkages between principles, outcomes and priorities would enhance the fluency of the strategy.

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

- Equity of outcome relies on equity of access, which in turn requires different and flexible modes of learning to be available and accessible to learners in different circumstances and with different needs.
- The OU provides flexible, supported distance learning. In Scotland, just over 40% of our 15,000 students study STEM subjects and, of those, 46% are female. In respect of the YASS modules mentioned above, 72% of the 129 students studying ‘Molecules, medicines and drugs’ and 43% of the 80 students studying ‘Galaxies, stars and planets’ are female.
- A fifth of our students (20%) have a disability, and almost a quarter (24%) live in a remote or rural area. We account for a disproportionately high number of students who declare themselves as care leavers across the Scottish sector, which may suggest that for this group – as with many others – access to (STEM) higher education must be available later in life, and not just immediately upon leaving school. Different people choose or need to enter higher education at different points in their lives.
- Last year we ran our first Women in Engineering conference to celebrate National Women in Engineering day. We intend to run this annually to contribute to improving the gender balance in engineering.
- eSTEeM, our centre for STEM pedagogy, works to promote innovation in our STEM teaching and scholarship and is currently undertaking a project to understand why we are experiencing low numbers of women opting to take our main computing degree. While this project is yet to conclude, it may be that female learners could be incentivised to study STEM subjects via formal channels.

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

- Collaboration and partnership between different kinds of STEM education providers, whether formal or informal, is critical. Improved articulation between colleges and universities is a key aspect of widening access to degree-level STEM study.
- Knowledge exchange activity and informal provision, while it may not always be measurable in formal terms, can serve to allow an individual to make their first step towards pursuing an interest in STEM. The OU has a long-standing partnership with the BBC which sees the commissioning and broadcast of a variety of STEM-related radio and television programmes, designed to have widespread appeal and to provide an initial pathway into informal learning for those who might be interested in finding out more.
- There is a need to support those who can influence the decisions made by, and understanding of, young people. We need to make sure parents are well-informed or know where to go to get relevant information on STEM education. Equally, teachers should be supported with STEM-related CPD activity.
Local collaboration can play a vital role, such as that undertaken by the Fife STEM partnership.

12. What could professional organisations and bodies and this sector organisations do to support the areas for action? This includes, in particular, the General Teaching Council for Scotland, the Standards Council for Community Learning and Development for Scotland, the teaching unions and representatives, and the learned societies

- All of these organisations can and should work to support their members and stakeholders to understand the issues around the decisions young people have to make in relation to their learning, the barriers to choosing STEM subjects, and provide tools and information to help encourage young people into STEM subject.
- However, there is a need to be mindful of competing demands on individuals which may lead to disengagement. Promotion of STEM learning and teaching should be coordinated to minimise this risk.

13. What more could science centres and festivals do to complement and enhance formal STEM education, to inspire scientists of the future, and to ensure their activities support those of the Scottish Government and its agencies?

- As mentioned in response to question five, knowledge exchange activity and partnerships with formal learning providers helps make STEM knowledge and research more accessible, offers insight into STEM career pathways and provides tangible role models with experience of making the choices faced by young people and people seeking to enter STEM subjects later on. Science centres and festivals should actively seek to work in partnership with formal STEM learning providers to create more opportunities for the public to engage with these issues.

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

- The changing demands of our economy suggest that school-leavers alone will not be able to fill all the vacancies of the future. It is therefore essential that access to lifelong learning and flexible learning opportunities is available to older learners and those in work. Businesses, particularly small businesses, should be supported to develop their staff, and programmes such as the recently announced flexible skills fund are a welcome step in this direction.
- Consideration must also be given to how graduate-level apprenticeships can support the STEM sector and provide an alternative route into not just STEM education but STEM-related employment.
- The OU works with many employers to upskill their workforce. For example, our partnership with Unite the Union and Rolls-Royce at their Inchinnan plant currently has more than 30 employees studying for professional and personal development, many in engineering and related subjects. The project offers demonstrable benefits to both employer and employee alike.
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?

- As mentioned in relation to question eleven, teacher CPD is a crucial aspect of supporting young people to make decisions in relation to STEM subjects. Several elements of our flexible provision may be suitable for this purpose and we would welcome the opportunity to further explore that possibility.
- Collaboration between different learning providers – such as universities and schools – can help to deliver the improvement framework.

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

- Collaboration between schools, colleges, universities and employers is essential to progressing this agenda. The OU has credit and articulation agreements in place with all of Scotland’s colleges (outside the UHI network), and has developed a ‘campus-based’ model (which allows HND students to complete their degree with The OU in the familiar surroundings of their college) with six colleges. This model focuses on social science provision at present.
- Our YASS scheme, highlighted in response to question five, allows hundreds of students from all over Scotland to undertake degree-level STEM study while at school.
- It should be noted that there is a risk to developing models of collaboration which rely wholly on local geography and partners. That raises issues in terms of rural settings and also points to the possibility of excluding non-geographic providers (such as The OU) which can contribute across all of Scotland.

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

- Some provision of this type already exists – for example, Stemnet STEM ambassadors, a network of volunteers which operates across the UK, including in Scotland, and with which many Scottish academics and other STEM professionals are involved. There may be a risk that industry may feel overwhelmed by multiple requests for similar types of support, and there could be a knock on effect on existing activity in terms of resource.

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

- Besides formal and informal STEM learning providers, teachers and parents need to be targeted in particular. However, Scotland’s skills and enterprise agencies have a role to play, as do business representative organisations.
- The Wakeham review of STEM degree provision and graduate employability, recently conducted on behalf of the UK Government’s Department for Business, Innovation and Skills (as was) and the Higher Education Funding Council for England may also be of interest.

19. Tell us about what you’re doing in your organisation, establishment or community that supports the aims and priorities of this strategy
Much of this activity has already been mentioned, particular in response to questions five and eleven. The OU is one of the world’s largest providers of free informal learning, with many thousands of hours of learning material, including STEM learning material, available on our OpenLearn and FutureLearn platforms. This is available directly to learners but can also be utilised by other providers and organisations to support their learners, clients, or stakeholders. In particular, we have already drawn attention to our STEM returners course at question five, but we have dozens of other relevant free courses including simple coding and maths basics.

Our work with the BBC to co-produce education programmes attracts millions of viewers and listeners every year. Our knowledge exchange activities include seminars, lectures and workshops as well as collaboration with science festivals and centres.

The OU has particular research, teaching and operational expertise in space science and is involved in many current European Space Agency missions. Space science is one of our designated priority strategic research areas.

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

- Employers should first and foremost avoid stereotypes and seek to be as inclusive as possible in their recruitment activities.
- They should ensure that their learning and development activities and relevant policies are inclusive and do not, for example, inadvertently bring in gender bias in their promotion of STEM roles and training.
- They must also make sure that they offer a mix of learning and development opportunities, offering their staff flexibility to suit different learning needs.

For more information

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