

Board Meeting

Date of Meeting	Monday 06 October 2014
Paper Title	Innovative and Creative Curriculum Partnerships
Agenda Item	5
Paper Number	BM3-C
Responsible Officer	Maureen McKenna, Director of Education, Glasgow City Council
Status	Disclosable
Action	To endorse the proposed approach

Innovative and Creative Curriculum Partnerships

Science, technology, engineering and mathematics

1. Vision

- 1.1** Through an ambitious partnership approach, we will design, develop, establish and sustain an innovative and global facing educational *Hub*, to support the development of Glasgow’s future STEM workforce, its leaders and its innovators.
- 1.2** Building on the substantial STEM legacy created in the city in previous generation through the Allan Glen’s School, The STEM *Hub*¹ will be the focal point for STEM curricular development and delivery across the city and, by extension, nationally. It will operate as a ‘Knowledge Hub’ for industry, research and practical study for young people in Glasgow schools to work with and gain experience of innovative, cutting edge practice already in existence across labs and businesses already operating in Glasgow. It will create clear academic and employment pathways for young people linking to the many partners in the city who already deliver STEM programmes and courses.
- 1.3** The *Hub* will be Glasgow’s principle response and leading development in creating the skills-mix and industry knowledge our young people need to steer their own STEM-based career. The *Hub* will give young Glaswegians the edge in a competitive global field by providing them with access to industry experts and qualifications best suited to the rapidly evolving STEM environment.
- 1.4** It will also provide “proof of concept” for a potentially far-wider network of Hubs designed to service key sectors in Glasgow and offer the potential for greater involvement of university partners throughout the Glasgow Region.

¹ The final name for the Hub will be agreed at a later date.

2. Background Research

- 2.1 *'Gaps in cognitive skills of boys and girls around age 15 are similar across countries: boys perform better than girls in mathematics in most countries, and girls outperform boys in reading in all countries. In terms of science literacy, there are no significant gender differences. But young women are much less likely than young men to choose Science, Technology, Engineering, or Mathematics (STEM) as field of study at graduate level; the share of women in these fields further declines at the post-graduate level.'*

Gender differences in educational choices appear to be related to student attitudes (motivation, interest) in studying a particular subject rather than their ability and school performance. Gender gaps in performance are smaller than gender gaps in fields of tertiary study, indicating that young women often do not translate their good school performance into field of studies for higher education that offer better employment prospects, such as STEM studies. Furthermore, even when women complete STEM studies they are less likely than men to work in these sectors. While it is difficult to separate innate and learned behaviours and to assess the influence of stereotypes, the effect of this gender imbalance is very clear. It hinders women's careers, it lowers their future earnings levels and deprives OECD economies of a source of talent and innovation. It is also an inefficient use of investment in education.'

Report on the Gender Initiative: Gender Equality in Education, Employment and Entrepreneurship; OECD (2011)

- 2.2 *'Universities are being strongly encouraged to promote access via more flexible and non-traditional routes, with the establishment of 'articulation hubs' linking colleges and universities around Scotland (ref) and the creation of pathways through college Higher National qualifications into second/third year at university. However, only about 3,600 students per year follow this learning pathway. Students are largely still making traditional choices, along well-trodden pathways of progression, driven perhaps by financial constraints and concerns about poor employment prospects.'*

'The narrow STEM discipline base of Scotland's secondary education system and in particular the restricted choice of SQA STEM qualifications provide obstacles to fast-tracking by able students if they do not yet have the appropriate subject knowledge to bypass first year at university in science disciplines that are not available at the senior level in schools. This same obstacle also restricts learners' awareness of the wide STEM subject choice available at universities and the diversity of subsequent STEM career pathways. While changes of subject choice are easily accommodated within the broad and flexible four year Scottish degree, as students become more aware of other STEM subjects and wider career opportunities, this becomes much harder to accommodate within three-year degrees. There are real and significant financial costs attached to wrong degree subject choice that can be ill-afforded by students and their parents and by universities. One solution to these problems is to make available a wider choice of (one-year) STEM Highers at sixth year to provide senior learners with a wider and more realistic perspective of STEM in higher education and in the world of work and at the same time to address the restricted STEM subject choice now available in the Senior Phase. The proposal for a

revised UCAS 'post-qualification application' (PQA) system currently under discussion would also support more flexible and 'aware' pathways.'

Supporting Scotland's STEM Education and Culture – Science and Engineering Education Advisory Group - Second Report 2012

- 2.3** There is no shortage of research evidence such as the above two reports which show that there is a need to encourage more young people, particularly girls, to take STEM subjects on school, college or university.
- 2.4** In addition, the Wood Commission published in 2014 recommended that 'A focus on STEM should sit at the heart of the development of Scotland's Young Workforce' (recommendation 12). The Wood Commission also recommended that 'Businesses across Scotland should be encouraged and supported to enter into 3-5 year partnerships with secondary schools. Every secondary school in Scotland and its feeder primaries should be supported by at least one business in a long-term partnership'.
- 2.5** This policy and research background provide a compelling case for the development of a centre of excellence for STEM in Glasgow building on the already strong partnerships between Education Services, Glasgow City Council, the three colleges in the city and the universities. The growing business partnerships among colleges, schools and universities will allow us to introduce more employer-led learning within both a school and college setting.

3. The Partners

- 3.1** The key partners involved in realising the STEM Hub will be:
- Allan Glen's Trust;
 - Glasgow City Council;
 - Glasgow's three colleges in terms of design and input; and City of Glasgow College in terms of the host location;
 - Scottish Funding Council;
 - The three city-based universities; and
 - Glasgow Chamber of Commerce and business / research leaders from across Glasgow based, micro, small, medium, large and global STEM industries
- 3.2** Each of the partners will have clearly defined roles within the development and will work interdependently to achieve an agreed set of outcomes based around the following areas of work:
- Accreditation;
 - Business-led curriculum design;
 - Academic and employment pathways;
 - Research;
 - Income generation/funding to improve sustainability and strengthen employer engagement; and

- Inclusion

4. Proposal

- 4.1** The proposal is to develop an innovative and creative *Knowledge Hub* for STEM. This would be based in one of the new City of Glasgow College buildings, opening in 2015/2016, in the city centre – Cathedral Street or Riverside Campus. The *Hub* would provide a unique opportunity for Glasgow City Council, Colleges, Scottish Funding Council and Allan Glen’s Trust to work together to develop an innovative and creative centre for STEM.
- 4.2** Accommodation would consist of office space and flexible learning areas and would be supported by an industry grade digital infrastructure. Access to specialist facilities would be in schools, colleges and Strathclyde University, building on the already successful Engineering Academy developed by the University to support young people into both Modern Apprenticeships and Higher National qualifications with the ultimate goal of accessing degree provision. The *Knowledge Hub* would thus develop improved and new pathways for young people to STEM courses in colleges and universities. The *Hub* would develop and build business partnerships which would inspire young people to learn more and understand better the potential career pathways in STEM. Employers would lead learning ensuring that the education being delivered was industry standard and geared towards future areas of economic growth.
- 4.3** The young people would be drawn initially from all city schools with a target age group of 14 to 18. The *Hub* would also provide high quality staff development for teachers and lecturers.

5. Potential pathways

- 5.1** The three examples given below are illustrative only.
- 5.2** A pupil in S2 as part of her school based science topic, along with the rest of her class has a range of science based challenges to complete. The development officer from the *Hub* works with the class in school, supported by a member of staff from Glasgow Science Centre. As part of their topic they visit the Innovation and Technology Centre at Strathclyde University and work with a STEM business, including a visit to their premises.
- 5.3** A pupil embarking on the senior phase (S4 to S6) having participated in the taster technology sessions offered by the *Hub*. This involved participating in a technology challenge, sponsored by a large engineering company based in the city, in the *Hub*. The challenge was introduced by the business partner and employees worked with the young people in the *Hub*. The pupil is now more interested in a STEM career and is choosing between the curricular options of a flexible twilight study one year NC or a two year HNC programme. These programmes have been designed in partnership with a STEM employer, such as Scottish Water. The programme involves study in college and work-based learning, including extended work experience during the school holidays. These programmes allow the pupil to gain qualifications in other subjects in school, which enables him to keep his options open. The school-based element also allows him to

benefit from the pastoral support offered by the school, particularly around health and wellbeing.

5.4 A pupil going into S6 has developed an interest in a STEM career. She participated in the taster technology sessions offered by the *Hub* when she was in S3 but kept her choices open through choosing a broad range of subjects, including two sciences in S4. In S5, she was still unclear about her career choices but chose to continue with two sciences and mathematics as part of her five Higher choices. During S5, she participated in the STEM career programmes offered at the *Hub* which were led by businesses, such as NHS. She found these sessions really helpful as it allowed her to understand more clearly the range of options available to her through engaging directly with employers and undertaking research on science topics relevant to industry. The *Hub* offered these sessions as twilight options as young people were concerned that they might miss important classwork if they were held during the day. During S5, she also participated in the universities' widening access programme. Now in S6, she is confident that she would like a career in STEM so she is undertaking two Advanced Highers, one in school and one in the hub at Glasgow Caledonian University. Through the *Hub's* business partnerships she is also undertaking an extended work experience (a day a week plus more time during the holidays) with a STEM industry company.

6. Staffing

6.1 The *Hub* would initially have four members of staff, three professional with a STEM background and one administrative member of staff.

7. Financial

7.1 The members of staff would be employees of Glasgow City Council or one of the three colleges, seconded to the *Hub*. Having both school and college staff will ensure appropriate curriculum design and delivery is in place with a smoother transition for school pupils moving onto college programmes having participated in Hub activities. One of the professional members of staff will be funded by Glasgow City Council. The other member of professional staff and the administrative staff will be met by funding from the Allan Glen's Trust. The third staff member would hopefully be funded by the Scottish funding Council in partnership with the three colleges. This could be a part-time post. The accommodations costs would be met by City of Glasgow College through their funding from Scottish Funding Council. A resources budget would be provided by Allan Glen's Trust and Glasgow City Council with additional funding drawn from industry links.

Staffing costs			Incl. oncosts
professional member of staff	grade 8 proven	£45,084.94	£55,905.33
professional member of staff	grade 8 proven	£45,084.94	£55,905.33
professional member of staff	Head of Curriculum or equivalent	£45,084.94	£55,905.33

administrative support	grade 5 proven	£24,481.29	£30,356.80
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GCC Total		£55,905.33
SFC maximum		£55,905.33
Allan Glen's Total		£86,262.13

- 7.2** The amount of the resources budget is to be agreed but it would be needed to cover transport costs, materials for taster projects, etc. There would need to be an increased budget for year 1 to allow establishment of equipment, including IT.
- 7.3** Access to college courses would be provided through current school/college partnerships and would involve all three colleges in the Region. Additional provision could be included in the Region Outcome Agreement with Scottish Funding Council. Pathways would link clearly to existing college STEM programmes.
- 7.4** Early engagement with Skills Development Scotland, the Glasgow Economic Leadership Group and the Glasgow Chamber of Commerce would enable the development of strong links with a range of employers to establish work placements, internships and opportunities for employment.