



Abertay Stem Strategy 2017-2020

Document Information

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Abertay STEM Strategy 2017-2020

Preface

Developing STEM (Science, Technology, Engineering and Mathematics) talent and capability is key to achieving the Scottish Government's aim of generating inclusive and sustainable economic growth, placing the Scottish economy at the forefront of the technological frontier¹. The STEM Strategy for Education and Training² aims to support the lifelong learning of STEM skills and grow STEM literacy, as well as promote the development of specialist STEM skills for employment and innovation in the growing and future STEM sectors.

STEM is an integral part of our future economic and social development. In Scotland, STEM-related sectors of the economy have been growing faster than the economy as a whole and this trend is set to continue. So in 2016, there were 963,400 people working in STEM related sectors in Scotland (APS, SIC defined), an increase of 70,500 (8%) from 2010 levels and double the overall increase in employment in the Scottish economy (4%). This represents a 37% share of total employment, higher than the Great Britain average of 32%. However, the Dundee City and Angus region has fewer people in STEM producing occupations (3.5% and 2.6% of the workforce)³ than the rest of Scotland, England and Wales and in Dundee there are more people in STEM dependent occupations than elsewhere (12.6% of the workforce)⁴. Underemployment, unemployment and skills gap issues in Dundee are above the UK national average, whilst the self-employment rate is lower than the UK average. Major growth is predicted for the region within the economic areas of professional (analytics) and support services, media, creative industries, information technology, construction and renewables, as well as in the health care and life sciences sectors. In order to meet demand, the region will need to grow the proportion of the workforce qualified at SQA Level 7 and above from 46% to 60% by 2024. Moreover, replacement of a retiring workforce will represent 94% of new demand⁵.

A highly skilled and well-qualified STEM workforce is crucial to the UK's economic development. Although STEM graduates receive some of the highest salaries of all new recruits, 42% of employers have reported difficulties in recruiting STEM skilled staff (CBI surveys in 2012, 2013 and 2014), particularly for the digital and engineering sectors, an issue corroborated by many professional and sector bodies. Research has also shown that individuals possessing analytical, numerical and problem solving competencies and qualifications are sought after for non-STEM as well as STEM sector jobs⁶.

Our Approach

At Abertay, we educate and train the next generation of scientists, technologists and engineers and we develop their ability to work across fields through interdisciplinary learning and collaborative working. We encourage the development of STEM (including digital) skills within all our graduates and STEM literacy more generally within the regional community. This we do through programmes of education, upskilling and reskilling, research, collaborative innovation and enterprise, outreach and public

¹ <https://www.gov.scot/policies/economic-growth/>

² <https://www.gov.scot/policies/science-and-research/stem-education-training/>

³ STEM Producing: scientists, engineers; STEM Dependent: Doctors, nurses, teachers; STEM Supporting: Technicians, associate professionals; STEM Using: Trades, welding, metal machining, vehicle, and construction.

⁴ ⁵Defining a Regional STEM Strategy for the Dundee and Angus Region: Supporting and Integrated and Coherent STEM Strategy (April 2017)

⁶ Defining a Regional STEM Strategy for the Dundee and Angus Region: Supporting and Integrated and Coherent STEM Strategy (April 2017) AND <https://www.gov.scot/policies/science-and-research/stem-education-training/>

engagement. Our activity is informed by professional body and employer engagement, as well as sectoral, national, and regional strategies and frameworks.

Aims and Outcomes

The Abertay STEM Strategy is aligned with the National STEM Strategy. We will:

1. *enhance the uptake of STEM provision as well as promote increased diversity and equity in participation, attainment and outcomes in STEM study, and engage with the Scottish Government's emerging STEM strategy*
2. *adjust and adapt our curriculum in response to evidence of current and future labour market needs of employers and the economy, particularly in STEM subjects and those of priority (e.g. ICT / digital, screen, and low carbon sectors).*
3. *develop an evolving STEM strategy, linking industry and the curriculum delivered in the region to drive productivity and growth.*

1. Uptake and attainment

Outreach and Public engagement:

Abertay staff and students engage with the external community to promote STEM literacy, engagement and the uptake of provision. For example, we manage and coordinate the Nuffield Research Placements for Scotland (around 100 Placements annually and an associated Celebration Event for around 200 pupils, parents, teachers and academics). We also encourage Nuffield project students to submit for a national CREST award. Abertay manage and coordinate the Dundee Primary Schools Science Week (e.g. in 2018, this involved 2,717 pupils and 227 teachers/accompanying adults), and the Dare Schools Challenge (17 pupils in 2017-18). We led the Royal Academy of Engineering "Ingenious: On the right track" project connecting Engineers involved in the Dundee Waterfront Regeneration to the wider community (1870 school pupils and 79 teachers across 15 primary and 5 secondary schools). Abertay are the founder, partner and funder with Dundee University and Dundee and Angus College, and the administrative base for the Dundee Children's University, a scheme based on a national framework that recognises the voluntary learning that children do (since 2015, 821 children have engaged with the programme). Abertay host and are a partner in the LIFT-OFF programme, which involves working with schools and pupils to improve success rates for college and university participation through a programme of events, the majority of which has involved female academics and role models (68%) engaging with mainly female school pupils (69%).

Abertay provides training and development to staff and students to enhance their ability to engage with children and other stakeholder groups. For example, we deliver an undergraduate elective module (Inspire and Discover, Communicating Science) where undergraduate students from a range of discipline areas develop and deliver inspirational learning activity for Dundee P7 pupils (in 2018 this was delivered to over 300 school pupils). Postgraduate Research Students are trained to develop and deliver STEM activities (through our Abertay PODs - Abertay Public Outreach Development - scheme) to children in schools and the Dundee Primary School Science Week, to help inspire children into science disciplines and professions. We particularly focus delivery to schools in areas of social deprivation. Abertay postgraduate research students and academic staff volunteer and offer career talks for schools, for example through the national STEM Ambassadors Network. Other outreach activities include, subject taster days, Dundee Café Science, Dundee Women in Science Festival, International Women in Engineering day and an annual Christmas Lecture focussed on Cybersecurity. A recent initiative has involved the Professional Masters in Games Development (MProf) students working in collaboration with the V&A Dundee, Gramazio Kohler Research and Master students from the Swiss Federal Institute of Technology in Zurich. The V&A Dundee has commissioned a pioneering robotic construction project being created in Zurich, with Abertay MProf students working collaboratively to develop a virtual platform giving visitors an insight into the design and fabrication process. The project is to be a major component of the *Hello, Robot. Design between Human and Machine* exhibition to be featured at the V&A Dundee in the autumn of 2019.

Abertay outreach and public engagement is intended to raise awareness and facilitate widening participation in STEM, as well as to support engagement between school teachers and the Higher Education sector. Abertay academics deploy their research discovery in schools to impact positively on the STEM education of children. For example, the Educational Impact Cluster research group engage with school teachers to help improve mathematics education through innovation in teaching practice.

Abertay staff and students will continue to engage with the external community to promote STEM literacy, engagement and the uptake of provision.

Diversity and equity in participation and attainment:

Our STEM Strategy is aligned with our Gender Action Plan and Widening Access Strategies. Abertay University is leading the way in widening access to higher education in Scotland. We have implemented the 'access thresholds' recommended by the Commission on Widening Access (CoWA) almost three years ahead of schedule, and we are the only Scottish university to have fully implemented the CoWA recommendations. CoWA recommended that by 2019 all universities should set access thresholds for degree programmes against which learners from the most deprived backgrounds should be assessed. Building on our experience of using 'contextual offers' over many years, Abertay introduced the criteria in November 2016 for the 2017 intake. In 2017, 10% of our entrants received an adjusted offer based on the access thresholds. In developing our access thresholds, we decided that a minimum of three Scottish Highers should be required – rather than the usual requirement of four – subject to an appropriate choice of subjects. We then used our academic judgement to set the access threshold, drawing on our experience of supporting students. For example, a programme normally requiring AABB at Higher has an access threshold of BBB. (The setting of entrance qualifications for our programmes also involves an analysis of potential barriers that might be perceived by either male or female applicants.)

The University's criteria for what constitutes disadvantage goes well beyond simply using Scottish Index of Multiple Deprivation (SIMD) classifications, with a student qualifying if he/she:

- has participated in a recognised access programme
- has spent significant time in care

or has a combination of at least two of the following factors

- attends a school where a low proportion of students progress to higher education
- has parents or guardians who have not previously attended university
- lives in an SIMD20 area

Applicants who met these criteria received an adjusted offer at the access threshold. 8% of our entrants received an adjusted offer in 2018 and 68 students were able to enter Abertay as a result of this offer, as they did not achieve the qualifications required for a standard offer. This approach is based on extensive evidence that universities get the best students by taking into account social and educational backgrounds and reflects our social mission to 'offer transformational opportunities to everyone who has the ability to benefit from Abertay's approach to university education'. 32% of our entrants were from the 40% most deprived postcode areas in 2018. Over a third of Abertay students come to Abertay from college, 88% of whom received full credit for their previous qualification. The benefit of contextual admissions, minimum access thresholds, and widening access activity is that it aims to attract students to Abertay for all programmes – the focus is on removing barriers for all applicants regardless of what they wish to study. We also apply our approach to access thresholds to the Scottish Wider Access Programmes (SWAP), and Higher National Programmes (HNC/HND).

Abertay also offers its own part time, evening Access to Higher Education at Abertay Dundee (AHEAD) programme aimed at those who have been out of education for 3 years. Each year, we aim to admit 40 students. 61% of the students on the programme in 2017-18 progressed onto (mostly STEM-affiliated) Abertay degree programmes in 2018-19 (the majority of the remaining 39% that did complete went on to attend programmes at other HEIs). More than two-thirds of AHEAD students are drawn from the local community, more than a quarter come from the most deprived quintile of the Scottish population and 10% identify as BME. (BME population for Dundee City is 6% and much lower in the neighbouring local authorities (DCC, 2015⁷)). Just over a third (37%) of enrolments are men. In general, higher completion rates are noted for female students.

⁷ *About Dundee*. Dundee Partnership. DCC KL/8/15 Retrieved from <http://www.dundeepartnership.co.uk/sites/default/files/About%20Dundee%202015.pdf>

We monitor the gender balance profile of our undergraduate intake every year and are addressing imbalances through the actions set out in our [Gender Action Plan](#) and developed through our participation in the ECU project “Attracting diversity: equality in student recruitment in Scottish HEIs”. The latter focused on four subject areas: computing, computer games art and design, sport and food innovation, but we monitor the full range of subjects through our institutional planning processes.

Our dedicated Widening Access and College Recruitment Officer undertakes an extensive range of recruitment activities aimed at encouraging applications from non-traditional learners. They play a crucial role in raising the aspirations and awareness of groups currently under-represented in higher education, taking responsibility for the marketing and recruitment of our Access to Higher Education (AHEAD) programme, as well as organising and delivering information and taster sessions to inform and inspire school, college and adult returners in the wider community to study at Abertay. Abertay works closely with Colleges to streamline the learner journey for STEM students in the region by creating and promoting clearer learning, transition and employability pathways. We have articulation arrangements in place with all colleges in the region. We have extensive articulation links with Colleges across Scotland that are regularly reviewed, working collaboratively to enhance and align our curriculum provision; for example, all Abertay STEM programmes offer articulation from Dundee and Angus College courses. We also hold a Clearing Advice Fair with Dundee and Angus and Fife Colleges where we discuss and offer routes into Abertay degrees. Currently, one third of our students articulated from College. Abertay has established specific ‘Progression Arrangements’ with Dundee and Angus and Fife Colleges, where students on truly articulated programmes are guaranteed a place at Abertay. Our staff build a relationship with these students as they go through their HNC/ HND programmes thereby facilitating successful articulation and attainment.

Abertay will enhance the uptake of STEM provision and promote increased diversity and equity in participation and study outcomes, through targeted marketing campaigns, cooperation with Colleges, support for applicants and contextualised offers.

In 2017-18, 52% of our Scotland-domiciled undergraduate entrants were to STEM courses and we aim to maintain at least 50% over the period of the outcome agreement.

2. Curriculum design: responding to labour market needs and technological developments

STEM skills for all:

Abertay are committed to the provision of STEM education and to developing a skilled STEM workforce aligned to industry demand. Two-thirds of our current undergraduate programmes are STEM. We provide our graduates with the skills that employers need, and instil an educational underpinning that will permit the flexibility required to respond to inevitable changes that will occur in labour market demand. Horizon scanning ensures that new and emerging technology areas of economic growth are developed, and that the curriculum is refreshed to support employer needs and learner expectations. We embed the development of relevant STEM knowledge and skills within all our students on all our programmes. So for example, all students including those reading non-STEM subjects, are required to interpret and analyse data and information, solve problems, critically evaluate, experiment, and explore the impact of new technologies, knowledge and understanding, on their chosen field. We are focussed on improving the data and digital capabilities of all our students as such skills cut across all sectors, and are increasingly important. We engage with the Digital Skills Partnership Scotland to ensure that our education provision is aligned to changing skills requirements and the pace of change within the digital economy, as well as to meet the increasing demand for people with world class advanced skills in computing and specialist roles. This will help reduce digital exclusion in an increasingly digital economy- the so-called “fourth industrial revolution”.

Informed curriculum design:

Abertay is committed to developing STEM provision that is applied in nature, frequently with a professional practice focus. We develop and constantly adapt our curriculum in response to evidence of current and future labour market needs, feedback from employers, and guidance from professional bodies. We add value to our provision by ensuring that the majority of our STEM programmes are professionally accredited (when appropriate). We shape our evolving and responsive curriculum by

seeking industrial liaison guidance during programme development and review, and respond to sector and regional trend data such as Sector and Regional Skills Investment Plans⁸.

Employability and enterprise:

Gaining exposure to, or experience of, a professional working environment can provide invaluable insights into the world of work and can help prepare students for employment post degree. Abertay offers a range of added value 'placement' opportunities: integrated work placements; research or work placement opportunities; preparation for professional practice and industry informed and/or mentored projects; and workplace simulations. We aim to offer every student the opportunity to undertake work experience as part of their degree programme. We encourage the development of enterprise skills, an intrapreneurial mindset, links with key services and agencies, and engagement with national innovation competitions, through access to our new Bell Street Ventures enterprise hub. Our endeavour to improve business and enterprise skills within our graduates should help to encourage self-employment, business start-up and innovation in the region.

Abertay will adjust and adapt its STEM offer and curriculum in response to evidence of current and future labour market needs and the economy.

3. Curriculum design for the region

Abertay STEM provision is designed to serve both national⁹ and regional¹⁰ priorities and to build capacity by providing contextualised learning provision aligned to support industry demand, employer needs, the economy and local community. Regional priorities include construction, ICT/ digital innovation including software development and cyber, energy, food and drink, engineering, the creative industries, human health and social care, and tourism services. This will involve upskilling and reskilling our workforce to take advantage of new employment opportunities and to fill existing and projected vacancies across the public and private sectors.

Our approach to research and knowledge exchange (RKE), as expressed within our interdisciplinary strategy (R-LINCS: Research-Led Innovation Nodes for Contemporary Society), involves working collaboratively and with stakeholders to provide innovative solutions, drive development of new research and subject areas, and strengthen disciplines through cross-fertilisation. Our activity ensures that both our undergraduate and postgraduate teaching are informed by research excellence and knowledge exchange. Our approach offers regional impact: it has helped shape innovative curriculum development and co-design, as well as drive economic growth through new employment opportunities locally and into the future.

We will engage with opportunities made available through the UKRI (e.g. InGame) and the Tay Cities Deal (e.g. the Cyberquarter), to build capacity within the STEM workforce, leadership and research base to support economic growth, scientific and technological innovation, creativity and increased productivity within key regional industry sectors.

We are committed to expanding STEM opportunities through the Graduate Apprenticeship model (as opportunities become available) to ensure Scotland's labour market meets both our current and future needs.

Abertay will develop an evolving STEM strategy, linking industry and the curriculum delivered in the region to drive productivity and growth.

⁸ <https://www.skillsdevelopmentscotland.co.uk/what-we-do/skills-planning/skills-investment-plans/>;
<https://www.skillsdevelopmentscotland.co.uk/media/44063/angus-la.pdf>;
<https://www.skillsdevelopmentscotland.co.uk/media/44978/tayside-summary-report.pdf>;
<https://www.skillsdevelopmentscotland.co.uk/media/44969/fife-summary-report.pdf>;
<file:///C:/Users/N510634/Downloads/00526537.pdf>

⁹ <https://www.gov.scot/policies/economic-growth/>

¹⁰ <https://www.skillsdevelopmentscotland.co.uk/what-we-do/skills-planning/skills-investment-plans/> ;
<https://www.taycities.co.uk/>